California Energy Commission

COMMISSION REPORT

Electric Program Investment Charge 2016 Annual Report

California Energy Commission

Edmund G. Brown Jr., Governor

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California Energy Commission

Angela Gould, Lead
Gina Barkalow
Primary Authors

Jesselyn Rosales
Project Manager

Aleecia Gutierrez
Manager
ENERGY GENERATION RESEARCH OFFICE

Laurie ten Hope
Deputy Director
RESEARCH AND DEVELOPMENT DIVISION

Robert P. Oglesby
Executive Director

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The *Electric Program Investment Charge 2016 Annual Report* was prepared with contributions from the following staff:

Bethany Brown

Eilene Cary

Nicole Dani

Pam Doughman

Susanne Garfield

Lorraine Gonzalez

Mike Gravely

Aleecia Gutierrez

Virginia Lew

Emma Luk

Molly O'Hagan

Fernando Piña

Rachel Salazar

Erik Stokes

Alejandro Venegas

ABSTRACT

The California Energy Commission is the state's primary energy policy and planning agency. As part of its overall mission, the Energy Commission administers several clean energy research and development programs that drive innovation and advance science and technology in the fields of energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission and distribution, and transportation. The Energy Commission is one of the administrators of the Electric Program Investment Charge (EPIC) Program, which funds investments in clean energy technologies and approaches for the benefit of electricity ratepayers of California's three largest investor-owned utilities. EPIC funding is authorized for applied research and development, technology demonstration and deployment, and market facilitation, which involves activities to address non-price barriers to adoption of clean technologies, such as regulatory barriers and lack of information.

This report outlines the progress and status of Energy Commission activities funded by EPIC from January 1, 2016, through December 31, 2016. It has been prepared in accordance with applicable California Public Utilities Commission decisions and California Public Resources Code Section 25711.5.

Keywords: California Energy Commission, Electric Program Investment Charge, energy research, innovation pipeline, RDD&D, energy efficiency, advanced generation, renewable energy, demand response, energy storage, buildings, distributed generation, transmission, smart grid, transportation, environmental, climate change, smart infrastructure, ratepayer benefits, public interest program, electricity, energy policy, loading order, jobs, greenhouse gas, California Public Utilities Commission

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TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

EXECUTIVE SUMMARY

INNOVATION

I believe in innovation and that the way you get innovation is you fund research and you learn the basic facts.

Bill Gates

Economic vitality and social well-being depend on affordable, safe, and reliable energy. Today, the energy used and the ways it's used are rapidly changing. Innovation is the bridge that enables California to move from the unsustainable status quo to a cleaner energy future. For more than 40 years the California Energy Commission has administered research and development programs to spur innovation in energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission and distribution, and transportation.

In 2012, the Electric Program Investment Charge (EPIC) was established by the California Public Utilities Commission (CPUC) to fund public investments in research that create and advance new energy solutions, foster regional innovation, and bring ideas from the lab to the marketplace. The California Energy Commission and the state's three largest investor-owned electric utilities – Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company – were selected to administer the EPIC funds and advance innovative technologies, tools, and approaches that provide benefits to their electric ratepayers.

The mandatory, primary guiding principle for these investments is providing electricity ratepayer benefits to promote greater reliability, lower costs, and increase safety. Complementary guiding principles include:

- Providing societal benefits.
- Reducing greenhouse gas emissions in the electricity sector at the lowest possible cost.
- Supporting California's loading order to meet energy needs first with energy efficiency and demand response, second with renewable energy (distributed generation and utility scale), and third with clean conventional electricity supply.
- Supporting low-emission vehicles and transportation.
- Providing economic development.
- Using ratepayer funds efficiently.

The Energy Commission is committed to ensuring public participation in its research and development programs. This commitment reflects the rich and diverse characteristics of California, its people, and its innovative spirit.

This report provides an overview of Energy Commission activities related to its administration of EPIC funds in 2016.

Overview of EPIC Programs and Plan Highlights

EPIC supports an energy innovation pipeline approach to creating new energy solutions, fostering regional innovation, and bringing clean energy ideas to the marketplace to benefit California's investor-owned electric utility ratepayers.

> **RESEARCH**
>
> In much of society, research means to investigate something you do not know or understand. Research is creating new knowledge.
>
> *Neil Armstrong*

Highlights of the EPIC Program in 2016 include:

- Addressing California's susceptibility to drought with cutting edge water and energy innovations
- Controlling vampire loads with technologies and infrastructure
- Creating the value proposition for zero or near zero net energy buildings
- Expanding demand response strategies across multiple sectors
- Alleviating operational limitations due to Aliso Canyon
- Launching an energy innovation ecosystem
- Establishing commercial opportunities for microgrids
- Creating innovative solutions to address tree mortality
- Adapting to climate risks to the electricity system
- Moving from energy storage research investments to procurement
- Building future commercial opportunities through successful military partnerships

Status of Programs

During 2016, EPIC administrators and the CPUC worked together to implement the administrators' approved investment plans. The Energy Commission's *2012–2014 EPIC Investment Plan* (also referred to as the first *EPIC Triennial Investment Plan*) was approved as modified by the CPUC in Decision 13-11-025 in November 2013. The Energy Commission's *2015-2017 EPIC Investment Plan* (also referred to as the second *EPIC Triennial Investment Plan*) was approved as modified by the CPUC in Decision 15-04-020 in April 2015. The coordinated administration of EPIC funds consolidates the research, development, and deployment initiatives of the Energy Commission and the three largest investor-owned electric utilities in California; avoids investment duplication; considers the public interest; and helps meet state energy goals.

In 2016, the Energy Commission released 11 competitive solicitations totaling $141.7 million in EPIC Program funding and includes $2 million from the *2012-2014 EPIC Investment Plan* and $139.7 million from the *2015-2017 EPIC Investment Plan.*

Also in 2016, the Energy Commission approved 111 projects (from solicitations released in 2015 and 2016) totaling more than $216 million at Energy Commission business meetings. This amount brings 198 EPIC-funded projects to just over $396 million. Of these approved awards, 173 projects encumbered almost $332 million from the *2012-2014 EPIC Investment Plan* funds, and 25 projects encumbered $64.5 million from the *2015-2017 EPIC Investment Plan* funds. One of the 198 projects ended in December 2016. In addition, the Energy Commission posted "notice of proposed awards" for 22 projects, totaling more than $40 million from the *2015-2017 EPIC Investment Plan* funds that were recommended for funding before December 31, 2016. Each of these projects is expected to be considered for approval at an Energy Commission business meeting in 2017. The Energy Commission will release additional requests for comments and competitive solicitations in 2017 and continue program development and implementation.

CHAPTER 1:
Building a 21st Century California Electrical Power System

In October 2015, Governor Edmund G. Brown Jr. signed Senate Bill 350 (De León, Chapter 547, Statutes of 2015) into law, deepening California's commitment to increasing renewable energy production and the efficiency of cars, buildings, and appliances. SB 350 outlines goals to boost the Renewables Portfolio Standard to 50 percent and to double the energy efficiency savings in electricity and natural gas of retail customers through energy efficiency and conservation by 2030. Furthermore, SB 350 prioritizes maximizing benefits to low-income customers and those in disadvantaged communities, as well as manufacturing and installing clean energy and pollution reduction technologies that create employment opportunities, including high-wage, highly skilled employment opportunities, and increased investment in the state.

Energy research, development, demonstration, and deployment (RDD&D) is vital in achieving the commitments directed by state policy. Energy RDD&D funds the transformational technologies for electricity systems in California to make the necessary leaps toward improving system reliability, affordability, and public safety. Rigorous, public, and objective RDD&D coupled with market acceleration investments is imperative to continue moving innovations through the technology maturation pipeline – from concept into consumers' hands.

The Energy Commission's transparent and public process for investment plan development and competitive award selection is an ideal vehicle to administer the EPIC funds that support RDD&D investments, advancing the next generation of clean energy technologies, systems, tools, and strategies. These investments will provide benefits to investor-owned utility (IOU) electricity ratepayers as cleaner, safer, more affordable, and more reliable electricity generation. Projects funded through EPIC will also reduce greenhouse gas emissions and other air pollutants and provide valuable societal, environmental, and economic benefits. These investments support California in achieving its dynamic energy, environmental, and economic goals.

INNOVATION

Do you know what my favorite renewable fuel is? An ecosystem for innovation.

Thomas Friedman

EPIC – The Importance of Energy Innovation

Energy innovation has a history of success in California. Investments by the Energy Commission and other research programs complement private corporate funding, provide guidance and direction to

state policies, share results publicly, and fund research not adequately addressed by competitive or regulated markets. Energy RDD&D investments reduce risk to investors, accelerate the path to market for emerging technologies, address barriers, and provide solutions to customers.

EPIC Program Highlights in 2016

While EPIC is a relatively young program, 2016 included several notable activities that are driving energy innovation toward a clean energy future. Highlights include:

Addressing California's Susceptibility to Drought With Cutting Edge Water and Energy Innovations

To develop new water and energy technologies and approaches to make California more drought-resilient, the Energy Commission initiated 14 new projects that will advance on-site water recycling, demonstrate energy efficient water and wastewater treatment techniques, advance hybrid air/water cooling systems, enhance energy efficient agricultural water use practices, and test innovative methods for water leak detection. A subset of three projects will also help treat non-traditional water sources for municipal and industrial use while increasing the energy efficiency of the treatment processes.

Controlling Vampire Loads With Technologies and Infrastructure

According to the US Department of Energy, miscellaneous electric loads are growing and are estimated to be 30-40 percent of residential and commercial building consumption by 2030. The Energy Commission launched eight new projects that will address increasing the efficiency of devices and appliances, reducing standby energy use and improving power management and monitoring of energy use. In addition, an on-going study on using direct current infrastructure in homes and small businesses shows the potential to reduce energy use by 30 percent due to minimizing conversion losses from electronic devices.

Creating the Value Proposition for Zero or Near Zero Net Energy Buildings

The State of California has set a goal of zero net energy homes and businesses by 2020 and 2030, respectively. On-going projects are working with builders to evaluate the most technically feasible and cost effective approaches to constructing high performance attics and walls to optimize energy efficiency and minimize moisture issues. Six new demonstration projects were kicked off in 2016 that emphasize large scale deployment of affordable and comfortable zero net energy homes, and retrofit demonstrations of existing buildings in disadvantaged or low income communities in Fresno, Ontario and San Francisco to show the value proposition and benefits of getting to or near zero net energy.

Expanding Demand Response Strategies Across Multiple Sectors

As the State of California moves toward more distributed generation and intermittent renewable energy generation, the need for Demand Response to provide full use of renewable resources, minimize reliance on fossil generation and provide carbon-free grid management services is growing. The Energy Commission initiated 15 new projects that will advance Demand Response strategies across residential, commercial, industrial,

agricultural, water treatment and transport and electric vehicle sectors. These projects will develop strategic approaches to integrating customer and grid needs while minimizing costs.

Mitigating Operational Limitations Due to Aliso Canyon

Several energy research projects were funded to help preserve reliability of natural gas and electric service for Southern California due to the operational limitations at the Aliso Canyon natural gas storage facility. These include projects to reduce electrical consumption in government buildings and educational facilities through use of innovative technologies and controls.

Launching an Energy Innovation Ecosystem

In 2016, the Energy Commission launched the California Energy Innovation Ecosystem, which includes four regional energy innovation clusters that provide and coordinate key resources, mentoring, and services needed by entrepreneurs. The Energy Commission also kicked off a small grant program that provides funding to enable entrepreneurs to prove out the early technical and commercial feasibility of their new science concepts, prepares them to be successful in obtaining larger private and public funding awards, and manages the resulting projects.

Establishing Commercial Opportunities for Microgrids

The Energy Commission invested in research to create a portfolio of microgrids for low carbon critical facilities and high-penetration renewable facilities with the goal of demonstrating the microgrids' ability to provide grid resiliency while providing repeatable solutions that can be tailored for use in similar areas and facilities throughout California. The Kaiser Permanente Microgrid, a critical facility, demonstrated success working with the utility on interconnection and with the Office of Statewide Health Planning and Development on permitting. If successful, Kaiser will create opportunities to develop other microgrids at its more than 35 hospitals statewide, providing clean and resilient power to meet emergency service needs.

Creating Innovative Solutions to Address Tree Mortality

With more than 102 million dead trees resulting from prolonged drought in California, the State is investigating solutions to reduce wildfire risk and protect our natural resources. Through the EPIC program, the Energy Commission is supporting several demonstrations that are converting forest and woody biomass to energy. In 2016, the Energy Commission released a new solicitation to support additional projects for innovative bioenergy systems, such as modular systems that can be operated in remote areas. These projects will remove dead trees from areas that have been stricken by bark beetle infestation, decreasing the risk of catastrophic wildfire damage to the forests. In November 2016, North Fork Community Power broke ground for a 2 MW biomass gasification plant in North Fork (Madera County) using a commercial-ready gasifier from General Electric to convert forest biomass from the surrounding area, a High Hazard Zone due to tree mortality, into bioenergy.

Adapting to Climate Risks to the Electricity System

The Energy Commission is advancing the understanding of climate impacts on the electricity system including modeling impacts at the regional level, in partnership with local government and utilities. One project with ICF International is investigating impacts of sea level rise to San Diego Gas and Electric assets. The portfolio of projects will identify climate vulnerabilities and adaptation measures that can be adopted in future utility risk planning efforts.

Moving from Energy Storage Research Investments to Procurement

With investments in energy storage to improve reliability, lower costs, and provide solutions for intermittent renewables, the Energy Commission is helping move two EPIC supported emerging technologies closer to commercialization. In its first round of procurements to help meet the state's 1.3 gigawatts (GW) mandate, Pacific Gas & Electric selected two of the Energy Commission's EPIC funded recipients: Amber Kinetics for 20 MW of flywheels and Eos Energy Storage for 10 MW of zinc-air batteries. Amber Kinetics and Eos Energy Storage may expand their customer base during future competitive selection rounds of storage procurement, scheduled for 2018 and 2020.

Building Commercial Opportunities Through Successful Military Partnerships

The Energy Commission developed and cultivated a successful partnership with the Department of the Navy and other military branches to share information and collaborate on energy and water projects. This partnership led to a Memorandum of Understanding (MOU) between the Department of the Navy, Office of the Secretary of the Navy to foster collaboration on energy and water issues such as energy assurance and resiliency, greenhouse gas reduction, fossil fuel reduction, energy efficiency, renewable energy and water reduction. This MOU and collaborations with other military branches will lead to additional research and demonstration projects with the military. This unique opportunity for EPIC emerging technologies opens the door to the military procurement system, the largest commercial procurement opportunity in the world and provides a pathway to commercialization for future EPIC emerging technologies.

Commitment to Diversity in EPIC RDD&D

In April 2015, the Energy Commission unanimously approved a formal Diversity Policy Resolution, consistent with state and federal law, to improve fair and equal opportunities for small businesses; women-, disabled veteran-, minority-, and LGBT-owned business enterprises; and economically disadvantaged and underserved communities to participate in and benefit from Commission programs.

On October 8, 2015, Governor Brown signed Assembly Bill 865 (Alejo, Chapter 583, Statutes of 2015), which directs the Energy Commission to establish a diversity task force to consider and make recommendations about diversity in the energy industry. These efforts build upon the outline Energy Commission Chair Robert B. Weisenmiller submitted in a

letter to the CPUC in November 2013.[1] In his letter, Chair Weisenmiller committed to increasing the participation of businesses owned by women, minorities, and disabled veterans through undertaking a comprehensive outreach plan to ensure that a diverse range of potential applicants know about, and understand how to participate in, EPIC Program activities, especially solicitations for projects. The plan comprised four main tenets, including:

- Continuing and advancing an outreach plan to ensure women, minorities, LGBT individuals, and disabled veterans are informed and educated about EPIC Program activities and encouraged to participate in R&D project funding opportunities.
- Targeting particular geographic regions within the state for specific program activities to better benefit electric ratepayers throughout all of the designated IOU territories. Such efforts could include, for example, job training or energy efficiency retrofits in economically depressed communities.
- Continuing and advancing efforts to address energy-related challenges and opportunities in economically depressed communities.
- Continuing to track, monitor, and report on the participation of California-based entities and women-, minority-, disabled-veteran-owned, and small businesses for the recipients of EPIC awards using the same definitions used by the investor owned utilities via CPUC General Order 156.[2]

The Energy Commission has undertaken several activities in 2016 to demonstrate its commitment to ensure a diverse range of applicants have the opportunity to participate in EPIC projects by implementing activities supporting these goals. These activities included informing stakeholders about available Energy Commission funding opportunities and providing strategies to develop successful proposals.

Building on a Comprehensive Outreach Plan

In 2016, Energy Commission staff updated the diversity outreach plan. This included:

- Meeting with dozens of community leaders, various stakeholders, and representatives of California business organizations.
- Building an email distribution list of outreach contacts.
- Enhancing the Energy Commission's website to reflect the agency's commitment to diversity.

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1 Letter to CPUC President Michael Peevey from California Energy Commission Chair Robert Weisenmiller, http://www.energy.ca.gov/research/epic/documents/2013-11-07_Letter_from_the_Chair_re_AB_340-Docket_12-EPIC-01.pdf.

2 General Order 156 seeks to increase the participation of women-, minority-, and disabled veteran-owned business enterprises (WMDVBE) in utility procurement, and requires the IOUs to submit annual plans to the CPUC for increasing WMDVBE participation in procurement and to submit annual reports on the implementation of those plans. Refer to CPUC Decision 13-11-025, p. 108.

- Convening various public workshops, internal communications meetings, the EPIC forum, and the annual EPIC Symposium.
- Creating easy-to-read informational materials to increase awareness of EPIC funding opportunities and engaging with disadvantaged and hard-to-reach communities throughout the State.
- Increasing the use of Twitter and other social networking platforms to educate and inform.
- Collaborating with the Energy Commission's Public Adviser to promote research funding opportunities with individuals interested in participating in EPIC solicitations.

Specific outreach activities included:

- Enhance the LinkedIn group page "California Energy Commission's Research and Development Networking Hub." This open group has nearly 1,200 members and provides a user-driven platform to help potential applicants – including disabled veteran-, women- and minority-owned businesses – connect and partner on proposals for solicitations funded through the EPIC Program.
- Conduct on-site meetings with local minority leaders in several Bay Area cities. The meetings served as opportunities to inform local leaders about R&D funding opportunities and open channels for future dialogue.
- Provide funding materials translated for non-English speakers, including "opportunity postcards" (Figure 1) and relevant materials in Spanish, Vietnamese, Chinese, Tagalog, Korean, and Japanese. The Energy Commission took steps to promote funding opportunities in other languages on multiple media platforms.
- Host a September 22, 2016, workshop to gather information about the types of program changes that could yield increased participation from the private sector in the EPIC Program. The workshop helped Commission staff understand the potential barriers that may deter private sector companies from applying for grant funding opportunities and solicit ideas for promoting greater private sector participation. Nine panelists from various backgrounds shared ideas for improving the EPIC grant funding process.
- Distribute EPIC materials at more than 20 key expositions and conferences in 2016, including:
    - California League of Food Processors Expo (February 2016).
    - CPUC Small Business Expo (March 2016).
    - Silicon Valley Manufacturing Roundtable (April 2016).
    - Women in Cleantech Networking Event (April 2016).
    - Young Professionals in Energy event (April 2016).

- Capital Region Clean Economy Workforce Cluster Forum (April 2016).
- Making Emerging Technology Work in the Agricultural Space (April 2016).
- Diversity Career Fair (May 2016).
- California State Scientists Day (May 2016).
- Greenlining Institute's 23rd Annual Economic Summit (May 2016)
- Resilient Communities training (May 2016.)
- Joint Workshop on Implementation of the EPIC Program (June 2016).
- Clean Energy Jobs & Economic Opportunities working group (July 2016).
- Meeting with Asian Pacific Environmental Network (July 2016).
- Meeting with Greenlining Institute Environmental Equity Director (July 2016).
- Meeting with Bay Area Council staff (July 2016).
- Meeting with Brightline Defense Council staff (July 2016).
- Meeting with Silicon Valley Leadership Group (July 2016).
- Meeting with the Minority Business Development Association (July 2016).
- Meeting with Prospect Silicon Valley staff (July 2016).
- 2016 Sustainability Summit in Hunters Point (September 2016).
- Working with California's Private Sector workshop (September 2016).
- Disabled Veterans Business Alliance event – "Turning Contacts into Contracts" (September 2016).
- La Kretz Innovation Campus Grand Opening (September 2016).
- 2016 National Distributed Energy Futures Conference (November 2016).
- Sacramento Business Matchmaking Event (December 2016).

2016 EPIC Symposium

Bringing Emerging Energy Efficiency Technologies to Low Income or Disadvantaged Communities

This session explored projects and strategies that focus on helping lower energy costs in disadvantaged communities and providing sustainable benefits, including access to education and training opportunities.

Projects featured included retrofitting multifamily properties for energy savings, maximizing energy efficiency in existing mixed use buildings in low-income areas, and providing energy efficient comfort through integrated smart ceiling fans and communicating thermostats. Presenters were joined in discussion by representatives from the Greenlining Institute and Linc Housing.

- Announcing EPIC funding opportunities, workshops, and the EPIC Innovation Showcase (http://innovation.energy.ca.gov) through listserv mailing lists, face-to-face meetings, and social media platforms to reach a more diverse audience.

- Hosting the Second Annual EPIC Symposium with a dedicated session on bringing emerging energy efficiency technologies to low-income or disadvantaged communities.

Figure 1: EPIC Funding Opportunity Postcards in Multiple Languages

Addressing Energy-Related Challenges and Opportunities in Disadvantaged Communities

In 2016, the Energy Commission approved projects aimed at providing increased opportunities in disadvantaged communities, as defined by the CalEnviroScreen tool, Version 2.0. Since 2014, the Energy Commission has awarded 50 EPIC projects that have either headquarters or a project demonstration site in a disadvantaged community (Figure 2).[3]

3 The Energy Commission awarded one project in 2014, eighteen in 2015, and more than thirty projects located in a disadvantaged community in 2016.

Figure 2: EPIC Projects Located in Disadvantaged Communities

http://innovation.energy.ca.gov/SearchResults.aspx?cat=Customers&subj=Home_and_Communities&subSubj=CalEnviroScreen_Disadvantaged_Communities

In December 2016, the Energy Commission adopted a target for 25 percent of EPIC Technology Demonstration and Deployment (TD&D) funding to be allocated to projects sited in disadvantaged communities, under Senate Bill 350 (De León, 2015).[4] In 2016, 35.7

4 Resolution adopted at the December 14, 2016 Business Meeting, item 8, proposing the adoption of the Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Residents and Small Business Contracting Opportunities in Disadvantaged Communities, prepared under SB 350 (De León, Chapter 547, Statutes of 2015), which requires the Energy Commission to complete and publish a study that explores the barriers to and opportunities for expanding low-income residents' access to energy efficiency, weatherization, and renewable energy. The study includes the following recommendations for the Energy Commission research, development, demonstration, and market facilitation programs to include targeted benefits for low-income customers and disadvantaged communities:

a. The Energy Commission's Electric Program Investment Charge (EPIC) Program should target 25 percent of technology demonstration and deployment funding for sites located in disadvantaged communities.

b. Energy Commission research development and deployment programs should conduct forums to share best practices and case studies on current projects located in disadvantaged communities.

c. The Energy Commission should analyze potential business models that would create market opportunities for emerging clean energy technologies to be deployed in a manner that directly benefits

percent of the funding awarded to TD&D projects went to projects that included at least one site in a disadvantaged community.

Tracking Diverse and Inclusive EPIC Funding Recipients

Energy Commission staff implemented a voluntary survey for EPIC funding recipients to better track participation of self-reported California based entities, women-, minority-, LGBT-, disabled-veteran-owned, and small businesses between prime recipients and their subcontractors. Additionally, the surveys allow staff to identify opportunities for future outreach efforts to encourage program diversity.

The Energy Commission received 95 completed surveys, which identified the following:

- Forty-eight of the 95 projects include a small business as either a prime or subcontractor. (Twenty-four were prime.)
- Sixteen of the 95 projects include a woman-owned business as either a prime or subcontractor. (Seven were prime.)
- Twelve of the 95 projects include a minority-owned business as either a prime or subcontractor. (Four were prime.)
- One of the 95 projects includes an LGBT-owned business as a subcontractor.
- Six of the 95 projects include a disabled-veteran-owned business as a subcontractor.
- Ninety-four of the 95 projects include certified California-based entities. (Ninety-three were prime.)

Looking to 2017, the Energy Commission will continue efforts to ensure that participation in the EPIC Program reflects the rich and diverse characteristics of California and its people. These plans include, but are not limited to:

- Collecting diversity data and providing reports identifying the diversity of Energy Commission program participants.
- Conducting a workshop soliciting input on strategies to effectively implement the 25 percent TD&D funding target established by the *Low-Income Barriers Study* for the greatest benefit to disadvantaged communities.
- Meeting with small businesses, veteran, women, minority, and other interested groups to provide information on partnering for success through the EPIC Program. The materials will also be available on the Energy Commission EPIC Web page.

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low-income customers and disadvantaged communities, including, but not limited to, tribal communities, rural communities, and mobile home communities.

d. The Energy Commission should sponsor prize competitions and challenges to spur novel ideas and solutions for bringing clean energy technologies to low-income customers and disadvantaged communities.

- Holding regional preapplication and prebid workshops throughout the state to explain requirements for grant and contract funding opportunities, answer questions, and encourage networking and partnering among potential applicants.

Creating EPIC

The Public Goods Charge, which funded electricity research and renewable energy in California, expired at the end of 2011.[5] Governor Brown recognized the importance and benefits of energy innovation and renewable energy programs supported by the Public Goods Charge and requested the California Public Utilities Commission (CPUC) take action under its authority to institute a new program, similar in size, but revised to "take into account the constructive ideas for program reform identified during the legislative process as well as ways to create jobs swiftly through investment in energy savings retrofits."[6]

TECHNOLOGY

The science of today is the technology of tomorrow.

Edward Teller

Following a deliberative process, the CPUC created the EPIC Program in December 2011 and authorized the utilities to collect EPIC funds for renewables and RDD&D purposes.[7] In May 2012, the CPUC adopted Decision 12-05-037, as modified, which provides the framework for CPUC oversight of the administration of EPIC. Investments funded by EPIC are administered by the Energy Commission and the state's three largest electric investor-owned utilities (IOUs): Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric Company (SDG&E). The administrators submitted their proposed first triennial investment plans for EPIC funds to the CPUC in November 2012.

The Energy Commission received authorization from the Legislature to spend EPIC Program funds in Senate Bill 1018 (Committee on Budget and Fiscal Review, Chapter 39, Statutes of 2012) and Assembly Bill 110 (Blumenthal, Chapter 20, Statutes of 2013), and each subsequent fiscal year, including Senate Bill 826 (Leno, Chapter 23, Statutes of 2016). The Energy Commission received program direction in Senate Bill 96 (Committee on Budget and Fiscal Review, Chapter 356, Statutes of 2013).

The Energy Commission's *2012–2014 EPIC Investment Plan* was approved as modified by the CPUC through Decision 13-11-025 in November 2013. Decision 13-11-025 incorporates requirements specified in SB 96 for the portion of the EPIC Program administered by the

5 Public Utilities Code Section 399.8.

6 September 23, 2011, Governor Jerry Brown letter to CPUC President Michael Peevey.

7 Decision 11-12-035, as modified.

Energy Commission. The Energy Commission's *2015-2017 EPIC Investment Plan* was approved as modified by the CPUC through Decision 15-04-020 in April 2015.

EPIC Program Components

Guiding Principles

The mandatory guiding principle of EPIC is to invest in clean energy technologies and approaches that benefit electricity ratepayers by promoting greater reliability, lower costs, and increased safety. In addition, complementary guiding principles include:

- Providing societal benefits.
- Reducing greenhouse gas emissions and increasing adaptation in the electricity sector at the lowest possible cost.
- Supporting the loading order.
- Advancing low-emission vehicles/transportation.
- Increasing economic development.
- Using ratepayer funds efficiently.

Principles articulated in Public Utilities Code Sections 740.1 and 8360 (which govern utility expenditures in the areas of RDD&D and smart grid[8]) serve as guidance. Section 740.1[9] states that in evaluating RDD&D projects, consideration will be given to:

- Projects providing reasonable probability of ratepayer benefits.
- Projects with a low probability of success being minimized.
- Projects consistent with the utility corporation's resource plan.
- Projects not duplicating previous or current research by other electrical or gas corporations or research organizations.
- Projects supporting one or more of these objectives:
    - Environmental improvement.
    - Public and employee safety.
    - Conservation by efficient resource use or by reducing or shifting system load.

8 A *smart grid* consists of interactive equipment and communication protocols allowing electricity system operators and customers to adjust energy consumption and energy generation in response to price signals or information about the status of the electricity system to help maintain affordability, safety, and reliability of the electricity system.

9 Public Utilities Code Section 740.1: http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PUC&sectionNum=740.1.

- Developing new resources and processes, particularly renewables resources and processes to advance supply technologies.
- Improving operating efficiency and reliability or otherwise reduce operating costs.

Section 8360 outlines the requirements for the state's electrical transmission and distribution system to maintain safe, reliable, efficient, and secure electrical service to meet future growth and demand to achieve:[10]

- "Increased use of cost-effective digital information and control technology to improve reliability, security, and efficiency of the electric grid.
- "Dynamic optimization of grid operations and resources, including appropriate consideration for asset management and utilization of related grid operations and resources, with cost-effective full cybersecurity.
- "Deployment and integration of cost-effective distributed resources and generation, including renewable resources.
- "Development and incorporation of cost-effective demand response, demand-side resources, and energy-efficient resources.
- "Deployment of cost-effective smart technologies, including real time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices for metering, communications concerning grid operations and status, and distribution automation.
- "Integration of cost-effective smart appliances and consumer devices.
- "Deployment and integration of cost-effective advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air-conditioning.
- "Provide consumers with timely information and control options.
- "Develop standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
- "Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services."

Investment Areas

10http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PUC&division=4.1.&title=&part=&chapter=4.&article=.

CPUC Decision 12-05-037 approved the Energy Commission to administer EPIC funds in these investment areas:

- **Applied Research and Development**: Activities supporting precommercial technologies and approaches designed to solve specific problems in the electricity sector, including research leading to advancements in energy efficiency, renewable energy, and smart grid technologies. Activities that address environmental and public health impacts of electricity-related activities and support clean transportation with links to electricity sector ratepayer benefits also fall into this area.

> **RESEARCH**
>
> Research is to see what everybody else has seen, and to think what nobody else has thought.
>
> *Albert Szent-Györgyi*

- **Technology Demonstration and Deployment**: Installing and operating precommercial technologies or employing operational strategies at a sufficient scale to assess functional and performance characteristics and financial risks.
- **Market Facilitation**: Activities to support clean energy technology and strategy deployment. These activities include incubating statewide clean energy innovation and entrepreneurship efforts, reducing barriers to deploy emerging clean energy solutions, developing the workforce needed to achieve the state's energy goals, encouraging greater participation from diverse businesses and communities, regulatory assistance and permitting, market research, program tracking, education and outreach to support clean energy technology, and strategy deployment. The CPUC Decision 12-05-037 further clarifies this category should not necessarily be limited to renewable energy and may include any other clean energy technologies and/or approaches.

Total EPIC funding for the Energy Commission activities is summarized in Chapter 2.

Connections to the Electricity Value Chain

EPIC investments are mapped or correlated to the different elements of the electricity "value chain," which is composed of grid operations/market design, generation, transmission, distribution, and demand-side management. Based on the guiding principles, each *EPIC Investment Plan* maps strategic initiatives clearly to the appropriate section of the value chain. Each project funded through EPIC also maps clearly to the appropriate section of the value chain, consistent with an approved EPIC Investment Plan.

EPIC Investment Strategy

California energy policy frames a vision for the state's electricity future to include a significant transition from fossil generation to renewable sources; highly efficient homes, businesses, industries and agricultural and water practices; identification of climate-related

vulnerabilities to the electricity; and electrification of portions of the transportation system. Through a competitive process, EPIC funds projects to bridge gaps along the energy innovation pipeline.[11]

Homes and businesses require high-quality and cost-effective energy efficiency products and services. Industry, agriculture, and the water sector require energy- and water-efficient technologies that are reliable and cost-efficient and result in improvements to standard practices without affecting the quality of their core products. Renewable generation and electric transportation must be seamlessly integrated into the electric grid at all levels of interconnection, ranging from small-scale home applications to large central-station power plants. For a resilient electricity system, assets that are vulnerable to the effects of climate change must be protected, such as extreme heat or more intense and frequent wildfires, and pursue adaptation measures to reduce exposure to climate-related risks. The Energy Commission's *Integrated Energy Policy Report* and ongoing analysis at the California Independent System Operator (California ISO), the CPUC, the United States Department of Energy (U.S. DOE), and the United States Environmental Protection Agency (U.S. EPA) identified key challenges to achieving this clean energy vision for California's IOU service territories. Each initiative described in the Energy Commission's *EPIC Investment Plans* addresses an important barrier and investment gap for clean energy.

EPIC Program Regulatory Process

The CPUC has regulatory authority over the Energy Commission's administration of EPIC funds, including approving investment plans. In addition, the Legislature must grant the Energy Commission spending authority to disburse EPIC funds for project awards and use EPIC funds for administrative expenses.

This annual report is provided to the CPUC in accordance with Decision 12-05-037, as modified, in Rulemaking 11-10-003; Decision 13-11-025 in Application 12-11-001, as consolidated; and Decision 15-04-020 in Application 14-04-034, as consolidated. These decisions specify the outline of this report and the specific reporting requirements for projects awarded EPIC funds to ensure consistent reporting for all administrators. The Energy Commission also provides this EPIC annual report to the Legislature, as specified in California Public Resources Code Section 25711.5, and makes the report publicly available on its website.

The Energy Commission administers the EPIC Program according to all applicable state laws and standards and follows the investment plans that were approved and modified by the CPUC to administer EPIC funds collected in the first two investment periods. Guidance from the CPUC includes overview of project selection to ensure that innovations funded by EPIC provide IOU electricity ratepayer benefits. The CPUC also reviews the projects to confirm the EPIC investments are aligned with the electricity value chain, which includes grid

11 As specified in Public Resources Code Section 25711.5, the Energy Commission is authorized to use noncompetitive sole source and interagency agreement methods if certain conditions are met.

operations/market design, generation, transmission, distribution, and demand-side management.[12] The Legislature, in California Public Resources Code Section 25711.5, directs the Energy Commission to fund projects that will benefit electricity ratepayers and lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals. Furthermore, funding should result in a portfolio of projects that is strategically focused and sufficiently narrow to advance the most significant technological challenges. These challenges include, but are not limited to, energy efficiency, integration of renewable energy into the electrical grid, energy storage, integration of electric vehicles into the electrical grid, and accurately forecasting the availability of renewable energy for integration into the grid.

Coordination

The Energy Commission is committed to ongoing coordination and collaboration with the three IOU administrators of EPIC funds and other energy innovation stakeholders in developing and implementing their EPIC investment plans. This coordination is important to ensure funded EPIC projects address priority topics and critical funding gaps and leverage other public and private funding sources.

EPIC Administrator Coordination

Administrator coordination meetings have been valuable in developing the first, second, and third investment plans and implementing the first and second investment plans, to identify each administrator's area of focus and synergistic opportunities for further collaboration.

Under CPUC Decision 12-05-037, the CPUC requires the four EPIC administrators to consult with interested stakeholders no less than twice a year, both during the development of each investment plan and during the execution thereof. CPUC Decision 15-04-020 requires one of these two annual workshops to be an EPIC Innovation Symposium intended to share progress, results, and future plans; improve coordination and understanding among administrators, parties, and the CPUC; raise awareness and visibility of EPIC investments; and promote program transparency.

During 2016, Energy Commission staff collaborated with the three IOU administrators (PG&E, SCE, and SDG&E), conducting conference calls, coordinating notification and outreach for upcoming events, and participating in public workshops on EPIC. The following highlights EPIC administrator coordination for 2016:

- In 2016, the Energy Commission held three meetings with each IOU individually to discuss smart grid research. Moreover, the Energy Commission held two similar meetings attended by all three IOUs. The discussions helped align the Energy Commission's smart grid applied research and development with the IOUs' technology demonstration and deployment research. The discussions also helped

12 CPUC Decision 12-05-037 in Rulemaking 11-10-003, ordering paragraph 12.

identify gaps, avoid duplication, and maximize the value of the meetings by identifying potential partnering opportunities. Energy Commission staff and the IOUs discussed research in renewable integration, open-source distribution modeling, energy storage, microgrids,[13] and electric vehicles.

- On June 22, 2016, Energy Commission staff joined the IOUs for the 2016 EPIC Summer Workshop in Westminster, California. At this public workshop, which focused on distribution automation, the EPIC administrators provided an overview and progress update of EPIC Program activities.
- On December 1, 2016, Energy Commission staff, in coordination with the three IOU administrators, organized and conducted the Second Annual Electric Program Investment Charge Innovation Symposium. The innovation symposium showcased 22 Energy Commission-funded and 9 IOU-funded EPIC projects, including projects addressing energy efficiency, generation, and power system modernization. The innovation symposium drew more than 300 participants in person and more than 200 participants online. Highlights of projects from the innovation symposium include:
    - Research targeting low-income, disadvantaged communities and strategies to help lower energy costs, provide building improvements, and increase access to education and training opportunities, while ensuring sustainable benefits. Energy Commission projects discussed included retrofitting multifamily properties for sustainable and persistence savings, integrating smart ceiling fans and communicating thermostats to provide energy-efficient comfort, and maximizing energy efficiency in existing low-income mixed-use residential and commercial buildings.
    - A showcase of five Energy Commission-funded low-carbon microgrids, in varying stages from design to construction, demonstrating the ability of the microgrids to use local renewable resources, provide grid resiliency in emergency situations, and provide repeatable solutions that can be tailored for use in similar areas in California. Featured projects included the design of Santa Monica's municipal and mixed-use advanced energy district, the City of Berkeley's design of a multifacility microgrid in an urban setting, the Fremont Fire Station microgrid, Kaiser Richmond's microgrid focusing on resilient hospital services, and the Laguna Sub Regional Waste Water Treatment Plant Microgrid.

13 U.S. Department of Energy (DOE) defines a *microgrid* as "a group of interconnected loads and distributed energy resources (DER) with clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid [and can] connect and disconnect from the grid to enable it to operate in both grid-connected or island mode."

- Technologies and strategies that provide an integrated approach to addressing California's energy- and water-saving needs that provide a dual benefit to California and maximize the potential value of investments. Energy Commission projects discussed included efforts to improve water and energy efficiency in California's dairy industry, research demonstrating a low-energy biofiltration system for groundwater contaminant removal, and an energy perspective on California's groundwater pumping.
- A conference room dedicated to providing information to attendees on the EPIC Innovation Showcase website and how to apply for EPIC funding.
- A panel composed of IOU representatives from PG&E, SCE, and SDG&E presented projects that aim to modernize California's power system. These panel sessions featured IOU projects advancing power system electrical safety and system communication security, enabling DER growth through infrastructure improvements that support electric vehicles and photovoltaics, and demonstrating new concepts for modeling, simulation, visualization and situational awareness to support power system operations

- On December 4, 2016, Energy Commission staff held a staff workshop to discuss the IOUs' Emerging Technology Programs and the Energy Commission's Energy Efficiency Research Programs in existing buildings; demand response; industrial, agriculture, and water; and market facilitation and outreach. The purpose of the workshop was to identify current activities, potential areas for coordination, and need for additional research or activity in these program areas. The panelists consisted of representatives from the Energy Commission, IOUs, and Lawrence Berkeley National Laboratory. Some of the main outcomes were:
  - IOUs' Emerging Technology Programs and the Energy Commission's EPIC Program should conduct webinars to highlight mutual projects to help inform and breakdown knowledge barriers for the public. This could help with technology transfer and market implementation.
  - Building assets needed to be flexible and be able to "shape, shed, shift, and shimmy" load in response to grid needs.
  - Demand response (DR) is the cheapest resource for grid management, and there is a need to embed DR technology into energy efficient products.
  - For existing buildings, scaling and cost of energy efficiency measures are critical to enable widespread adoption. In addition, built-in technology embedded in systems should be considered to verify and record energy efficiency savings.
  - The industrial, agricultural, and water sectors are challenging because they are highly customized and unique, and demonstrating success in one may not result in success in another industry. For many in these sectors, energy

savings is not the driving force to implement a project. Areas with the greatest potential for replicability include refrigerated warehouses, data centers, pumps, and the beverage industry. These industries have potential for DR applications in addition to energy efficiency.

    - A path to market is needed for technologies resulting from both Emerging Technology Programs and EPIC R&D Programs. After testing, verifying savings, and demonstrating the technology, providing incentives, education, and training are key in helping entrepreneurs to get into the marketplace.

- Energy Commission staff participated in biweekly conference calls with the EPIC IOU administrators throughout 2016 to coordinate activities such as invoicing and implementing the EPIC Investment Plans and to provide updates on research, annual reports, and CPUC proceedings. These meetings also included preparation and logistical coordination for the June 22, 2016, public workshop in Westminster and the December 1, 2016, EPIC Innovation Symposium in Sacramento.
- IOUs participated in Energy Commission workshops on electric vehicle charging, smart grid, storage, and microgrids.

In 2017, the EPIC administrators will continue to work together, as appropriate, and coordinate including:

Information Sharing and Coordinated Planning

The administrators will collaborate to address common goals, consistent with the state's energy and environmental policies and the guiding principles for EPIC as stated in CPUC Decisions 12-05-037 and 15-04-020. The administrators will share information regarding their investment plans, programs, and projects to maximize the efficient use of funds and ease dissemination of results to benefit electric utility ratepayers. The EPIC administrators also will coordinate workshops for the development of the *2018-2020 EPIC Investment Plan*.

Leveraging Funding and Avoiding Duplication of Projects

To the extent legally permissible, the administrators will work together to avoid unnecessary duplication of efforts, consistent with Public Utilities Code Section 740.1, and leverage funds for the benefit of electric utility ratepayers.

Coordinated Input and Advice From Stakeholders

The administrators will continue to work together to schedule, solicit, and respond to comments and advice from stakeholders on their respective proposed and ongoing plans and programs.

Consistent Evaluation, Measurement, and Verification of RDD&D Results

The administrators worked together to establish consistent and common evaluation, measurement, and verification protocols to report to the CPUC and stakeholders on the performance and results of funded projects.

Coordination with Other Energy Innovation Efforts

In 2016, the Energy Commission engaged in several coordination efforts with other state and federal entities involved in similar RDD&D activities, including the following:

- **U.S. DOE's Advanced Research Projects Agency – Energy (ARPA-e) program** – On January 20, 2016, Energy Commission staff met in Sacramento with ARPA-e staff. ARPA-e funds riskier early stage research on smart grid, energy efficiency, renewable energy, storage, and other energy technologies. The Energy Commission and ARPA-e have a memorandum of understanding to meet annually to discuss research and identify opportunities to advance early stage research.
- **California's Fourth Climate Change Assessment** – On March 22, 2016, Energy Commission staff facilitated the kick-off meeting. This meeting brought together the contributing research teams, assessment leads from California's Natural Resources Agency and the Governor's Office of Planning and Research, technical managers from the Energy Commission, and technical staff from other agencies involved with steering the assessment through their role in the Climate Action Team Research Working Group. Energy Commission staff focused on energy-related climate issues, and staff from the Natural Resources Agency covered non-energy topics. Quarterly technical meetings led by Energy Commission staff and the Department of Water Resources continued throughout 2016 and provided a means for close technical coordination of the entire (energy-sector and natural resources) research portfolio.
- **Energy Sector Adaptation Implementation Working Group** – On March 24, 2016, and August 24, 2016, Energy Commission staff participated in meetings of this working group, which was formed in late 2015 to identify and promote energy sector adaptation efforts as suggested by the state's adaptation plan, *Safeguarding California*. Cochaired by Energy Commission Chair Weisenmiller and CPUC Commissioner Liane Randolph, this effort also involves staff-level interactions regarding energy sector adaptation activities.
- **Joint Agency Workshop on Microgrid Roadmap** – On May 24, 2016, the Energy Commission, CPUC, and California Independent System Operator held a joint agency workshop to develop a roadmap that will help commercialize microgrids in the state. At this workshop, the agencies presented an overview on work that had been completed to date that would contribute to developing the roadmap. The agencies also provided an overview of the work scope and schedule for the roadmap and described the processes for how stakeholders could contribute to developing the roadmap.
- **Workshop on Climate Adaptation and Resiliency** – On June 21, 2016, Energy Commission staff supported an Integrated Energy Policy Report (IEPR) Commissioner Workshop on Climate Adaptation and Resiliency for the Energy Sector. This workshop engaged other agencies involved in resiliency (such as the Governor's Office of Planning and Research, the Ocean Protection Council, and the

Office of Emergency Services), as well as key stakeholders involved in energy sector adaptation (including the CPUC and IOUs). Workshop discussions contributed to a chapter on "Climate Adaptation and Resiliency" in the *2016 IEPR Update,* including recommendations to help ensure climate resilience in California's energy sector.

- **Joint Agency Microgrid Workshop** – On September 6, 2016, Energy Commission staff, in collaboration with the CPUC and the California ISO, conducted a workshop to learn about California customers' microgrid implementation strategies and challenges with a focus on energy resiliency, renewable integration, costs/benefits performance, lessons learned, how cybersecurity is being addressed, and efforts to commercialize microgrids in California. This information provided a technical foundation for the 2016 joint-agency effort to develop a microgrid roadmap for the commercialization of microgrids in California.
- **National Distributed Energy Futures Conference** – The Energy Commission cosponsored the 2016 National Distributed Energy Futures conference in San Francisco November 2-3, 2016. At this conference, participants discussed California's progress in redesigning the distribution grid and bringing new distributed energy resources to market from the state's leading experts. The Energy Commission had a booth at this conference and participated in panel discussions.
- **Association of State Energy Research and Technology Transfer Institutions Meeting** – On November 17-18, 2016, Energy Commission staff hosted a meeting with the Association of State Energy Research and Technology Transfer Institutions (ASERTTI). ASERTTI members attending include those from the Electric Power Research Institute, University of Illinois at Chicago-Energy Resources Center, Iowa Energy Center, Washington State University-Cooperative Extension Energy Program, Desert Research Institute, Pacific Northwest Laboratory, and Gas Technology Institute. Energy Commission staff presented information on its Research and Development, Codes and Standards, and Fuels and Transportation programs. The meeting was followed by tours of Energy Efficiency Research Centers at UC Davis.
- **Joint Agency Workshop on Vehicle-Grid Integration** – On December 7, 2016, Energy Commission staff held a public workshop with the CPUC, California Air Resources Board, and the California ISO to discuss communication standards for vehicle-grid integration. The workshop supported the state's implementation of the transportation electrification directives of Senate Bill 350 (De León, Chapter 547, Statutes of 2015) and the actions of the *Vehicle-Grid Integration Roadmap,* as ordered by Executive Order B-16-2012.
- **Third Annual California Multi-Agency Update on Vehicle-Grid Integration Research** – On December 12, 2016, Energy Commission staff convened the Third Annual California Multi-Agency Update on Vehicle-Grid Integration Research. At this public workshop, energy-related agencies reviewed the progress of research from the *California Vehicle-Grid Integration Roadmap* as part of the Governor's *Zero-*

Emission Vehicle Action Plan. Participants included the California ISO, the CPUC, the Energy Commission, SDG&E, SCE, PG&E, a panel of automaker representatives, a variety of research and demonstration project leaders, and other organizations interested in vehicle-grid integration.

- **Solar + Storage for Resiliency Workshop** – On December 16, 2016, Energy Commission staff attended a workshop in San Francisco on Solar + Storage for Resiliency. This workshop was conducted by the City and County of San Francisco and the Lawrence Berkeley National Lab and featured discussions on how existing solar resources in San Francisco and other cities could be leveraged to provide energy to the community in the event of a power outage.
- **Distribution Resources Plan Working Group Meetings** – Energy Commission staff participated in meetings for the Locational Net Benefits Analysis and Integrated Capacity Analysis working groups, which are coordinated by More Than Smart[14] to inform the CPUC's Distribution Resources Plan proceeding.
- **Smart Inverter Working Group Meetings** – Energy Commission representatives participated in meetings of the Smart Inverter Working Group, led by the CPUC. This effort helped identify key research needs to advance smart inverters, which in turn are expected to increase the distributed generation that the grid can accommodate without equipment upgrades.
- **Tree Mortality Task Force** – Energy Commission staff participated in the Tree Mortality Task Force, which is composed of state and federal agencies, local governments, utilities, and various stakeholders. This task force will coordinate emergency protective actions and monitor ongoing conditions to address the vast tree mortality resulting from four years of unprecedented drought and the resulting bark beetle infestations across large regions of the state.
- **U.S. DOE Workshops** – Energy Commission staff attended grid modernization workshops held by U.S. DOE. At these workshops, staff learned about U.S. DOE's grid modernization research advancement occurring in its national labs.
- **Stakeholder Meeting** – Energy Commission staff met with staff from the Electric Power Research Institute (EPRI) on June 24, 2016, to discuss the Energy Commission's research initiatives from the 2015-2017 Investment Plan and to learn about EPRI's vision for California's electricity grid, including market trends and challenges, lessons learned, and potential integrated solutions to address future challenges.
- **Public Participation** – Energy Commission staff held solicitation scoping workshops and released several requests for public input on research topics associated with

14 More Than Smart is a nonprofit "that brings industry, advocacy and government experts together to develop solutions for integrating more distributed generation resources gradually into state electricity distribution grids."

grid integration of distributed solar resources, strategies and technologies for increased geothermal and wind power production, and electricity-saving technologies and strategies for the industrial, agricultural, and water sectors. These requests for public input helped refine the scope of solicitation topics. Pre-application workshops were held in 2016 for the following solicitations:

- RFP-15-319: California Commercial End-Use Survey
- GFO-15-320: Assess Vulnerability of California's Transportation Fuel Sector to Extreme Weather-Related Events and Identify Resilience Options
- GFO-15-321: Los Angeles Regional Energy Innovation Cluster
- GFO-15-323: Innovative Water and Energy Efficiency Demonstrations for the Commercial, Industrial or Water/Wastewater Sectors
- GFO-15-325: Development, Demonstration and Deployment of Environmentally and Economically Sustainable Biomass-to-Energy Systems for the Forest and Food Waste Sectors (three preapplication workshops were held for this solicitation: one in Sacramento, one in Merced, and one in Diamond Bar)
- GFO-16-301: Improving Performance and Cost Effectiveness of Small Hydro, Geothermal and Wind Energy Technologies
- GFO-16-302: Advance Breakthrough and Piezoelectric-Based Systems Development to Increase Market Penetration of Distributed Renewable Generation
- GFO-16-303: Advanced Vehicle-Grid Integration Research and Demonstration
- GFO-16-304: Emerging Energy Efficient Technology Demonstrations (EEETD) (two preapplication workshops were held for this solicitation: one in Sacramento and one in Diamond Bar)
- GFO-16-305: Advancing Cutting-Edge Technologies and Strategies to Reduce Energy Use and Costs in the Industrial, Agriculture and Water Sectors (two preapplication workshops were held for this solicitation: one in Sacramento and one in Diamond Bar)
- GFO-16-306: Addressing Air Quality and Environmental Impacts of Conventional and Emerging Electricity Sector Technologies in a Changing Climate
- GFO-16-309: Solar+: Taking the Next Steps to Enable Solar as a Distribution Asset

Transparent and Public Process and Solicitation Activities

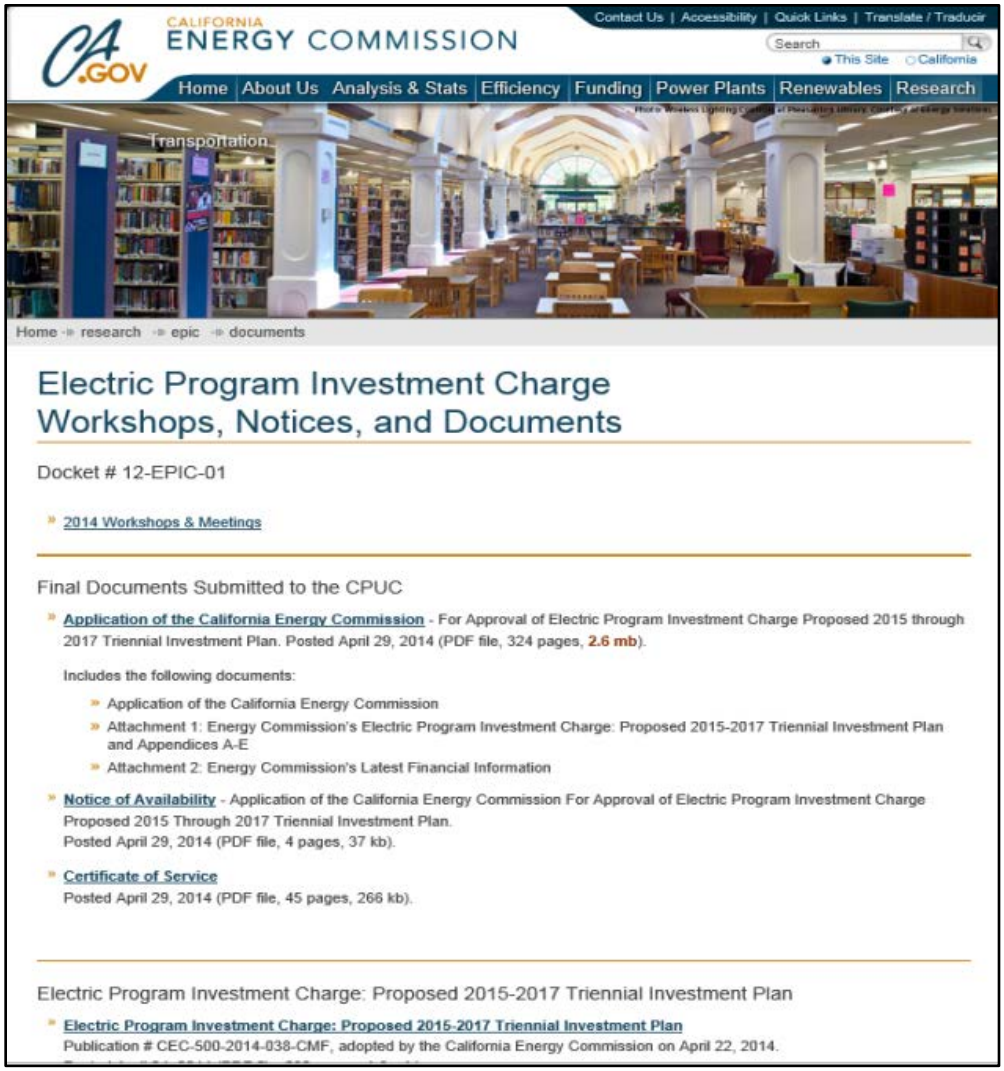
The Energy Commission is committed to a transparent and public process in all phases of EPIC administration, including investment plan development and approval, competitive solicitation processes, and project approval and management.

To help ensure a transparent and public process, the Energy Commission operates a Web page (http://energy.ca.gov/research/epic/) that provides information about:

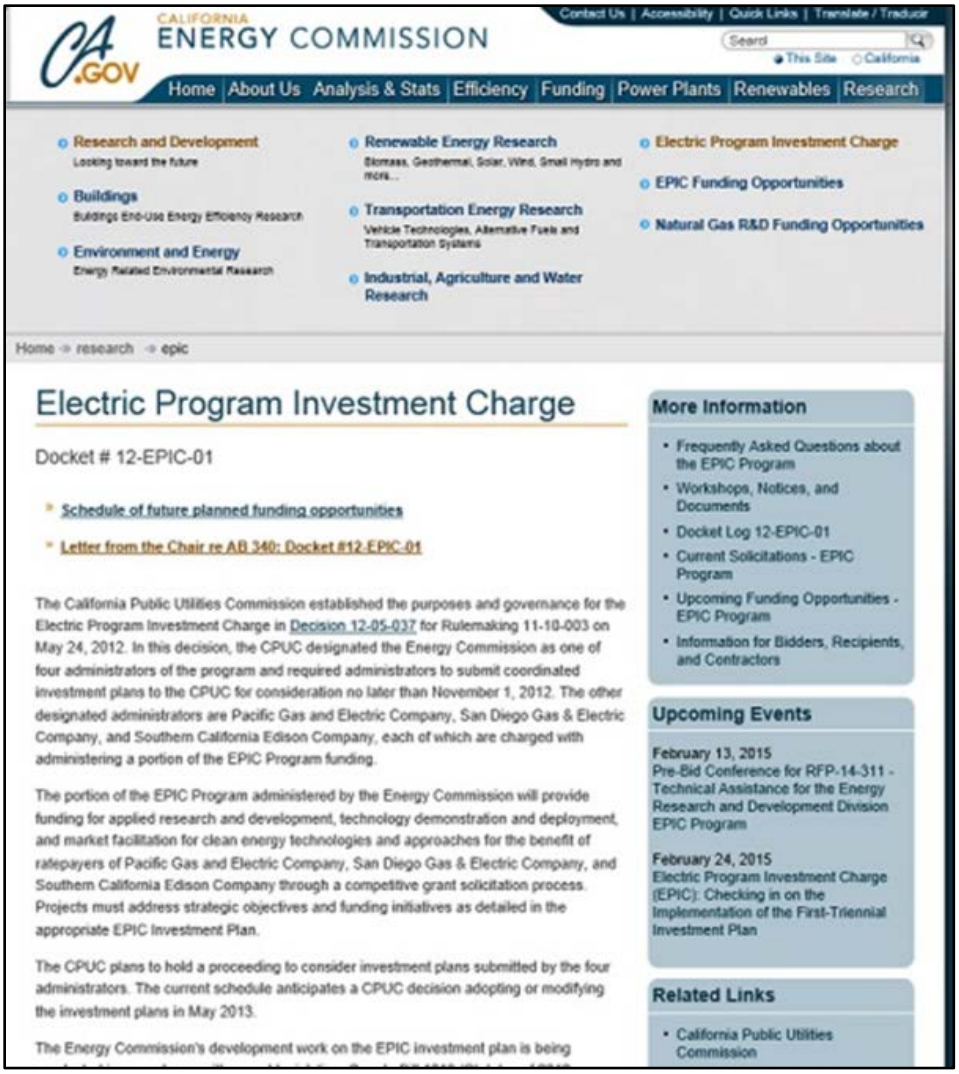
- EPIC Program overview.
- Previous and upcoming workshops.
- Public comments.
- Upcoming events.
- How to sign up for the listserv.
- Documents associated with the program.

The page (Figure 3) also serves as a resource for Energy Commission proceedings related to developing future triennial EPIC Investment Plans. Interested stakeholders can navigate to Energy Commission EPIC policy documents, presentations, funding solicitations, annual EPIC reports, workshop announcements and other resources that promote active participation in the program. EPIC solicitations and requests for comments to inform selected solicitation development are available online at http://www.energy.ca.gov/contracts/epic.html. Information on public workshops is available online at http://www.energy.ca.gov/research/epic/documents/. In addition, the Energy Commission established docket 16-EPIC-01, called the EPIC Ideas Exchange. Interested stakeholders can file their ideas under this docket for consideration in future solicitations.

Figure 3: California Energy Commission EPIC Website



Research Division EPIC homepage, http://energy.ca.gov/research/epic/



All EPIC-related documents, http://www.energy.ca.gov/research/epic/documents/

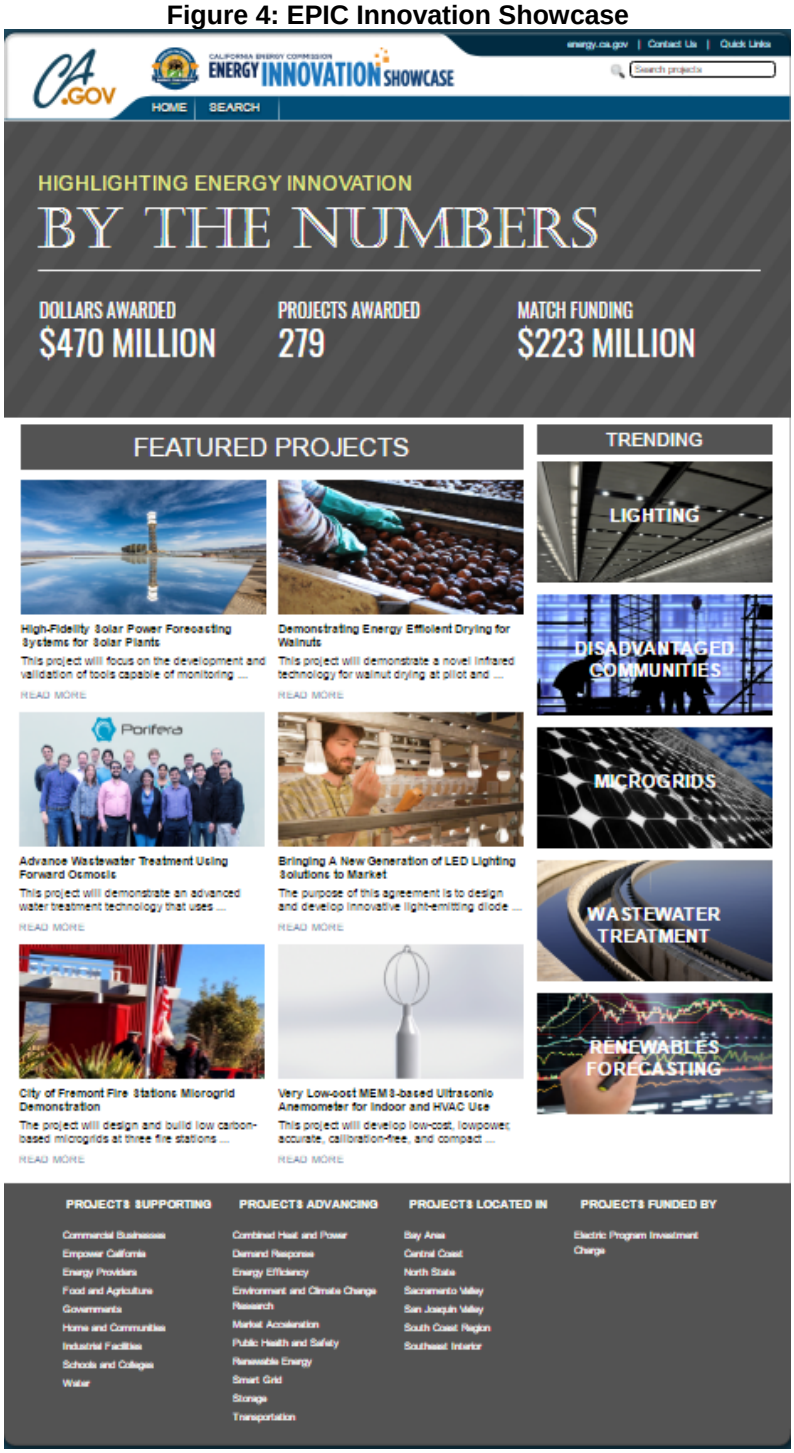
Source: California Energy Commission

Highlighting Projects and Diversity

In addition, the Energy Commission launched a new website called the EPIC Innovation Showcase[15] in May 2016 (Figure 4). The graphical Web page gives insight to the various projects, lists the award recipients and funding amount, and explains how the project benefits ratepayers. Projects can be searched by location, by areas of support, and by research topic. Visitors can also see what energy activities are trending. The page also highlights the Energy Commission's goal of increasing diversity in the energy sector and its expanded outreach to women, minority, disabled veteran, and LGBT communities.

15 http://innovation.energy.ca.gov/SearchHome.aspx?ti=636187052672554667.

Figure 4: EPIC Innovation Showcase



EPIC Innovation Showcase main page: http://innovation.energy.ca.gov/SearchHome.aspx?ti=636187052672554667

EPIC project page example,
http://innovation.energy.ca.gov/SearchResultProject.aspx?p=30084&tks=636219715867457134

Source: California Energy Commission

Competitive Solicitation Process and Activities

In 2016, the Energy Commission issued 11 competitive solicitations to fund initiatives outlined in the first two EPIC Investment Plans. To ensure a fair and transparent competitive solicitation, Energy Commission staff conducted the following for each solicitation:

- Posted the solicitation on the Energy Commission's website and notified interested parties of the solicitation through the Opportunity listserv, the EPIC listserv, and the LinkedIn Networking Hub. The Opportunity listserv contains 4,893 subscribers, and the EPIC listserv contains 1,348 subscribers. (There is some overlap.) The LinkedIn Networking Hub has 1,188 subscribers.
- Held at least one publicly noticed workshop for each solicitation to review the purpose, requirements, eligibility, and innovation topics of the solicitation with interested parties. The public workshop also provided an opportunity for potential applicants to participate remotely and ask questions about the solicitation and the application process.
- Provided interested parties the opportunity to submit written questions about the solicitation.
- Posted staff responses to solicitation questions on the Energy Commission's website to ensure that all potential applicants had access to the same information. These responses are also sent out to everyone on the Opportunity listserv.
- Posted on the Energy Commission's website and sent to the Opportunity listserv any revisions made to the solicitation (via addenda).
- For solicitations where scoring was completed in 2016, the Energy Commission released a notice of proposed awards (NOPA) identifying proposed funding recipients.
- For recipients not awarded funding for these solicitations, an opportunity was provided to receive a debriefing.

In addition to the administrative standards and practices listed, the Energy Commission conducts activities to ensure that the competitive solicitation process — including solicitation development — is fair and transparent. The Energy Commission's *2015-2017 EPIC Investment Plan* states that, to benefit from coordination among EPIC administrators and to ensure fairness for all bidders in competitive solicitations, IOUs may not submit bids to those solicitations they help develop. Similarly, state agencies, universities, and other stakeholders that provide input on the development of a solicitation are precluded from submitting bids in that solicitation, unless the input is provided through a public forum (such as a workshop, webinar, or staff survey) in which other entities have the same opportunity to provide input.

Project Approval and Management

After the NOPA is issued, Energy Commission staff works with each awardee to develop a grant agreement or contract. Before work can begin, the grant agreement or contract must be approved by the Energy Commission at a publicly noticed business meeting. In 2016, the Energy Commission approved 111 EPIC projects.[16] Project details are provided in Chapter 3 of this report.

Once agreements are approved, Energy Commission staff manages the agreement, which includes conducting site visits, tracking project progress, facilitating technical advisory committee and critical project review meetings, and reviewing project deliverables. Project fact sheets and final reports will be publicly accessible on the Energy Commission's website to share project results. Except when valid reasons exist for confidentiality, the Energy Commission will make available upon request all data, findings, results, computer models, and other products developed through the EPIC Program, consistent with the treatment of intellectual property requirements.[17] In addition, each annual report includes summaries and metrics for all active projects and all projects completed during the past year.[18]

16 This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

17 As required in CPUC Decision 13-11-025, Ordering Paragraph 13.

18 As required by Public Resources Code Section 25711.5 and CPUC Decision 13-11-025, Ordering Paragraphs 14, 23, and 27.

CHAPTER 2:
Budget

Authorized Budget

The CPUC approved a final EPIC budget for the first triennial investment cycle (2012-2014) in Decision 13-11-025. The Energy Commission's total EPIC funding allocation of $368.7 million for funds collected in 2012-2014 includes $331.8 million in project funds to be awarded under the three program areas, as well as $36.9 million for program administration (Table 1). Decision 12-05-037, as modified, caps program administrative costs for each EPIC administrator at 10 percent.

Table 1: CPUC-Approved Energy Commission EPIC Funding 2012-2014

Funding Element/Program Area	Total (in millions)
Applied Research and Development	$158,700,000
Technology Demonstration and Deployment	$129,800,000
Market Facilitation	$43,300,000
Subtotal	**$331,800,000**
Program Administration	$36,900,000
Grand Total	**$368,700,000**

Source: California Energy Commission

The Energy Commission must also obtain state Budget Act authority to pay out these funds from the Legislature each fiscal year. Between fiscal years 2012-2013 and 2014-2015, the Energy Commission received a total state Budget Act authority of $23.829 million for program administration and $331.8 million for project awards. This made the total state authorized budget for project awards through fiscal year 2014-2015 consistent with the CPUC's approved budget of $331.8 million for project awards. The Energy Commission has committed this full amount in completed, active, and planned solicitations.

The Energy Commission's approved *2015-2017 EPIC Investment Plan* proposed a total of $388.8 million over the three-year period. In 2015, the CPUC approved about an additional $16.99 million in funding over the three-year period as a result of Consumer Price Index (CPI) and other adjustments.[19] This amount brings the adjusted total for project awards to

19 CPUC Decision 15-04-020 modified and approved the proposed 2015-2017 EPIC Investment Plan. The approved budget is listed in Appendix B, Table 5.

about $365.01 million and $40.78 million for program administration (Table 2). The Energy Commission has committed this full amount in completed, active, and planned solicitations.

For fiscal year 2016-2017, the Energy Commission received state Budget Act authority of $19.786 million for program administration and $125.003 million for project awards.

Table 2: CPUC-Approved, Escalated Energy Commission EPIC Funding 2015-2017

Funding Element/Program Area	Total
Applied Research and Development	$158,166,500
Technology Demonstration and Deployment	$151,271,600
Market Facilitation	$55,566,400
Subtotal	**$365,004,500**
Program Administration	$40,782,600
Grand Total	**$405,787,100**

Source: California Energy Commission

The Energy Commission administrative costs for EPIC include all research planning, project management, and administrative and program oversight work performed by Energy Commission staff for the EPIC Program, including the following tasks:[20]

- Research available energy technologies and identify the most promising emerging technological solutions. Develop solicitations to reach performance targets and to attract proposals that provide the most promise in delivering energy technologies that are cleaner, safer, more reliable, and affordable.
- Manage research agreements to achieve technological goals for the EPIC-funded grants, contracts, and awards. Research managers visit sites, evaluate technology progress to plan, and determine if research is on track. Corrective action is taken to redirect projects or stop work if research is not meeting expectations.
- Execute EPIC research, development, and demonstration, and market facilitation program, including planning, contracting, and awarding grants, as defined in the approved investment plans.
- Conduct workshops, meetings, and Web conferences on the current state of the energy market, policy impacts, and opportunities for renewable energy and other energy emerging technologies to assist in developing competitive solicitations and to help prepare initiatives for future investment plans.

20 Energy Commission administrative costs are categorized differently than IOU administrative costs.

- Develop, coordinate, publish, and submit required annual reports and documents to the CPUC and the Legislature.
- Research, coordinate, develop, and submit to the CPUC proposed investment plans.
- Participate in CPUC EPIC-related proceedings and workshops.

Funding Commitments and Encumbrances

CPUC Definitions of Commitments and Encumbrances

To clarify the difference between commitments and encumbrances for the EPIC Program, the CPUC adopted the following definitions in Decision 13-11-025:

"'Committed funds' are funds identified during the planning of a solicitation for a specific project that will be needed to fund a contract or grant for that project at the conclusion of a planned or released solicitation…'Encumbered funds' are monies that are specified within contracts and grants signed during a previous triennial investment plan cycle and associated with specific activities under the contract or grant. All activities carried out under a contract or grant during a specific triennial investment plan cycle need not be completed and funds need not be spent during that particular program cycle if the activities undertaken pursuant to the contract or grant are expected to be completed. Only funds that are committed or encumbered during the prior program cycle are eligible for being rolled into the following program cycle."[21]

Approved Awards in 2016

Table 3 shows projects that were approved for funding in 2016. A full list of submitted projects is available in the Energy Commission's notice of proposed action (NOPA) for each solicitation.[22]

21 CPUC Decision 13-11-025, Ordering paragraphs 44 and 45.

22 More information on proposed awards can be found at http://www.energy.ca.gov/contracts/epic.html#closed.

Table 3: Approved EPIC Funding Awards in 2016

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Regional Energy Innovation Clusters (GFO-15-306) Applied Research and Development				
EPC-15-030	Cleantech San Diego Association	San Diego Regional Energy Innovation Cluster	2012-2014 Investment Plan	$3,000,000
EPC-15-032	Physical Science Innovations, Inc.	Bay Area Regional Energy Innovation Cluster	2012-2014 Investment Plan	$2,000,000
EPC-15-038	California State University, Fresno Foundation	Central Valley Energy Innovation Cluster: BlueTech Valley Energy Cluster	2012-2014 Investment Plan	$3,000,000
AR&D Subtotal				**$8,000,000**
Regional Energy Innovation Clusters (GFO-15-306) Market Facilitation				
EPC-15-030	Cleantech San Diego Association	San Diego Regional Energy Innovation Cluster	2015-2017 Investment Plan	$2,000,000
EPC-15-032	Physical Science Innovations, Inc.	Bay Area Regional Energy Innovation Cluster	2015-2017 Investment Plan	$2,980,000
EPC-15-038	California State University, Fresno Foundation	Central Valley Energy Innovation Cluster: BlueTech Valley Energy Cluster	2015-2017 Investment Plan	$2,000,000
MF Subtotal				**$6,980,000**
Subtotal				**$14,980,000**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Reducing Costs for Communities and Businesses Through Integrated Demand-Side Management and Zero-Net-Energy Demonstrations (GFO-15-308) Applied Research and Development				
EPC-15-097	Build It Green	Achieving Zero-Net-Energy in Multifamily Buildings	2015-2017 Investment Plan	$1,955,811
EPC-16-001	Institute of Gas Technology dba Gas Technology Institute (GTI)	Measure Results From Affordable Zero-Net-Energy Homes	2015-2017 Investment Plan	$1,000,000
EPC-16-002	Lawrence Berkeley National Laboratory	Pathways to More Cost-Effective ZNE Homes	2015-2017 Investment Plan	$1,000,000
EPC-16-003	Regents of the University of California, Davis - California Lighting Technology Center	Pilot-Scale Evaluation of an Integrated Building Control Retrofit Package	2015-2017 Investment Plan	$1,999,089
EPC-16-004	Lawrence Berkeley National Laboratory	Integrated Whole-Building Zero–Net-Energy Retrofits for Small Commercial Offices	2015-2017 Investment Plan	$2,000,000
EPC-16-005	Regents of the University of California, Davis	Energy-Efficient HVAC Packages for Existing Residential Buildings	2015-2017 Investment Plan	$1,200,000
EPC-16-007	Regents of the University of California, Davis	Optimization of Energy Efficiency to Achieve Zero-Net-Energy in Multifamily and Commercial Buildings	2015-2017 Investment Plan	$1,000,000
EPC-16-013	The Regents of the University of California on behalf of the Berkeley campus	Integrating Smart Ceiling Fans and Communicating Thermostats to Provide Energy-Efficient Comfort	2015-2017 Investment Plan	$1,888,683
AR&D Subtotal				**$12,043,583**
Reducing Costs for Communities and Businesses Through Integrated Demand-Side Management and Zero-Net-Energy Demonstrations (GFO-15-308) Technology Demonstration and Deployment				
EPC-15-041	Prospect Silicon Valley	MarketZero: Taking an existing grocery store to scalable near-ZNE	2012-2014 Investment Plan	$2,999,591
EPC-15-042	California Homebuilding Foundation (CHF)	Zero Energy Residential Optimization - Community Achievement (ZERO-CA)	2012-2014 Investment Plan	$4,819,805
EPC-15-053	Electric Power Research Institute, Inc.	Customer-Centric Approach to Scaling IDSM Retrofits	2012-2014 Investment Plan	$3,894,721
EPC-15-064	Prospect Silicon Valley	Innovative Net Zero: ZNE Demonstration in Existing Low-Income Mixed-Use Housing	2012-2014 Investment Plan	$2,995,653

EPC-15-085	Center for Sustainable Energy	San Diego Libraries Zero Net Energy and Integrated Demand-Side Management Demonstration Project	2012-2014 Investment Plan	$2,715,516
EPC-15-094	Electric Power Research Institute (EPRI)	Demonstration of Affordable, Comfortable, Grid Integrated Zero-Net-Energy Communities	2012-2014 Investment Plan	$3,207,432
			2015-2017 Investment Plan	$1,735,377
TD&D Subtotal				**$22,368,095**
Subtotal				**$34,411,678**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Reduce the Environmental and Public Health Impacts of Electrical Generation and Make the Electricity System Less Vulnerable to Climate Impacts: Phase II (GFO-15-309) Applied Research and Development				
EPC-15-028	Electric Power Research Institute, Inc.	Real-World Electrification Options of Energy Services and Environmental Justice (EJ) Considerations	2012-2014 Investment Plan	$799,444
EPC-15-029	Black & Veatch Corporation	Distributed Generation Environmental Planner	2012-2014 Investment Plan	$199,976
EPC-15-033	Regents of the University of California, Davis	Ventilation Solutions for Energy-Efficient California Schools: Improving Indoor Air Quality Through Advanced, High-Performance HVAC	2012-2014 Investment Plan	$1,500,000
EPC-15-034	Public Health Institute	Emerging Energy Public Health Research Roadmap	2012-2014 Investment Plan	$151,000
EPC-15-035	Lawrence Berkeley National Laboratory	Clarifying and Quantifying Current and Near-Term Groundwater Pumping Energy Use and Costs in California to Improve Energy and Water Systems Reliability	2012-2014 Investment Plan	$625,000
EPC-15-036	Eagle Rock Analytics	Probabilistic Seasonal and Decadal Forecasts for the Electricity System Using Linear Inverse Modeling	2012-2014 Investment Plan	$400,000
EPC-15-037	Lawrence Berkeley National Laboratory	Smart Ventilation for Advanced California Homes	2012-2014 Investment Plan	$1,500,000

EPC-15-039	The Regents of the University of California, Berkeley	Carbon Balance With Renewable Energy: Effects of Solar Installations on Desert Soil Carbon Cycle	2012-2014 Investment Plan	$499,181
EPC-15-040	Zoological Society of San Diego d/b/a San Diego Zoo Global	Assessing California's Mitigation Guidelines for Burrowing Owls Impacted by Renewable Energy	2012-2014 Investment Plan	$598,671
EPC-15-043	Regents of the University of California, Los Angeles	Development of a Genoscape Framework for Assessing Population-Level Impacts of Renewable Energy Development on Migratory Bird Species in California	2012-2014 Investment Plan	$599,236
EPC-15-049	Antelope Valley Water Storage, LLC	Electricity Pumped Storage Systems Using Underground Reservoirs: A Feasibility Study for the Antelope Valley Water Storage System	2012-2014 Investment Plan	$197,300
EPC-15-060	Regents of the University of California, Davis	Optimizing Solar Facility Configuration Effects on Habitat, Managed Plants, and Essential Species Interactions	2012-2014 Investment Plan	$597,865
EPC-15-062	The Regents of the University of California, Irvine Advanced Power and Energy Program	Robust, Low-Cost, Real-Time, NOx Sensor for Optimization of Dispatchable Distributed Generation Systems	2012-2014 Investment Plan	$200,000
EPC-15-068	Lawrence Berkeley National Laboratory	Understanding and Mitigating Barriers to Wind Energy Expansion in California	2012-2014 Investment Plan	$200,000
EPC-15-070	Altostratus, Inc.	Intraurban Enhancements to Probabilistic Climate Forecasting for the Electric System	2012-2014 Investment Plan	$193,326
EPC-15-072	The Regents of the University of California, Davis Campus	New Chemical Compounds for Cost-Effective Carbon Capture	2012-2014 Investment Plan	$200,000
EPC-15-078	The Regents of the University of California, Berkeley	Risk Modeling and Cognitive Science Characterization of Barriers to Climate Change Adaptation in California Electricity Sector	2012-2014 Investment Plan	$350,000
EPC-15-080	Thalassa Research & Consulting, LLC	Interdependencies of Electric Grid and Critical Lifelines: Identifying Climate Exposure and Adaptation Strategies	2012-2014 Investment Plan	$128,188

EPC-15-081	Ghoulem Research	Historical Insights for Electricity Transition Scenarios in California and Flexible Energy Demand Modeling for Residential Air Conditioning With Improved Behavioral Specificity	2012-2014 Investment Plan	$400,000
EPC-15-082	The Regents of the University of California, Merced	Low-Temperature Microplasma-Assisted Hydrogen Production From Biogas for Electricity Generation	2012-2014 Investment Plan	$200,000
Subtotal				**$9,539,187**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Developing a Portfolio of Advanced Efficiency Solutions: Plug Load Technologies and Approaches for Buildings, Phase II (GFO-15-310) Applied Research and Development				
EPC-15-021	AGGIOS, Inc.	Mobile Efficiency for Plug Load Devices	2012-2014 Investment Plan	$1,996,999
EPC-15-022	The Regents of the University of California, Irvine	Power Management User Interface	2012-2014 Investment Plan	$785,124
EPC-15-023	Lawrence Berkeley National Laboratory	Gaming System Energy Efficiency Without Performance Compromises	2012-2014 Investment Plan	$1,386,530
EPC-15-024	Lawrence Berkeley National Laboratory	Efficient and ZNE-Ready Plug Loads	2012-2014 Investment Plan	$1,600,000
EPC-15-025	Home Energy Analytics, Inc.	Plug Load Reduction App: RYPL	2012-2014 Investment Plan	$884,100
EPC-15-026	Lawrence Berkeley National Laboratory	Unlocking Plug Load Energy Savings Through Energy Reporting	2012-2014 Investment Plan	$1,630,699
EPC-15-027	Fisher-Nickel, Inc.	Electric Plug Load Savings Potential of Commercial Foodservice Equipment	2012-2014 Investment Plan	$937,469
EPC-15-031	Electric Power Research Institute (EPRI)	Flexible Control Strategies for Plug Loads With Context-Aware Smart Power Outlets to Mitigate Electricity Waste and Support Demand Response	2012-2014 Investment Plan	$1,050,022
Subtotal				**$10,270,943**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Advancing Solutions That Allow Customers to Manage Their Energy Demand (GFO-15-311) Applied Research and Development				
EPC-15-045	Electric Power Research Institute (EPRI)	Transactive Incentive Signals to Manage Electricity Consumption for Demand Response	2012-2014 Investment Plan	$498,054
EPC-15-048	Alternative Energy Systems Consulting, Inc.	Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed Energy Resources	2012-2014 Investment Plan	$3,996,560
EPC-15-051	Lawrence Berkeley National Laboratory	The Value Proposition for Cost-Effective, DR-Enabling, Nonresidential Lighting System Retrofits in California Buildings	2012-2014 Investment Plan	$500,000
EPC-15-054	Universal Devices, Inc.	Complete and Low-Cost Retail Automated Transactive Energy System (RATES)	2012-2014 Investment Plan	$3,187,370
EPC-15-057	The Regents of the University of California (CIEE)	Customer-Controlled, Price-Mediated, Automated Demand Response for Commercial Buildings	2012-2014 Investment Plan	$4,000,000
EPC-15-073	Regents of the University of California, Los Angeles	Identifying Effective Demand Response Program Designs to Increase Residential Customer Participation	2012-2014 Investment Plan	$2,007,875
EPC-15-074	Center for Sustainable Energy	Meeting Customer and Supply-Side Market Needs With Electrical and Thermal Storage, Solar, Energy Efficiency and Integrated Load Management Systems	2012-2014 Investment Plan	$3,960,805

EPC-15-075	Electric Power Research Institute (EPRI)	Customer-centric Demand Management Using Load Aggregation and Data Analytics	2012-2014 Investment Plan	$3,998,587
EPC-15-083	Ohmconnect, Inc.	Empowering Proactive Consumers to Participate in Demand Response Programs	2012-2014 Investment Plan	$3,995,028
EPC-15-084	BMW of North America, LLC	Total Charge Management: Advanced Charge Management for Renewable Integration	2012-2014 Investment Plan	$3,999,900
Subtotal				**$30,144,179**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
The EPIC Challenge: Accelerating the Deployment of Advanced Energy Communities, Phase 1 (GFO-15-312) Market Facilitation				
EPC-15-052	ZipPower, LLC	ZipPower San Leandro	2012-2014 Investment Plan	$1,495,338
EPC-15-055	Charge Bliss, Inc.	The Charge Bliss Advanced Renewable Energy Community for a Disadvantaged Southern California Community	2012-2014 Investment Plan	$1,500,000
EPC-15-056	Natural Capitalism Solutions, dba Clean Coalition	Peninsula Advanced Energy Community (PAEC)	2012-2014 Investment Plan	$1,318,997
EPC-15-058	The Regents of the University of California, Berkeley	The Oakland EcoBlock - A Zero-Net-Energy, Low-Water-Use Retrofit Neighborhood Demonstration Project	2012-2014 Investment Plan	$1,500,000
EPC-15-061	Regents of the University of California, Los Angeles	Using Data-Driven Approaches to Design Advanced Energy Communities for Existing Buildings	2012-2014 Investment Plan	$1,497,996
EPC-15-065	City of Berkeley	Berkeley Energy Assurance Transformation (BEAT) Project	2012-2014 Investment Plan	$1,499,214
EPC-15-066	Groundwork San Diego-Chollas Creek	Developing an Advanced Energy Master Plan for the Encanto Neighborhood in San Diego	2012-2014 Investment Plan	$1,500,000
EPC-15-067	Local Government Commission	Integrated Community Resource Marketplace	2012-2014 Investment Plan	$1,500,000
EPC-15-069	Zero Net Energy (ZNE) Alliance	Lancaster Advanced Energy Community (AEC) Project	2012-2014 Investment Plan	$1,469,779
EPC-15-071	Biodico, Inc.	Zero-Net-Energy Farms	2012-2014 Investment Plan	$1,175,919
EPC-15-076	Zero Net Energy (ZNE) Alliance	Richmond Advanced Energy Community Project	2012-2014 Investment Plan	$1,480,111
EPC-15-077	The Regents of the University of California, Irvine Advanced Power and Energy Program	Huntington Beach Advanced Energy Community Blueprint	2012-2014 Investment Plan	$1,500,000
EPC-16-008	City of Santa Monica	Santa Monica Advanced Energy District	2015-2017 Investment Plan	$1,487,609
Subtotal				**$18,924,963**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Developing the Smart Grid of 2020: Clean, Safe, and Highly Intelligent (GFO-15-313) Applied Research and Development				
EPC-15-044	Electric Power Research Institute (EPRI)	Certified Open-Source Software to Support the Interconnection Compliance of Distributed Energy Resources	2012-2014 Investment Plan	$816,539
EPC-15-046	Siemens Corporation, Corporate Technology	Developing a Distribution Substation Management System	2012-2014 Investment Plan	$500,000
EPC-15-047	SLAC National Accelerator Laboratory	Powernet - A Cloud-Based Method for Managing Distribution Resources	2012-2014 Investment Plan	$2,210,720
EPC-15-059	Onset, Inc.	UniGen Smart System for Renewable Integration	2012-2014 Investment Plan	$638,993
EPC-15-086	Advanced Power and Energy Program (APEP) - University of California, Irvine	Substation Automation and Optimization of Distribution Circuit Operations	2012-2014 Investment Plan	$932,718
EPC-15-089	Electric Power Research Institute (EPRI)	Expanding Standards and Developing Tools to Enable DNP3 Support of Energy Storage Use Cases	2012-2014 Investment Plan	$873,516
EPC-15-090	The Regents of the University of California (UC Riverside)	Integrated Distributed Energy Resources Management System (iDERMS)	2012-2014 Investment Plan	$1,119,437
Subtotal				**$7,091,923**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Advancing Water and Energy-Efficient Strategies and Technologies in California (GFO-15-317) Applied Research and Development				
EPC-16-006	ES Engineering Services, LLC	Low-Energy, Zero-Liquid-Discharge Adsorption Technology to Remove Contaminants and Recover Source Water	2015-2017 Investment Plan	$986,262
EPC-16-009	Porifera, Inc.	Testing a Low-Energy Water Treatment System for Fail-Safe Direct Potable Reuse	2015-2017 Investment Plan	$999,795
EPC-16-010	Regents of the University of California (University of California, Davis)	Improving Water and Energy Efficiency in California's Dairy Industry	2015-2017 Investment Plan	$1,000,000

EPC-16-011	Kennedy/Jenks Consultants	Novel Membrane Technology to Improve Energy Efficiency and Water Savings in Wastewater Treatment Operations	2015-2017 Investment Plan	$882,430
EPC-16-012	Altex Technologies Corporation	Power and Water Saving Advanced Hybrid Air/Wet Cooling System	2015-2017 Investment Plan	$999,994
EPC-16-014	Lawrence Livermore National Laboratory	A New Solution to California's Energy and Water Challenges: Reducing the Cost of Desalination and Increasing Water Reuse	2015-2017 Investment Plan	$999,040
AR&D Subtotal				**$5,867,521**
Advancing Water and Energy-Efficient Strategies and Technologies in California (GFO-15-317) Technology Demonstration and Deployment				
EPC-15-050	Regents of the University of California, Davis	Winery Water and Energy Savings	2012-2014 Investment Plan	$1,989,201
EPC-15-079	Victor Valley Wastewater Reclamation Authority (VVWRA)	Advanced Renewable Energy Storage and Recycled Water Project	2012-2014 Investment Plan	$1,734,059
EPC-15-087	Electric Power Research Institute (EPRI)	Cooling Tower Water Treatment Using Vortex Process Technology for Energy and Water Savings	2012-2014 Investment Plan	$1,999,995
EPC-15-088	Kennedy/Jenks Consultants	Biofiltration as an Advanced Primary Treatment Method to Achieve Substantial Energy Savings	2012-2014 Investment Plan	$1,306,185
EPC-15-091	Electric Power Research Institute (EPRI)	Energy Efficiency and Water Savings in Agriculture by Innovative Plant-Aware Irrigation System	2012-2014 Investment Plan	$1,097,990
EPC-15-092	Tomorrow Water dba BKT United	Low-Energy Biofiltration System With Low Backwash Rate for Groundwater Contaminant Removal	2012-2014 Investment Plan	$1,722,072
EPC-15-096	American Water Works Company, Inc.	Demonstrating Innovative Leakage Reduction Strategies: Correlating Continuous Acoustic Monitoring, Satellite Imagery and Flow–Sensitive, Pressure-Reducing Valve System	2012-2014 Investment Plan	$1,517,780
TD&D Subtotal				**$11,367,282**

Advancing Water and Energy-Efficient Strategies and Technologies in California (GFO-15-317) Market Facilitation				
EPC-15-093	Water Energy Innovations, Inc.	Accelerating Drought Resilience Through Innovative Technologies	2015-2017 Investment Plan	$1,000,000
MF Subtotal				**$1,000,000**
Subtotal				**$18,234,803**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Los Angeles Regional Energy Innovation Cluster (GFO-15-321) Market Facilitation				
EPC-16-015	Los Angeles Cleantech Incubator	Los Angeles Regional Energy Innovation Cluster	2015-2017 Investment Plan	$4,999,247
Subtotal				**$4,999,247**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Innovative Water and Energy Efficiency Demonstrations for the Commercial, Industrial or Water/Wastewater Sectors (GFO-15-323) Technology Demonstration and Deployment				
EPC-16-017	Silicon Valley Clean Water	Maximizing Energy Efficiency and Reducing Biosolids Waste From New Anaerobic Wastewater Treatment Technology	2015-2017 Investment Plan	$1,999,962
EPC-16-018	BDP Technologies	Biological Double-Efficiency Process as an Advanced Wastewater Treatment Method to Achieve Substantial Energy and Water Savings	2015-2017 Investment Plan	$1,565,400
Subtotal				**$3,565,362**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Improving Performance and Cost-Effectiveness of Small Hydro, Geothermal, and Wind Energy Technologies (GFO-16-301) Applied Research and Development				
EPC-16-020	SRI International	Recovery of Lithium From Geothermal Brines	2015-2017 Investment Plan	$873,387
EPC-16-021	Lawrence Berkeley National Laboratory	High-Resolution Imaging of Geothermal Flow Paths Using a Cost-Effective Dense Seismic Network	2015-2017 Investment Plan	$1,672,639
EPC-16-022	Lawrence Berkeley National Laboratory	Comprehensive Physical-Chemical Modeling to Reduce Risks and Costs of Flexible Geothermal Energy Production	2015-2017 Investment Plan	$999,032
Subtotal				**$3,545,058**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Developing a Portfolio of Advanced Efficiency Solutions: Technologies and Approaches for More Affordable and Comfortable Buildings (PON-13-301) Applied Research and Development				
EPC-15-019	Regents of the University of California (University of California, Davis)	Low-Cost, Large-Diameter, Shallow Ground Loops for Ground-Coupled Heat Pumps	2012-2014 Investment Plan	$1,212,186
EPC-15-020	Electric Power Research Institute (EPRI)	Intelligent HVAC Controls for Low-Income Households: A Low-Cost, Nonconnected Device That Understands Consumer Preferences and Performs Adaptive Optimization	2012-2014 Investment Plan	$2,705,759
Subtotal				**$3,917,945**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Developing Advanced Energy Storage Technology Solutions to Lower Costs and Achieve Policy Goals (PON-13-302) Applied Research and Development				
EPC-15-016	Amber Kinetics, Inc.	A Transformative Flywheel R&D Project	2012-2014 Investment Plan	$2,000,000
EPC-15-018	Eos Energy Storage, LLC	Pilot Testing of Eos' Znyth Battery Technology in Distributed Energy Storage Systems	2012-2014 Investment Plan	$1,894,866
Subtotal				**$3,894,866**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Federal Cost Share Under the Electric Program Investment Charge (PON-14-308) Applied Research and Development				
EPC-16-016	Hyperlight Energy	Commercializing a Disruptively Low-Cost Solar Collector	2015-2017 Investment Plan	$750,000
Subtotal				**$750,000**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Driving the Integration of Electric Vehicles to Maximize Benefits to the Grid (PON-14-310) Applied Research and Development				
EPC-15-013	The Regents of the University of California, Berkeley	Open Source Platform for Plug-In Electric Vehicle Smart Charging in California	2012-2014 Investment Plan	$1,500,000
EPC-15-015	Andromeda Power, LLC	Grid Communication Interface for Smart Electric Vehicle Services Research and Development	2012-2014 Investment Plan	$681,693
Subtotal				**$2,181,693**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Connecting Emerging Energy Technologies and Strategies to Market Needs and Opportunities (RFP-15-304) Market Facilitation				
300-15-009	Navigant Consulting, Inc.	Connecting Emerging Energy Technologies and Strategies to Market Needs and Opportunities	2012-2014 Investment Plan	$6,825,763
			2015-2017 Investment Plan	$112,126
Subtotal				**$6,937,889**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Sustainable Energy Entrepreneur Development (SEED) Initiative (RFP-15-305) Applied Research and Development				
300-15-007	California Clean Energy Fund dba CalCEF Ventures	California Sustainable Energy Entrepreneurial Development (SEED) Technical Consulting	2012-2014 Investment Plan	$9,788,043
			2015-2017 Investment Plan	$20,211,957
Subtotal				**$30,000,000**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Research Roadmap for Getting to Zero-Net-Energy Buildings (RFP-15-315) Applied Research and Development				
300-15-008	Itron, Inc., dba IBS	Research Roadmap for Getting to Zero-Net-Energy Buildings	2012-2014 Investment Plan	$999,884
Subtotal				**$999,884**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Research Roadmap for Advancing Technologies in California's Industrial, Agricultural, and Water Sectors (RFP-15-316) Applied Research and Development				
300-15-010	Energetics Incorporated	Research Roadmap for Advancing Technologies in California's Industrial, Agricultural, and Water Sectors	2012-2014 Investment Plan	$647,728
Subtotal				**$647,728**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
California Commercial End-Use Survey (RFP-15-319) Market Facilitation				
300-15-011	ADM Associates, Inc.	California Commercial End-Use Survey	2012-2014 Investment Plan	$7,990,063
Subtotal				**$7,990,063**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
California Investor-Owned Utility Electricity Load Shapes (RFP-15-322) Market Facilitation				
300-15-013	ADM Associates, Inc.	California Investor-Owned Utility Electricity Load Shapes	2015-2017 Investment Plan	$1,147,406
Subtotal				**$1,147,406**

Agreement #	Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Approved
Noncompetitive Bid Awards*				
300-15-004	The Regents of the University of California, Merced	Optimizing Hydropower Operations While Sustaining Stream Temperatures and Ecosystem Functions	2012-2014 Investment Plan	$650,000
300-15-005	The Regents of the University of California, Irvine	Improving Hydrologic and Energy Demand Forecasts for Hydropower Operations With Climate Change	2012-2014 Investment Plan	$720,000
300-15-006	The Regents of the University of California, Los Angeles	Optimizing Use of Non-traditional Waters, Drought-Proofing the Electricity System and Improving Snowpack Prediction	2015-2017 Investment Plan	$1,130,000
Subtotal				**$2,500,000**
Total**				**$216,674,817**

* The three noncompetitive bid awards are all federal cost-share match awards.

** This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

Source: California Energy Commission

Proposed Awards in 2016

Table 4 shows proposed projects that were recommended for funding through a NOPA in 2016 but were not considered for approval at an Energy Commission business meeting in 2016. It is anticipated that these proposed projects will be approved in 2017. A full list of submitted projects can be seen in the Energy Commission's NOPA for each solicitation.[23]

23 More information on proposed awards can be found at http://www.energy.ca.gov/contracts/epic.html#closed.

Table 4: Proposed EPIC Funding Awards in 2016

Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Recommended
Improving Performance and Cost-Effectiveness of Small Hydro, Geothermal, and Wind (GFO-16-301) Applied Research and Development			
Regents of the University of California (University of California, Davis)	21st Century Solutions for 20th Century Wind Projects	2015-2017 Investment Plan	$810,438
San Gabriel Valley Water Company	San Gabriel Valley Water Company "Plug and Play" In-Conduit Hydropower Development Project (SGVWC Project)	2015-2017 Investment Plan	$500,000
Stantec Consulting Services Inc.	Comprehensive Assessment, Tools and Resources for Advancing In-Conduit Hydropower in California	2015-2017 Investment Plan	$400,000
Amador Water Agency	The Amador Water Agency In-Conduit Hydropower Development Project (AWA Project)	2015-2017 Investment Plan	$750,000
Natel Energy	Cost-Effective and Climate Resilient In-Conduit Hydropower and Civil Works Innovation	2015-2017 Investment Plan	$954,715
Subtotal			**$4,790,307**

Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Recommended
Emerging Energy-Efficient Technology Demonstrations (EEETD), Phase 1 (GFO-16-304) Technology Demonstration and Deployment			
Zero Net Energy Alliance	Automated Cloud-Based Continuously Optimizing Building Energy Management System (ACCO-BEMS)	2015-2017 Investment Plan	$2,500,000
California State University Long Beach	Internet of Things and Ubiquitous Sensing in University Building Energy Management: Design Optimization and Technology Demonstration	2015-2017 Investment Plan	$2,509,946
New Buildings Institute	Leading in Los Angeles: Demonstrating Scalable Emerging Energy-Efficient Technologies for Integrated Façade, Lighting, and Plug Loads	2015-2017 Investment Plan	$4,981,000
Subtotal			**$9,990,946**

Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Recommended
Advancing Cutting-Edge Technologies and Strategies to Reduce Energy Use and Costs in the Industrial, Agriculture, and Water Sectors: Phase 1 (GFO-16-305) Applied Research and Development			
PowWow Energy	Increased Energy Efficiency via Programmable Irrigation and Ferigation	2015-2017 Investment Plan	$2,992,660
Terzo Power Systems, LLC	Hyperefficient Pump Motor Unit With Fully Integrated Permanent Magner Motor and Motor Controls With Combined Liquid Cooling	2015-2017 Investment Plan	$2,311,050
The Regents of the University of California (UC Riverside)	Enabling Energy-Efficient Data Centers in Smart Power Distribution	2015-2017 Investment Plan	$1,783,118
Institute of Gas Technology dba Gas Technology Institute	Pilot Testing of Isothermal Compression	2015-2017 Investment Plan	$2,570,946

Electric Power Research Institute	Development and Testing of an Energy-Efficient Ultra-Low-Charge Ammonia Refrigeration System in a Food Processing Plant	2015-2017 Investment Plan	$2,406,054
Antelope Valley Water Storage, LLC	Water/Energy Bank Proof-of-Concept	2015-2017 Investment Plan	$1,000,000
Polaris Energy Services, Inc.	Development of New Technologies for Agricultural Loads to Participate in Renewables Integration, RTP Programs, and/or New Time-of-Use Rates	2015-2017 Investment Plan	$2,884,912
Advanced Microgrid Solutions, Inc.	Irvine Ranch Water District Demand Response Pilot Project	2015-2017 Investment Plan	$1,403,469
Irrigation for the Future	Demonstration, Development, and Validation of a Decision Support System for Irrigation/Energy Management and Demand Response: Facilitating On-Farm Participation in Energy Demand Management Programs	2015-2017 Investment Plan	$1,647,791
Electric Power Research Institute	Develop and Pilot Test Flexible Demand Response Control Strategies for Water Pumping Stations and Industrial Refrigeration Plants	2015-2017 Investment Plan	$3,000,000
Subtotal			**$22,000,000**

Prime Applicant	Project Title	EPIC Investment Plan	EPIC Funds Recommended
Federal Cost Share Under the Electric Program Investment Charge (PON-14-308) Applied Research and Development			
Lawrence Berkeley National Laboratory	Performance Evolution, Specification and Verification of Building Control Sequences (STAGE II)	2015-2017 Investment Plan	$1,000,000
SLAC National Accelerator Laboratory	Volttron Testing Tool Kit (Stage II)	2015-2017 Investment Plan	$70,000
Sunpreme, Inc.	High-Performance Cu-Plating for Heterojunction Silicon Cells, Based on Ultra-Low-Cost Printed Circuit Board (PCB) Technology	2015-2017 Investment Plan	$2,430,000
Subtotal			**$3,500,000**
Total			**$40,281,253**

Source: California Energy Commission

Committed Funds in 2016

The Energy Commission has committed the full $331.8 million from the *2012-14 Triennial Investment Plan* and the full funding amount for the *2015-17 Triennial Investment Plan*. As of December 31, 2016, the Energy Commission has approved projects totaling $64.6 million from the *2015-17 Triennial Investment Plan* program funds. In addition, $40.3 million of proposed projects have been recommended for funding in 2016, and these projects are expected to be considered for approval at an Energy Commission business meeting in 2017. There is also $105.2 million of committed funds in released solicitations as of December 31, 2016 (see Table 5 Active EPIC Solicitations and Table 6 Closed EPIC Solicitations). Table 5 shows EPIC solicitations that were still active on December 31, 2016. Table 6 shows solicitations that were closed and did not yet have a NOPA posted before December 31, 2016. The remaining funding from the *2015-17 Triennial Investment Plan* will be awarded from solicitations released in 2017.

Table 5: Active Solicitations for Energy Commission EPIC Project Funding

Active EPIC Solicitations as of December 31, 2016 2015-2017 EPIC Investment Plan				
Solicitation Title	**Release Date**	**Program Area/ Strategic Objective**	**Funding Amount**	**Application Deadline**
Emerging Energy-Efficient Technology Demonstrations (EEETD) (GFO-16-304)	Phase 2 November 23, 2016	Technology Demonstration and Deployment (S12)	$10 million	January 17, 2017
Advancing Cutting-Edge Technologies and Strategies to Reduce Energy Use and Costs in the Industrial, Agriculture, and Water Sectors (GFO-16-305)	Phase 2 December 20, 2016	Applied Research and Development (S1)	$3 million	January 18, 2017
Solar+: Taking the Next Steps to Enable Solar as a Distribution Asset (GFO-16-309)	November 22, 2016	Applied Research and Development (S3, S4, S6) Technology Demonstration and Deployment (S15)	$26 million	January 31, 2017
*Federal Cost Share (PON-14-308)	November 4, 2014 (ongoing)	Applied Research and Development (S11)	$7 million	Ongoing
		Technology Demonstration and Deployment (S17)	$8 million	Ongoing

* The Federal Cost Share solicitation is ongoing and funds are awarded to passing proposals on a first-come, first-served basis. As of December 31, 2016, $4.25 million of the Applied Research and Development amount has been recommended for funding.

Source: California Energy Commission

Table 6: Closed Solicitations for Energy Commission EPIC Project Funding

Closed EPIC Solicitations, With No Notice of Proposed Award (NOPA) Posted As of December 31, 2016* 2015-2017 EPIC Investment Plan			
Solicitation Title	**Application Deadline**	**Program Area/ Strategic Objective**	**Proposed Funding Amount**
Advanced Vehicle-Grid Integration Research and Demonstration (GFO-16-303)	October 21, 2016	Applied Research and Development (S9) Technology Demonstration and Deployment (16)	$16 million
Addressing Air Quality and Environmental Impacts of Conventional and Emerging Electricity Sector Technologies (GFO-16-306)	November 15, 2016	Applied Research and Development (S5)	$5.2 million
Advance Breakthrough and Piezoelectric-Based Systems Development to Increase Market Penetration of Distributed Renewable Generation (GFO-16-302)	November 18, 2016	Applied Research and Development (S3)	$7 million
Development, Demonstration, and Deployment of Environmentally and Economically Sustainable Biomass-to-Energy Systems for the Forest and Food Waste Sectors (GFO-15-325)	Phase 2 December 21, 2016	Applied Research and Development (S3) Technology Demonstration and Deployment (S13)	$23 million

* The applications for these solicitations were still being evaluated as of December 31, 2016, and the NOPAs are anticipated to post in 2017.

Source: California Energy Commission

Federal Cost Share in 2016

The Energy Commission maintains an ongoing federal cost-share solicitation to provide cost-share funding to applicants that apply for and receive an award under an eligible federal funding opportunity announcement (FOA). Table 7 shows the list of FOAs released in 2016 that were eligible for federal cost share under the EPIC Program and the number of applications for each FOA that received a letter of cost-share commitment. As of December 31, 2016, $4.25 million in federal cost share, applied research and development funds has been recommended for funding.

Table 7: Federal Cost-Share Activities in 2016

Funding Opportunity Announcement Number	Funding Opportunity Announcement Name	Funding Opportunity Announcement Description	Number of Applications Receiving a Letter of Cost-Share Commitment	NOPA Posting Date
DE-FOA-0001385	Solutions to Improve the Energy Efficiency of U.S. Small and Medium Commercial Buildings	Enable solutions to the market barriers that hinder the growth of energy efficiency in the small and medium commercial building sector.	0	N/A
DE-FOA-0001395	Building Industry Partnerships for High-Performance Housing Innovation	Develop and implement solutions to technical challenges in the process of meeting performance goals for both new and existing homes.	0	N/A
DE-FOA-0001429	Single-Pane Highly Insulating Efficient Lucid Designs	Aimed at funding research and development that would reduce heat loss for improved building efficiency.	0	N/A
DE-FOA-0001441	Industry Partnerships for Cybersecurity of Energy Delivery Systems Research, Development and Demonstration for the Energy Sector	Enable next-generation tools and technologies to enhance and accelerate additional cybersecurity capabilities for the U.S energy critical infrastructure.	0	N/A

Funding Opportunity Announcement Number	Funding Opportunity Announcement Name	Funding Opportunity Announcement Description	Number of Applications Receiving a Letter of Cost-Share Commitment	NOPA Posting Date
DE-FOA-0001384	2016 Vehicle Technologies Program-wide Funding Opportunity Announcement	Projects to reduce the cost of advanced highway transportation technologies that reduce petroleum consumption and greenhouse gas emission, while meeting or exceeding vehicle performance and cost expectations.	0	N/A
DE-FOA-0001383	Buildings Energy Efficiency Frontiers And Innovation Technologies (BENEFIT) - 2016	Energy efficiency projects focused on advanced HVAC&R and miscellaneous electric loads (MELs), and other topics focused on early stage R&D applications (“Innovations”) and precommercial prototype development and scale-up (“Scale-up”).	1	9/2/2016
DE-FOA-0001496	State Energy Evolution and Diffusion Studies II - State Energy Strategies, Topic 1 Focus Areas only	Aimed at increasing foundational understanding of the technology evolution, soft costs, and barriers to solar deployment in the U.S.	0	N/A
DE-FOA-0001467	Next Generation Electric Machines: Enabling Technologies	In this FOA, AMO envisions a three-year programmatic RDD&D effort.	0	N/A

Funding Opportunity Announcement Number	Funding Opportunity Announcement Name	Funding Opportunity Announcement Description	Number of Applications Receiving a Letter of Cost-Share Commitment	NOPA Posting Date
DE-FOA-0001495	ENABLING EXTREME REAL-TIME GRID INTEGRATION OF SOLAR ENERGY (ENERGISE)	The DOE SunShot Initiative is a collaborative national effort launched in 2011 that aggressively drives innovation to make solar energy cost competitive, without subsidies, with traditional energy sources before the end of the decade.	1	8/22/2016
2016-NIST-NNMI-01	National Network for Manufacturing Innovation (NNMI) Institute Awards	NIST is soliciting applications for National Network for Manufacturing Innovation (NNMI) Institute Awards from eligible applicants to establish and operate a Manufacturing Innovation Institute in an area of U.S. advanced manufacturing national need.	1	7/12/2016
DE-FOA-0001566	Energy-Efficient Light-Wave Integrated Technology Enabling Networks That Enhance Data Centers (Enlitened)	The growing demand for data center services across a range of applications has resulted in significant and sustained growth in electrical energy consumption in the information communications technology (ICT) sector.	1	10/25/2016
DE-FOA-0001554	Wind Energy – Eagle Impact Minimization Technologies and Field Testing Opportunities	This topic area will support development and testing activities for bald and golden eagle impact minimization systems, advancing systems from TRL 5/6 at time of application through TRL 7.	0	N/A

Funding Opportunity Announcement Number	Funding Opportunity Announcement Name	Funding Opportunity Announcement Description	Number of Applications Receiving a Letter of Cost-Share Commitment	NOPA Posting Date
DE-FOA-0001594	Clean Energy Manufacturing Innovation Institute for Reducing EMbodied-energy And Decreasing Emissions (REMADE) in Materials Manufacturing	This FOA supports the establishment of a Clean Energy Manufacturing Innovation Institute for Reducing EMbodied-energy And Decreasing Emissions (REMADE) in Materials Manufacturing.	1	9/16/2016
DE-FOA-0001616	Sensor and Modeling Approaches for Enhanced Observability and Controllability of Power Systems with Distributed Energy Resources (DERs)	This RDD&D, in the areas of low-cost sensors and improved modeling using sensor data input, will lead to enhanced observability and controllability of power systems to support increased hosting capacity for distributed energy resources (DERs), including energy storage.	0	N/A
DE-FOA-0001613	Solid-State Lighting Advanced Technology R&D - 2017	The specific goal of the SSL Program is by 2025, develop advanced SSL technologies.	1	12/23/2016

Source: California Energy Commission

2016 Encumbered Program Funds

In 2016, 111 projects encumbered a total of $216,674,817, of which 86 projects for $152,099,571 were from the *2012-2014 EPIC Investment Plan* funds, and 25 projects for $64,575,246 were from the *2015-2017 EPIC Investment Plan* funds.[24]

2016 Program Expenditures

The Energy Commission approved a total of $41,345,235 for EPIC Program project invoices in calendar year 2016. The total cumulative funds expended through December 31, 2016, is $56,925,958.

2016 Program Administration Funds

Expenditures for Energy Commission administrative costs in labor and operating expenses totaled $11,461,039 in calendar year 2016. In addition, the Energy Commission awarded two projects totaling $6 million from the program administration funds to date; and of those funds, a total of $78,487 was approved in invoice expenditures in 2016.

Expenditures for Energy Commission administrative costs in 2016 are approximately 8.5 percent of the average annual EPIC budget for 2015-2017.

Funding Shifts

Funds shifted between funding categories or program areas are limited to 5 percent.[25] In 2016, the Energy Commission did not shift funds between funding categories or program areas.

Uncommitted/Unencumbered Funds

Based on the definitions provided, "uncommitted" and "unencumbered" funds are funds that are not identified in solicitation plans or encumbered into project awards. Moreover, these funds are considered "unspent."

Decision 13-11-025 states, "Given the shortened timeframe of the initial investment plan cycle, and for the purposes of the initial investment plan cycle only (2012-2014), the uncommitted and unencumbered funds that would, under normal circumstances, be returned to ratepayers if legally permitted to do so, must be rolled over as if those funds were encumbered or committed. At the conclusion of the second investment plan cycle, if any funds approved for the first investment plan cycle are uncommitted or unencumbered, they must be credited against the approved budget for the third investment plan cycle."[26]

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24 This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

25 In accordance with Decision 13-11-025.

26 CPUC Decision 13-11-025, Ordering Paragraph 39.

At the end of the second investment plan cycle on December 31, 2017, any unspent funds[27] as of that date will be moved forward and used to offset funding for the third investment plan cycle as required. In addition, EPIC administrators must explain in their third triennial investment plans what caused any unspent funds in the second investment plan cycle, and how the unspent funds will affect the program area(s) and projects.[28] Furthermore, the investment plan cycle budget for 2018-2020 will be reduced by the amount of unspent funds from the 2012-2014 and 2015-2017 *EPIC Investment Plans* to offset future program funding requirements.[29]

In addition, the budget adopted for a subsequent investment plan cycle must be reduced by the amount of interest accrued in the previous investment plan cycle.[30] At the end of the third investment plan cycle, any unspent funds and accumulated interest should be returned to the ratepayers, if there is a legal means to do so.[31]

Regarding the means for returning accumulated interest to the ratepayers, Decision 13-11-025 states: "Because the CEC cannot administratively return accumulated interest, the CEC must report the accumulated interest in arrears from the previous investment plan cycle, and the IOUs must reduce the amounts transferred to the CEC during the next triennial investment cycle by the reported accumulated interest amount and return an amount equal to the accumulated interest to ratepayers."[32]

Decision 12-05-037, as modified, states: "[I]f administrative costs can be less than the cost cap, we expect the administrators to put those extra funds to good use for program purposes."[33]

The Energy Commission will provide an update to interest accrued at the end of the 2015-2017 investment cycle.

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27 "Unspent funds" are funds that are neither committed nor encumbered by the end of the investment cycle on December 31, 2017.

28 CPUC Decision 13-11-025, Ordering Paragraph 41.

29 CPUC Decision 13-11-025, Ordering Paragraph 38 and 39.

30 CPUC Decision 13-11-025, Ordering Paragraph 42.

31 CPUC Decision 13-11-025, Ordering Paragraph 43.

32 CPUC Decision 13-11-025, p. 105.

33 CPUC Decision 12-05-037, p. 66.

CHAPTER 3:
Projects

In 2016, the Energy Commission awarded EPIC funds to 111 projects encumbering $216,674,817. Since the beginning of the EPIC Program, the Energy Commission has made 198 project awards, encumbering $396,374,258.[34] Figure 5 depicts a map of the projects awarded as of December 31, 2016, with the green dots depicting recipient headquarters addresses and the orange dots depicting project site locations that have been identified as of December 31, 2016.

34 This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

Figure 5: EPIC Awarded Projects

Source: California Energy Commission

Table 8 summarizes the 198 projects awarded since 2012.

Table 8: Summary of EPIC Projects Awarded by Strategic Objective (2012-2016)

Strategic Objective	Number of Projects (as of December 31, 2016)	Total Funding (as of December 31, 2016)
2012-2014 EPIC Investment Plan		
Applied Research and Development		
S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector.	21	$38,815,729
S2: Develop New Technologies and Applications That Enable Cost-Beneficial Customer-Side-of-the-Meter Energy Choices.	10	$30,144,179
S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable.	12	$18,508,646
S4: Develop Emerging Utility-Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base.	7	$9,995,832
S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts.	35	$19,352,181
S6: Develop Technologies, Tools, and Strategies to Enable the Smart Grid of 2020.	5	$5,401,868
S7: Develop Operational Tools, Models, and Simulations to Improve Grid Resource Planning.	2	$1,690,055
S8: Integrate Grid-Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits.	5*	$8,673,198
S9: Advance Technologies and Strategies That Optimize the Benefits of Plug-In Electric Vehicles to the Electricity System.	5	$6,681,669
S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies.	6	$19,435,655
S11: Provide Cost Share for Federal Awards.	0	$0
Technology Demonstration and Deployment		
S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies.	19	$47,208,132

Strategic Objective	Number of Projects (as of December 31, 2016)	Total Funding (as of December 31, 2016)
2012-2014 EPIC Investment Plan		
S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies.	13	$42,334,079
S14: Demonstrate the Reliable Integration of Energy-Efficient Demand-Side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy-Smart Community Development.	12	$40,257,789
S15: Provide Cost Share for Federal Awards.	0	$0
Market Facilitation		
S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure.	12	$17,437,354
S17: Strengthen the Clean Energy Workforce by Creating Tools and Resources That Connect the Clean Energy Industry to the Labor Market.	2	$8,908,107
S18: Guide EPIC Investments Through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach.	7	$16,954,539
Total	**173**	**$331,799,012**

Strategic Objective	Number of Projects (as of December 31, 2016)	Total Funding (as of December 31, 2016)
2015-2017 EPIC Investment Plan		
Applied Research and Development		
S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.	15	$19,041,104
S2: Enable Cost-Effective Demand Respond for California IOU Electricity Customers.	0	$0
S3: Develop Innovative Solutions to Increase the Market Penetration of Distributed Renewable and Advanced Generation.	0	$0

Strategic Objective	Number of Projects (as of December 31, 2016)	Total Funding (as of December 31, 2016)
2015-2017 EPIC Investment Plan		
S4: Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems.	3	$3,545,058
S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts.	0	$0
S6: Advance the Use of Smart Inverters as a Tool to Manage Areas With High Penetrations of PV.	0	$0
S7: Develop Advanced Distribution Modeling Tools for the Future Smart Grid.	0	$0
S8: Advance Customer Systems to Coordinate With Utility Communication Systems.	0	$0
S9: Advance Electric Vehicle Infrastructure to Provide Electricity System Benefits.	0	$0
S10: Advance the Early Development of Breakthrough Energy Concepts.	0**	$20,211,957
S11: Provide Federal Cost Share for Applied Research Awards.	1	$750,000
Technology Demonstration and Deployment		
S12: Overcome Barriers to Emerging Energy Efficiency and Demand-Side Management Solutions Through Demonstrations in New and Existing Buildings.	2**	$5,300,739
S13: Demonstrate and Evaluate Biomass-to-Energy Conversion Systems, Enabling Tools, and Deployment Strategies.	0	$0
S14: Take Microgrids to the Next Level: Maximize the Value to Customers.	0	$0
S15: Demonstrate Advanced Energy Storage Interconnection Systems to Lower Costs, Facilitate Market, and Improve Grid Reliability.	0	$0
S16: Expand Smart Charging and Vehicle-to-Grid Power Transfer for Electric Vehicles.	0	$0
Provide Federal Cost Share for Technology Demonstration and Deployment Awards.	0	$0
Market Facilitation		
S18: Foster the Development of the Most Promising Energy Technologies Into Successful Businesses.	1**	$12,091,373

Strategic Objective	Number of Projects (as of December 31, 2016)	Total Funding (as of December 31, 2016)
2015-2017 EPIC Investment Plan		
S19: Facilitate Inclusion of Emerging Clean Energy Technologies Into Large-Scale Procurement Processes.	0	$0
S20: Accelerate the Deployment of Energy Technologies in IOU Territories Through Innovative Local Planning and Permitting Approaches.	2	$2,487,609
S21: Inform Investments and Decision-Making Through Market and Technical Analysis.	1	$1,147,406
Total	**25**	**$64,575,246**

* This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

** Six projects use funds from both the *2012-2014 and 2015-2017 EPIC Investment Plans*. Those projects that include funds from both plans are indicated under the first plan only. Therefore, under the *2015-2017 EPIC Investment Plan*, there are an additional four projects under S18 (five projects total), one project under S12 (three projects total), and one project under S10 (one project total) that are not included in the "Number of Projects" column in this table, because they were already included in the project totals for the *2012-2014 EPIC Investment Plan*. The numbers in the "Total Funding" column, however, include all projects, even those that are funded under both plans.

Source: California Energy Commission

Description of Projects

EPIC-funded projects, including new awards, active and completed projects in 2016, are highlighted in project write-ups following the report outline requirements listed in Attachment 5 (Item 4c of the outline) of CPUC Decision 13-11-025 and found in Appendix B of this annual report.

CPUC EPIC Project Status Report

Each project awarded EPIC funds includes specific information in an electronic spreadsheet format using the template provided in Attachment 6 of CPUC Decision 13-11-025 and found in Appendix C of this annual report.

a. Investment Program Period

b. Program Administrator

c. Project Name

d. Project Type

e. A Brief Description of the Project

f. Date of the Award

g. Was This Project Awarded in the Immediately Prior Calendar Year?

h. Assignment to Value Chain

i. Encumbered Funding Amount ($)

j. Committed Funding Amount ($)

k. Funds Expended to Date: Contract/Grant Amount ($)

l. Funds Expended to Date: In-House Expenditures ($)

m. Funds Expended to Date: Total Spent to Date ($)

n. Administrative and Overhead Costs to Be Incurred for Each Project

o. Leveraged Funds

p. Partners

q. Match Funding

r. Match Funding Split

s. Funding Mechanism

t. Intellectual Property

u. Identification of the Method Used to Grant Awards

v. If competitively selected, provide the number of bidders passing the initial pass/fail screening for project.

w. If competitively selected, provide the name of selected bidder.

x. If competitively selected, provide the rank of the selected bidder in the selection process.

y. If competitively selected, explain why the bidder was not the highest scoring bidder, explain why a lower scoring bidder was selected.

z. If interagency or sole source agreement, specify date of notification to the Joint Legislative Budget Committee (JLBC) was notified and date of JLBC authorization.

aa. Does the recipient for this award identify as a self-reported California-based entity, small business, or businesses owned by women, minorities, or disabled veterans?

ab. How the project leads to technological advancement or breakthroughs to overcome barriers to achieving the state's statutory energy goals.

ac. Applicable Metrics From Attachment 4 of D.13-11-025[35]

35 http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M081/K773/81773445.PDF.

ad. Project Update.

Completed Projects

Only one EPIC project, *Validated and Transparent Energy Storage Valuation and Optimization Tool* (EPC-14-019), was completed in 2016. The final report[36] for this project, including a comprehensive description of the project, detailed findings and results, is available at http://www.energy.ca.gov/2017publications/CEC-500-2017-016/CEC-500-2017-016.pdf. A summary of the outcomes of this project is also included in a project write-up found in Appendix B of this annual report.

36 CPUC Decision 13-11-025, Ordering Paragraph 14 requires the Energy Commission to include with its annual report a final report on every project completed during the previous year.

CHAPTER 4: Conclusion

Key Results for 2016

- In 2016, the Energy Commission released 11 competitive solicitations totaling $141.7 million of EPIC project funding. The solicitations covered a wide variety of issues and California's policy goals, including vehicle-grid integration, improved air quality, managing tree mortality, and converting food waste to energy.
- As of December 31, 2016, $216,674,817 was encumbered for 111 projects approved in 2016.[37] These projects included new areas of focus such as advanced energy communities and regional innovation clusters.
- The Energy Commission approved 37 percent more EPIC projects and encumbered 27 percent more EPIC funds in 2016 than in 2015. The Energy Commission also expanded its diversity outreach and focus on providing increased opportunities in disadvantaged communities. The Energy Commission awarded over thirty projects in 2016 that had recipient headquarters or a project site in a disadvantaged community, up from eighteen in 2015.
- The Energy Commission held five topical workshops throughout California in 2016 to solicit stakeholder input on a variety of topics related to electricity research and development.
- The Energy Commission held public preapplication workshops, one or more for each solicitation, to explain open solicitations and answer questions before the due date for applications or bids.
    - Some of these workshops were held in different locations throughout the state, including Atwater and Diamond Bar.
- As required, the Energy Commission filed its fourth *EPIC Annual Report* to the CPUC in February 2016 and, in April 2016, its second *EPIC Annual Report* to the Legislature.
- In coordination with the IOU administrators and the CPUC, the Energy Commission held a public workshop on EPIC in June 2016 and held the second annual EPIC Innovation Symposium in December 2016. These events met the requirement in CPUC Decision 12-05-037.[38]

37 This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

38 Ordering Paragraph 15.

- In December 2016, the Energy Commission adopted the *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Residents and Small Business Contracting Opportunities in Disadvantaged Communities*.[39] The study included recommendations intended to reduce the obstacles facing low-income residents and small businesses in disadvantaged communities. These recommendations included the following:
    - The Energy Commission's EPIC Program should target 25 percent of technology demonstration and deployment funding for project sites located in disadvantaged communities based on CalEnviroScreen.[40]
    - Energy Commission research development and deployment programs should conduct forums to share best practices and case studies on current projects located in disadvantaged communities.
    - The Energy Commission should analyze potential business models that would create market opportunities for emerging clean energy technologies to be deployed in a manner that directly benefits low-income customers and disadvantaged communities, including, but not limited to, tribal communities, rural communities, and mobile home communities.
    - The Energy Commission should sponsor prize competitions and challenges to spur novel ideas and solutions for bringing clean energy technologies to low-income customers and disadvantaged communities.

Next Steps for EPIC

The Energy Commission's next steps for EPIC administration include the following:

- The Energy Commission will continue to release competitive solicitations and requests for comment according to the schedule available on the Energy Commission's EPIC Web page (http://www.energy.ca.gov/research/epic/) and update the schedule as needed.
- Consistent with its investment plans, the Energy Commission will continue to release a NOPA for each competitive solicitation and approve each award at a public business meeting.
- The Energy Commission will hold public workshops no fewer than twice a year, both when developing each investment plan and during its execution, consistent with ordering paragraph 15 in CPUC Decision 12-05-037, as modified.

39 See footnote 12.

40 http://oehha.ca.gov/calenviroscreen

- The Energy Commission will take steps to implement the recommendations of the Low Income Barriers Study, including ensuring that at least 25 percent of technology demonstration and deployment funding is allocated to projects in disadvantaged communities.

Issues

The Energy Commission's EPIC annual report is required to include brief discussion of issues "that may have major impact on progress in projects, if any."[41]

The only issues experienced were minor. Two EPIC projects were terminated in 2016; however, no work was done on these projects, and no EPIC funds were spent. The two terminated projects were both with grant recipient LightSail Energy. The purpose of the first project (EPC-15-011) was to pilot test an isothermal compressed air energy storage (I-CAES) system and would be used for renewable energy integration, load following, and grid services and support. The second project (EPC-15-017) was developed to design, build, and pilot test an isothermal compressed air energy storage (I-CAES) system in a smart Microgrid environment at the University of California, Irvine. LightSail Energy withdrew from these projects because the company closed its energy storage division.

41 Attachment 5, page 2 of CPUC Decision 13-11-025.

GLOSSARY

Term	Definition
AB	Assembly Bill
ARPA-e	Advanced Research Projects Agency-Energy – a United States Department of Energy Program advancing high-impact energy technologies by providing funding, technical assistance, and market readiness
California ISO	California Independent System Operator
CO2	carbon dioxide
CPUC	California Public Utilities Commission
Disadvantaged community	A community that scores at or above 75% in the version of CalEnviroScreen that was available at the time of application.
EPIC	Electric Program Investment Charge
EPRI	Electric Power Research Institute
FOA	Funding opportunity announcement
HVAC	heating, ventilation, and air conditioning
IEPR	Integrated Energy Policy Report
IOU	investor-owned utility
NOPA	notice of proposed awards
PG&E	Pacific Gas and Electric Company
RDD&D	research, development, demonstration, and deployment
SB	Senate Bill
SCE	Southern California Edison Company
SDG&E	San Diego Gas & Electric Company
Smart grid	A smart grid is the thoughtful integration of intelligent technologies and innovative services that produce a more efficient, sustainable, economic, and secure electrical supply for California communities.
TD&D	technology deployment and demonstration
U.S. DOE	United States Department of Energy
U.S. EPA	United States Environmental Protection Agency

ZNE	zero net energy

APPENDIX A:
Table of Energy Commission EPIC Requirements to Report for 2016

The California Energy Commission is committed to full compliance with all guidance and requirements pertaining to its management of Electric Program Investment Charge (EPIC) funds for the advancement of energy innovation. The following table lists Energy Commission responsibilities and requirements for its administration of EPIC in calendar year 2016. These requirements include those specified by the California Public Utilities Commission (CPUC) and by the Legislature in Senate Bill 96.

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
Project Reporting Requirements in SB 96 (Committee on Budget and Fiscal Review, Chapter 356, Statutes of 2013) and D.13-11-025, Attachment 6: A brief description of each project awarded or completed in the previous year, as well as an update for each project underway. **Among other items**, this includes: 1. The name of the recipient, project title, and date and amount awarded. 2. Comply with SB 96 (PRC §25711.5)(e)(1)-(6), provided later in the table.	This annual report identifies the required information for each EPIC project.	12/31/2016
CPUC project reporting requirements: Identify ratepayer benefits, any leveraged or matched funds, any intellectual property, and other information as specified in Attachment 6 of the CPUC final decision (D. 13-11-025), for each project. Specific formatting requirement for project status reports: "The information below must be reported electronically in spreadsheet format. Information for each project must be listed on separate rows in the columns specified" in Attachment 6.	This annual report identifies the required information for each EPIC project.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
CPUC information availability requirement: The EPIC administrators must, “except when valid reasons exist for confidentiality…make available upon request all data, findings, results, computer models and other products developed through the Electric Program Investment Charge program, consistent with the treatment of intellectual property requirements.” (D.13-11-025, ordering paragraph 13)	The Energy Commission will respond to all requests for information in accordance with any relevant confidentiality and intellectual property requirements. Requests for information on Energy Commission EPIC projects should be sent to RandDProjectinfo@energy.ca.gov.	As requested
CPUC project metric reporting requirements: The EPIC administrators "may choose metrics on a project-by-project basis from those included as Attachment 4 or additional metrics where appropriate. However, the Administrators must identify in the Electric Program Investment Charge annual report the metrics used for each project." (D.13-11-025, ordering paragraph 27).	This annual report identifies metrics used for each EPIC project.	12/31/2016
CPUC project reporting requirements: Submit a final report for every project completed during the previous year, including a comprehensive description of the project, detailed findings and results, a summary of all data collected, and how the data may be accessed (D.13-11-025, ordering paragraph 14).	One project was completed in 2016. The final report for the project is available at http://www.energy.ca.gov/2017publications/CEC-500-2017-016/CEC-500-2017-016.pdf.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
CPUC project reporting requirements: Identify the use of noncompetitive awards (D. 13-11-025, ordering paragraph 15).	The Energy Commission awarded three noncompetitive bid awards at the March 9, 2016, Business Meeting: 1. 300-15-004: $650,000 contract with University of California (UC) Merced 2. 300-15-005: $720,000 contract with UC Irvine 3. 300-15-006: $1,130,000 contract with UC Los Angeles	12/31/2016
CPUC project reporting requirements: Provide a justification for every noncompetitive award made (D.13-11-025, ordering paragraph 18).	A consortium of UC campuses, in partnership with LBNL, was selected by the U.S. DOE to administer a research program, the U.S. China Clean Energy Research Center for Water and Energy Technologies (CERC-WET), to advance water-energy science and technology that increases water and energy efficiency, decreases GHG emissions, and increases climate resilience. The total DOE award is $12.5 million with public/private match of $10 million. The Energy Commission's $2.5 million cost-share funding was directed to supplemental projects with UC Merced, UC Irvine, and UC Los Angeles that will address California's water and energy challenges.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
CPUC Annual Report Requirements: Follow the report outline agreed to by the EPIC administrators and DRA, and approved by the CPUC as contained in D. 13-11-025 (Attachment 5).	This report follows the outline indicated in D.13-11-025 Attachment 5.	2/28/2017
CPUC Budget Requirements: 10 percent cap on administrative costs, excluding program evaluation costs (D.12-05-037, ordering paragraph 5). IOU in-house costs are not included in the 10 percent administrative cap (D.13-11-025, Conclusion of Law 40). D.13-11-025, ordering paragraph 31: "The administrative costs to grant and administer the Intellectual Property licenses and royalties are not subject to the Energy Commission's cap on the California Energy Commission's administrative budget for Electric Program Investment Charge."	Energy Commission administrative costs for 2012-2014 are less than the capped amount.	12/31/2016
CPUC Budget Requirements: 5 percent cap on fund shifting between the following category areas (D.12-05-037, ordering paragraph 14): applied research and development, technology demonstration and deployment, and market facilitation (D.12-05-037, ordering paragraph 12(b)(i) lists the program areas; program areas are defined in D.12-05-037 Findings of Fact paragraph 3, 4, and 6).	In 2016, the Energy Commission did not shift funds between funding categories or program areas.	12/31/2016
CPUC Budget Requirements: Report authorized budget (program administration and each category/program area), committed/encumbered funds (administration, program solicitations, and individual project awards), and amount spent. IOUs must also report in-house activities. All administrators must report uncommitted/unencumbered funds. (D.13-11-025, Attachment 5).	The annual report includes authorized budget, committed/encumbered project and administrative funds, amount spent, and uncommitted/unencumbered funds.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
CPUC Accumulated Interest Requirements: "Because the CEC cannot administratively return accumulated interest, the CEC must report the accumulated interest in arrears from the previous investment plan cycle, and the IOUs must reduce the amounts transferred to the CEC during the next triennial investment cycle by the reported accumulated interest amount and return an amount equal to the accumulated interest to ratepayers." (D.13-11-025, p. 105)	The report of accumulated interest for the 2012-2014 investment cycle was provided in the *2015 EPIC Annual Report*; the next report of accumulated interest will be provided at the end of the of the second investment cycle.	Planned for completion in the annual report due 2/28/2018
CPUC Annual Report Distribution Requirements: File annual reports annually on 2/28/13 through 2/28/20 with the CPUC's Energy Division Director. Annual reports shall be served on all parties in the most recent EPIC proceeding, all parties to the most recent general rate case of each electricity utility named above, and each successful and unsuccessful applicant for an EPIC funding award during the previous calendar year, except bidders for an IOU-administered EPIC contract that have signed a voluntary and informed waiver of the right to be served an EPIC annual report. (D.12-05-037, OP 16; D.13-11-025, p. 64 and OP 24).	The Energy Commission prepared the distribution list for this annual report in coordination with the CPUC and the EPIC IOU administrators to ensure the distribution list meets these requirements.	2/28/2017
CPUC Annual Report Distribution (additional): The CPUC Commissioners approving the final decision "encourage the CEC to make its reports accessible to the public on its EPIC webpage and through its Public Advisor." (D.13-11-025, p. 64)	The Energy Commission will post the EPIC annual report on its EPIC Web page and make the report available through the Public Adviser's Office.	2/28/2017

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
CPUC EPIC Report Distribution: In Section 2.15 Annual Reports, CPUC D.13-11-025 states: "PRC Section 25711.5(e) requires the CEC to submit reports to the Legislature on its administration of the EPIC program. The CEC should promptly provide copies of each of these reports to the Commission through the Commission's Executive Director and Energy Division Director." (D.13-11-025, p. 63). In addition, in the section of the CPUC D.13-11-025 discussing treatment of intellectual property interests developed and royalties derived from EPIC-funded CEC grants and contracts (Section 2.18.1), the decision states: "As a condition of approving the CEC's 2012-2014 investment plan, we will require that the CEC provide the Commission (through the Commission's Energy Division Director) a copy of all reports prepared for the Legislature. (D.13-11-025, p. 71-72). In D.13-11-025 ordering paragraph 29(a): "The California Energy Commission (CEC) must: Provide to the Commission copies of the Electric Program Investment Charge (EPIC) reports to the Legislature required by Public Resources Code Section 25711.5(e)."	In progress.	2016 EPIC report to the Legislature planned for completion prior to 4/30/2017
SB 96 (PRC §25711.5[a]): Award funds for projects that will benefit electricity ratepayers and lead to technological advancement and breakthroughs to overcome the barriers that prevent the achievement of the state's statutory energy goals and that result in a portfolio of projects that is strategically focused and sufficiently narrow to make advancement on the most significant technological challenges that shall include, but not be limited to, energy storage, renewable energy and its integration into the electrical grid, energy efficiency, integration of electric vehicles into the electrical grid, and accurately forecasting the availability of renewable energy for integration into the grid.	All EPIC-funded projects meet the requirements of SB 96 to benefit electricity ratepayers and lead to technological advancement and breakthroughs to overcome the barriers that prevent the achievement of the state's statutory energy goals.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
SB 96 (PRC §25711.5 [b]): In consultation with the Treasurer, establish terms that shall be imposed as a condition to receipt of funding for the state to accrue any intellectual property interest or royalties that may derive from projects funded by the EPIC Program. The Energy Commission, when determining if imposition of the proposed terms is appropriate, shall balance the potential benefit to the state from those terms and the effect those terms may have on the state achieving its statutory energy goals. The Energy Commission shall require each reward recipient, as a condition of receiving moneys pursuant to this chapter, to agree to any terms the Energy Commission determines are appropriate for the state to accrue any intellectual property interest or royalties that may derive from projects funded by the EPIC Program.	Energy Commission staff consulted with the State Treasurer's Office to establish terms and conditions for intellectual property and royalties for EPIC funding awards.	2/2/14
SB 96 (PRC §25711.5 [c]): Require each applicant to report how the proposed project may lead to technological advancement and potential breakthroughs to overcome barriers to achieving the state's statutory energy goals.	Each EPIC solicitation includes this requirement for each applicant project.	Included in first EPIC solicitation released in March 2014 and each solicitation thereafter.
SB 96 (PRC §25711.5 [d]): Establish a process for tracking the progress and outcomes of each funded project, including an accounting of the amount of funds spent by program administrators and individual grant recipients on administrative and overhead costs and whether the project resulted in any technological advancement or breakthrough to overcome barriers to achieving the state's statutory energy goals.	Management tools are in place to comply with these requirements. Energy Commission staff uses Attachment 6 of D.13-11-025 to report annual progress and outcomes of each funded project, including the information required by PRC§ 25711.5, subparagraph (d).	12/31/2013

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
SB 96 (PRC §25711.5 [e]): Notwithstanding Section 10231.5 of the Government Code, prepare and submit to the Legislature no later than April 30 of each year an annual report in compliance with Section 9795 of the Government Code that shall include all of the following (see next rows):	This report, including information required by SB 96, will be considered by the Energy Commission for adoption before April 30. The Energy Commission will submit the adopted version of the report to the Legislature no later than April 30, 2017.	Planned for completion prior to 4/30/2017
SB 96 (PRC §25711.5 [e] [1]): A brief description of each project for which funding was awarded in the immediately prior calendar year, including the name of the recipient and the amount of the award, a description of how the project is thought to lead to technological advancement or breakthroughs to overcome barriers to achieving the state's statutory energy goals, and a description of why the project was selected.	This report provides this information for the projects awarded EPIC funding in 2016.	12/31/2016
SB 96 (PRC §25711.5 [e] [2]): A brief description of each project funded by the EPIC Program that was completed in the immediately prior calendar year, including the name of the recipient, the amount of the award, and the outcomes of the funded project.	This annual report provides a link to this information for the project completed in 2016.	12/31/2016
SB 96 (PRC §25711.5 [e] [3]): A brief description of each project funded by the EPIC Program for which an award was made in the previous years but that is not completed, including the name of the recipient and the amount of the award, and a description of how the project will lead to technological advancement or breakthroughs to overcome barriers to achieving the state's statutory energy goals.	Projects awarded EPIC funds in 2016 are listed as required for PRC Section 25711.5(e)(1). The Energy Commission will continue to comply in 2017 and beyond.	12/31/2016
SB 96 (PRC §25711.5 [e] [4]): Identification of the award recipients that are self-reported California-based entities, small businesses, or businesses owned by women, minorities, or disabled veterans.	This report provides this information for projects awarded EPIC funds through December 31, 2016. Data were collected, and a summary of these data can be found in the attached 2016 EPIC Annual Report Project Status Report, Column AA.	2/28/2017

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
SB 96 (PRC §25711.5 [e] [5]): Identification of which awards were made through a competitive bid, interagency agreement, or sole source method, and the action of the Joint Legislative Budget Committee pursuant to paragraph (2) of subdivision (g) for each award made through an interagency agreement or sole source method.	Competitive bids were used for all but three projects awarded EPIC funding in 2016. The Energy Commission awarded three noncompetitive bid awards at the March 9, 2016, Business Meeting: 1. 300-15-004: $650,000 contract with University of California (UC) Merced 2. 300-15-005: $720,000 contract with UC Irvine 3. 300-15-006: $1,130,000 contract with UC Los Angeles	12/31/2016
SB 96 (PRC §25711.5 [e] [6]): Identification of the total amount of administrative and overhead costs incurred for each project.	Administrative costs for EPIC for calendar year 2016 are reported herein. This report includes administrative and overhead costs incurred for each EPIC project through December 31, 2016.	12/31/2016
SB 96 (PRC §25711.5 [f]): Establish requirements to minimize program administration and overhead costs, including costs incurred by program administrators and individual grant recipients. Each program administrator and grant recipient, including a public entity, shall be required to justify actual administration and overhead costs incurred, even if the total costs incurred do not exceed a cap on those costs that the Energy Commission may adopt.	Administrative costs for EPIC for calendar year 2016 are reported and justified herein. The Energy Commission has established electronic submissions for EPIC proposals, which reduces administrative costs.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
SB 96 (PRC §25711.5 [g] [1]): The Energy Commission shall use a sealed competitive bid as the preferred method to solicit project applications and award funds pursuant to the EPIC Program.	The Energy Commission awarded three noncompetitive bid awards at the March 9, 2016, Business Meeting: 1. 300-15-004: $650,000 contract with University of California (UC) Merced 2. 300-15-005: $720,000 contract with UC Irvine 3. 300-15-006: $1,130,000 contract with UC Los Angeles All other EPIC solicitations released in calendar year 2016 used a competitive selection process.	12/31/2016
SB 96 (PRC §25711.5 [g] [2] [A]): The Energy Commission may use a sole source or interagency agreement method if the project cannot be described with sufficient specificity so that bids can be evaluated against specifications and criteria set forth in a solicitation for bid and if both of the following conditions are met (see next two rows):	The Energy Commission awarded three noncompetitive bid awards at the March 9, 2016, Business Meeting: 1. 300-15-004: $650,000 contract with University of California (UC) Merced 2. 300-15-005: $720,000 contract with UC Irvine 3. 300-15-006: $1,130,000 contract with UC Los Angeles	12/31/2016
SB 96 (PRC §25711.5 [g] [2] [A] [i]): The Energy Commission, at least 60 days prior to making an award pursuant to this subdivision, notifies the Joint Legislative Budget Committee and the relevant policy committees in both houses of the Legislature, in writing, of its intent to take the proposed action.	The Energy Commission notified the Joint Legislative Budget Committee in writing on December 21, 2015, of its intent to make the above awards. The Energy Commission will comply in 2017 and beyond.	12/31/2016

Energy Commission Responsibility or Requirement	Status for Portion of the EPIC Funds Administered by the Energy Commission	Date Completed or Anticipated Completion Date
SB 96 (PRC §25711.5 [g] [2] [A] [i]): The Joint Legislative Budget Committee either approves or does not disapprove the proposed action within 60 days from the date of notification required by clause (i).	The Joint Legislative Budget Committee sent several questions that were answered by the Energy Commission. No disapproval was received. The Energy Commission will comply in 2017 and beyond.	12/31/2016
CPUC Decision 12-05-037, requires the four EPIC Administrators (the Energy Commission, Pacific Gas and Electric Co., San Diego Gas & Electric Co., and Southern California Edison Co.) to consult with interested stakeholders no less than twice a year. CPUC Decision 15-04-020 (ordering paragraph 27) requires one of these two annual workshops to be an Electric Program Investment Charge Innovation Symposium (EPIC Innovation Symposium) intended to achieve the following: share progress, results, and future plans; improve coordination and understanding among administrators, parties, and the CPUC; raise awareness and visibility of EPIC investments; and, promote program transparency.	The EPIC administrators hosted two events in 2016. The first workshop was hosted by SCE and took place on June 22, 2016. It was focused on sharing progress on EPIC investments related to energy management systems. The second, hosted by the Energy Commission, was the EPIC Innovation Symposium on December 1, 2016. The innovation symposium had three tracks, focusing on energy efficiency, electricity, and power system modernization.	12/3/2016

APPENDIX B:
Project Write-Ups of All Active and Approved Energy Commission EPIC Project Awards

In 2016, the Energy Commission made 111 project awards encumbering $216,674,817 of EPIC Program funds. Overall, the Energy Commission has made 198 project awards, encumbering $396,374,258.[42] Appendix B provides an overview of the project write-ups for all active or approved projects in 2016. Each project write-up includes and expands upon the following information required in Attachment 5 to CPUC Decision 13-11-025:

i. Investment Plan Period (included in Investment Plan)
ii. Assignment to Value Chain
iii. Objective (included in Project Description)
iv. Scope (included in Project Description)
v. Deliverables (included in Project Description)
vi. Metrics
vii. Schedule (included in Project Term)
viii. EPIC Funds Encumbered
ix. EPIC Funds Spent
x. Partners (if applicable)
xi. Match Funding (if applicable)
xii. Match Funding Split (if applicable)
xiii. Funding Mechanism (if applicable)
xiv. Treatment of Intellectual Property (if applicable)
xv. Status Update

Additional items provided in each project write-up include:

i. Program Area and Strategic Objective
ii. Issue
iii. How the Project Leads to Technological Advancement or Breakthroughs
iv. Related CPUC Proceedings
v. Total Budgeted Administrative and Overhead Costs
vi. Number of Initial Passing Applicants/Bidders
vii. Rank of Selected Applicant/Bidder

42 This does not include two projects that were approved at an Energy Commission business meeting in 2015 and 2016 and later terminated by the recipient.

CONTENTS

1. 300-15-004

Project Name:

Optimizing Hydropower Operations While Sustaining Stream Temperatures and Ecosystem Functions

[300-15-004]

Recipient/Contractor:

The Regents of the University of California on behalf of the Merced Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/1/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Increasing the share of renewable energy generation depends in part on reliable load following generation. Hydroelectric generation is one such source that can provide that service to the grid without adding to emissions. However, aquatic life is dependent on the same stream flows that are held in reserve for hydroelectric generation. Balancing the needs of energy and environment is critical to get right in order to keep costs of energy down and reliability stable. There is a critical need for modeling work to be done to assess tradeoffs in hydropower management under climate change in order to inform planning and management decisions.

Project Description:

The purpose of this research is to improve upon optimization models for hydropower operations by taking future climate conditions into account, under three greenhouse gas emissions scenarios, and compare the optimized model to a more realistic partial optimization model that considers legal and institutional constraints in hydropower management.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Prior studies of tradeoffs between environmental protection and cost-effective energy reliability for hydropower have been based on unrealistic optimization studies that do not take real-world policy preferences in to account. The set of models to be produced by this research will for the first time create "quasi" optimization models, to be tools for hydropower decision-making in the context of climate change, which incorporate aspects of policy preferences of relevant hydropower utilities.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 2a, 3a, 3f, 4d, 5c

Lower Costs:

When environmental degradation of aquatic habitat reaches the point of conflict, it can lead to additional expenses for utilities to mitigate damages and defend prior action. Models like the one being developed in this project can assist decision-makers to plan in a way that prevents them from incurring those costs.

Greater Reliability:

High renewable penetration relies in part on ancillary services from hydropower. As climate change influences the amount of water available for hydropower, decisions need to balance environmental concerns with energy production in a way that protects both the environment and reliability. The models produced in this study will develop scenarios including climate impacts on some reservoirs that decision-makers can use help inform planning for greater reliability.

Environmental Benefits:

Hydropower that provides ancillary services to the grid general depends on holding water back from stream flow, to store energy for later use. That system however can create problems for wildlife which are dependent on certain kinds of stream flow. This project will develop a model to demonstrate hypothetical management strategies to protect habitat while keeping energy reliable and low cost.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $114,054	
EPIC Funds Encumbered: $650,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: United States Department of Energy: $12,500,000		**Leveraged Funds:** $12,500,000	
Funding Method: Non-competitive	**Funding Mechanism:** Interagency Agreement; Sole Source	**No. of Initial Passing Applicants/ Bidders:** N/A	**Rank of Selected Applicant/ Bidder:** N/A

If not the highest scoring applicant/bidder, explain why selected:

This interagency agreement (sole source) leveraged significant federal funds.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-004 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project has been delayed due to contract negotiations over terms and conditions. The study is part of a coordinated effort co-funded by the Department of Energy and the Government of China to partner on water-energy studies that will benefit the US and China, called "CERC WET". The CERC WET studies co-funded by the Energy Commission through EPIC are planning on a joint kick off meeting in early 2017.

2. 300-15-005

Project Name:

Improving Hydrologic and Energy Demand Forecasts for Hydropower Operations with Climate Change

[300-15-005]

Recipient/Contractor:

The Regents of the University of California, Irvine Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/1/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Hydropower is an extremely important clean electricity generation option for California and its importance will grow as it is needed to alleviate the intermittent nature of wind and solar generation units as California continues to its goal of 50% renewables by 2030. At the same time, climate change, without proper management tools, can substantially degrade the availability of hydropower generation. Hydropower scheduling, and near short-term scheduling in particularly, is one of the most crucial factors in reservoir operation and clean energy supply.

Project Description:

The main focus of this research project is to develop grid-wide forecasts of inflows and electricity demands based on ground sensors and remotely sensed data, with emphasis on the effects from temperature fluctuations on electricity demands, hydrologic conditions, and grid performance. Furthermore, the project will improve the accuracy of an existing near real-time Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks (PERSIANN) product, originally developed at UC Irvine's Center for Hydrogeology and Remote Sensing.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The advancement of tools for hydropower scheduling/prediction will facilitate power exchanges in the electricity markets, reduce unnecessary consumption of non-renewable energy sources, and, increase the reliability of energy generation. California will be the study region so that the utility companies in California achieve necessary support in their decision making process.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 3f, 5c

Greater Reliability:

More accurate and current information on streamflow will contribute to the increasing confidence and higher efficiency of hydropower scheduling decisions generated by reservoir and hydropower dispatch models.

Environmental Benefits:

The improved accuracy of an existing near real-time PERSIANN tool will enable more efficient management of clean energy resources in California and will lead to improved resilience of water and energy systems to future climate change impacts. Improved hydropower managing methodology will incorporate ecologically beneficial metrics for ecosystems to minimize adverse ecosystem impacts from the electricity generation.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $144,000
EPIC Funds Encumbered: $720,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: United States Department of Energy: $12,500,000	**Leveraged Funds:** $12,500,000

Funding Method: Non-competitive	**Funding Mechanism:** Interagency Agreement; Sole Source	**No. of Initial Passing Applicants/ Bidders:** N/A	**Rank of Selected Applicant/ Bidder:** N/A

If not the highest scoring applicant/bidder, explain why selected:

This interagency agreement (sole source) leveraged significant federal funds.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-005 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved in October 2016 and the kick-off meeting was held on January 5, 2017.

3. 300-15-006

Project Name:

Optimizing Use of Non-traditional Waters, Drought Proofing the Electricity System and Improving Snowpack Prediction

[300-15-006]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	4/1/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

This project addresses three critical needs for the State of California. (1) Non-traditional waters are available in abundant quantities, but they cannot be used for most industrial, agricultural and municipal applications without the development of new approaches to manage contaminants. (2) Impacts of water conservation on power plants reliant on recycled water for operation. (3) Stream flow forecasts to date are considered inaccurate and pose a risk of misstating California water supply. Research is needed to illuminate which method or combination of methods will substantially improve forecasting skills and allow for use in practical applications

Project Description:

The purpose of this project is to fund research that will reduce the stress on current water infrastructure in California. Research will include: (1) development of high water recovery desalination processes for non-traditional waters, (2) characterizing the potential for non-traditional water use in California, (3) development of recycled water scenarios for electricity generation, and (4) improving the characterization of California's snowpack.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Research conducted will develop flexible, integrated approaches to reduce energy use and costs associated with the use of non-traditional waters, and minimize the volume of waste water produced from their treatment. In addition, the contract will provide guidance on the "best-fit" technologies for California based on geographic area, energy resources and water quality available. Additional research will provide reliability benefits include improving water forecasting scenarios pertaining to recycled water for electricity generation and snowpack forecasting for hydropower operations.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 3a, 4a, 4c, 4d, 5a, 5c

Lower Costs:

This project could provide lower energy costs associated with the treatment of non-traditional waters.

Greater Reliability:

This project will provide greater reliability by improving forecasting methods used to predict water resource availability for electricity generation.

Environmental Benefits:

By reducing energy costs associated with treatment of non-traditional water, the project could reduce greenhouse gas emissions.

Energy Security:

This project will improve energy security by expanding on potential sources of water for cooling towers used in electricity generation. Additionally, improved forecasting will allow better water resource management for both cooling towers and hydroelectric generation.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $198,000
EPIC Funds Encumbered: $1,130,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: United States Department of Energy: $12,500,000	**Leveraged Funds:** $12,500,000

Funding Method: Non-competitive	**Funding Mechanism:** Interagency Agreement; Sole Source	**No. of Initial Passing Applicants/ Bidders:** N/A	**Rank of Selected Applicant/ Bidder:** N/A

If not the highest scoring applicant/bidder, explain why selected:

This interagency agreement (sole source) leveraged significant federal funds.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-006 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Contract was approved by the California Department of General Services in November 2016. There was a stakeholder workshop held in August with all the UC/LBNL project managers associated with the CERC-WET project. Work is tentatively scheduled to begin in December/January with a kick-off meeting planned for February 2017.

4. 300-15-007

Project Name:

California Sustainable Energy Entrepreneurial Development (SEED) Technical Consulting [300-15-007]

Recipient/Contractor:

California Clean Energy Fund dba CalCEF Ventures

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan 2015-2017 Triennial Investment Plan	4/20/2016 to 3/1/2023

Program Area and Strategic Objective:

Applied Research and Development

S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies

S10: Advance the Early Development of Breakthrough Energy Concepts

Issue:

In the past, energy entrepreneurs have had trouble securing very early stage funding for potential breakthrough technologies even if those technologies would merit significant follow-on funding after the proof-of-concept is completed. Additionally, entrepreneurs with technology concepts often do not have adequate access to the mentoring, technical consulting, and business services that they need to successfully bring their technology to market.

Project Description:

The CalSEED Initiative will help develop California's next generation of clean energy entrepreneurs, providing two levels of seed funding as well as mentoring, technical consulting, and business development services to support energy entrepreneurs and research teams in their quest to develop breakthrough solutions that will benefit electric ratepayers in Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric service territories.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

CalSEED addresses a critical gap in the early technology development phase where small amounts of funding can have a significant impact in bringing new ratepayer-beneficial innovations to market by providing seed funding as well as mentoring, technical consulting, and business development services to support energy entrepreneurs and research teams in their quest to develop breakthrough clean energy solutions.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Smart grid: R.08-12-009 Smart Inverter: D.14-12-035 (in R.11-09-011) Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 2a, 3e

Lower Costs:

The CalSEED Initiative will prove out the early technical merits and commercial potential of new energy technology concepts, helping validate whether these concepts merit larger funding amounts.

Economic Development:

The CalSEED Initiative fills important niche in the energy innovation space by providing initial small grant funding to energy entrepreneurs to prove out their technology concept. The results can be used to attract private sector interest and funding for their energy technology venture.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,563,250
EPIC Funds Encumbered: 2012-2014 Plan: $9,788,043 2015-2017 Plan: $20,211,957 Total: $30,000,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: California Clean Energy Fund dba CalCEF Ventures: $1,367,604 (4.1 %) Energy Excelerator: $100,000 (0.3 %) The Grant Farm, Inc: $267,591 (0.8 %) The Cleantech Open: $1,040,000 (3.1 %) Greenlining Institute: $68,700 (0.2 %) Umberg Zipser: $552,328 (1.7 %)	**Match Funding:** $3,396,223
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Contract	**No. of Initial Passing Applicants/ Bidders:** 5 out of 7 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-007 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The CalSEED Initiative is currently preparing to receive its first wave of applicants as the first open application period will take place in mid-January. CalSEED also has its own webpage which is already up and running and gives information about CalSEED. Find the website at: CalSEED.FUND

5. 300-15-008

Project Name:

Research Roadmap for Getting to Zero Net Energy Buildings

[300-15-008]

Recipient/Contractor:

Itron Inc., which will do business in California as IBS

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 5/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies

Issue:

The CPUCs Long-Term Energy Efficiency Strategic Plan calls for all new residential construction and all new commercial construction in California to be Zero Net Energy (ZNE) by 2020 and 2030, respectively. Additionally, AB 758 requires the Energy Commission, in collaboration with the CPUC and stakeholders, to develop a comprehensive program to achieve greater energy efficiency in existing buildings. An up-to-date gaps analysis that summarizes the current ZNE technologies available, what research needs still exist, and the market barriers hindering ZNE technology adoption is needed to inform the development of that comprehensive program.

Project Description:

Itron will work with Energy Commission staff to develop a gaps analysis that identifies, describes and prioritizes research, development, demonstration and deployment (RDD&D) gaps that need to be addressed to achieve the state's goals for Zero-Net Energy (ZNE) buildings in a safe, equitable and cost-beneficial manner. The gaps analysis will be developed in consultation with stakeholders and subject matter experts through interviews, written comments, and public workshops.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will fund research to develop analysis on the most critical RDD&D gaps that need to be addressed to achieve California's goals of zero net energy buildings for all new construction of residential buildings by 2020 and commercial buildings by 2030. Results of the analyses will be used to strategically target future EPIC investments in a manner that provides optimal benefits to IOU electric ratepayers, and maximizes the use of public research and development investments

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

<table>
<tr><td colspan="4">Applicable Metrics: CPUC Metrics- 2a, 3e
Lower Costs:
This project will help identify the most promising R&D opportunities that will benefit IOU electric ratepayers; and ensure future R&D funding opportunities leverage and do not duplicate current research underway.</td></tr>
<tr><td colspan="2">Assignment to Value Chain:
Demand-side Management</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $171,332</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$999,884</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
None</td><td colspan="2">Match Funding:
$0</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Contract</td><td>No. of Initial Passing Applicants/ Bidders:
5 out of 6 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 1</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement 300-15-008 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
This contract has been executed as of December 2016. Kickoff meeting will take place in January 2017.</td></tr>
</table>

6. 300-15-009

Project Name:

Connecting Emerging Energy Technologies and Strategies to Market Needs and Opportunities [300-15-009]

Recipient/Contractor:

Navigant Consulting, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan 2015-2017 Triennial Investment Plan	6/13/2016 to 3/31/2021

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

S18: Foster the Development of the Most Promising Energy Technologies into Successful Businesses

Issue:

Emerging energy technologies sometimes fail to be commercialized because of: difficulty entering the market, inability to find an optimal first customer, and inability to the address what end users actually want. To become viable in the market place, companies need market knowledge and support to develop products that meet customer needs, are cost competitive compared to existing products, and have viable path-to-market strategies that target appropriate early adopters.

Project Description:

This contract will provide market analysis that will address the barriers that hamper commercial development of emerging energy technologies. Tasks under this work authorization contract could include: Tracking past and current award EPIC technology solutions to monitor successes and more accurately consider future EPIC funding opportunities. The deliverables from this project will help prioritize future Energy Commission funding towards technologies that solve the addressed issues.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will benefit California IOU electricity ratepayers through the increased probability of commercialization and deployment of a portfolio of technologies that can reduce electricity costs, decrease peak demand, and improve system reliability and safety. Recommendations resulting from this agreement will help the Energy Commission better direct EPIC Program technologies towards addressing customer needs and becoming widespread, commercial products.

CPUC Proceedings addressing issues related to this EPIC project:

Integration of Distributed Energy Resources (IDER): R. 14-10-003 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 2a, 3e

Lower Costs:

This project will increase the likelihood that technologies funded through the EPIC Program

are successfully commercialized.

Consumer Appeal:

Market research will help better design products and research initiatives to address customer needs, increasing the attractiveness of these products in the marketplace.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $3,302,587
EPIC Funds Encumbered: 2012-2014 Plan: $6,825,763 2015-2017 Plan: 112,126 Total: $6,937,889	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Contract	**No. of Initial Passing Applicants/ Bidders:** 3 out of 4 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-009 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team has been assigned three work authorization projects (November 2016), and has begun work to develop Scopes of Work for each project. These projects include: a Benefits Methodology for the Regional Energy Innovation Clusters; Market Research on Microgrids; and Investing in Disadvantaged Communities to overcome: barriers to accessing energy efficiency and renewable generation, and enabling local workforce development in these communities.

7. 300-15-010

Project Name:

Research Roadmap for Advancing Technologies in California's Industrial, Agricultural, and Water Sectors

[300-15-010]

Recipient/Contractor:

Energetics Incorporated

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/20/2016 to 5/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies

Issue:

California's industrial, agriculture, and water sectors use nearly 30 percent of all energy consumed in the state. Industry must keep operating costs low, while maintaining environmentally clean and energy-efficient operations. Agriculture is highly dependent on electricity for irrigation and post-harvest food processing, and water-energy intensity varies across the state. New analysis is needed to identify and prioritize research and development gaps for advancing energy technologies and strategies that can benefit electric ratepayers through innovation in the agriculture, industrial, and water sectors.

Project Description:

Energetics Incorporated will work with Energy Commission staff and in consultation with stakeholders and subject matter experts to develop a technical assessment and gaps analysis that identifies, describes and prioritizes key research, development, demonstration, and deployment needs for achieving the state's goals for advancing technologies in the industrial, agricultural, and water sectors.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Results of the analyses will be used to strategically target future EPIC investments in a manner that provides optimal benefits to IOU electric ratepayers; maximizes the use of public research and development investments to find less water-energy intensive technologies and strategies for the industrial, agricultural and water sectors.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 2a, 3e

Lower Costs:

Identifying research gaps will help prioritize research and lower costs for end users. Establishing end-users' demands for service outputs will enable research to focus on those areas in which new innovations can make the largest impact, driving down costs while increasing technology efficacy and water and energy efficiency for these sectors.

Environmental Benefits:

The industrial sector's share of California's energy consumption in 2013 amounted to nearly one quarter of the total state energy consumption, and in 2008, total irrigation consumption for California farms amounted to 7,129 million gallons. Targeted research will help mitigate the electricity and water usage of California's IAW sectors.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $122,646
EPIC Funds Encumbered: $647,728	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Energetics Incorporated: $16,860 (2.5 %) TSS Consultants: $10,000 (1.5 %) Taylor Biomass Energy, LLC: $1,500 (0.2 %) Renewable Oil International LLC: $750 (0.1 %)	**Match Funding:** $29,610
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Contract	**No. of Initial Passing Applicants/ Bidders:** 3 out of 4 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-010 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This agreement was approved at the May 2016 Business Meeting, and executed in January 2017.

8. 300-15-011

Project Name:

California Commercial End-Use Survey

[300-15-011]

Recipient/Contractor:

ADM Associates, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/15/2016 to 3/30/2020

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

Issue:

A commercial end-use survey is used to calculate various estimates including: commercial floor space, annual whole building energy use, end-use fuel saturations, and annual whole-building hourly load profiles. Various parties throughout California have indicated interest in having forecasts of energy use that are more granular, disaggregated to the local or regional service territory level. The potential for uncertainty and inaccuracy in forecasting increases as the degree of forecasting granularity increases if the data being used do not fully support the granularity. The Energy Commission can reduce this inaccuracy in energy forecasts with a more extensive disaggregation of data.

Project Description:

This project will (1) develop a methodology to conduct a survey of the characteristics of commercial utility customers that will serve as a baseline and support the Energy Commission's work on the demand forecast, (2) implement the survey, and (3) provide an unbiased, comprehensive analysis of the data. The Commercial End-Use Survey (CEUS) will facilitate the commercial success and market adoption of technologies, strategies, and other innovations.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

End-use survey and saturation study activities further smart grid development by providing data and analyses useful for strategic deployment of appliances and technologies. The survey activity also aids in identifying current appliance distributions and where opportunities exist for further action. Additionally, a statewide survey will assist with identifying barriers and issues with technology and service deployment within the state.

CPUC Proceedings addressing issues related to this EPIC project:

Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11 Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Long-Term Procurement Proceeding (LTPP): R.13-12-010

Applicable Metrics: CPUC Metrics- 1c, 2a, 5c

Lower Costs:

This project can lead to reduced costs by leading to a more accurate demand forecast for the commercial sector. This can lead to more certainty on base-line end-use consumption and provide a better input into the CPUC's Long-Term Procurement Planning efforts so that only the generation that is truly needed, will be planned and procured.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $3,426,324
EPIC Funds Encumbered: $7,990,063	**EPIC Funds Spent:** $0
Match Partner and Funding Split: ADM Associates, Inc.: $100,893 (1.2 %)	**Match Funding:** $100,893
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Contract	**No. of Initial Passing Applicants/ Bidders:** 4 out of 4 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement 300-15-011 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved at the May 11, 2015 Business Meeting. The contract was executed by the Department of General Services on August 30, 2016 and the project kick-off meeting was held in October 2016.

9. 300-15-013

Project Name:

California Investor-Owned Utility Electricity Load Shapes

[300-15-013]

Recipient/Contractor:

ADM Associates, Inc.

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/29/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S21: Inform Investments and Decision-Making Through Market and Technical Analysis.

Issue:

Informed electricity generation and transmission decisions require accurate hourly load projections for electricity that account for the impact of demand-side measures and changing customer trends. The Energy Commission, in its current analysis, applies hourly load profiles based on historic patterns to the demand forecast to develop projected hourly usage. These load profiles, however, do not take into account any changes to the mix of end-uses that would be brought on by emerging trends or expected demand-side policies.

Project Description:

This project will develop market analysis to characterize existing and future electricity load in the service territories of Pacific Gas & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company that will inform the Energy Commission's demand forecast. This information will, by including a mix of emerging energy trends and demand-side innovations be used to identify and target opportunities to further reduce cost, improve safety, and improve reliability through clean energy technology research, development, deployment, and market facilitation opportunities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will help overcome technical barriers to achieving California's clean energy goals by providing an accurate assessment of the contributions of clean energy technologies to reducing peak demand, integrating renewable energy, and maintaining electricity system reliability as the deployment of clean energy technologies and strategies increase over time.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Long-Term Procurement Proceeding (LTPP): R.13-12-010

Applicable Metrics: CPUC Metrics- 1c, 5c

Greater Reliability:

This project can lead to reduced costs by leading to a more accurate demand forecast for typical usage of appliances and equipment, building type, and implemented demand-side policies. This can lead to more certainty on base-line end-use consumption and provide a better input into the CPUC's Long-Term Procurement Planning efforts so that only the generation that is truly needed, will be planned and procured.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $430,673
Grid Operations/Market Design	

<table>
<tr><td colspan="2">EPIC Funds Encumbered:
$1,147,406</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
ADM Associates, Inc.: $58,330 (4.8 %)</td><td colspan="2">Match Funding:
$58,330</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Contract</td><td>No. of Initial Passing Applicants/ Bidders:
5 out of 5 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 1</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement 300-15-013 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
This project was approved at the June 2016 Business Meeting and received approval from the Department of General Services in August 2016. The Recipient and Energy Commission staff has begun the first technical task of examining available data that can be used to develop the baseline load profiles. In 2017, the project is expected to finish collection of all necessary data and begin development of baseline load profiles and the impact of different scenarios.</td></tr>
</table>

10. EPC-14-001

Project Name:

Improving Solar & Load Forecasts: Reducing the Operational Uncertainty Behind the Duck Chart

[EPC-14-001]

Recipient/Contractor:

Itron Inc., which will do business in California as IBS

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/15/2015 to 6/29/2018

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

Solar is an intermittent resource, and accurate forecasting techniques for predicting when and how much solar resource is available are currently lacking. Increasingly accurate forecasting tools have been developed in recent years, but they have yet to be fully implemented into grid operations to optimize operations for high-penetration solar. Furthermore, the error associated with predicting net-load on California's grid is largely affected by solar availability. State-of-the-art solar forecasts need to be integrated into net-load forecasts to minimize solar integration costs.

Project Description:

This project plans to improve solar forecasts for grid-connected PV in California, use those improved forecasts to create enhanced net-load forecasts, and apply these enhanced forecasts to reduce scheduling errors for utilities and the California Independent System Operator (CAISO).

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will reduce resource scheduling uncertainty for California utilities and CAISO by improving solar forecasts, integrating those forecasts into enhanced net-load forecasts, and implementing the forecasts to quantify specific improvements and cost savings.

CPUC Proceedings addressing issues related to this EPIC project:

Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1c, 4a, 5c

Lower Costs:

The project aims to result in estimated near-term savings of $10 to $17 million annually by reducing the scheduling errors associated with forecasting PV power output and net-load for the California grid.

Greater Reliability:

The project will increase system reliability by significantly increasing the accuracy of solar PV forecasts and the associated net load forecasts.

Environmental Benefits:

Reduced requirements for regulation services and spinning reserves will help reduce GHG emissions by an estimated 2.7 million tons per year through reduced use of natural gas fired peaker plants.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $998,926		**EPIC Funds Spent:** $5,618	
Match Partner and Funding Split: Itron, Inc., dba IBS: $451,062 (31.1 %) Clean Power Research: $2,400 (0.2 %)		**Match Funding:** $453,462	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 18 out of 18 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-001 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

A non-disclosure agreement between the Energy Commission and the California Public Utilities Commission was approved to allow grantee Itron, Inc. and subcontractor Clean Power Research access customer meter data. The amendment includes the implementation of special terms and conditions to ensure confidentiality of data. The study *Improving Short-Term Load Forecasts by Incorporating Solar PV Generation* was executed to determine if there was a way of improving the load forecast accuracy of the CAISO's existing load forecast models by incorporating forecasts of solar PV generation. The Critical Project Review meeting was held in October 2016 to discuss the results of the ongoing studies.

11. EPC-14-002

Project Name:

Investigating Flexible Generation Capabilities at the Geysers

[EPC-14-002]

Recipient/Contractor:

Geysers Power Company, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/5/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

Electric system operators are concerned about large quantities of intermittent energy sources being reliably integrated onto the grid. While geothermal energy has served to provide a steady level of baseload energy, reducing impacts of intermittent energy will require quickly dispatchable sources of generation with the flexibility to ramp up or down as needed. Modifying geothermal operations to provide this flexibility would be valuable to system operation. However physical and operational issues are associated with providing such flexible generation from geothermal facilities.

Project Description:

This project will investigate how the operation of Geysers geothermal facilities may be modified in order to address the greater demands imposed on the grid by the significant addition of intermittent resources. To do so, the project will develop an integrated model that simulates the effects of providing flexible operation on the reservoir, wells, pipelines, and power plants. The model will be tested at isolated wells, pipeline and power plant sites, and then at a cross-tied location, to determine the effects of flexible operation on the larger steam field. Results will be used to identify risks to structure and operations. Management and mitigation strategies needed to address specific flexible generation objectives will be identified and tested at a variety of representative problem areas. An evaluation of management strategies and costs will be developed to provide flexible generation and ancillary services.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will result in the ratepayer benefits of greater electricity reliability and lower costs by determining if low carbon geothermal resources at the Geysers can cost-effectively be used to provide the flexible capacity needed to integrate renewable energy onto the grid.

CPUC Proceedings addressing issues related to this EPIC project:

Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1b, 2a, 3f, 4a, 5b

Lower Costs:

Increased flexibility and increased renewable generation will result in lower electricity cost to ratepayers.

Greater Reliability:

If successful, geothermal facilities will have electric generation flexibility allowing integration of intermittent resources and leading to greater reliability.

Environmental Benefits:

Improved geothermal flexibility and increased generation from other renewable resources reduces fossil fuel generation, reducing air pollutants and greenhouse gas emissions.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $3,000,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: TBD-Major Mechanical Contractor: $2,071,190 (28.1 %) TBD-Reservoir Engineering Contractor: $16,400 (0.2 %) TBD-Major Mechanical Equipment Supplier: $659,223 (9.0 %) Geysers Power Company, LLC: $1,615,560 (21.9 %)	**Match Funding:** $4,362,373
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 18 out of 18 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-002 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project commenced initial modeling activities in the first half of 2015. However, due to forest fires in late 2015 that damaged Geyser's geothermal facilities, project-related activities halted and the company focused on restoring the facilities damaged by the fire. The project schedule will be adjusted to reflect this unanticipated delay.

12. EPC-14-003

Project Name:

Low- Cost Thermal Energy Storage for Dispatchable CSP

[EPC-14-003]

Recipient/Contractor:

The Regents of the University of California on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/15/2015 to 3/15/2018

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

There is a growing problem facing the California electric grid as more and more electricity is being generated by renewable resources such as wind and solar. While there are many benefits to these resources, by their nature, they are 1) unable to match power production to usage, and 2) highly variable and/or intermittent in their production when compared to traditional electricity sources. A possible solution to these issues is increased use of thermal energy storage (TES) with concentrating solar power (CSP). Unfortunately, current TES technologies are prohibitively expensive and difficult to dispatch.

Project Description:

The purpose of this project is the development and demonstration of a cost-optimal, robust, and low-cost thermal energy storage (TES) fluid, elemental sulfur. Use of sulfur as a TES fluid will enable overall low system costs, long lifetime, and scalability for a wide range of concentrating solar power (CSP) applications and temperatures.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will develop a low-cost thermal storage fluid, elemental sulfur, which enables overall low system costs, long lifetime, and scalability for a wide range of concentrating solar power applications.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Energy storage: R.15-03-011 Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 2a, 3a, 3b, 3h, 4a, 4b

Lower Costs:

This project aims to reduce the cost of TES to $15/kWh. Compared to current state-of-the-art, this leads to a decrease in LCOE from 3 cents/kWh to 0.4 cents/kWh, providing $0.66 billion to $1.32 billion in annual savings depending on CSP penetration.

Greater Reliability:

Use of TES allows excess harvested solar energy to be stored during the day to be used during peak or non-solar hours, which increases dispatchability of renewable resources and provides load shifting.

Economic Development:

Assuming 5% to 10% penetration of CSP and deployment beginning in 2017, the 10-year net present value of this technology is estimated to be between $680 and $906 million.

Environmental Benefits:

Assuming 5% to 10% penetration of CSP and 1010 MWh of TES by 2020, significant GHG and criteria air pollutant reductions would be achieved: 2791 ton/MW of CO2, 37 ton/MW of SO2, 5 ton/MW of NOx, and 2.4 ton/MW of CO.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $198,528	
EPIC Funds Encumbered: $1,497,024		**EPIC Funds Spent:** $188,054	
Match Partner and Funding Split: Southern California Gas Company: $300,000 (16.7 %)		**Match Funding:** $300,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 18 out of 18 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-003 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

A project kickoff meeting was held in April 2015 and technical progress is underway. The project team has conducted heat transfer modeling and simulation as well as laboratory-scale material compatibility experiments that will feed into on-sun testing in 2017.

13. EPC-14-004

Project Name:

Systems Integration of Containerized Molten Salt Thermal Energy Storage in Novel Cascade Layout

[EPC-14-004]

Recipient/Contractor:

Halotechnics

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/15/2015 to 1/14/2019

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

California has aggressive renewable energy goals; 33% of energy production must be from renewable sources by 2020. More variable renewable energy from wind and solar means more energy storage is needed to maintain grid reliability. The California Public Utilities Commission recently implemented a requirement for the State's Investor Owned Utilities to procure 1325 MW of grid scale energy storage by 2024. Thermal energy storage (TES) using molten salt has been commercially proven at various CSP plants over the past 15 years. However further cost reductions are required in order to increase the competitiveness of CSP.

Project Description:

The project aimed to build, validate, thermally cycle, and pilot test a modular 75 kW, 6 hour (500 kWh) molten salt thermal energy storage (TES) system, using standard shipping containers and commercially available tanks and insulation. The project leverages a novel cascaded tank arrangement and high-volume manufacturing and factory assembly, to significantly reduce the installed cost of TES for concentrating solar power (CSP).

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The Halotechnics thermal storage system sought to improve system design and modularity and reduce the cost of molten salt energy storage by 25% by reducing the required storage volume. However, researchers found that the innovative storage technology would have to be very large to cost competitive with battery storage and, therefore, would not effectively reduce the cost of small CSP plants to make them competitive in the market.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Energy storage: R.15-03-011

Applicable Metrics: CPUC Metrics- 1i, 2a, 3b

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $283,080
Generation	

EPIC Funds Encumbered: $1,500,000		**EPIC Funds Spent:** $377,870	
Match Partner and Funding Split: Halotechnics: $19,038 (1.3%)		**Match Funding:** $19,038	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 18 out of 18 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-004 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The project was approved at the December 10, 2014 Energy Commission Business Meeting and the project work was started in January 2015. The process design and the mechanical design of all major components were completed, along with specified control system requirements which included the use of three tanks, the minimum number prescribed to evaluate the operation and viability of a multiple tank system. Halotechnics terminated the project after 10 months prior to the procurement of any hardware due to insufficient commercial traction from customers in the concentrated solar power industry.			

14. EPC-14-005

Project Name:

Solar Forecast Based Optimization of Distributed Energy Resources in the LA Basin and UC San Diego Microgrid

[EPC-14-005]

Recipient/Contractor:

The Regents of the University of California, San Diego

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/15/2015 to 3/15/2018

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

The variable nature of solar power is of concern to electric grid operators in California. If short-term solar variability cannot be predicted or reduced, the integration cost of solar power increases through investment in energy storage or regulation capacity by the grid operator. Especially at the microgrid and distribution feeder level, the geographic diversity is less available and solar generation is the primary contributor to net load variability, causing voltage issues affecting service quality and reliability.

Project Description:

This project aims to integrate high-accuracy solar forecasting to optimize the operation of distributed energy resources, and utilize the value of solar forecasting in utility grid operations to improve grid reliability, reduce ratepayer costs and increase safety. The objectives are to apply forecasts to inform control and scheduling decisions for distributed energy resources with emphasis on energy storage and electric vehicle charging control at warehouse photovoltaic clusters in the LA-Orange-Riverside-San Bernardino-San Diego Counties as well as the UCSD microgrid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project aims to improve solar energy forecast accuracy by 45% over the existing persistence forecast method to optimize the operation of distributed energy resources. Doing so will mitigate the concerns of electric operations over the variable nature of solar power that contributes to net load variability, causing voltage issues affecting service quality and reliability.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Smart grid: R.08-12-009 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1c, 4a, 5c

Lower Costs:

The project will lower the energy cost by developing strategies to reduce electricity peak demand through system optimization including peak (net) load shifting and PV smoothing and ramp rate mitigation.

Greater Reliability:

The project is expected to result in greater reliability by integrating high-accuracy solar forecasts to distributed energy resources (DERs), offering a highly accurate and granular solar forecasting resource available to utilities and balancing authorities like CAISO.

Economic Development:

The project will boost economic activities related to the optimized use of distributed solar energy resources, increased cost-effectiveness of DERs technologies integrated to solar production forecasting, and reduced grid net load variability. The project will also include the cost considerations favor adoption of electric vehicles (EV) as alternative to fixed storage devices.

Environmental Benefits:

The project will optimize the use of distributed solar energy technologies that leads to reduce the water consumption and greenhouse gas (GHG) emissions in the energy generation sector. The project will also include the environmental considerations favor adoption of electric vehicles (EV) as alternative to fixed storage devices.

Public Health:

The project will help improve public health by reducing air emission pollutants including NOx, SOx, and PM10.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Generation</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $157,282</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$999,984</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
San Diego Gas & Electric Company: $250,000 (12.5 %)
Strategen: $93,614 (4.7 %)
Itron, Inc. dba IBS: $483,032 (24.2 %)
University of California, San Diego, San Diego Supercomputer Center: $173,338 (8.7 %)</td><td colspan="2">Match Funding:
$999,984</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
18 out of 18 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 1</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
</table>

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-005 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

During the TAC meeting, participants identified the most relevant "use cases" for a suite of DER technologies to be analyzed in the project. The two use cases are: 1) whole market sales, where excess DER capacity participate in CAISO markets for energy and ancillary services, and 2) generation capacity saving, where DERs avoid investments in new generation capacity. Researchers developed the solar forecast requirements to implement the "use cases" and deployed nine sky cameras in the Los Angeles Basin and two cameras at the UC San Diego microgrid. The ongoing work is focused on the development of a schedule for EV charging based on solar production forecast data generated by the sky imager.

15. EPC-14-007

Project Name:

Improving Short-Term Wind Power Forecasting through Measurements and Modeling of the Tehachapi Wind Resource Area

[EPC-14-007]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Davis campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/15/2015 to 7/15/2017

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

Large, rapid changes (ramps) in wind power production are one of the most significant renewable integration issues for balancing authorities. If not effectively managed, these ramps can impose reliability issues and additional costs on the electric system. Accurate forecasting of wind ramps can ameliorate these impacts. However, this remains difficult because of the complexity of the meteorological processes that drive wind ramps. This is particularly challenging in the Tehachapi Wind Resource Area (TWRA) with its large amount of installed capacity, lack of spatial diversity in generation assets, and complex multi-scale wind patterns across the complex terrain.

Project Description:

This project comprises coordinated atmospheric field measurements and computational modeling improvements to improve the accuracy of prediction of short-term wind ramps (i.e. large, rapid changes in wind power production). The Tehachapi Pass Wind Resource Area will be the focus of the project. Since the area features complex terrain and meteorology, the findings can be readily adapted and applied to many other regions.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Improvements to accuracy of short-term (3-15 hours) and very short-term (0-3 hours) wind ramp forecasting would reduce generating reserves scheduled by grid operators, with corresponding decreases in grid operating costs and greenhouse gas emissions, and, simultaneously, increased grid reliability.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1c, 3b, 5c

Lower Costs:

Reducing wind forecast error by a little as 10% will reduce annual grid integration costs by $28 million in the WECC (which includes California) at 14% wind penetration, and as much as $100 million annually at 24% wind penetration.

Greater Reliability:

This project will foster greater grid reliability by more accurately forecasting short-term wind energy ramps.

Environmental Benefits:

Developing more accurate wind forecasting will foster greenhouse gas reductions through accurate predictions of available wind energy and reduction of needed generating reserves.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $247,542	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $423,115	
Match Partner and Funding Split: Department of Mechanical and Aerospace Engineering - UC Davis: $90,325 (8.3 %)		**Match Funding:** $90,325	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 18 out of 18 bidders	**Rank of Selected Applicant/ Bidder:** Ranked #7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-007 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team has completed the measuring program that included sodar, ceilometer, radiometer, radar wind profiler, and radio acoustic sounder measurements scattered over six sites and completed a forecast sensitivity study of wind ramping behavior based on suite of physics-based predictive models versus observed sodar data, including obtaining results for a sensitivity study of observed bias of mean absolute error of 0-15 hr. energy forecast for Tehachapi wind resource area. Ongoing efforts include developing improvements to very short-term forecasting including the selection of the best model(s) and formulation of Model Output Statistics that yield best performance.

16. EPC-14-008

Project Name:

High-Fidelity Solar Power Forecasting Systems for the 392 MW Ivanpah Solar Plant (CSP) and the 250 MW California Valley Solar Ranch (PV)

[EPC-14-008]

Recipient/Contractor:

The Regents of the University of California, San Diego

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/15/2015 to 3/15/2018

Program Area and Strategic Objective:

Applied Research and Development

S4: Develop Emerging Utility Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base

Issue:

Accurate forecasting tools for solar irradiance and solar power output have the potential to increase the reliability of California's energy supply, and the ability to optimize the dispatch of energy sources by reducing the uncertainty created by fast-changing weather conditions. High fidelity solar forecasting is an enabling technology for increasing solar penetration into the grid. However, there is a lack of well-developed forecasting models for components of solar irradiance that are critical to concentrating solar technologies, especially Direct Normal Irradiance (DNI) and Plane of Array (POA).

Project Description:

This project will focus on the development and validation of tools capable of monitoring and forecasting DNI and POA irradiance and the power generation accurately, from 5 minutes out to 72 hours in the future, mainly at the Ivanpah Solar Thermal plant, but also at the California Valley Solar Ranch (CVSR) plant. The project will also include the development of tools for predicting wind speed, which affects the heliostats' deployment, and improve the power generation forecast via Resource-to-Power Model (RTP) for Ivanpah CSP and CVSR (Tracking PV) plants. The goal of this system is aimed at reducing uncertainties associated with operation, regulation and scheduling of Ivanpah. The new forecast models will be used as a feed forward input to the RTP model in the solar field controls system that will enable the solar field to preemptively position itself for weather transients.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will develop and validate forecast models optimized for direct normal irradiance (DNI), plane of array (POA) irradiance for large-scale concentrating solar power (CSP), concentrating photovoltaics (PV), and tracking PV power plants. The application of big data and behavioral analysis will help optimize power plant operations.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 California Solar Initiative: R.12-11-005

Applicable Metrics: CPUC Metrics- 1c, 4a, 5c

Lower Costs:

The project will deliver models that will help utility scale costs associated with day-ahead scheduling, reduce plant operation costs associated with intra-day variability, and reduce ancillary service purchases needed to avoid forced outages.

Greater Reliability:

The project will result in greater reliability by developing high-fidelity models that increase the accuracy of solar energy forecasting to decrease the number of forced outages associated ancillary reserves.

Economic Development:

The project will help economic development by reducing solar power plant operating cost by more than 10% and having the ability to substantially affect the effective solar capacity in California.

Environmental Benefits:

The project will result in GHG emission reductions by decreasing the uncertainty associated with solar power generation to diminish the need of fossil fuel generation.

Public Health:

The project will improve public health by increasing level of renewable energy utilization which results in reduction of air emission pollutants generated from fossil fuel generation.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $168,624	
EPIC Funds Encumbered: $999,898		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: NRG Energy, Inc.: $460,000 (26.1 %) Itron, Inc. dba IBS: $304,019 (17.2 %)		**Match Funding:** $764,019	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 18 out of 18 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-008 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

During the TAC meeting held in April 2016, TAC members mentioned that CAISO is interested in intra-day and day-ahead forecasts for dealing with ramps, and discussed the importance of the 30-minute horizon forecast. Researchers assessed the performance of the forecasting models using common error metrics as a function of the forecast horizon (intra-hour, intra-day, day-ahead) and found that the increased ground data results in substantial forecast accuracy improvements. Additionally, a network of low-cost sensors has been installed for distributed monitoring at the California Valley Solar Ranch power plant. The devices provide a solution to the need for high-density ground telemetry.

17. EPC-14-009

Project Name:

Optimizing Radiant Systems for Energy Efficiency and Comfort

[EPC-14-009]

Recipient/Contractor:

The Regents of the University of California on behalf of the Berkeley campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Application of radiant systems has increased in recent years, as they provide an opportunity to achieve energy and peak demand savings compared to conventional all-air systems. Despite this growth, controls and operation of radiant systems can be challenging due to a lack of familiarity within HVAC design and operation professions. Also, recent research has shown that new and/or revised definitions and methods for the design, sizing, and control of effective radiant cooling and heating systems are needed. This has created a situation where radiant systems are being designed, installed, and operated with only limited guidance and inappropriate tools to assist designers and building operators.

Project Description:

This project will develop new practical design and operation tools for radiant cooling and heating systems in order to provide a standardized guidance for radiant systems. The approach will include a combination of fundamental full-scale laboratory experiments, whole-building simulations, development of simplified models for radiant system controls, validation of these new methods in field studies, occupant satisfaction surveys, and an update to Title-24 for radiant systems. The project outcomes will include 1) a simplified tool for calculating the cooling load and cooling capacity of a radiant slab system, including calculation methods with significant direct solar radiation, 2) a simplified online operational tool for radiant slab systems, and 3) updates to the Title 24 Alternative Calculation Method Reference Manual to enable improved modeling capabilities of radiant systems.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, radiant systems can be an integral part of ZNE and other advanced high performance buildings and reduce energy and peak energy use and cost compared to conventional systems.

CPUC Proceedings addressing issues related to this EPIC project:

Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 4a

Lower Costs:

The technology could reduce energy consumption and costs in California commercial buildings.

Environmental Benefits:

The technology could reduce CO2e emissions due to reductions in energy use for cooling California commercial buildings.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $450,466
EPIC Funds Encumbered: $2,939,964	**EPIC Funds Spent:** $606,064
Match Partner and Funding Split: Center for the Built Environment - UC Berkeley: $239,194 (7.4 %) Price Industries: $60,000 (1.9 %)	**Match Funding:** $299,194
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method:	**Funding Mechanism:**	**No. of Initial Passing Applicants/ Bidders:**	**Rank of Selected Applicant/ Bidder:**
Competitive	Grant	Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-009 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The second round of testing at the FLEXLAB was completed October 2016. Data analysis has begun and will continue over the next several months. Environmental data is being collected from two of their field sites. The third site is currently being identified.

18. EPC-14-010

Project Name:

Solar-Reflective "Cool" Walls: Benefits, Technologies, and Implementation

[EPC-14-010]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	3/30/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Increasing the albedo (solar reflectance) of a building's envelope reduces solar heat gain in the cooling season. Raising envelope albedo can also cool the outside air, boosting energy savings and demand reduction by decreasing the air temperature difference across the building envelope. Lowering urban surface and air temperatures improves air quality by slowing the reactions that produce smog, and delays global warming through negative radiative forcing ("global cooling"). Current data are insufficient to accurately predict savings impacts for different cool wall materials; which prevents cool wall technology from being included in building standards or utility rebate programs.

Project Description:

This project will (a) quantify the energy savings, peak demand reduction, urban cooling, and air quality improvements attainable from cool walls in Californian; (b) assess the performance of existing cool wall technologies, and develop innovative cool wall solutions; and (c) facilitate collaboration among government agencies, utilities, and industry to create a cool-wall infrastructure that includes application guidelines, a product rating program, incentives, and building code credits.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Cool walls could increase building energy efficiency, saving money for ratepayers and reducing emissions from power plants. This would lower the risks of grid failure, loss of air conditioning, and morbidity/mortality on hot, sunny days. Cool walls will also reduce urban air temperatures, helping mitigate extreme heat events and air pollution episodes.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)
Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 4a, 5d

Lower Costs:

The project will reduce heat gain through building shells, thus reducing space conditioning energy use and peak demand, which will directly reduce customer bills, generation costs and, when incorporated in the Load Forecast, procurement requirements.

Environmental Benefits:

By reducing space conditioning load, annual power plant emissions reduced, with consequent reductions in greenhouse gas emissions as well as nitrogen oxides and sulfur dioxide.

Public Health:

Reduced heat load would lower the risks of grid failure, loss of air conditioning, and morbidity/mortality on hot, sunny days. Cool walls will also reduce urban air temperatures, helping mitigate extreme heat events and air pollution episodes.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $908,941
EPIC Funds Encumbered: $2,500,000	**EPIC Funds Spent:** $1,454,820
Match Partner and Funding Split: _3M: $7,600 (0.2 %) BEHR: $33,000 (1.1 %) Metal Construction Association: $88,100 (2.8 %) PPG Industries: $100,000 (3.2 %) Saint-Gobain: $90,000 (2.9 %) Tex-Cote: $10,000 (0.3 %) Valspar: $270,000 (8.7 %) Sherwin Williams: $12,100 (0.4 %)	**Match Funding:** $610,800
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-010 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project is on track on all tasks. The project team held a meeting in late Fall 2016 with their project partners and TAC members to present early research results and outline the project's next steps. Partners and TAC members in attendance did not express any reservations on the results to date or the directions the research is taking. A CPR meeting was held on January 24, 2017; no red flags were identified.

19. EPC-14-011

Project Name:

From the Laboratory to the California Marketplace: A New Generation of LED Lighting Solutions

[EPC-14-011]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/1/2015 to 3/19/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Adoption of lighting emitting diode (LED) lighting for general illumination is poised to be the largest advancement in lighting building efficiency during the 21st century. A variety of market actors have introduced LED products and made performance claims that have set the technology up with unrealistic performance expectations. LED manufacturers have focused on research into efficacy cost at the expense of quality, resulting in an influx of poor quality LED products with minimal options such as color and dim ability. This has led to a lack of consumer satisfaction, and resulting minimal market share for LED products in key indoor residential and commercial applications.

Project Description:

This project will design and develop innovative LED lighting solutions for three key general illumination product categories. These solutions are a best-in-class medium, screw-base replacement lamp, linear tubular light emitting diode (TLED) replacement lamps and spectrally optimized, dedicated LED luminaires. Product design requirements will be based on consumer light quality and functional performance preferences determined through a series of unique laboratory-based consumer preference and product characterization studies.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project could improve understanding of metrics and test procedures associated with LED quality and performance, increase lamp manufacturer's ability to comply with future energy codes and standards and increase consumer acceptance and use of LED lamps.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 3e, 4a

Lower Costs:

The LED products developed could result in direct electricity and peak demand reduction and cost savings for consumers.

Greater Reliability:

Efficient lighting will reduce electricity demand and reduce strain on the electric grid.

Economic Development:

The development and deployment of the developed LED products could create jobs opportunities at the manufacture phase and at the implementation phase.

Environmental Benefits:

The development and deployment of the developed LED products could reduce electricity use and CO2 emissions.

Public Health:

The development and deployment of the developed LED products could help regulate circadian rhythm and production of important neurochemicals, impacting everything from sleep and mood to the health of the human immune system.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $557,072	
EPIC Funds Encumbered: $2,995,187		**EPIC Funds Spent:** $437,709	
Match Partner and Funding Split: Regents of the University of California, Davis - California Lighting Technology Center: $5,000 (0.2 %)		**Match Funding:** $5,000	
Leverage Contributors: California Lighting Technology Center - UC Davis : $5,000		**Leveraged Funds:** $5,000	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-011 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

CLTC completed the selection process for products in the lamp characterization using the test methodology selection guidelines. The recipient also began work on mapping Type A, B and C lamp products for future use in selection of top-tier products that could serve as a model for best in class products. A Critical Project Review meeting is scheduled for June, 2017.

20. EPC-14-012

Project Name:

Comparing Attic Approaches for Zero Net Energy Homes

[EPC-14-012]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	3/30/2015 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

As homes approach zero net energy (ZNE), the energy impacts of some emerging construction strategies need investigation to determine their energy impacts. One strategy is to seal and insulate the attic that contains the home's thermal distribution system. However there are questions regarding the level of air sealing and insulation needed, the impact on attic humidity and potential for attic or roof damage, and the overall impact on annual building energy use.

Project Description:

The project will focus on the performance of different attic assemblies and their associated heating, ventilating and air conditioning (HVAC) systems. Field measurements of attic and HVAC system performance will be conducted in two new high performance homes in California with sealed and insulated attics. One home will be built to be about 30 percent better than Title 24 and the other will be a ZNE home. The attic insulation approach will be a new lower-cost approach using blown insulation that does not use expensive spray-foam. The results of the measurements will be used directly to provide technical support for potential changes to Title 24 and provide information to contractors and builders on sealed and insulated attic performance and alternative approaches.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The technologies and construction techniques studied could lead to electricity savings and peak demand savings and changes in future construction practices. There is potential for reductions of up to 50% in energy use relative to typical duct systems. Comfort is also increased because homes take less time to cool down to meet set points. For new construction, this performance improvement will contribute to achieving ZNE goals. The techniques can be applied to home retrofits with HVAC equipment.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

The technologies and construction techniques could result in significant reduction in heating and cooling energy cost and use.

Environmental Benefits:

A 10 percent reduction in energy use associated with unvented attics could result in reductions in greenhouse gas emissions.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $563,439
EPIC Funds Encumbered: $1,000,000	**EPIC Funds Spent:** $1,000,000
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-012 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Contractor has completed simulation test plan and instrumentation of the first test house. The first technical advisor committee meeting and the second critical project review have been held. Attic performance data collection started in June 2016 and data will continue to be collected during the winter months.

21. EPC-14-013

Project Name:

Very Low-cost MEMS-based Ultrasonic Anemometer for Use Indoors and in HVAC Ducts [EPC-14-013]

Recipient/Contractor:

The Regents of the University of California on behalf of the Berkeley campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	8/25/2015 to 3/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Air velocity and air flow are currently measured using devices such as hot-wire anemometers or are inferred from pressure measurements. These are inaccurate, failure-prone, and often expensive. They limit the applications in which air speeds and their associated energy flows are measured in buildings, causing very large energy costs and health risks.

Project Description:

This project will develop low-cost, low power, accurate, calibration-free, and compact airflow sensors (anemometers) for measuring: (1) room airflow in occupied commercial buildings; and (2) volumetric air flow in heating, ventilation and air conditioning (HVAC) systems. The technology will save energy by using the collected data to correct current wasteful HVAC malfunctions that result in inefficient systems and uncomfortable buildings. The anemometers will be wireless, able to be inexpensively installed in existing buildings, and operate on a battery for years and communicate wirelessly via the internet to the building's control system. The device will also sense temperature, its orientation, and its location.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Estimated savings for all California building types is 183 GWh/yr and 52,000 metric tons CO2e/yr, assuming the technology is applicable in 25-75% of buildings, a 10-15% potential for savings on all HVAC related energy use, and a final market penetration of 5-25%. These figures are based upon an estimated level of market penetration 10 years from project end (a rate of approximately 1-2.5% of applicable buildings per annum, a rate of approximately 0.2-1.8% of the overall building stock in each category).

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 3a, 4a

Lower Costs:

Estimated savings of $26 million per year in reduced energy bills for building owners/occupants, and reduce operations and maintenance costs, assuming technology applicability in 25-75% of buildings, a 10-15% potential for savings on all HVAC related energy use, and market penetration of 5-25%

Greater Reliability:

HVAC systems can be turned off when measured airflow indicates ventilation requirements have been met, resulting in improved system operation, power reliability, and reduce grid impacts.

Increase Safety:

Safety of occupants is improved when ventilation air is accurately measured, as inaccurate pressure sensors often lead to reduced zone ventilation rates, and malfunctioning outside air dampers often do not provide sufficient minimum outside air.

Economic Development:

This project will provide work for 17 individuals in California for a total of 42,683 hours over the course of 3.5 years. The mature technology has the potential to create high tech manufacturing jobs in California.

Environmental Benefits:

Estimated savings of 112,000 metric tons of carbon dioxide/yr, assuming technology applicability in 25-75% of buildings, a 20-30% potential for savings on all HVAC related energy use, and market penetration of 5-25%.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $595,177	
EPIC Funds Encumbered: $2,488,964		**EPIC Funds Spent:** $66,940	
Match Partner and Funding Split: Price Industries: $40,000 (1.5 %) BAF Technologies Inc.: $45,000 (1.6 %) Chirp Microsystems, Inc.: $120,000 (4.4 %) Center for the Built Environment - UC Berkeley: $14,000 (0.5 %) Vigilent: $30,000 (1.1 %)		**Match Funding:** $249,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			

Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-013 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.
Update: As of January, 2017, the project is on schedule and on budget. The Anemometer Test Plan was submitted to the Energy Commission agreement manager, reviewed and approved. The hardware for the prototype #1 room-velocity anemometer has been designed and configured. The 1-D anemometer prototype is being tested and shows promise as the signal clearly changes with changes in air speed. The anemometer carrier board and connectors configuration have been studied and design decisions made. An on-site CPR and a lab visit were conducted on December 15, 2016.

22. EPC-14-015

Project Name:

Direct Current as an Integrating and Enabling Platform

[EPC-14-015]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/15/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

The potential energy savings and interoperability advantages of direct current (DC) and alternating current (AC)-DC hybrid systems are estimated to be very significant, especially for zero net energy (ZNE) buildings that integrate on-site renewable energy with battery storage, electric vehicle (EV) charging, and the Smart Grid. Yet the barriers to transitioning from traditional AC-powered electric systems to DC or AC-DC hybrid systems are significant, even in a world dominated by digital devices and end-use equipment that require DC power. More research, information, design guidelines/templates, and training are needed to understand the savings potential and costs for implementing DC and AC.

Project Description:

This project will research DC and AC-DC hybrid systems in buildings and develop resource information, end-use templates, and building guidelines that could improve the ability to achieve zero net energy buildings. The feasibility, costs, benefits, market barriers, and customer and education needs will be assessed, including guidelines for residential and small commercial buildings.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Researchers have estimated energy savings potential of 10% to 30% for DC-powered systems for ZNE buildings with storage and or EV charging. It is estimated that ZNE DC homes could reduce site energy use by 20%, reduce PV size by 25%, and reduce the home cost by $22,000. Several DC-powered data center demonstrations have documented roughly 15% to 20% electricity savings from improved electrical efficiency and reduced cooling loads. ZNE buildings with EVs and storage, DC systems can improve efficiency between 10% and 30%, and provide California IOU electric ratepayers with lower energy costs, increased safety through the use of low-voltage DC, and greater reliability.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 3b, 3e

Lower Costs:

Use of DC power will avoid unnecessary power conversions, improving efficiency, and eliminating the need for some conversion equipment. Total savings are estimated to be $800 million over a ten year period, assuming full penetration of DC distribution in all buildings that install PV between 2015 and 2024.

Greater Reliability:

DC power has a long history of reliability in the telecommunications sector. Similar improvement is expected for DC power use in buildings. DC power use in buildings will improve reliability by eliminating failure in power conversion equipment.

Environmental Benefits:

Reduction in energy use could result in reductions in greenhouse gas emissions. Also, eliminating the need for some conversion equipment could reduce the cost of PV, storage and other related systems.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $495,365	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $822,245	
Match Partner and Funding Split: California LMCC IBEW-NECA: $50,000 (4.5 %) EMerge Alliance: $50,000 (4.5 %)		**Match Funding:** $100,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-015 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

As of January, 2017, the project is on schedule and on budget. A paper based on Task 2 literature review findings was presented at the 2016 ACEEE Summer Study. A Technology Transfer Plan was submitted and approved and a Task 2 Preliminary Draft Report was submitted and commented on by the Energy Commission project manager. A stakeholder meeting was held on December 15, 2016 and a Technical Advisory Committee meeting will be held on January 31, 2017. Technical tasks are expected to be completed by April, 2017.

23. EPC-14-016

Project Name:

Cost- and Energy-Efficient Attic Designs for California Homes

[EPC-14-016]

Recipient/Contractor:

BIRAenergy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/29/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

In 2013, new California home construction totaled 85,310 units; 36,878 single family units and 48,432 multifamily units. An estimated 90% of the single family homes had the heating, ventilation and air conditioning (HVAC) equipment and ductwork (ducts) in the temperature extremes of ventilated attics. California homes place the HVAC and ducts in the attic to avoid using valuable living space. Placing ducts in the attic makes duct installations easier and less expensive. However, this practice results in wasted energy estimated at about 4.8 TWh and significant carbon emissions estimated at 1.2 million metric tons of equivalent carbon dioxide emissions (CO2e) each year.

Project Description:

Three different attic designs will be refined, tested, evaluated, and demonstrated in new home construction. The team will recommend the best of these approaches to home builders addressing cost-effectiveness and energy-efficiency. The baseline for comparison will be current energy efficiency code practices for attic construction involving ventilated, un-insulated attics containing code compliant ducts. The team will evaluate the new design approaches analytically at the start of the project. Researchers will assess approaches that include methods to produce sealed, insulated attics, as well as, standard vented attics, both of which have been demonstrated and are in limited use in the market today but currently add considerable cost to builders. The team will employ new and novel installation methods and materials that have the potential for energy savings on par with ducts in the conditioned space, but at a cost similar to current practice.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project has the potential to lower utility costs, improve comfort, reduce carbon emissions through reduced energy use, and reduce peak electricity demand in new and existing homes. Pilot work has demonstrated that these approaches have the potential to be cost neutral. Assuming a market penetration of 73% of the current single-family, new construction market would potentially recoup the costs to ratepayers within a single year.

CPUC Proceedings addressing issues related to this EPIC project:

Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

The project could lower energy cost to consumers by developing attic assemblies that allow ducts to perform as if they were located in the "conditioned space" and reduce HVAC energy costs.

Environmental Benefits:

The new attic designs proposed in this project could save 3700 metric tons of CO2e per year.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $228,148
EPIC Funds Encumbered: $1,000,000	**EPIC Funds Spent:** $523,570
Match Partner and Funding Split: Owens Corning: $265,000 (20.9 %)	**Match Funding:** $265,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 11

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-016 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient has nearly completed all of the laboratory research and have submitted the corresponding reports for Tasks 2 "Attic Moisture Management", Task 3, "Air Sealing Junction of Exterior Wall and Attic", and Task 4, "Optimize Insulation and Guidelines for Netting Permeance in Sealed Insulated Attic." The recipient is preparing for project field test, and will install monitoring equipment in the attics of four new homes, one of which is a control home. A draft research plan has been prepared and the recipient is working with the builder partner to coordinate the construction and monitoring phases.

24. EPC-14-017

Project Name:

Developing Flexible, Networked Lighting Control Systems That Reliably Save Energy

[EPC-14-017]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/1/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

The greatest difficulty in deploying advanced and intelligent lighting control systems is the lack of multi-vendor interoperability and standard user interface elements. Building owners may have multiple lighting systems that cannot be controlled by whole-building automation because of different user interfaces, and replacing working lighting systems in order to use whole-building automation is costly.

Project Description:

The recipient will develop low-cost lighting components with open communication interfaces that allow seamless integration into whole-building control and automation systems. The project will target future California Building Energy Efficiency Standards (Title 24), and establish methods by which the site-specific configuration and operation of networked lighting controls systems can be effectively addressed, and more easily implemented by the marketplace.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If the project is successful, it will accelerate the adoption of standardized lighting control systems and will help realize the California Lighting Action Plan goal of 60-80 percent reduction in lighting energy use by 2020. Estimated overall energy savings potential of advanced, networked lighting controls exceeds 20%, or about 1.5 TWh/year, after the technologies have been implemented in the commercial building stock.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a

Lower Costs:

The technology could reduce energy consumption and costs associated with lighting energy use in commercial buildings. Additionally, one of the goals is to develop low cost lighting components which could facilitate easier implementation into the marketplace.

Greater Reliability:

Reduced stress on the grid due to lighting efficiencies.

Environmental Benefits:

The technology could reduce greenhouse gas emissions due to reductions in energy use for lighting in commercial buildings.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $216,162
EPIC Funds Encumbered: $1,875,000	**EPIC Funds Spent:** $854,000
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-017 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Standard data models for connected lighting systems were developed, communication protocols, methodologies, metrics and control testing for the outcome-based lighting systems are in progress. FlexLab testing is still monitoring Enlighted's networked lighting control system and comparing reported data types.

25. EPC-14-019

Project Name:

Validated and Transparent Energy Storage Valuation and Optimization Tool

[EPC-14-019]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/11/2015 to 12/30/2016

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

The California Public Utilities Commission has set a target of 1.325 GW of energy storage by 2020, however, the role and value of energy storage is not fully understood. The barriers to energy storage use include: high capital costs; lack of information regarding performance; limited operational experience; and lack of comprehensive, publicly available tools that can analyze the financial and technical performance of energy storage systems. Models are needed that optimize grid-level energy storage deployment with respect to location, size, and type.

Project Description:

This project will develop, test, and validate a publicly available computer model for the CPUC's energy storage use cases to determine the most optimal energy storage systems. This software model will assess costs and benefits and will guide energy storage projects with respect to location, size, and type. The software will be publicly released as a cloud-hosted tool.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This agreement will attempt to develop a "first of its kind" publicly available tool that can determine the value of energy storage with respect to location, size, and type.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1c, 1i, 2a, 4a, 5b

Lower Costs:

This Agreement will lower costs by making available a tool for determining the costs and benefits of energy storage projects with respect to location, size, and type so that the lowest cost solution can be selected.

Greater Reliability:

This Agreement will increase reliability of the transmission and distribution grid by encouraging greater use of energy storage in the bulk and distribution system to increase resilience to disruptions and intermittency of renewable generation.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Grid Operations/Market Design</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $482,416</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$1,000,000</td><td colspan="2">EPIC Funds Spent:
$622,218</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
Electric Power Research Institute (EPRI): $901,944 (47.4 %)</td><td colspan="2">Match Funding:
$901,944</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
35 out of 38 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 4</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-14-019 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
Alpha and Beta Software were developed in the second half of 2016. In addition, the Alpha model functionality was completed and structure testing was performed with 10 TAC individuals and 3 EPRI members. Live project tests were completed in July 2016. The Beta version was then released, and tested by EPRI and TAC members in September 2016. By December 30, 2016, EPRI will complete this project and have a final report.</td></tr>
</table>

26. EPC-14-021

Project Name:

Development and Testing of the Next Generation Residential Space Conditioning System for California

[EPC-14-021]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Cooling and heating of buildings to achieve comfortable temperature and humidity levels accounts for a large portion of the electricity bills for Californians. The building sector awaits the promise of novel energy-efficiency technologies that will decrease operating costs of space-conditioning equipment and increase comfort. Many of the technologies that deliver efficiency exist, but are not integrated into a single HVAC system, nor are they optimized for California climates.

Project Description:

This project will develop a next-generation residential space-conditioning system optimized for California climates. The advanced efficiency solutions integrated into the HVAC system will include: variable-capacity compressor and variable-speed fans using state-of-the-art inverter technology; integrated ventilation to harness fresh air for "free cooling;" intelligent dual-fuel technology to decrease energy cost and empower consumers to choose between electricity and natural gas; zonal control to prevent conditioning of unoccupied rooms; demand-response interactivity to grid flexibility and reliability; advanced fault detection and diagnostics to ensure proper installation, operation, and maintenance; and alternative refrigerants for improved operation and significant reductions in the potential for global warming.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will develop a climate optimized HVAC system that includes advanced energy efficiency features. If successful, the technology could reduce electricity use, demand and costs, enhance occupant comfort, provide for fault detection and diagnostics to ensure continued optimal system performance, and allow the use of alternative refrigerants that reduce the potential for global warming.

CPUC Proceedings addressing issues related to this EPIC project:

Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010

Applicable Metrics: CPUC Metrics- 1e, 1f, 1g, 1h, 4a

Lower Costs:

This technology is estimated to reduce electricity usage by 725 GWh per year, or approximately $108 million annually. In addition the fault detection and diagnostic feature could help reduce operation and maintenance costs on HVAC equipment.

Greater Reliability:

The technology is estimated to reduce peak demand by 1.5 GW which could reduce impacts to the grid.

Environmental Benefits:

The technology is estimated to reduce greenhouse gas emissions by 193,000 metric tons of CO2 emissions annually due to reductions in energy use.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,072,105
EPIC Funds Encumbered: $2,993,005	**EPIC Funds Spent:** $403,278
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $322,281 (9.7 %)	**Match Funding:** $322,281
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-021 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient completed its first round of lab testing in June 2016. The analysis of text results were completed in October 2016 and the recipient is preparing for their second round of lab tests to begin in January 2017.

27. EPC-14-022

Project Name:

The Lakeview Farms Dairy Biogas - To - Electricity Project

[EPC-14-022]

Recipient/Contractor:

ABEC #3 LLC, dba Lakeview Farms Dairy Biogas

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 5/14/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

The reasons in favor of dairy-based bioenergy generation systems are compelling; however, many factors hinder their financing, development, demonstration, and deployment. Important factors are the economics and that dairy farmers lack expertise in electricity generation and are not interested in becoming energy managers.

California Bioenergy and some dairy farmers in the San Joaquin Valley are pursuing an ownership structure, in which multiple dairies pool their interest across multiple biogas electricity and fuel production projects. This model could be used for California dairy farms interested in dairy biogas systems, but concerned about the economic and technical risks.

Project Description:

ABEC #3 LLC, DBA Lakeview Farms Dairy Biogas will install and demonstrate an innovative covered lagoon digester system that will process dairy manure into biogas to generate renewable electricity for export to the electricity distribution grid. This particular project is located near 11 other dairies and will help launch the state's first "hub-and-spoke" dairy digester cluster by preparing the 1 MW generator platform to accept 2 MWs of future capacity potentially utilizing biogas from neighboring dairies. This hub and spoke approach was initially proposed in a case study prepared for the USDA on the economic feasibility of dairy digester clusters in California. The idea is to allow the dairies to benefit from the aggregation of capital investment and reduce operation and management costs by centrally locating the generators and associated electrical equipment.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will significantly reduce methane emissions and generate renewable electricity helping to achieve the State's GHG emission reductions and renewable electricity goals. The improved digester design will decrease dairy operating costs and provide valuable co-products, such as nutrient-rich, more absorbable irrigation water. Further, this hub and spoke model, if successful, could lead to the development of more dairy digester biogas-to-electricity projects.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 3a, 4a, 4e

Lower Costs:

The project aims to demonstrate a system that ultimately reduces dairy digester project costs by participating in electricity energy markets and taking advantage of economies of scale from the planned hub and spoke build-out.

Environmental Benefits:

The project will deploy new renewable power generation and destroy methane gas currently vented into the atmosphere. The double-lined lagoon enhances groundwater protection by minimizing leaching of manure into underlying groundwater.

Consumer Appeal:

The project will improve odor control, through hydrogen sulfide removal, an issue important to the dairy employees and benefits the local community.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $32,107
EPIC Funds Encumbered: $4,000,000	**EPIC Funds Spent:** $880,812
Match Partner and Funding Split: ABEC #4 LLC, CE&S Dairy Biogas: $4,500,000 (52.9 %)	**Match Funding:** $4,500,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-022 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

California Bioenergy LLC Lagoon Digester Systems. Propriety designs, processes, expertise and operational procedures include, for example, developed digester systems to support gas storage, energy storage, flexible liquid and gas volumes, co-digestates, clustered generator configurations, H2S reduction, improved effluent value, farmer savings, and integration with fuel programs.

Update:

The project kickoff meeting was held in June, 2015. There was a Technical Advisory Committee (TAC) meeting in March, 2016 and a Critical Project Review (CPR) meeting in August 2016. The project is progressing and broke ground in fall, 2016. Monthly invoicing and progress reports are being submitted and the project is expected to be completed as planned.

28. EPC-14-023

Project Name:

Utility Demonstration of Znyth Battery Technology to Characterize Performance and Grid Benefits

[EPC-14-023]

Recipient/Contractor:

Eos Energy Storage, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 3/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

Distributed energy storage can provide fast-responding grid services and much needed locational capacity to integrate renewable energy. Despite this great potential, the high cost and short life of current commercial energy storage technologies make their use largely uneconomical. Moreover, safety and energy density limitations have prevented wide-spread deployment of energy storage on a distributed basis. There is minimal experience in integrating these storage systems with traditional utility infrastructure. Safer and more cost-effective energy storage options need to be developed for integration into the electrical grid with input from the electric utilities.

Project Description:

Eos will perform pilot testing of a 125 kW/375 kWh AC-integrated energy storage system consisting of approximately 140 Eos Znyth (Trademark) battery modules. The system will be installed at PG&E's Advanced Technology Services laboratory and at the grid simulation testing 'Distribution Test Yard' in San Ramon, CA. System performance will be characterized against a variety of use cases, including peak shaving, ancillary services, load following, and frequency regulation. Eos will model a portion of PG&E's distribution network to create simulated grid conditions that will allow for dynamic testing of the battery before its deployment to the electricity grid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This demonstration will provide information and data to better determine the value and cost savings of battery energy storage when interconnected to the grid.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1c, 1i, 2a, 4a, 5b

Lower Costs:

This project will determine any cost savings by testing this battery system and determining how well the battery can cost effectively provide the grid with peak shaving, ancillary services, load following, and frequency regulation. These markets and services may provide a revenue stream for energy storage users.

Greater Reliability:

This project will contribute to more efficient battery storage which will ensure greater reliability for the grid as a whole and increase energy storage use.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $691,504
EPIC Funds Encumbered: $2,156,704	**EPIC Funds Spent:** $84,248
Match Partner and Funding Split: Eos Energy Storage, LLC: $1,117,607 (33.6 %) Electric Power Research Institute, Inc.: $50,000 (1.5 %)	**Match Funding:** $1,167,607
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 35 out of 38 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-023 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The Draft Test Plan and Draft Interconnection Survey were completed. Work continues on the Modeling and Simulation of the battery storage system, and Eos has reviewed and commented on the next iteration of modeling simulations prepared by subcontractor Lawrence Berkeley National Lab. A draft of the System Specifications has been written and is currently under review with Eos.

29. EPC-14-024

Project Name:

Modular Biomass Power Systems to Facilitate Forest Fuel Reduction Treatment

[EPC-14-024]

Recipient/Contractor:

West Biofuels LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/13/2015 to 3/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

Community-scale bioenergy infrastructure is critical to support sustainable management of the forested landscape to protect communities, watersheds, and energy infrastructure from the catastrophic wildfire. As identified in the California Bioenergy Action Plan (2012), the utilization of forest waste to promote sustainable forest management practices is of critical importance to the State and to utility ratepayers. While biomass power has existed in the forested settings in California with the deployment of large-scale direct combustion power plants, mostly built in the 1980's, community-scale biomass conversion technology has yet to be successful largely due to cost and performance issues.

Project Description:

This project plans to develop a modular biomass gasification system that can be rapidly deployed to communities across California to promote and support fire-safe management activities. The pilot-scale modular biomass gasification system integrated with a high-efficiency lean-burn engine will convert forest residues into renewable grid power to reduce the cost and increase the benefits of forest fuel reduction projects in high fire risk regions of the state.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project aims to reduce direct costs of utility-caused wildfire, protect utility infrastructure, preserve forest carbon sequestration, promote defensible communities, protect key watersheds, and lower size and intensity of wildfires.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1a, 1c, 4a

Lower Costs:

The IOUs pay an average of more than $11 million per year in fire-related damages to state and federal land management agencies. Reducing wildfire risks would reduce direct costs to utilities and likely also reduce costs of fire insurance.

Economic Development:

It is estimated that approximately 4.9 jobs are created per MW of bioenergy generation. Most bioenergy facilities are, and will be, sited in rural areas that are experiencing significant economic hardship.

Environmental Benefits:

As forest landscapes are treated and excess biomass is removed, wildfire behavior is mitigated. Over time, as result, strategic fire suppression effectiveness will be enhanced as fossil fuels are reduced through generation of renewable electricity using forest biomass.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $334,354
EPIC Funds Encumbered: $2,000,000	**EPIC Funds Spent:** $635,906
Match Partner and Funding Split: West Biofuels, LLC: $510,000 (20.1 %) TSS Consultants: $18,754 (0.7 %) Soper-Wheeler Co. LLC: $8,160 (0.3 %) Christiana Darlington: $3,000 (0.1 %)	**Match Funding:** $539,914
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-024 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Researchers examined the biomass availability, harvest, processing, and chemical properties that impact the availability and cost of utilizing forest-sourced feedstock for a community-scale modular biomass-to-electricity system. The recipient presented an overview of forest type and landownership pattern in California, and the description of Forest Management Practices typical in each of the regions. The ongoing activities are focused on preparing the CircleDraft gasifier for the testing that will determine the operating conditions for optimized efficiency and syngas quality. Some targets are: Syngas Energy Content > 150 Btu/ft3 and Tar Content < 20 mg/Nm3.

30. EPC-14-025

Project Name:

Mass-manufactured, Air Driven Trackers for Low Cost, High Performance Photovoltaic Systems

[EPC-14-025]

Recipient/Contractor:

Sunfolding Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

Solar tracking has taken off in the last few years, but current trackers have run out of options for cost reductions. The state of the art designs use a traditional approach of motors, gearboxes, and bearings. These components are manually assembled with high-cost materials, leading to limits in cost reduction and scale up. Further, this approach includes many points of failure and has high maintenance costs.

Project Description:

The project will install and test a 300 kW photovoltaic solar system with air driven trackers. Two key technical innovations will be demonstrated. First, the use of mass-manufacturing for the drive system results in an extremely low cost structure and very low part count. Second, only tubing is connected to each actuator, removing requirements for outdoor wiring or individual control hardware. The proposed research will also involve collecting six-month performance data for the proposed solar PV tracking technology.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will result in ratepayer benefits of reduced cost of energy and increased energy supply reliability. The reduced cost of energy will be achieved by demonstrating a new type of ground mount tracker that adds 20-40% more power over fixed tilt systems at a cost that is well below the cost of current solar trackers. The increases in energy supply reliability will be achieved by delivering additional power that occurs in the late afternoons to the grid.

CPUC Proceedings addressing issues related to this EPIC project:

California Solar Initiative: R.12-11-005

Applicable Metrics: CPUC Metrics- 2a, 3b, 4a

Lower Costs:

This project will lower levelized cost of electricity (LCOE) by 40-50% of the levelized cost of electricity of currently available solar energy systems with trackers.

Greater Reliability:

This project will result in greater energy supply reliability by increasing the energy efficiency by 20-40% over fixed tilt systems at a cost well below the cost of current solar energy systems with trackers.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $157,497	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $436,295	
Match Partner and Funding Split: PV Evolution Labs: $265,000 (12.2 %) Sunfolding, Inc.: $906,565 (41.7 %)		**Match Funding:** $1,171,565	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-025 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The project was kicked off in July 2015. Significant progress has been made on subsystem development including pneumatics, compressor system, and controls. The actuator work has moved to design, building, and testing for the 1-axis tracking system, which includes manufacturing of a new bellows design with improved torque capability. Researchers are modeling how potential failures due to leaks or blockages can impact tracker operation and performance. A 6.5kW tracker was assembled and installed as a precursor to the PVUSA field installation. It has been continuously tracking without issues or downtime since it went online.			

31. EPC-14-026

Project Name:

Examining the Heterogeneity of Energy Efficiency Adoption and Savings Across Socio-Economic and Ethnic Groups Using a Large Scale Quasi-Experiment

[EPC-14-026]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 6/30/2017

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

Issue:

Numerous studies have found that consumers are failing to adopt seemingly cost-effective investments in energy efficiency. Current energy efficiency programs and energy demand forecasts do not account for varying participation across social, cultural, and socioeconomic groups. Previous studies have been small scale or based on stated-choice surveys. The results of these studies can be unreliable due to low participation rates, recall bias, and other biases.

Project Description:

This project will conduct a quasi-experimental, econometric study of energy efficiency adoption and energy savings with a focus on differences between social, cultural, and socio-economic groups. The study will apply modern economic methods, including regression-discontinuity and propensity score matching. The large data sets and rigorous methods will result in precise estimates to improve demand forecasts, energy efficiency program design, and future energy studies concerning social, cultural, and socioeconomic groups.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (De Leon, 2015) sets energy efficiency targets for 2030 and allows for the targets to be achieved, in part, from utility programs that provide financial incentives and rebates to their customers to increase energy efficiency. This project will examine opportunities to increase customer participation in utility efficiency programs in a cost-optimal manner.

CPUC Proceedings addressing issues related to this EPIC project:

Long-Term Procurement Proceeding (LTPP): R.13-12-010 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 5c

Greater Reliability:

New metrics on the impacts of utility energy efficiency programs for various subpopulations can increase the accuracy of energy demand forecasts used in Long Term Procurement Planning and Resource Adequacy proceedings.

Consumer Appeal:

Energy efficiency programs that incorporate social, behavioral and cultural aspects into the program design are likely to have greater appeal to potential customers.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $65,406	
EPIC Funds Encumbered: $360,632		**EPIC Funds Spent:** $257,481	
Match Partner and Funding Split: The Regents of the University of California, Berkeley: $150,784 (29.5 %)		**Match Funding:** $150,784	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-026 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team has submitted a test plan (October 2016) for the final technical deliverable from this project (Heterogeneity Analysis Test Plan), and continues further analysis towards completing the Heterogeneity Analysis task.

32. EPC-14-027

Project Name:

High Temperature Hybrid Compressed Air Energy Storage (HTH-CAES)

[EPC-14-027]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 3/31/2017

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

The California Public Utilities Commission has set a target of 1.325 GW of energy storage by 2020, but the role and value of energy storage is not understood. The barriers to energy storage use include: high capital costs; lack of information regarding performance; limited operational experience; and lack of comprehensive, publicly available tools that can analyze the financial and technical performance of energy storage systems. Advanced energy storage technologies and systems need to be developed and demonstrated for eventual deployment by investor owned utilities.

Project Description:

This project will build a fully-functional, low-cost and scalable high temperature hybrid compressed air energy storage (HTH-CAES) system that can efficiently store grid-level energy from renewable sources and release that energy when it is needed to meet peak demand, particularly for ancillary services and load following use-cases. The HTH-CAES system utilizes a state of the art, high temperature energy storage unit to reduce losses in the air compression process. This innovative technology offers a highly efficient, ultra-low-cost solution for mitigating intermittent renewables.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Compressed air energy storage may be a viable solution for long-term and large-scale storage applications. HTH-CAES potentially has lower capital and maintenance cost and less geographic restrictions than other storage technologies. In HTH-CAES technology, compressors are used to convert inexpensive off-peak electric power into compressed air and thermal reservoirs. Industry is interested if HTH-CAES can support large-scale power applications with low capital cost.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1c, 1i, 2a, 4a, 5b

Lower Costs:

The proposed 74 kW system to be quantified has a designed cost of $938/kW and $156/kWh installed. If it achieves a life-time of 15,000 cycles and reaches an efficiency goal of 85%, the levelized cost could be 7 cents/kWh/cycle.

Environmental Benefits:

HTH-CAES produces no carbon emissions and utilizes a low-waste and environmentally friendly construction. This technology will reduce emissions of CO2, SO2, NOx, and CO by displacing natural gas fired peaker plants.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $206,222
EPIC Funds Encumbered: $1,621,628	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 35 out of 38 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-027 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The design of a 6-hour discharge, 74kW High Temperature Hybrid Compressed Air Energy Storage system was completed. The optimum boundaries of the plant operation were determined through thermodynamics analysis. The plant design included multiple rounds of iteration for a) the process, which resulted in a final Piping and Instrumentation Drawing, b) the final design of the coupled mechanical/thermal design of the solid state High Temperature Energy Storage, and c) a completed 3D layout of the plant. All major components for construction have been purchased. A no-cost time amendment for 8-month extension with SOW revision, budget reallocation, and change in location of the demonstration site.

33. EPC-14-028

Project Name:

Low Cost Biogas Power Generation with Increased Efficiency and Lower Emissions

[EPC-14-028]

Recipient/Contractor:

InnoSepra, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/1/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

Conventional biogas purification technologies used for biogas upgrading have high capital and operating costs, and have not been used commercially in power generation applications. Innovative technologies and physical sorbents to effectively remove multiple impurities from raw biogas in a single step prior to power generation would enable a significant reduction in the capital and operating costs and energy required for biogas purification. The use of purified biogas for power generation can provide significant cost, efficiency and environmental benefits in combined heat and power generation applications.

Project Description:

This project will deploy a pre-commercial technology demonstrating a sorbent-based biogas purification process for combined heat and power generation at the pilot scale that removes multiple troublesome impurities from biogas, upgrading the fuel to near-pure methane for combustion in conventional prime movers. The pilot plant will be installed and tested at a brewery wastewater plant and at a landfill site to demonstrate the environmental and cost benefits of biogas purification prior to use in combined heat and power applications.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will help meet renewable fuel obligations at a lower cost by generating baseload renewable energy with a higher efficiency and a lower cost, lowering the cost of environmental compliance, and enabling utilization of marginal biogas sources for CHP applications using conventional natural-gas fired prime movers.

CPUC Proceedings addressing issues related to this EPIC project:

Self-Generation Incentive Program: R.12-11-005 SB 1122 Bioenergy feed-in tariff: R.11-05-005 Combined heat and power: D.10-12-035., R.08-06-024.

Applicable Metrics: CPUC Metrics- 1a, 1b, 3g, 4a, 4b

Lower Costs:

This project is expected to lower costs by reducing the number of stages required to condition biogas to meet fuel specifications of most prime movers.

Environmental Benefits:

The project will reduce carbon dioxide emissions by using biogas in place of natural gas. The project will result in fewer methane emissions by reducing the flaring of natural gas into the atmosphere.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $105,570	
EPIC Funds Encumbered: $1,318,940		**EPIC Funds Spent:** $76,831	
Match Partner and Funding Split: InnoSepra, LLC: $700,000 (34.2 %) ES Engineering, Inc. formerly Environ Strategy Consultants, Inc.: $11,000 (0.5 %) Waste Management of California, Inc.: $18,150 (0.9 %)		**Match Funding:** $729,150	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-028 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions. Pre-existing: U.S. Pat 8,591,627, 26 Nov 2013; U.S. Pat Appl 2014002675, 26 Sept 2013 Application number and date: Process for Upgrading Gases Containing Methane, to be filed in Feb 2015			
Update: The project team discovered that the original design for batch removal of H2S, CO2 and H2O in the pre-processing skid was inadequate to the task and had to redesign for continuous removal. Redesign was completed, including piping and instrumentation diagrams and full mechanical drawings for modifications to the processing skid. A Request for Quotes sent to vendors for making the modifications and vendor selection is expected by year's end. Fabrication is expected to take place in the first quarter of 2017 with installation taking place by mid-year, and testing to commence in the latter half of 2017.			

34. EPC-14-029

Project Name:

The West Star North Dairy Biogas-to -Electricity Project

[EPC-14-029]

Recipient/Contractor:

ABEC #2 LLC, dba West Star North Dairy Biogas

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Despite a regulatory environment encouraging renewable energy production and greenhouse gas reductions, dairy digester development has lagged in California. Fewer than two-dozen dairies in California have installed digesters and roughly half of these projects are operating. With dairy digesters having the potential to play an important role in providing renewable baseload electricity as well as reducing California's GHG emissions, California needs to demonstrate projects, which include design, operation and management strategies, that result in successful dairy digester-to-electricity projects.

Project Description:

This project will advance digester design by building and demonstrating an innovative, double-cell covered lagoon digester and 1-megawatt (MV) generation system. The system will convert dairy manure into biogas and store the biogas above the Primary and Secondary Lagoons under an inflatable cover. The biogas will be converted into renewable electricity anticipated for sale and export to the PG&E distribution grid or for use on-site. Further, dairy biogas systems qualify for participation in the CPUC's Assembly Bill (AB) 2514 electricity storage program. In a future phase, the biogas system may compete for an energy storage contract. The project will also improve groundwater protection by minimizing leaching of manure into the groundwater.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will significantly reduce methane emissions and generate renewable electricity helping to achieve the State's GHG emission reduction and renewable electricity goals. The improved digester design will decrease dairy and digester operating costs while also enhancing the protection of groundwater. Other important benefits include: lowered manure handling costs and valuable co-products, such as nutrient rich, more absorbable irrigation water.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 3a, 4a, 4e

Lower Costs:

By advancing digester economics and design, through efficient manure management practices, the project will help lower dairy management and operation costs.

Environmental Benefits:

The project supports implementation of California's energy and GHG management goals and targets through the deployment of new renewable power generation capacity and the capture and destruction of methane currently vented into the atmosphere. The double-lined lagoon enhances groundwater protection by minimizing leaching of manure into groundwater.

Consumer Appeal:

The project will improve odor control, through hydrogen sulfide removal, an issue important to the dairy employees and benefits the local community.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $32,107
EPIC Funds Encumbered: $4,000,000	**EPIC Funds Spent:** $983,694
Match Partner and Funding Split: ABEC #2 LLC, dba West Star North Dairy Biogas: $5,000,000 (55.6 %)	**Match Funding:** $5,000,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-029 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Bioenergy Storage and Management System and Method.

Lagoon Digester with Flexible Volume Capability.

California Bioenergy LLC Lagoon Digester Systems.

Update:

The project kickoff meeting was held in June, 2015. There was a Technical Advisory Committee (TAC) meeting in March, 2016 and a Critical Project Review (CPR) meeting in August 2016. The project is progressing and broke ground in fall 2016. Monthly invoicing and progress reports are being submitted and the project is expected to be completed as planned.

35. EPC-14-030

Project Name:

Paths to Sustainable Distributed Generation Through 2050: Matching Local Waste Biomass Resources with Grid, Industrial, and Community Levels

[EPC-14-030]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/15/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

There is a disconnect between studies that develop waste biomass utilization strategies and studies focused on identifying opportunities for distributed generation (DG), and specifically combined heat and power (CHP) or combined cooling, heat, and power (CCHP). No previous research has attempted to match local waste biomass sources in California with the variety of available conversion/power generation technologies and local demand for DG and waste heat applications to identify opportunities for efficient, cost-effective, and environmentally sustainable projects.

Project Description:

This project will highlight locations where waste biomass can be used most efficiently and sustainably for distributed generation by developing scenarios through 2050 that identify the most promising opportunities for waste biomass DG, identify key technical and regulatory hurdles to waste biomass DG utilization, develop tools for matching available waste biomass resources with energy production opportunities, and suggest solutions for achieving cost parity with fossil fuels.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This analysis will: (1) identify high-priority areas within California and feedstock types for further public deployment funding, (2) highlight promising geographic areas or available technologies to encourage increased investment in waste biomass DG by the private sector, and (3) improve efficiency and reduce environmental burdens by helping to minimize biomass transportation distances and maximize the efficiency of power production and waste heat utilization.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Combined heat and power: D.10-12-035., R.08-06-024. Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 3c, 3g, 4a

Economic Development:

Integrated use of waste biomass (from municipal wastes, agricultural residues, and food processing wastes) for distributed generation applications in California has the potential to produce about 4.2 terawatt-hours of renewable electricity per year.

Environmental Benefits:

The use of waste biomass is expected to result in avoided fossil greenhouse gas emissions of about 2.5 million metric tons of carbon dioxide (CO2)-equivalent per year (of which 1.2 million tons is from avoided grid electricity, and 1.3 million tons is from avoided natural gas use for heating).

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $670,276
EPIC Funds Encumbered: $1,500,000	**EPIC Funds Spent:** $743,720
Match Partner and Funding Split: Energy Bioscience Institute: $50,000 (2.8 %) Allotrope Partners: $200,000 (11.2 %) PepsiCo R&D: $32,000 (1.8 %)	**Match Funding:** $282,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-030 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The researchers have started work to develop near term and long term scenario projections for waste biomass supply in California. The first TAC meeting was held on March 30, 2016 to discuss distributed generation (DG) and thermal energy demand inventory (task 3). Task 3 focuses on scope and scale for sale of waste heat and waste heat-generated cooling to customers in the domestic, commercial, and industrial process markets, including locations where biomass-fueled DG may have the greatest potential to achieve cost parity with fossil-fueled DG.

36. EPC-14-031

Project Name:

Pollution Control and Power Generation for Low Quality Renewable Fuel Streams

[EPC-14-031]

Recipient/Contractor:

The Regents of the University of California on behalf of the Irvine Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2015 to 3/31/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Many potential renewable fuel streams cannot be used to generate electricity using current technology without considerable upgrading (i.e., increasing the heating value) and substantial clean up (e.g., cleaning contaminants such as hydrogen sulfide or siloxanes introduced by the feedstock). Prime examples include landfills that are approaching end of life that produce gases with some heating value, but the values are generally too low for commonly used combustion devices (e.g., reciprocating engines, gas turbines). Landfill biogases are also notoriously challenging due to the variability in level of contaminants.

Project Description:

The project will utilize a 250 kW gas turbine system that converts relatively dirty, low heating value fuels into heat using gradual oxidation. This gradual oxidation technology was developed by Ener-Core, a California company, and has been demonstrated in operating systems for well over 500 hours, but has not yet been commercially deployed in California. The intended site for the demonstration is a closed landfill producing low quality gas that is currently flared. This site is a good match for the proposed 250kW demonstration as it will eliminate the flaring of the otherwise unusable gas by generating electricity for onsite use and use in other county-owned facilities as facilitated by SB 1122 or SB 43. The project will be carried out in collaboration with Orange County Waste & Recycling who is responsible for the test site.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will demonstrate and deploy a novel gradual oxidation system in conjunction with a gas turbine that is capable of converting low-grade landfill biogas into renewable electricity.

CPUC Proceedings addressing issues related to this EPIC project:

Self-Generation Incentive Program: R.12-11-005 Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011

Applicable Metrics: CPUC Metrics- 1a, 1c, 3a, 3h, 4a, 4b

Lower Costs:

This project will generate 250 kW of baseload power, reducing peak demand to the surrounding grid and saving the landfill $240,000 annually.

Greater Reliability:

The electricity generated on site will help offset grid draw of power during peak use times, thus helping with overall reliability of the electricity system.

Environmental Benefits:

Low-grade biogas produced by landfills is typically flared. By utilizing it to produce electricity instead, this project will reduce NOx produced at the landfill by nearly one ton per year.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $98,402
EPIC Funds Encumbered: $1,499,386	**EPIC Funds Spent:** $882,917
Match Partner and Funding Split: Ener-Core, Inc.: $384,856 (19.9 %) ES Engineering, Inc. formerly Environ Strategy Consultants, Inc.: $5,000 (0.3 %) Advanced Power and Energy Program (APEP) - University of California, Irvine: $48,489 (2.5 %)	**Match Funding:** $438,345
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-031 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was presented at the December 2015 EPIC Innovation Symposium in the "Bioenergy and High Fire Risk Areas" session. Site engineering, site drawings, and project permitting were completed in early 2016. An interconnection study with two supplemental reviews was completed by Southern California Edison in mid-2016. The study identified the need for substation upgrades and consequently an interconnection cost which far exceeds budgeted amount. The project is currently seeking a new landfill host site to demonstrate the novel gradual oxidation technology.

37. EPC-14-032

Project Name:

Capturing Cultural Diversity in California Residential Energy Efficiency Potential: An Energy Ethnography of Hispanic Households

[EPC-14-032]

Recipient/Contractor:

Inova Energy Group, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 5/8/2018

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

Issue:

An increasing proportion of California's population identifies as being Hispanic, but Hispanics have historically had low participation in energy efficiency programs. Due to cultural background, frequent linguistic isolation, and higher densities of rental, low-income, and multifamily households, Hispanics are considered hard-to-reach customers in California's energy efficiency landscape and are found to have disproportionately low participation in energy efficiency programs. As such, there is a significant energy efficiency potential that has not been realized from this hard-to-reach group.

Project Description:

This project will focus on reaching Hispanic subpopulations in California to better understand the social, cultural, and behavioral aspects of their decisions to adopt energy efficient technologies and behaviors. The study will combine data collected from participants via energy usage journals, in-home interviews, and energy meters to further the knowledge of Hispanic cultural associations and beliefs related to energy use decisions and choices. The information gathered in this study can be used to improve the metrics and assumptions underlying energy demand forecasting and energy efficiency potential and goals studies. In addition, the study will provide information that can be used for targeted marketing of energy efficiency programs to the Hispanic population and improved levels of service to these households.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (De Leon, 2015) sets energy efficiency targets for 2030 and allows for the targets to be achieved, in part, from utility programs that provide financial incentives and rebates to their customers to increase energy efficiency. This project will help increase customer participation in utility efficiency programs by better understanding the social, cultural and behavior aspects of the Hispanic subpopulation that discourage or prevent their participation.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Long-Term Procurement Proceeding (LTPP): R.13-12-010 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 5c

Greater Reliability:

New metrics on the impacts of utility energy efficiency programs for various subpopulations can increase the accuracy of energy demand forecasts used in Long Term Procurement Planning.

Consumer Appeal:

Energy efficiency programs that incorporate social, behavioral and cultural aspects into the program design are likely to have greater appeal to potential customers.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $10,681	
EPIC Funds Encumbered: $224,593		**EPIC Funds Spent:** $128,503	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-032 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

In 2015 the project team completed an extensive literature review, as well as a set of interviews with subject matter experts in both the energy efficiency field as well as Hispanic community leaders. These efforts established a solid baseline to inform the rest of the study. In 2016, the project moved to recruit individual level participants and began conducting energy-use journal deployment, in-home interviews and electricity meter data analysis. In 2017 the project is expected to complete individual-level data collection and begin to compile and analyze the results for a final report. The final report is scheduled to be completed by the end of 2017.

38. EPC-14-033

Project Name:

North Fork Community Power Forest Bioenergy Facility Demonstration

[EPC-14-033]

Recipient/Contractor:

The Watershed Research and Training Center

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 9/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Forest biomass fueled bioenergy gasification projects have the potential to be more efficient and have cleaner electricity generation than direct combustion systems, and can reduce the risk of forest fires and pollutant emissions. The electricity generation is anticipated to be economical in the long-term, but is dependent on the ability of developers to achieve necessary operating hours. However, forest bioenergy demonstration facilities must collect additional scientific and technical data that will help demonstrate economic viability and attract private investment.

Project Description:

The North Fork Forest Bioenergy project will construct and demonstrate a 1 megawatt (MW) forest waste bioenergy gasification-to-electricity facility in the foothills of the Sierra Mountains. The biomass gasification facility is targeted to be a commercial-scale, community-based facility capable of accepting and processing wood waste from forest management that would otherwise create wildfire and air quality challenges, and generating renewable grid-connected electricity. Key activities of the project will include investigation of the best practices and evaluation of individual components and protocols to improve performance and reduce operating costs.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project has allowed General Electric, an industry leader that has not previously participated in gasification in the United States, to enter this emerging market in California. A combination of use of General Electric's commercial-ready gasification technology along with the producer gas clean up research will prove distributed, renewable, and cleaner woody biomass fueled electricity as demonstrably economically feasible and able to operate for 7000 hours/year.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1a, 1c, 2a

Lower Costs:

Siting these plants near the forest reduces the cost of hauling biomass from the forest and reduces biomass electricity costs below those of larger, traditional biomass power plants.

Increase Safety:

This system will be smaller than most electricity systems and will not require a pressurized system, which increases safety.

Economic Development:

This plant will be built and operated by local contractors. In some cases, workers may even be trained to work on site. It is owned in part by a local Community Development Council, which will receive profits from the PPA and reinvest them in the community.

Environmental Benefits:

This project will be fueled by forest restoration by-product, which will increase air quality and reduce wildfire threat or intensity. Removing small, overstocked trees from the forest will release water into the watershed. Additionally, the power plant will anchor a biomass utilization campus, which will expand to include other forest products.

Public Health:

Disposing of biomass in controlled systems dramatically decreases emissions over pile and burn or wildfire. Placer County Air Pollution Control District published 60% CO_2, 3% CH_4, and 41% particulate emissions reductions over pile and burn in a direct combustion system. The system will reduce these even further by using gasification.

Consumer Appeal:

Providing jobs, protecting homes, and enhancing functioning forest ecosystems through water release, increased biodiversity, and decreased wildfire threat are all benefits that this power plant will be able to advertise to increase consumer appeal.

Energy Security:

This project will rely on California-grown fuel and operates as a baseload plant. Development will also require PG&E and plant owners to invest in the local substation, which will increase rural energy security.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $87,680
EPIC Funds Encumbered: $4,965,420	**EPIC Funds Spent:** $2,881,875
Match Partner and Funding Split: The Watershed Research and Training Center: $22,706 (0.4 %) Phoenix Energy: $684,144 (10.8 %) Yosemite Sequoia Resource Conservation and Development Council: $55,500 (0.9 %) Western Energy Systems: $253,750 (4.0 %) North Fork Community Development Council: $180,000 (2.8 %) USDA Forest Service - Sierra National Forest: $150,000 (2.4 %) TSS Consultants: $13,260 (0.2 %) Kamalesh Doshi: $2,000 (0.0 %)	**Match Funding:** $1,361,360

Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-033 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: Permitting work is mostly completed and contractors for groundwork have been selected. The project had a groundbreaking on November 3, 2016. Ground preparations and constructions are on-going; equipment delivery is expected to be completed by December 2016 with the full system expected to be operational by June 2017.			

39. EPC-14-034

Project Name:

Interra Reciprocating Reactor for Low-Cost & Carbon Negative Bioenergy

[EPC-14-034]

Recipient/Contractor:

Interra Energy, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

Baseload bioenergy technologies have the potential to increase the reliability of California's energy supply, reduce the cost of renewable generation, reduce GHG emissions from the energy sector, and reduce the risk of forest fires. Current bioenergy technologies are not profitable at distributed scales. Further, the use of waste biomass resources in the state currently can have negative environmental impacts without appropriate technology and management strategy.

Project Description:

The purpose of this project is to install a pilot-scale demonstration of an innovative biomass conversion system to generate high quality biomethane with high fixed carbon biochar as a co-product. The project will determine if the technology, known as Reciprocating Reactor, coupled with valuable co-product, are sufficient to demonstrate economic feasibility for small distributed generation bioenergy projects in California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will help stabilize the grid, improve service reliability, and reduce the risk of forest fire. Advanced bioenergy systems that produce useful co-products can also reduce the cost of renewable energy procurement and mitigate the GHG impacts of energy generation. Interra technology could prove to be a cost-effective modular distributed generation system alternative compared to conventional biomass plants, helping to meet California's aggressive renewable energy goals.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1c, 4a, 4b

Lower Costs:

This project is expected to cross subsidize power production and reduce the capital expenditures of bioenergy facilities. The production of biochar contributes to the competitiveness of this bioenergy technology.

Greater Reliability:

This type of system is expected to improve service reliability and provide baseload renewable energy generation.

Environmental Benefits:

This project will reduce the GHG emissions of waste biomass processing. In addition, the reduction of forest fire risk by utilizing forest waste as an energy source.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $264,400	
EPIC Funds Encumbered: $2,000,000		**EPIC Funds Spent:** $873,751	
Match Partner and Funding Split: Interra Energy, Inc.: $4,627,400 (69.8%)		**Match Funding:** $4,627,400	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-034 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Energy Commission staff requested two Critical Project Review meetings to determine the operational status of the reciprocating reactor. During the site visit in October 2016, Energy Commission staff determined that the recipient has integrated the equipment needed to operate the bioenergy system and to demonstrate the operational status of the system for performance enhancement experiments. Interra is currently working on a test plan and will soon commence work on a system performance report.

40. EPC-14-035

Project Name:

Demonstration of integrated photovoltaic systems and smart inverter functionality utilizing advanced distribution sensors

[EPC-14-035]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

Power distribution networks of today have limited visibility and diagnostic capabilities, and were designed to accommodate a limited number of rotating power generation plants. A future grid that incorporates large numbers of distributed PV systems will require different and more complex control mechanisms, which in turn will require coordinated control of both utility distribution equipment and solar inverters.

Project Description:

The research project will develop, demonstrate, and evaluate, at the pilot scale, the ability of an integrated, advanced PV and storage system at a state-of-art test bed in the LBNL Facility for Low Energy Experiments (FLEXLAB). The system includes smart inverter control to enhance and optimize grid support and system performance. The strategy will evaluate the use of distribution synchrophasor units data to support specific visualization and control applications on distribution circuits. The project includes a 13 to 15 kilowatt (kW) PV electric generating system and a 14 kW (56 kW-hour) battery storage installation at FLEXLAB.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will advance a breakthrough technology that is scalable across investor-owned utility territory leading to well-coordinated and managed high-density PV installations and ratepayer benefits of greater reliability, lower costs and increased safety.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1f, 1g, 2a, 3f, 3h, 4a

Lower Costs:

Ratepayers will experience reduced costs because of decreased utility infrastructure spending and increased allowable PV penetration.

Greater Reliability:

Ratepayers will see electricity reliability improve as high-density PV installations are coordinated and managed more efficiently.

Increase Safety:

This project will enhance grid safety by improving the ability for PV installations to detect and understand grid conditions and ensure safe operation in the event of grid failures.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $375,000	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $594,424	
Match Partner and Funding Split: Tesla Motors: $25,000 (2.4 %)		**Match Funding:** $25,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 12
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-035 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: Identified critical project needs to inform overall system design prior to running any tests. Continuing efforts to subcontract with Solar City and Tesla, with distinction between materials supply vs. installation subcontract. Discussions with LBNL Facilities staff and planned subcontractors (Solar City and Tesla) to select a best site.			

41. EPC-14-036

Project Name:

Smart Inverter Interoperability Standards and Open Testing Framework to Support High-Penetration Distributed Photovoltaics and Storage

[EPC-14-036]

Recipient/Contractor:

SunSpec Alliance

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

High PV penetration with legacy inverters on California grid feeder circuits can exacerbate problems associated with grid stability. While inverter power technology exists to address grid operating variability, a standard and cost-effective communication interface to monitor and control inverter operating functions has not been broadly deployed. It is currently both expensive and risky for grid operators to monitor and control diverse distributed energy resources (DER) assets. What is missing is the availability of a test framework for interoperability, empirical data to validate the effects of smart inverters on the grid, and market data to evaluate economic impacts.

Project Description:

The project will develop a complete solution of smart solar PV-based DER system that addresses key barriers impeding the progress towards high penetration of solar and DER. The work includes development of a CA Rule 21 test framework and test scripts; compliance testing of smart inverters with functionality as described in the CPUC CA Rule 21 Smart Inverter Working Group (SIWG) recommendations; monitor and control inverter operating functions including participation in ancillary service for diverse DER assets; increase of photovoltaic (PV) penetration and cost effectiveness while enhancing safety and reliability of the California grid. This agreement will deliver a smart inverter test framework and open source software tools to enable rapid product development and safety testing and will demonstrate the benefits to all stakeholders including ratepayers, utilities, manufacturers, investors and operators.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Ratepayer benefits are greater reliability, lower cost, and increased safety from the use of smart inverters with single standard communication interface to save installation time; a field demonstration of DER systems on feeder circuits at or above 15% penetration; measure of reliability and safety impacts; and demonstrating participation in ancillary service markets to evaluate benefits of utility cost avoidance.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Distribution Level Interconnection (Rule 21): R.11-09-011 Smart Inverter: D.14-12-035 (in R.11-09-011) Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1b, 3d, 3f, 4a, 5b

Lower Costs:

Savings of $0.16 to $0.30 per installed watt are achievable in IOU cost avoidance for circuit upgrades. Standardization can provide $0.05 per installed watt savings in avoided switching costs and can result in a $0.02 savings per watt due to decreased need for specialized labor.

Greater Reliability:

The testing of smart inverters will demonstrate that higher levels of PV penetration can be achieved. Integration of energy storage with renewables provides greater flexibility to local capacity and increases reliability through improved capacity.

Environmental Benefits:

Decreased GHG emissions.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $162,005
EPIC Funds Encumbered: $2,000,000	**EPIC Funds Spent:** $493,870
Match Partner and Funding Split: SunSpec Alliance: $1,421,875 (35.0 %) Olivine, Inc.: $70,000 (1.7 %) Solar City Corporation: $575,000 (14.1 %)	**Match Funding:** $2,066,875
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-036 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

To date, UL 1741 SA, outlining exact tests required for CA Rule 21 compliance, has now been ratified and published. The State of California has announced that inverters installed in the state will be required to comply with the Rule 21 grid interconnection requirements within one year of publication of the UL 1741 SA. SunSpec is reviewing UL 1741 SA to add and modify the test plan and test scripts. Also started data collection on inverters manufacturers and national lab testing procedures and is working directly with the product developers at the inverter companies on UCSD lab testing schedule.

42. EPC-14-037

Project Name:

Home Energy Efficiency Retrofits in California: An Analysis of Sociocultural Factors Influencing Customer Adoption

[EPC-14-037]

Recipient/Contractor:

Center for Sustainable Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 3/31/2018

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

Issue:

The current policy framework used to assess the adoption of residential energy efficiency measures is driven primarily by estimates of cost effectiveness. However, cost effectiveness calculations alone are inadequate to accurately predict adoption and market potential, as they do not capture the multitude of factors influencing the decision-making process of individual market sectors. Recent studies suggest that social, cultural and behavioral factors have a significant influence on the adoption of energy efficiency measures in residential households and should be considered in the decision-making process.

Project Description:

This project will conduct a multidisciplinary, data driven study to understand the role and interactions of various factors influencing the adoption and utilization of residential energy efficiency measures. The study will provide insight into the stand alone and interactive effects of factors such as income, ethnicity, language, and political orientation on the adoption of energy efficient technologies. The study will facilitate the learnings from prescriptive energy-efficiency programs in California and enhance energy policy and program design.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (De Leon, 2015) sets energy efficiency targets for 2030 and allows for the targets to be achieved, in part, from utility programs that provide financial incentives and rebates to their customers to increase energy efficiency. This project will help increase customer participation in utility efficiency programs by better understanding the social, cultural and behavior aspects of the Hispanic subpopulation that discourage or prevent their participation

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 5c

Lower Costs:

Understanding social, cultural and behavioral aspects can help utilities more cost-effectively and efficiently market their energy efficiency programs to hard-to-reach customer groups.

Greater Reliability:

New metrics on the impacts of utility energy efficiency programs for various subpopulations can increase the accuracy of energy demand forecasts used in Long Term Procurement Planning and Resource Adequacy proceedings.

Consumer Appeal:

Energy efficiency programs that incorporate social, behavioral and cultural aspects into the program design are likely to have greater appeal to potential customers.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $166,993
EPIC Funds Encumbered: $599,924	**EPIC Funds Spent:** $262,825
Match Partner and Funding Split: Renovate America: $214,000 (26.3 %)	**Match Funding:** $214,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-037 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The work on the grant has made good progress in the first twelve months. CSE conducted two TAC meetings via WebEx and a CPR meeting discussion also via WebEx. The original data provider (Renovate America) withdrew the offer of using its data. However, CSE was able to select a backup data provider for the grant survey. The survey is moving on schedule with some in person interviews, on line surveys and mailings. CSE also finished the literature review and provided a report.

43. EPC-14-038

Project Name:

Fieldwork to Document Technology Adoption and Behavior Change Across Diverse Geographies and Populations to Inform Energy Efficiency Program Design

[EPC-14-038]

Recipient/Contractor:

Indicia Consulting

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 1/31/2019

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

Issue:

Technological innovation has been an impressive driver of efficiency gains; however, over time it has become clear that without a greater understanding of the human factors, potential energy savings will remain untapped. The goal of this research is to be able to recommend an alternative energy efficiency potential model. This new model would draw upon variables descriptive of culture and behavior among California sub-populations, and demonstrate the cost-effectiveness of programs designed to holistically address how different people experience and respond to technologies.

Project Description:

This project will use empirical research methods grounded in anthropology and other social and behavioral sciences to explore the factors affecting behavior beyond simple economic rationale. This practice will be achieved by documenting and analyzing emerging attitudes, emotions, experience, habits, and practices around technology adoption for purposes of devising predictive indicators for on-going potential studies regarding energy consumption in California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (De Leon, 2015) sets energy efficiency targets for 2030 and allows for the targets to be achieved, in part, from utility programs that provide financial incentives and rebates to their customers to increase energy efficiency. This project will help increase customer participation in utility efficiency programs by better understanding the social, cultural and behavior aspects of various subpopulations that discourage or prevent their participation.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 5c

Lower Costs:

Understanding social, cultural and behavioral aspects can help utilities more cost-effectively and efficiently market their energy efficiency programs to hard-to-reach customer groups.

Greater Reliability:

New metrics on the impacts of utility energy efficiency programs for various subpopulations can increase the accuracy of energy demand forecasts used in Long Term Procurement Planning and Resource Adequacy proceedings.

Consumer Appeal:

Energy efficiency programs that incorporate social, behavioral and cultural aspects into the program design are likely to have greater appeal to potential customers.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $40,208	
EPIC Funds Encumbered: $574,545		**EPIC Funds Spent:** $203,247	
Match Partner and Funding Split: Indicia Consulting: $52,500 (8.4 %) California State University San Marcos		**Match Funding:** $52,500	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-038 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project is proceeding on schedule. The project team has overcome initial difficulties in obtaining utility cooperation and have been able to identify and collect data from survey recipients and interview participants in order to implement Task 2 (Document/Analyze emerging attitudes) and Task 3 (Identify drivers of cybersensitives). Deliverables have been completed on schedule. Discussions between the CAM and team members in early Fall 2016 resulted in the decision to reschedule the CPR meeting planned for September to Spring 2017, after completion of the 2nd deliverable "Psychosocial Drivers of Technology Engagement Among Cybersensitives" (currently in review by CAM and TAC).

44. EPC-14-039

Project Name:

Cultural Factors in the Energy Use Patterns of Multifamily Tenants

[EPC-14-039]

Recipient/Contractor:

TRC Engineers, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 12/22/2017

Program Area and Strategic Objective:

Market Facilitation

S18: Guide EPIC Investments through Effective Market Assessment, Program Evaluation, and Stakeholder Outreach

Issue:

Currently, one third of all Californians live in multifamily housing. Multifamily units have represented 50 percent of all new housing starts in the state continuously since 2009. However, energy patterns and cultural factors in multifamily settings have been understudied. A better understanding of energy usage patterns in multifamily settings will provide important insight into the future of California energy use as this housing type becomes increasingly common, and an essential component of future zero-net energy strategies.

Project Description:

This project will examine the cultural and demographic factors that correlate with multifamily tenants' electric energy use patterns, before and after energy efficiency upgrades. For this project, a field experiment will be conducted to better determine how cultural factors influence tenant interest in consumer level technologies that can reduce electricity use, especially for lighting and plug loads.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (De Leon, 2015) sets energy efficiency targets for 2030 and allows for the targets to be achieved, in part, from utility programs that provide financial incentives and rebates to their customers to increase energy efficiency. This project will help increase customer participation in utility efficiency programs by better understanding the social, cultural and behavior aspects of multi-family building tenants that discourage or prevent their participation.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 5c

Lower Costs:

Understanding social, cultural, and behavioral aspects of can help utilities most cost-effectively and efficiently market their energy efficiency programs to hard-to-reach customer groups.

Greater Reliability:

New metrics on the impacts of utility energy efficiency programs for various subpopulations can increase the accuracy of energy demand forecasts used in Long Term Procurement Planning and Resource Adequacy proceedings.

Consumer Appeal:

Energy efficiency programs that incorporate social, behavioral and cultural aspects into the program design are likely to have greater appeal to potential customers.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $107,714	
EPIC Funds Encumbered: $379,019		**EPIC Funds Spent:** $173,586	
Match Partner and Funding Split: Pacific Gas and Electric Company: $100,000 (20.9 %)		**Match Funding:** $100,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-039 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

In May 2015, the research plan for recruitment and project launch was finalized. Study preparation included the development of data collection instruments and outreach material targeting multifamily tenant study participation to assist in conducting the study.

TRC was able to compose the questionnaires with the help of the TAC members. The questionnaires have been distributed by TRC staff to a number of apartment and condominium complexes. The responses to the questionnaires will be collected through mail and on-line link. The results are expected at the end of 2016.

45. EPC-14-040

Project Name:

Self-Tracking Concentrator Photovoltaics for Distributed Generation

[EPC-14-040]

Recipient/Contractor:

Glint Photonics, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

The highest efficiency PV cells are multijunction PV cells used in concentrator photovoltaic (CPV) systems, which offer about 40% conversion efficiency compared to about 16% for polycrystalline Silicon. However, concentrator photovoltaic systems require special mounting and precision tracking, and the resulting cost and complexity has prevented them from achieving significant market penetration.

Project Description:

This research is developing, testing, and demonstrating a self-tracking concentrator photovoltaic (ST-CPV) system, a new concentrator photovoltaic technology that does not require a precision mechanical tracker to keep it aligned to the sun. The ST-CPV panel contains a thin layer of fluids that passively responds to the changing solar angle, automatically adjusting optical pathways within the device to ensure that incident sunlight is captured and concentrated over a wide range of angles. The passive internal tracking allows ST-CPV panels to be mounted in a stationary configuration or with a simple single axis tracker. This makes the system highly economical, greatly reduces installation and maintenance complexity, and enables distributed generation with higher efficiency CPV modules.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Glint technology has the potential to capture 1% of the future potential rooftop solar market (153 MW). Glint Photonics anticipates a product introduction to the market in 2018, with penetration of the rooftop market to grow in the 2020s. If the anticipated performance can be realized, the company anticipates 1 MW of panels installed by the end of 2020, with significant potential for additional capacity and cost savings in future years.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 California Solar Initiative: R.12-11-005

Applicable Metrics: CPUC Metrics- 1a, 4a

Lower Costs:

This research is developing a novel self-tracking concentrator panel that does not require a precision mechanical tracker to maintain alignment of the sun. This technology can cut the installed system cost for distributed PV systems in half.

Economic Development:

The ST-CPV technology being developed under this project will help boost rooftop-installed solar energy that will produce renewable electricity, the equivalent worth of which will contribute to the state's economy. Additional benefits from successfully introducing ST-CPV products will accrue in job creation and improved peak demand management.

Environmental Benefits:

Greater adoption of PV power will reduce greenhouse gas emissions. Specifically, commercial adoption of ST-CPV systems on rooftops will help offset several millions of metric tons of carbon dioxide equivalent (CO2e) compared to conventional generation.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $67,377
EPIC Funds Encumbered: $999,940	**EPIC Funds Spent:** $231,490
Match Partner and Funding Split: United States Department of Energy: $1,000,000 (50.0 %)	**Match Funding:** $1,000,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-040 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

TAC members agreed that anticipated performance should be reported in terms that facilitate a direct comparison to silicon panels, and to use levelized cost of energy as a performance metric for ultimate comparison. The ongoing activities are focused on design of next-generation optics (Lens 2) for the concentrated photovoltaic prototypes and the prototype fabrication and performance testing. Glint fabricated an improved proof-of-concept prototype using the "Lens 1" optics, where initial test results showed substantial improvements to optical efficiency as a result of design changes.

46. EPC-14-041

Project Name:

Installation of a Lean Burn Biogas Engine with Emissions Control to Comply with Rule 1110.2 at a Wastewater Treatment Plant in South Coast Air Quality Management District

[EPC-14-041]

Recipient/Contractor:

Biogas & Electric, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2015 to 5/31/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Combustion of biogas in a low cost, lean burn combined heat and power (CHP) is vastly more economical than alternatives such as fuel cells, micro-turbines or conditioning biogas to pipeline quality. However, biogas fired internal combustion engines generate NOx and SOx, thus to obtain necessary air permits, biogas projects are required to deploy costly post-treatments such as selective catalytic reduction (SCR) to attain compliance. In addition to employing expensive catalysts, a downside of selective catalytic reduction -type systems is the need to maintain stocks of ammonia on hand to support the cleanup process.

Project Description:

Biogas & Electric will design, build and install a continuously operating commercial scale emissions reduction system for the lean burn biogas engine(s) at a municipal wastewater treatment plant in Palm Springs California. The technology being deployed is a low cost NOx and SOx reduction wet scrubbing technology called NOxRx (a registered trademark) which can be used in conjunction with all biogas engines and anaerobic digesters in the market today. NOxRx has a patented method of utilizing the effluent stream from an anaerobic digester to reduce emissions from biogas engines. Unlike SCR, it does not produce N2O and does not require H2S removal or biogas conditioning prior to combustion. Therefore, NOxRx represents a significant cost savings over competing NOx reduction solutions. The chief goal of this demonstration will be to demonstrate the commercial viability of NOxRx for biogas-fired lean burn engines to comply with CARB NOx and SOx standards, and SCAQMD Rule 1110.2.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will enable lean burn biogas engines to comply with existing and future air quality regulations when deployed at wastewater treatment plants, resulting in reduced flaring and net reductions in emissions.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1a, 1c, 1f, 3a, 3b, 4b, 4e

Lower Costs:

This technology will enable operators to deploy low-cost internal combustion engines for biogas generation by avoiding the need for pre-treatment and by replacing conventional selective catalytic reduction with a wet scrubber that uses the chemistry of the plant's available effluent rather than purchased or stored chemicals.

Environmental Benefits:

Cost-effective solutions for converting biogas to power will enable wastewater treatment facilities to reduce flaring to the atmosphere, and subject the products of combustion to post-processing that will reduce NOx and SOx emissions to tighter regulatory standards.

Energy Security:

Lower cost internal combustion engine technology will increase the viability of deploying biogas-fired distributed generation at smaller wastewater treatment plants.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $2,249,322		**EPIC Funds Spent:** $11,858	
Match Partner and Funding Split: Veolia North America: $450,000 (16.7%)		**Match Funding:** $450,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-041 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Pre-existing: Patent number US 8, 012,746. Pending: 13/519,539 (7/27/12); US2010/61780 (12/22/10); 2,785,368 (12/22/10); 201080064956.8 (12/22/10); 10841589.4 (12/22/10); 5460/DELNP/2012 (12/22/10); 14/333,429 (7/16/14); US2014/046902 (7/16/14)

Update:

Project partner Veolia North America performed a pro forma analysis for the project that re-estimated the cost of the project as $4.62M. With Energy Commission funding set at $2.25M and approved match funding of $450,000, the project owner (City of Palm Springs) is seeking assistance from the State Water Resources Control Board to bridge the gap. Project construction has been delayed as a result.

47. EPC-14-044

Project Name:

Enabling Anaerobic Digestion Deployment for Municipal Solid Waste-to-Energy

[EPC-14-044]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/30/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Production of energy from waste biomass aligns with California's clean energy policies and diverts waste from landfills, reduces landfill methane and fossil carbon dioxide (CO2) emissions, reduces fossil fuel reliance, and improves grid reliability and resiliency. Using the organic fraction of California's municipal solid waste (MSW) for combined heat and power (CHP) generation would help the state meet its Renewable Portfolio Standard (RPS), diversify the mix of resources in the state's electric generation portfolio, and help municipal governments achieve sustainability goals.

Project Description:

The purpose of this project is to enable environmentally and economically sustainable deployment of technology that transforms organic municipal solid waste into heat, electricity, and compost via dry anaerobic digestion. A dry anaerobic digestion and composting facility processing the organic fraction of MSW will be scaled up from 40,000 tons/year to 90,000 tons/year, and will increase production of renewable electricity and heat.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will provide valuable insight to identify optimum pathways that overcome barriers for large-scale deployment of biomass conversion technologies. The research will focus on overcoming barriers for urban stakeholders, including odor, access to the utility grid, and improved utilization of waste heat.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005 Combined heat and power: D.10-12-035., R.08-06-024.

Applicable Metrics: CPUC Metrics- 2a, 3g, 4a

Lower Costs:

The renewable electricity and heat output has the potential to offset fossil fuel use, thus reducing fuel costs and helping to insulate ratepayers from future fluctuations in fossil fuel prices.

Economic Development:

It is estimated that 10 percent diversion of California's organic MSW for CHP generation has the potential to produce about 0.5 terawatt-hours (TWh) of renewable electricity per year, as well as about 51 million therms of renewable heat energy per year.

Environmental Benefits:

The strategies to minimize odor-causing and other air emissions will improve public perception of anaerobic digestion, CHP, and compost facilities, and increase the likelihood that these facilities can be sited in or near cities throughout California to reduce transportation costs. Avoided GHG is estimated to be 298,651 metric tons CO2e per year.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $1,497,504
EPIC Funds Encumbered: $4,300,000	**EPIC Funds Spent:** $2,781,401
Match Partner and Funding Split: Zero Waste Energy Development Company: $1,500,000 (25.9 %)	**Match Funding:** $1,500,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-044 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The first TAC meeting was held on May 3, 2016. Measured NOx emissions during several flaring events to establish primary NOx formation pathways, which may include thermal, fuel, and prompt NOx formation. Collected operational data on odor control measures taken by ZWEDC.

48. EPC-14-045

Project Name:

Advanced Recycling to 1-MW Municipal Solid Waste of Electricity Generation

[EPC-14-045]

Recipient/Contractor:

Taylor Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

In California, 30-million tons of organic materials are being added to landfills each year - equivalent to disposing 30-million barrels of oil per year in 80 California landfills. There is a broad gap in available technology and scientific knowledge required for economic use of municipal solid waste as a gasification feed, particularly in the 1-MWe to 20-MWe power output range. There is a market need to address refuse derived biomass (RDB) as an "opportunity" feedstock and to address the equipment size range needed for distributed power generation in California communities.

Project Description:

This project will design, develop and test a Waste-to-Energy Process Development Unit (PDU), involving conversion of Refuse Derived Biomass into clean fuel gas by Thermal-Catalytic Gasification, Reforming and Pulse Detonation Technology. This project will start-up and test a 3-pound per minute PDU, evaluate the results, and provide engineering data to design a 30 ton/day plant generating 1-MW electric power.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will research, develop, and verify thermal catalytic gasification technology that will overcome technical and economic barriers preventing the use of RDB as an energy resource in California. Completion of the current gasification/reforming test program will enable future scale-up to 30-ton/day RDB-to-energy (1-MWe scale), in preparation for commercial scale design at 300-ton/day, generating 10-MW of electricity with costs of less than $3,750/kWh of installed capacity.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005 Combined heat and power: D.10-12-035., R.08-06-024.

Applicable Metrics: CPUC Metrics- 2a, 4a, 4e

Lower Costs:

The Levelized Cost of Power (LCOP) is estimated at $118/MWh for 10-MW scale, which results in ratepayer savings of approximately $30/MWh compared to grid supplier power that will likely average $150/MWh through 2024.

Environmental Benefits:

The project will divert MSW from landfills and generate electricity, reducing NOx emissions from flaring or direct combustion.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $188,248	
EPIC Funds Encumbered: $1,499,481		**EPIC Funds Spent:** $954,514	
Match Partner and Funding Split: Taylor Energy: $46,616 (3.0 %)		**Match Funding:** $46,616	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-045 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Patent. Gasifying Carbon Materials: Jet Spouted bed Integrated with Draft-Tube Reformer, both powered by pulse-detonation -burner(s) and bed material optimum for the process.

Update:

The contractor has completed design and fabrication of the Process Development Unit. The equipment layout work has been performed at the host site. A gas-flare and gas conditioning equipment are in the process of installation completion. Major equipment consisting of PDU and reformer (consisting of 60 percent project budget for equipment and installation) has been installed, and testing was started during recent TAC meeting.

49. EPC-14-046

Project Name:

Lowering Food-Waste Co-digestion Costs through an Innovative Combination of a Pre-Sorting Technique and a Strategy for Cake Solids Reduction

[EPC-14-046]

Recipient/Contractor:

Kennedy/Jenks Consultants, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Energy generation potential through the digestion of municipal sewage at wastewater treatment plants (WWTP) and the co-digestion of fats, oils and grease (FOG) and food wastes is estimated at more than 600 megawatts (MW). While combined heat and power generation systems using digester gas is highly beneficial, several barriers exist that impedes the installation of these systems. Among the key barriers for food waste co-digestion are the challenges in pre-processing food wastes prior to their addition to the digesters.

Project Description:

The project will demonstrate two complementary approaches to lower the overall cost of co-digestion: a new technology to lower preprocessing cost of food wastes, and a new strategy to lower the mass of cake solids requiring disposal. The new technology for the preprocessing of food wastes uses an organic waste preprocessing technique known as an organic extrusion press (OEP) for selective extrusion of organic materials and is capable of recovering 95% of organics. The project will apply a new strategy in operating co-digestion systems that involves optimizing the organic waste loading in a way that will lower the mass of cake solids requiring disposal relative to the conventional process.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will result in reliable and cost effective energy production by producing bioenergy from waste water treatment plants (WWTP) through the addition of locally available food waste and restaurant fats, oil, and grease (FOG). Though there is some seasonal variation, the supply of wastewater, food waste and FOG are very reliable.

CPUC Proceedings addressing issues related to this EPIC project:

SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 3a, 4a, 4e

Greater Reliability:

Applying the results of this project to waste water treatment facilities will reduce grid imports and provide a reliable generation source for these facilities and the grid.

Environmental Benefits:

The technology from this project has the potential to reduce greenhouse gas emissions by 443,345 MTCO2e/year at a modest 10% market penetration. Furthermore, a lower volume of sludge requiring disposal will lower the emissions from trucks used for hauling sludge.

Public Health:

The project will help avoid manual handling and separation of decomposable waste materials and divert up to around 4,100 tons per day of food wastes out of landfills.

Energy Security:

The project will help increase market penetration of renewable energy thereby adding more diversity to electric supply mix and help in achieving energy security.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $323,906	
EPIC Funds Encumbered: $1,496,902		**EPIC Funds Spent:** $186,937	
Match Partner and Funding Split: Silicon Valley Clean Water (SVCW): $2,600,000 (63.0 %) Water Environment & Reuse Foundation: $30,000 (0.7 %)		**Match Funding:** $2,630,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-046 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Researchers are establishing baseline conditions for digester operations without the addition of food waste and FOG. Installation of the OREX equipment for organic extrusion at the offsite facility is completed. The polishing equipment at the subcontractor, SVCW, facility is expected to be installed and ready for operation by January, 2017.

50. EPC-14-047

Project Name:

Dairy Waste-to-Bioenergy via the Integration of Concentrating Solar Power and a High Temperature Conversion Process

[EPC-14-047]

Recipient/Contractor:

Southern California Gas Company

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/15/2015 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

Because of the intermittent nature of many renewable energy sources, special attention must be taken when connecting them to the electrical grid. Energy storage technologies have the potential to increase the reliability of California's energy supply, as well as the ability to dispatch renewable energy sources on demand instead of upon production. Yet, traditional forms of energy storage are often prohibitively costly and lack mature mechanisms for participation in electricity markets.

Project Description:

This project will integrate Concentrating Solar Power (CSP) and Hydrothermal Processing (HTP) into a single, integrated system; confirm that it can convert dairy manure into RNG and bio-crude; study the economics of integrated CSP-HTP systems sited at dairy farms; and confirm that the RNG produced meets pipeline-transmission and geological-storage quality standards. In this way, the project anticipates proving that it is possible to store the energy contained in dairy manure waste in a manner that enables California natural gas plants to produce readily dispatchable, ultra-low-emissions renewable electricity.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will develop and demonstrate a new bioenergy pathway which utilizes hydrothermal processing and concentrating solar power to convert dairy manure into bio-crude and renewable natural gas that will enable dispatchable and low emissions renewable electricity.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Energy storage: R.15-03-011 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1a, 1i, 2a, 3g, 4a, 4b, 4e

Lower Costs:

Cost-effective production of pipeline-quality renewable natural gas and bio-crude will offset use of fossil fuels and provide a pathway for low-cost energy storage, reducing peak electricity costs and lowering the price for ratepayers.

Economic Development:

Commercialization of this technology would positively impact several markets including: dairies, fuel refineries, natural gas pipeline operators, and electricity producers.

Environmental Benefits:

By converting dairy manure into renewable natural gas and bio-crude, greenhouse gas emissions typically associated with manure can be avoided.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $98,501	
EPIC Funds Encumbered: $1,494,736		**EPIC Funds Spent:** $413,097	
Match Partner and Funding Split: Southern California Gas Company (SoCalGas): $600,000 (28.6 %)		**Match Funding:** $600,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-047 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Negotiations with subcontractor NREL were completed in December 2015 and the redesign of the CSP receiver has been completed. Design of the Genifuel hydrothermal processing (HTP) unit with input from the Pacific Northwest National Laboratories (PNNL) was completed and a fabricator has been chosen. Fabrication and pilot testing of HTP and CSP systems will be conducted in 2017.

51. EPC-14-050

Project Name:

City of Fremont Fire Stations Microgrid Project

[EPC-14-050]

Recipient/Contractor:

Gridscape Solutions

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 3/31/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address climate change impacts such as increased fires, severe storms, and heatwaves. Critical facilities are especially vulnerable to climate change impacts that disrupt the normal delivery of energy needed for their operation. Microgrids could help increase the resiliency of critical facilities through maximizing use of local renewable energy. Microgrid demonstrations at fire stations will develop a case study to assess their ability to support fire station operations and safely island from the grid.

Project Description:

This project will design and build low carbon-based microgrids at three fire stations in Fremont, California. Each microgrid consists of a microgrid energy management system, parking lot canopy photovoltaic system, and battery energy storage. The automated microgrid control system will optimally manage local energy resources and loads. The microgrid will provide at least three hours a day of power for critical loads during a utility power outage.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The microgrids will attempt to reduce grid congestion which increases grid reliability. The microgrids will demonstrate their ability to improve energy efficiency by optimizing power generation and loads using advanced, automated microgrid control. Local, renewable photovoltaic generation and energy storage may provide increased energy security during utility power outages and reduce carbon dioxide emissions.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Greater Reliability:

This project will attempt to reduce congestion and improve resiliency for the distribution system by using local photovoltaic generation, thus reducing the utility load where substations are near maximum capacity. The fire stations will have greater reliability by using local energy resources during a utility outage, at least three hours a day.

Environmental Benefits:

This project will reduce carbon dioxide emissions by using local clean power generation (solar photovoltaics) and energy storage when available. This emissions reduction will help the City of Fremont meet its goal of reduced greenhouse gas emissions by 2020 and achieve its zero net energy goals for city government buildings.

Energy Security:

The fire station microgrids will provide at least three hours a day of electricity to critical loads during utility power outages. The fire stations are vulnerable to earthquakes from the nearby Hayward faults, so having local, renewable generation decreases their dependence on outside electricity sources.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $73,475
EPIC Funds Encumbered: $1,817,925	**EPIC Funds Spent:** $703,661
Match Partner and Funding Split: Delta Products Corporation: $71,691 (2.9 %) City of Fremont: $80,000 (3.2 %) Microgrid Energy: $10,000 (0.4 %) Gridscape Solutions: $495,569 (20.0 %)	**Match Funding:** $657,260
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-050 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

In 2015, Gridscape Solutions built and tested a small-scale, prototype microgrid system in their lab. On September 13, 2016, city council of Fremont approved the project in a public council meeting. For fire station #11, 100% drawings and design were completed in August, 2016; PG&E interconnection permit was granted on October 28, 2016; city permits were approved on December 21, 2016; construction and installation of microgrid will start in January 2017. Drawings for fire station #6 and 7 will be submitted to the City office for permit application in January 2017. Gridscape Solution presented their work at CEC microgrid workshop in September, 2016.

52. EPC-14-051

Project Name:

Cleaner Air, Cleaner Energy: Converting Forest Fire Management Waste to On Demand Renewable Energy

[EPC-14-051]

Recipient/Contractor:

All Power Labs, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/15/2015 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

California has an opportunity from forest biomass to help achieve the state's renewable energy goals but it also faces conflicting challenges managing parched forests in a time of drought and climate change. Gasification is a key technology to forest biomass-to-energy conversion leading to reliable energy, reduced cost and greenhouse gas (GHG) emissions, and reduced risk of forest fires. Current related technologies are not profitable at distributed scales. Further, any negative environmental impacts from the use of forest waste and biomass resources in the state must be mitigated with appropriate technology and management strategy.

Project Description:

This project offers a solution that addresses a range of California's energy, climate, and air quality goals. Under this grant, a 150kW modular biomass gasification energy device will be designed and deployed. It will make renewable energy from fire remediation material, while dramatically lowering air pollution and meeting applicable air quality standards.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Biomass gasification can provide ratepayers with a new kind of energy, one that is on demand and renewable, but not weather dependent. This project, built entirely of technology designed and manufactured in California, will demonstrate a cost effective way to address a myriad of issues associated with climate change, including drought, fires, and the need for more renewable energy.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1a, 1c, 4a

Lower Costs:

The project uses increased forest thinning to produce renewable energy more economically via a low cost modular and mobile biomass gasification technology that is able to have a levelized cost of energy at or below SB1122 incentive target levels.

Greater Reliability:

This project analyzes and demonstrates how this technology could present CAISO and other regulatory bodies with a dynamic peak load shifting tool to address localized load and capacity constraints.

Environmental Benefits:

The project reduces about 95%+ in Carbon Monoxide, Volatile Organic Compounds, and PM-10 emissions compared to burning forest wastes.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $463,311
Generation	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$1,990,071	$1,204,622
Match Partner and Funding Split:	**Match Funding:**
All Power Labs, Inc.: $477,550 (19.4%)	$477,550
Leverage Contributors:	**Leveraged Funds:**
None	$0

Funding Method:	**Funding Mechanism:**	**No. of Initial Passing Applicants/ Bidders:**	**Rank of Selected Applicant/ Bidder:**
Competitive	Grant	25 out of 27 bidders	Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-051 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

All Power Labs provided the Engineering Validation Testing plan, and Design Validation Testing plan, and design drawings for the gasifier subsystem of the Powertainer to validate that the performance of the gasifier meets the larger system needs and will be ready to progress to the Powertainer Performance Testing. The ongoing activities are focused on the manufacturing and assembly of the Powertainer to get up to an operational start with individual subsystem cold and hot testing.

53. EPC-14-052

Project Name:

Community Scale Digester with Advanced Interconnection to the Electrical Grid

[EPC-14-052]

Recipient/Contractor:

Organic Energy Solutions, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2015 to 5/31/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Digester systems have the potential to play an important role in providing renewable electricity while reducing California's GHG emissions. Despite a regulatory environment encouraging renewable energy production and greenhouse gas reductions, there is a need for technology to lower the system cost as traditional methods require high capital costs to remove organic materials from the waste water stream to create good quality slurry for an anaerobic digester system.

Project Description:

The project will install and operate an innovative anaerobic digestion system using an innovative high-rate biodigester technology that will process approximately 50 tons per day (TPD) of organic waste from a large supermarket (Albertsons) distribution center and 50 TPD (20,000 gallons) of high-strength slurry created by recovering and concentrating organics in wastewater streams. This project will be co-located with the Co-West Commodities Wastewater Pre-Treatment Facility- an operation that collects wastewater (Carbs, sugar, protein, and fat, grease, and oil known as FOG) from industrial businesses and pre-treats the material for disposal into the local sewer system.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will demonstrate the use of electrical generation powered by digester gas to provide reliable power to a critical facility during outages on the grid. The electricity from this project will be exported to the SoCal Edison distribution grid through SB 1122 Bioenergy Feed-in Tariff. The system will also be equipped with islanding capability to support the critical facility during an interruption in the grid.

CPUC Proceedings addressing issues related to this EPIC project:

SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 1b, 1c, 2a

Lower Costs:

The method developed by this project would lower the system cost, resulting in a significantly lower price of electricity compared to traditional or fossil generation.

Greater Reliability:

This project will provide reliable renewable electricity without the need for standby and backup power, capable of providing power during peak energy demand.

Environmental Benefits:

The project will divert and use food wastes to generate electricity that will yield reductions in GHG emissions. It will also improve environmental quality by providing clean energy while improving wastewater quality and reducing odor via anaerobic digestion.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $252,977
EPIC Funds Encumbered: $5,000,000	**EPIC Funds Spent:** $12,184
Match Partner and Funding Split: Organic Energy Solutions: $7,700,539 (60.3 %) CleanWorld: $75,400 (0.6 %)	**Match Funding:** $7,772,939
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 23 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-052 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project kicked-off on 8/25/2016 after a significant delay pending resolution of match funding and subcontractor conflicts. The project team is currently working on a compressed schedule to complete pre-construction and planning, design developments, and cost estimating tasks by the end of 2016. Products completed to date include: feedstock procurement plan; site work, permitting and systems requirement report; and project coordination and execution meeting report.

54. EPC-14-053

Project Name:

A Renewable Based Direct Current Building Scale Microgrid

[EPC-14-053]

Recipient/Contractor:

Robert Bosch LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address climate change impacts such as increased fires, severe storms, and heatwaves. Microgrids are able to disconnect from the grid and provide islands of stable, independent power that maximizes the use of local renewable energy. Microgrids can reliably integrate energy efficient demand-side resources, distributed clean energy generation, and smart grid components to enable energy smart community development.

Project Description:

This renewable-based Direct Current (DC) Microgrid will connect on-site generation with loads and provide a low cost, high energy efficiency solution to save costs. Solar PV will be directly connected to energy efficient DC lighting, DC energy storage systems, and ventilation on a 380 V DC bus to form a DC building Microgrid. This Microgrid system reduces the need for DC-AC inverters for PV and AC-DC rectification equipment in the loads, thus improving the overall utilization of solar energy by 7-10% as compared to conventional AC systems, while lowering component complexity and costs. The DC Microgrid system also provides a more reliable and resilient power supply to critical loads. Bosch brought together top industry expertise in electricity grid analysis and commercial building electrical design, such as Navigant Consulting and the California Lighting Technology Center at UC Davis. They will partner with Bosch on the design, technical validation and economic analysis.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will demonstrate the feasibility and benefits of a commercial-scale DC building microgrid that integrates multiple advanced technologies to provide reliable power to the loads on the DC circuits, resilience during grid outages, increased energy efficiencies and renewable energy utilization.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Lower Costs:

By operating advanced technologies such as LED lighting and energy storage systems on DC power as opposed to AC power, installation and operating costs will be reduced.

Environmental Benefits:

If adopted by 2-5 percent of commercial buildings in California, it can result in 128 gigawatt-hours per year of energy savings. This translates to avoided carbon dioxide emissions of 36,000 metric tons per year, and avoided NOx emissions of 343 metric tons per year.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $276,825
EPIC Funds Encumbered: $2,817,566	**EPIC Funds Spent:** $630,979
Match Partner and Funding Split: Regents of the University of California, Davis - California Lighting Technology Center: $9,183 (0.2 %) Maxwell Technologies: $56,393 (1.2 %) Imergy Power Systems: $45,000 (1.0 %) AMERICAN HONDA MOTOR COMPANY, INC.: $110,631 (2.4 %) Robert Bosch LLC: $1,576,337 (34.2 %)	**Match Funding:** $1,797,544
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-053 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Bosch purchased equipment and worked with subcontractors and vendors to finalize system and component specifications and requirements. The equipment includes bidirectional inverters, PV racks, DC panels, and metering and data loggers for energy use reporting. Bosch and Baker Electric will continue to work with Southern California Edison on finalizing and obtaining the interconnection approvals.

55. EPC-14-054

Project Name:

Demonstrating a Community Microgrid at the Blue Lake Rancheria

[EPC-14-054]

Recipient/Contractor:

Humboldt State University Sponsored Programs Foundation

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	7/6/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address climate change impacts such as increased fires, severe storms, and heatwaves. Microgrids are able to disconnect from the grid and provide islands of stable, independent power that maximizes the use of local renewable energy. Microgrids can reliably integrate energy efficient demand-side resources, distributed clean energy generation, and smart grid components to enable energy smart community development.

Project Description:

This project will demonstrate the ability of a community-scale microgrid to bolster the resiliency of an American Red Cross critical support facility. The project will demonstrate the capability of the microgrid to power itself with a high penetration of local renewable resources. The microgrid will be designed to island indefinitely.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will measure customer energy and cost savings benefits and demonstrate the benefits of microgrids for vulnerable communities. The microgrid will have the ability to disconnect from and operate without the larger electric grid by managing and balancing a portfolio of distributed energy resources.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Lower Costs:

The solar PV array and battery storage system will lower annual energy purchases and also lower average peak demand by using onsite renewable energy resources.

Greater Reliability:

The proposed microgrid will be designed to be capable of supplying electric power indefinitely, even in the event of a utility grid outage. The microgrid controller will prevent uncontrolled export of energy to the electric grid which will increase grid reliability.

Increase Safety:

The microgrid as anticipated will increase the safety of the community by being able to provide electric power to the emergency response center if the electric grid goes down during a disaster.

Environmental Benefits:

The microgrid system will reduce power purchased from the electric grid by using onsite renewables and lower the amount of power generated by the on-site diesel generator.

Assignment to Value Chain: Distribution		**Total Budgeted Project Admin and Overhead Costs:** $832,908	
EPIC Funds Encumbered: $5,000,000		**EPIC Funds Spent:** $2,741,591	
Match Partner and Funding Split: Serraga Energy, LLC at Blue Lake Rancheria: $715,935 (11.3 %) Humboldt State University Foundation, Schatz Energy Research Center: $82,221 (1.3 %) GHD, Inc.: $10,266 (0.2 %) Siemens Energy and Automation, Inc.: $250,000 (4.0 %) Tesla Motors: $210,000 (3.3 %) Pacific Gas and Electric Company: $50,000 (0.8 %)		**Match Funding:** $1,318,422	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-054 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The design for the microgrid was completed, key components were purchased, and construction is complete. An interconnection agreement with PG&E has been executed. A pre-energization test was completed and on November 3 the 12.5kV BLR microgrid was connected to PG&E with supervisory control provided by a Schweitzer Engineering Laboratories 700GT relay. The PV array and battery systems are installed. The Siemens Microgrid Management System is being tested at Idaho National Laboratory. Commissioning activities are scheduled for November 2016 through January 2017, with permission to operate from PG&E expected in late January or February of 2017.

56. EPC-14-055

Project Name:

Las Positas Community College Microgrid

[EPC-14-055]

Recipient/Contractor:

Chabot-Las Positas Community College District

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address climate change impacts such as increased fires, severe storms, and heatwaves. Microgrids are able to disconnect from the grid and provide islands of stable, independent power that maximizes the use of local renewable energy. Microgrids can reliably integrate energy efficient demand-side resources, distributed clean energy generation, and smart grid components to enable energy smart community development.

Project Description:

This project will demonstrate the ability of a commercial-scale microgrid to optimize distributed energy resources for customers, distribution utilities, and the California ISO by using advanced energy management tools to coordinate a high penetration of customer renewable energy assets with multiple energy storage technologies on a community college microgrid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project identifies and measures the benefits of microgrids for customers that shift peak energy use to coincide with peak solar production and for distribution utilities and the California ISO by demonstrating the resource capability of microgrids. This project will measure the microgrid's benefits by using existing retail rates as well as simulating a market in which all microgrid benefits can be monetized.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Lower Costs:

The project will try to optimize renewable energy production and energy utilization to reduce maximum demand, peak demand, and part-peak demand with a goal of 400kW reduction. Based on the campus' current tariff this could reduce annual demand charges by approximately $100,000.

Greater Reliability:

The project may increase energy reliability on the campus by increasing the amount of solar energy that is used for campus operations instead of allowing uncontrolled export of solar energy to the local utility grid. Controlling the export of energy onto the grid will also increase reliability by reducing congestion.

Energy Security:

The project will attempt to increase energy security of the campus by enabling critical loads on the campus to island from the main distribution grid and operate for up to 10 hours with power generated from the campus solar PV system.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $260,719
EPIC Funds Encumbered: $1,522,591	**EPIC Funds Spent:** $86,200
Match Partner and Funding Split: Chabot-Las Positas Community College District: $300,000 (15.2 %) UniEnergy Technologies: $150,000 (7.6 %)	**Match Funding:** $450,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-055 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The primary focus has been development of the GELI control algorithms to manage the operation of the battery and the chiller/ice storage system. GELI has worked with the central plant controls vendor to develop protocols wherein a signal from GELI will select energy charging (chiller operation) or energy discharge (ice cooling). Tech Transfer presentations were made to the California Higher Education Sustainability Conference, UC, and CSU staff, and at the California Community College Facilities Coalition. The Las Positas College Microgrid project has replaced the project's flow battery vendor with UniEnergy Technologies with delivery scheduled for First Quarter 2017.

57. EPC-14-056

Project Name:

Demonstration of Electric Vehicle Smart Charging and Storage Supporting Grid Operational Needs

[EPC-14-056]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

Plug-in electric vehicles (PEV) appear to offer a promising alternative for meeting the state's transportation needs. For instance, load patterns when charging the PEVs tend to spike, rather than remain at constant current. PEVs may also provide a number of benefits for the electrical grid when integrated with smart charging technologies and other advanced systems. The California Independent System Operator identified barriers requiring additional research such as determining how vehicle grid integration can be implemented into residential and fleet applications and the possible role PEVs could play in grid stabilization.

Project Description:

This project will develop and demonstrate technologies that integrate electric vehicles into the electrical grid. The Recipient's core technology of using networked devices to collect data and send control signals to regulate the level of charge going into an electric vehicle, is the backbone for the project. The demonstration will collect data such as vehicle identification, status of charge, battery temperature, power usage in kW, voltage, amperage, and power quality variables, such as active and reactive power to assess performance. The control signals will connect and disconnect a charger based on various inputs, such as grid capacity, user preferences, time of use, demand response events, etc. The Recipient's artificial intelligence-based control system will determine the optimized charging and/or backfill operations. The project will use simulations and emulations to provide useful results for Investor Owned Utilities to integrate in their planning processes.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project aims to provide greater electricity reliability and lower costs by demonstrating technologies for the deployment and integration of cost effective use of plug-in electric and hybrid electric vehicles for electricity storage and peak shaving. The project attempts to provide grid services to mitigate the PV duck-curve with vehicle-to-grid and grid-to-vehicle infrastructure to smooth renewable over-generation while generating a revenue stream for the vehicle user.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1g, 1h, 2a, 3f, 4a, 4b, 5b

Lower Costs:

The project attempts to provide grid services to smooth renewable over-generation while generating a revenue stream for the vehicle user. The center will define the scenarios and smart charging tools, and apply them to five sites in Santa Monica, which is a leader in municipal EV fleets.

Greater Reliability:

The project will potentially increase reliability by implementing V2G to provide the equivalent of energy storage. This will be compared with the grid impacts of the surrounding area to determine the effectiveness of this approach.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $358,770
EPIC Funds Encumbered: $1,989,432	**EPIC Funds Spent:** $431,730
Match Partner and Funding Split: California Lithium Battery: $100,000 (4.0 %) Proximetry: $130,000 (5.2 %) City of Santa Monica: $146,000 (5.9 %) Korea Institute of Energy Research (KIER): $36,000 (1.4 %) The Regents of the University of California, Los Angeles: $88,000 (3.5 %)	**Match Funding:** $500,000
Leverage Contributors: City of Santa Monica: $146,000 Korea Institute of Energy Research (KIER): $36,000 UCLA MAE: $218,000 California Lithium Battery: $100,000	**Leveraged Funds:** $500,000

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-056 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The UCLA team designed a new communication schema, which will be integrated into the current communication network. As of December 2016, they assembled a level 2 smart EV charger for the Santa Monica Civic Center Parking lot. The team acquired and set up an interface for the inverter communication modules, and received updated firmware from the communication gateway vendor. This new communication approach using TCP protocols was tested successfully and will improve the communication network by removing static IP address issues. The team continues to update and improve the EV control center and EV User web application and is working on IEC 61850 gateway development.

58. EPC-14-057

Project Name:

Smart Charging of Plug-in Vehicles with Driver Engagement for Demand Management and Participation in Electricity Markets

[EPC-14-057]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/4/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

Plug-in vehicle (PEV) charging presents new challenges for reliable grid operations and ratepayers. PEV charging can add substantial power draw to a facility and when several PEV chargers are co-located the ratepayer is likely to face substantial demand charges. For grid operators, PEV charging can add substantial loads during periods when the grid is already stressed. Currently, no commercially-available solutions exist for intelligently coordinating the charging of vehicles by either responding to automated demand response signals, by mitigating demand charges for a ratepayer, or by offering PEVs as a resource for the wholesale market.

Project Description:

This project will develop an aggregation system for smart charging PEV vehicles to provide demand response, mitigate demand charges, leverage time of use rates, and offer wholesale market services. The demonstration will tap into the inherent flexibility in the time and rate of PEV charging to participate in PG&E's automated demand response programs, and CAISO wholesale markets for demand response and ancillary services. A charging control system will be applied to a fleet of vehicles owned by Alameda County and to charging stations that are used by both county vehicles and the public. The project will add systems for intelligent prediction of PEV loads and control algorithms to create a flexible, modular, and scalable solution for smart charging county fleet and public PEVs.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Benefits include greater reliability in the electrical transmission and distribution infrastructure, increased safety, and lower costs. The managed charging control system will enable growth in PEV adoption without straining current grid infrastructure. The system will be developed to help avoid vehicles stranding during travel, thereby increasing safety.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1g, 1h, 2a, 3f, 4a, 4b, 5b

Lower Costs:

This project attempts to lower cost for energy users by allowing them to participate in energy markets which creates a revenue stream for vehicle users.

Greater Reliability:

This project will attempt to use plug-in vehicles for demand management and supply needed grid services by using the vehicles as mobile energy storage.

Economic Development:

New revenues will be enabled by controlling PEV charging to offer grid services, including demand response and ancillary services.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $812,829
EPIC Funds Encumbered: $1,993,355	**EPIC Funds Spent:** $583,530
Match Partner and Funding Split: Kisensum: $416,800 (16.5 %) Bay Area Climate Collaborative: $25,000 (1.0 %) County of Alameda, General Services Agency: $27,711 (1.1 %) ChargePoint, Inc.: $45,743 (1.8 %) The Regents of the University of California, Berkeley: $21,507 (0.9 %)	**Match Funding:** $536,761
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-057 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient successfully tested the remote control of the charging rate for the Electric Vehicle Supply Equipment (EVSE) at the Alameda County parking garage. They have met with the Alameda County fleet management staff to learn about day-to-day operations and discuss how to overcome the challenges of having more fleet PEVs than EVSEs. A Technical Advisory Committee meeting was held on November 29, 2016.

59. EPC-14-059

Project Name:

Laguna Subregional Wastewater Treatment Plant Microgrid

[EPC-14-059]

Recipient/Contractor:

Trane U.S., Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/8/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address the impacts of climate change, such as increased fires, severe storms, and heat waves. Critical facilities are vulnerable to climate change impacts that disrupt the normal delivery of energy for their operation. However, microgrid technologies are capable of improving a facility's energy resilience and providing additional value. A demonstration of a microgrid at a wastewater treatment plant will develop a case study on such a plant's ability to provide sanitary services during times of emergency and to maximize on-site renewable energy use.

Project Description:

This project will upgrade an existing wastewater treatment plant to act as a microgrid with the ability to provide ancillary services to the grid. The project team will then monitor the plant as it operates, gathering data for microgrid operations.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will demonstrate that a microgrid at a wastewater treatment plant can operate without compromising water quality guidelines or negatively affecting plant operation, deliver reliable ancillary services to the grid, and reduce the need for new peaker or load following generation resources by providing a load balancing ancillary service in the form of dispatchable, curtailable loads.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Lower Costs:

This project will explore using on site renewables and demand response to lower the facility peak load, which will reduce operating costs.

Environmental Benefits:

This microgrid proposes to provide ancillary services by using renewables and demand-side resources instead of peaker plants.

Public Health:

If successful, this microgrid will support a critical facility that is vital to maintaining public health in an emergency.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $187,080
EPIC Funds Encumbered: $4,999,804	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Alstom Grid, LLC: $1,460,000 (20.3 %) City of Santa Rosa: $750,000 (10.4 %)	**Match Funding:** $2,210,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-059 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The microgrid is in the advanced design phase and includes formal hardware/software specifications, methods of data storage and integration, and microgrid controller architecture. The project team responded to City of Santa Rosa requests regarding construction locations, operations, and other on-site requirements so as to not interrupt wastewater treatment plant operation. These activities with the City of Santa Rosa will lead to a formal City Agreement allowing the team to perform construction activities.

60. EPC-14-060

Project Name:

Borrego Springs - A Renewable-Based Community Microgrid

[EPC-14-060]

Recipient/Contractor:

San Diego Gas & Electric Company

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/22/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address climate change impacts such as increased fires, severe storms, and heatwaves. Microgrid demonstrations are needed to show if microgrids are able to disconnect from the grid and provide islands of stable, independent power using local renewable energy. Demonstrations of microgrids integrating energy efficient demand-side resources, distributed clean energy generation, and smart grid components are needed to encourage energy smart community development.

Project Description:

SDG&E and the project team will demonstrate a utility owned community microgrid at Borrego Springs. The renewable based microgrid will be able to island the entire community with a peak load of approximately 14 MW serving approximately 2,500 residential and 300 commercial and industrial customers. SDG&E will utilize two large PV systems, 14 rooftop PV systems, two substation batteries and three distributed batteries.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project proposes to demonstrate and measure improved grid resiliency. The project will attempt to lower costs and provide environmental benefits by making greater use of locally available renewable energy while avoiding adverse grid impacts through the use of a microgrid controller/energy management system.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Lower Costs:

Borrego Springs saw an average of four hours of outages per year between 2008 and 2012. If the microgrid in this project can avoid these outages, using Lawrence Berkeley National Lab's value of service estimates tool, savings for customers may top $600,000 per year.

Greater Reliability:

It is anticipated that the microgrid in this project may be able to achieve a 98 percent reduction in the System Average Interruption Duration Index figure.

Environmental Benefits:

Once deployed for this project, a single 26 MW array could represent a reduction of as much as 21,000 metric tons of CO2 according to the CEC benefits methodology.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $923,165
EPIC Funds Encumbered: $4,724,802	**EPIC Funds Spent:** $1,923,672
Match Partner and Funding Split: SMA America: $90,000 (1.4 %) San Diego Gas & Electric Company: $530,000 (8.2 %) OSISoft, LLC: $1,119,560 (17.3 %)	**Match Funding:** $1,739,560
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 31 out of 40 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-060 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The primary focus of the project has been on the completion of the infrastructure upgrades including the installation of 18 new Wireless Fault Indicators (WFI) and 5 new Molded Vacuum Reclosers. Additionally the project has focused on the development of the microgrid controller. Specifically the integration, testing and evaluation of the microgrid assets into the Wave software. Progress on the evaluation of UCSD's Molded Vacuum Recloser software for the decoupling of voltage and frequency has begun and NREL is working on the test plan for the evaluation of the control software at SDG&E's Integrated Test Facility (ITF).

61. EPC-14-061

Project Name:

Learning from Real-World Experience to Understand Renewable Energy Impacts to Wildlife [EPC-14-061]

Recipient/Contractor:

U.S. Geological Survey

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

There is a general lack of data to adequately determine some impacts of renewable generation on wildlife and habitat loss. This lack of understanding presents challenges to assessing, mitigating and permitting new renewable energy development.

Project Description:

The goal of this research is to use real-world data to understand renewable energy impacts to wildlife. The approach is to analyze observed wildlife fatalities and habitat loss to determine the significance of fatalities to population persistence; compare pre-construction predicted and post-construction actual impacts (fatalities) to sensitive species, as a foundation for improving predictive accuracy; and compare predicted and actual benefits of mitigation to sensitive species, as a foundation for improving predictive accuracy. The research goal is to produce a set of decision-making tools for renewable energy developers and permitting and regulatory agencies in California. Implementation of this set of tools will benefit ratepayers by streamlining permitting and reducing costs of energy development and electricity.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Outcomes from this project can affect the reliability of energy delivery, cost structures and, in some cases, safety. For example, reliability of energy delivery can be influenced by costly approaches to environmental management (e.g., turbine curtailment when protected species are present). Furthermore, cost structures are determined in part by the quantity and efficiency of compliance with environmental regulations.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 3a, 4f, 4g

Lower Costs:

This project is expected to help streamline environmental permitting management (improving reliability and cost). Likewise, improved prediction of fatality and mitigation outcomes allow streamlining minimization of compliance efforts, which reduces costs.

Greater Reliability:

Having a better understanding of impacts and how to mitigate them could lead to more capacity via more developments and longer operating time (e.g., reduced curtailments).

Environmental Benefits:

Refining predictions associated with infrastructure development will reduce impacts and improve mitigation effectiveness in future renewable energy development.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $262,924
EPIC Funds Encumbered: $1,000,000	**EPIC Funds Spent:** $457
Match Partner and Funding Split: US Geological Survey: $94,707 (3.6 %) University of Maryland Center for Environmental Studies Appalachian Laboratory: $22,470 (0.9 %) NextEra Energy: $1,500,000 (57.3 %)	**Match Funding:** $1,617,177
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-061 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project is primarily in the data collection phase. The research team has compiled close to 300 environmental impact and monitoring reports and about 3000 carcasses that are being prepared for analysis.

62. EPC-14-062

Project Name:

Energy Efficiency in California's Water Sector Using Customized Energy Management and Supervisory Control and Data Acquisition Systems

[EPC-14-062]

Recipient/Contractor:

The Regents of the University of California on behalf of the Riverside campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	7/1/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Many water and wastewater treatment facilities in California have a variety of older energy consuming equipment from different vendors each having their own unique communication protocols. Upgrades, modernization and integration of control equipment of various vintages present serious communication challenges for optimizing energy efficiency and peak demand management.

Project Description:

This project will demonstrate and deploy energy management and supervisory control and data acquisition (SCADA) system strategies that can improve energy efficiency while reducing peak loads and electricity costs in the delivery and treatment of water in California. This new system will use the existing SCADA system without disrupting current operations. This project will involve water and wastewater agencies that pump ground water and surface water, and that handle reclaimed water, in large, medium, and small quantities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will highlight a pathway for water and wastewater agencies in California to increase energy efficiency and reduce their peak energy consumption with no decrement in service or reliability by overcoming communication challenges with different vintages and vendors of control equipment. Better pump and other equipment management will reduce energy costs; especially during peak demand periods when energy costs are most expensive.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1h, 4a

Lower Costs:

The project could reduce energy costs for California water treatment facilities due to lower energy and demand costs.

Environmental Benefits:

By lowering peak demand, the project could reduce greenhouse gas emissions. Fast start peaker plants used during periods of peak demand; particularly on the hottest days of summer typically produce more emissions of GHG and criteria pollutants.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $452,544	
EPIC Funds Encumbered: $3,017,034		**EPIC Funds Spent:** $349,317	
Match Partner and Funding Split: Opto 22: $94,198 (2.0 %) OSISoft, LLC: $1,081,469 (22.8 %) Regents of the University of California, Riverside Campus: $123,709 (2.6 %) Cucamonga Valley Water District: $198,896 (4.2 %) Inland Empire Utilities: $115,360 (2.4 %) Olivehain Municipal Water District: $109,100 (2.3 %)		**Match Funding:** $1,722,732	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-062 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The recipient has completed its assessment of each of the three proposed demonstration sites by analyzing the energy use and demand data for each site. This assessment will determine what hardware and software configuration will be needed to track usage and demand. Project deployment at these sites is planned to begin in early 2017.			

63. EPC-14-063

Project Name:

Advance Wastewater Treatment Using Forward Osmosis to Produce High Quality Water [EPC-14-063]

Recipient/Contractor:

Porifera, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Industrial-scale wastewater treatment systems have the potential to save energy, reduce wastewater volumes, and generate pure water streams for on-site re-use. However, many industrial wastewaters are very difficult to treat, as they contain high levels of dissolved and suspended solids, making low cost treatment with membrane-based systems ineffectual.

Project Description:

This project is demonstrating an advanced wastewater treatment technology that produces high quality water while reducing energy, chemicals and maintenance required for treatment of industrial wastewaters. The project includes technological advancements in membrane development and module design in forward osmosis to address cost and performance issues. The demonstration projects are located at a winery, frozen food facility and a soap company. Each demonstration will document energy savings and potential for this technology to purify, concentrate and reuse challenging wastewaters that contains high levels of contaminants. This technology has the potential for application in the food and beverage, oil and gas, and other industrial sectors.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Treatment of industrial wastewater is very challenging because of the high solids, pulps, free and emulsified oils and greases and their high chemical and biological oxygen demand. If the project is successful then this technology could be used to treat challenging wastewaters to achieve high purity and provide high temperature water for reuse while using less energy than other processes. Reclaiming water for onsite reuse will reduce the need for fresh water purchases.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 4c

Lower Costs:

This technology will treat challenging industrial wastewaters for water reuse and can result in energy and water saving benefits and also cost savings.

Environmental Benefits:

By reducing electricity use and water use, the project could reduce greenhouse gas emissions. With broad adoption, the technology could enable the reuse of industrial wastewaters rather than being disposed in the sewer system.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $964,131
EPIC Funds Encumbered: $3,230,420	**EPIC Funds Spent:** $916,781
Match Partner and Funding Split: CDM Smith, Inc. : $9,885 (0.3 %) Porifera, Inc.: $417,108 (10.8 %) Jackson Family Wines : $99,800 (2.6 %) Dr. Bronner's Magic Soaps : $69,700 (1.8 %) Wawona Frozen Foods : $50,000 (1.3 %)	**Match Funding:** $646,493
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-063 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Porifera is constructing the pilot system at Dr. Bronner's Soap Company, and has started data collection for the M&V at Jackson Family wines. They have also changed the Wawona Frozen Foods site to Ale Industries as they determined that the PFO Recycler will yield more savings and be better suited to meet the Ale Industry's needs.

64. EPC-14-064

Project Name:

Aerosol Impacts on the Hydrology and Hydropower Generation in California

[EPC-14-064]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Riverside Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/13/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Hydrologic forecasts for hydropower units can have substantial errors. This hampers the efficient management of hydropower units. Hydropower is a very important clean resource that provides peak generation in hot summer months and can provide electricity when wind and/or solar resources go down. Improving hydrologic forecasts could substantially increase these and other benefits obtained from hydropower units. Simulating the effect of aerosols (small particles in the air) into clouds and precipitation is a very promising option to improve weather/climate forecasts.

Project Description:

This project will develop a fully coupled aerosol-meteorology-snowpack forecast model for hydropower applications, using observational datasets (precipitation, snowpack, stream inflow) for Southern California Edison's hydropower plant on Big Creek. The researchers will also use a SCE model designed to optimize the operation of their hydropower units. The main goal is to demonstrate that the use of advanced forecasts can improve the management of hydropower units.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The results of this project are expected to improve the management of hydropower units which should reduce overall electricity generation costs.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1c, 4a, 5c

Lower Costs:

The proposed research is intended to significantly advance our knowledge of aerosol impacts on the hydrology and hydropower generation in California. The improved forecast should maximize California ratepayer benefits by increasing the hydroelectric power plant's availability, flexibility and revenue in the wholesale electricity market.

Environmental Benefits:

Improved hydropower management will foster the use of a clean resource during peak hours.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Generation</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $92,951</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$399,818</td><td colspan="2">EPIC Funds Spent:
$18,855</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
University of California, Riverside: $56,262 (8.0 %)
University of California Los Angeles: $249,975 (35.4 %)</td><td colspan="2">Match Funding:
$306,237</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
12 out of 14 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 2</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-14-064 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The research team has set up the computer models and is currently testing them against observed data to make sure their performance is adequate. The next phase will involve work with SCE to make sure research products are useful.</td></tr>
</table>

65. EPC-14-065

Project Name:

Demonstration of Forward Osmosis to Produce Juice Concentrate, Purify and Reuse Wastewater and Reduce Energy Use

[EPC-14-065]

Recipient/Contractor:

Porifera, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

There is a need for energy efficient methods to concentrate food and beverage products and wastes under varying processing conditions and operations while preserving or improving product quality. Food and beverage operators are eager to implement new methods, but first need to be convinced of the effectiveness without compromising the high quality standards of California's food and beverage products.

Project Description:

This project will demonstrate a new technology innovation to reduce the energy, chemicals, and maintenance required for food and beverage processing and waste concentration. The technology uses forward osmosis and reverse osmosis in an energy efficient way to achieve the equipment performance of an evaporator and that, in addition, generates purified water streams for reuse. When designed and implemented correctly, the technology can save energy and money.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, this technology can save thermal and electrical energy for each facility and eliminate the use of evaporators for making juice concentrates. Evaporators require massive amounts of steam created from boilers to produce concentrate, and boilers need massive amounts of fuel in creating that steam.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 4c

Lower Costs:

This technology could lower energy use and costs for food processing and industrial operations.

Environmental Benefits:

Since this technology could lower energy use, it could lower greenhouse gas emissions. Also the project has the potential to purify wastewater for on-site reuse, thereby lessening need for fresh water.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $621,536	
EPIC Funds Encumbered: $2,499,289		**EPIC Funds Spent:** $927,564	
Match Partner and Funding Split: CDM Smith, Inc. : $9,885 (0.3 %) Porifera, Inc.: $233,108 (7.5 %) Los Gatos Tomato: $385,575 (12.3 %)		**Match Funding:** $628,568	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-065 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: Porifera has switched the Ale Industries site with Wawona Frozen Foods as they have determined that the PFO Concentrator would yield more savings and is better suited for Wawona's process. They are also working on regulatory approval for food contact with the PFO Concentrator at Los Gatos Tomato, and are still in the process of optimizing the system at Anheuser Busch.			

66. EPC-14-066

Project Name:

High-Performance Integrated Window and Facade Solutions for California Buildings

[EPC-14-066]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Windows are responsible for annual building HVAC energy use and have a significant impact on peak heating and cooling loads, and HVAC system sizing and layout. Windows can provide ventilation air and can offset electric use for lighting. While most envelope systems are static (insulation), windows can dynamically change their energy properties (switchable glass) in response to user, building owner, and grid demands. However, a smart systems and controls infrastructure to optimize dynamic operations to reliably capture these energy advantages is unavailable.

Project Description:

This project will develop, validate and quantify energy impacts of a new generation of high performance facade systems and provide the design and management toolkits that will enable the building industry to meet challenging energy performance goals leading to net zero buildings by 2030. Building envelope technologies can be integrated into a cost-effective system that reduces energy-use associated with HVAC and lighting while improving occupant comfort. Technology development activities include highly insulating (Hi-R) windows, energy recovery-based envelope ventilation systems, and dynamic daylight redirecting systems. Supporting tools, data, and design methods will also be developed to enable widespread, reliable, cost-effective deployment throughout California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Improvements in window and facade technologies could lower energy use and demand in buildings due to reduced HVAC and lighting loads while also reduce building owner operating costs.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 2a

Lower Costs:

The technologies included in this project are estimated to be capable of reducing statewide energy use by 5755 gigawatt-hours and peak electricity demand by 2250 megawatts resulting in lower electricity costs of $816 million/year (assuming 75 percent market penetration in new and existing commercial buildings).

<table>
<tr><td colspan="2">Assignment to Value Chain:
Demand-side Management</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $1,308,746</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$3,000,000</td><td colspan="2">EPIC Funds Spent:
$650,000</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
United States Department of Energy: $450,000 (13.0 %)</td><td colspan="2">Match Funding:
$450,000</td></tr>
<tr><td colspan="2">Leverage Contributors:
United States Department of Energy: $450,000</td><td colspan="2">Leveraged Funds:
$450,000</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
Phase 1:
48 out of 120 bidders
Phase 2:
32 out of 44 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 12</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-14-066 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
Completed design optimization of highly insulating glazing, spacer and framing systems and signed on industry partners to launch year 2 prototyping phase. Completed concept design and selected smart controller platform for a perimeter ventilation system that maximizes use of natural ventilation in mild California climates to offset mechanical cooling. Developed initial designs of glare free daylighting optics designed to double the savings potential of daylight solutions. Developed and tested initial software solutions for new modeling and optimization tools to provide designer confidence in new smart active facade technologies that will help dynamically manage building electric loads.</td></tr>
</table>

67. EPC-14-067

Project Name:

Improving Hydrological Snowpack Forecasting for Hydropower Generation Using Intelligent Information Systems

[EPC-14-067]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/29/2015 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Next-generation hydrographic data networks are needed to better measure and predict critical snowpack levels that can help hydropower operators adjust to increased variability and precipitation consequences of climate change.

Project Description:

The purpose of this project is to develop improved snowpack forecasts within a representative Sierra Nevada watershed in order bolster the hydrographic data network that supports hydropower planning and operations. The project is expected to reduce uncertainty in water forecasts in a changing climate, and assist in the development of reliable and flexible operations of hydropower dams that will also bring economic benefits to utilities and ratepayers.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The anticipated benefits to California includes improved predictive planning and scheduling tools to manage hydroelectric resources that are needed to adapt to increasing vulnerabilities and uncertainties of a changing climate. This project will specifically target three powerhouses (Rock Creek, Crest, and Poe Powerhouses) operated by PG&E.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 2a, 5c

Lower Costs:

Increasing ability of hydropower to respond to fluctuations in demand and supply will result in lower costs of energy production.

Greater Reliability:

The improved snowpack data should allow for greater predictability and therefore increased reliability in hydropower generation.

Environmental Benefits:

Better, more-detailed, real-time predictions for water basin-runoffs will increase the hydropower availability and contribute to the mitigation of climate change effects.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $205,897	
EPIC Funds Encumbered: $1,100,000		**EPIC Funds Spent:** $106,354	
Match Partner and Funding Split: University of California Merced: $86,263 (6.5 %) California Department of Water Resources: $150,000 (11.2 %)		**Match Funding:** $236,263	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-067 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The first TAC meeting was held on 3/23/2016 and three project sites were chosen: Grizzly Ridge, Kettle Rock, and Buck's Lake. In April all permits that were required to obtain access to the sites were secured and the installation of hardware has started. Software development progress was at 90% to completion.			

68. EPC-14-068

Project Name:

Evaluation of Cost, Performance and Water Conserving Capability of Hybrid Cooling

[EPC-14-068]

Recipient/Contractor:

Maulbetsch Consulting

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/13/2015 to 1/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

The needs for increasing amounts of electric power and clean water have sometimes come into conflict in California. Hybrid, wet/dry cooling systems enable significant water savings in comparison to wet cooling and improved plant efficiency and output in comparison to all-dry systems. To expedite the introduction of hybrid systems, a methodology and computational tool to provide regulators, planners and potential users with reliable, validated comparative performance and water use cost comparisons with optimized wet and dry cooling systems is needed.

Project Description:

This project will analyze the design, performance and cost of optimized hybrid cooling systems at utility power plant scale to illustrate the potential benefits of hybrid cooling in California. This project will use an existing Excel spreadsheet-based computational tool with the capability of specifying, at an "engineering-level", design parameters for optimized closed-cycle wet, direct dry and parallel wet/dry hybrid cooling systems. The tool's output will be checked against information from participating plants equipped with wet, dry and hybrid cooling systems. The capability to make rigorous, reliable evaluations of hybrid cooling systems and the trade-offs between economic power production and water resource conservation will enable the selection of preferred cooling systems for the economic and environmental benefit of California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Hybrid cooling systems for electric power plants will provide an alternative cooling option for California power plants that can simultaneously achieve significant reduction in water consumed for power production compared to closed-cycle wet cooling, improve both peak load and annual average power production efficiency and output compared to all-dry cooling and reduce the air emissions that all dry cooling systems can impose on fossil-fired power plants.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 2a, 3a, 4c

Lower Costs:

The results of this project will be used to reduce plant capital costs below the cost of dry cooled plants of comparable output.

Greater Reliability:

The results of this project are expected to eliminate the significant efficiency penalties incurred by dry cooled plants during the hot periods of the year when power demand is the highest.

Environmental Benefits:

The results of the project are expected to reduce the amount of water required to keep plants operating in comparison to traditional wet cooling.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $581,580		**EPIC Funds Spent:** $189,120	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-068 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

The Recipient has identified an unregistered Spreadsheet Tool software as "project relevant pre-existing intellectual property" in agreement EPC-14-068 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The Recipient initiated contact and obtained data sets from 6 thermal generating plants that use hybrid cooling: Gateway and Colusa (PG&E), Mountain View (SoCal Edison), Afton (Public Service New Mexico), Goldendale (Puget Sound Electric), Mountain View (SoCal Edison). The acquisition of weather data from airports located close to the mentioned above power plants was completed. All collected data were formatted so that they can be used in tool being developed by Grant Recipient. Preliminary comparisons of spreadsheet tool estimates for hybrid cooling with actual plant data have shown a good agreement. Currently the spreadsheet tool is being further calibrated.

69. EPC-14-069

Project Name:

Develop Analytical Tools and Technologies to Plan for and Minimize the Impacts of Climate Change on the Electricity System

[EPC-14-069]

Recipient/Contractor:

Energy and Environmental Economics, Inc. (E3)

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/13/2015 to 7/31/2017

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

If California is to achieve its long-term goal of reducing greenhouse gas emissions 80 percent below 1990 levels by 2050, the electricity system must play a pivotal role. Electricity generation must have significantly reduced carbon intensity and much of transportation and other end uses that are currently powered by direct fossil fuel combustion must be electrified. Prior research has identified "proof of concept" low carbon scenarios, but many aspects of the energy transition remain poorly understood.

Project Description:

This project will advance the understanding of key parameters of long-term energy scenarios and greenhouse gas abatement options in the California energy system. This project will achieve this by further developing detailed scenarios and modeling capabilities of the California electricity sector, as well as interactions between the electricity sector and other sectors, and by exploring the implications of particular policy choices on the electricity system in the medium (2020-2030) and long term (2050). This project will provide critical insight into some of the key challenges facing the low carbon transition in the electricity system, the options for addressing these challenges, and the dynamic interactions among these options, which are likely to grow more important over time.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will develop options for improving electricity planning methodologies, such that they better incorporate knowledge of how the electricity system will need to evolve over the next 15 to 30 years. This will include a better understanding of how current policy choices will impact long-term climate outcomes, providing critical policy-relevant information to state energy agencies that will be implementing the Governor's energy and climate goals over the next 15 years.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Long-Term Procurement Proceeding (LTPP): R.13-12-010

Applicable Metrics: CPUC Metrics- 3f, 4a

Lower Costs:

This research will provide information to policy makers about key choices that would lower the cost of meeting the state's environmental goals in the electricity sector.

Greater Reliability:

This project will provide information to policy makers about the key choices and decisions needed to maintain electric reliability of the future system with increased renewable and distributed generation.

Environmental Benefits:

This project will investigate the environmental and land use implications of different renewable development scenarios under a 50 percent renewable future in 2030 while reducing environmental impacts.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $286,936
EPIC Funds Encumbered: $700,000	**EPIC Funds Spent:** $307,553
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-069 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The research team is improving their models and data sets. The project team participated in a joint technical meeting in September 2015 to coordinate on assumptions and contributions for scenario development among the three research teams that received awards for this work. Policy and Technical Advisory Committees meetings took place on February 24, 2016. The research team has presented initial results to the PAC and TAC and received their input. The work is progressing well and will conclude in the summer of 2017.

70. EPC-14-070

Project Name:

Wexus Energy and Water Management Mobile Software for the Agricultural Industry [EPC-14-070]

Recipient/Contractor:

GDRU Energy Solutions LLC (dba Wexus Technologies)

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

California's agricultural industry is one of the state's largest users of energy and water and has been historically underserved by a lack of effective efficiency technologies. The agriculture industry is also rapidly transitioning to the next generation of technology: mobile, cloud-based software, big data, and connected devices in the field. The combination of rising energy rates, increasing regulation and reporting, drought and changing weather patterns is driving demand for new agricultural energy efficiency solutions. Farmers currently cannot manage what they do not measure, leading to higher operational costs for farms.

Project Description:

This project deployed the Wexus (Water-Energy Nexus) mobile, cloud-based software platform in California's agricultural industry. The Wexus platform leverages existing utility meter infrastructure and helps agribusinesses to quickly assess energy (and water) usage and cost from virtually anywhere on any mobile device. Through customized alerts and reporting, the platform allows farms to quickly respond to changes in energy usage, adjust and optimize equipment in the field, and reduce operational expenses due to energy costs. Through collaboration with project partners, this project will further extend existing water-energy data analysis, visualization and remote controlling capabilities to the Wexus platform to further optimize water-energy resource management in the agribusiness sector.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The Wexus platform uses site data and electric and water utility data to estimate how energy is used on-farm. The data is translated into reports and informs the farmer when to turn off equipment in order to participate in demand response programs. The technology could save farmers about 10% in energy and water bills. The following are the estimated savings over three years for the 3 demonstration farms: 2.4 million kWh, 4000 acre feet of water, 600 metric tons of GHG and more than $400,000.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011 Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h

Lower Costs:

The project could reduce energy costs (and water costs where possible) for California farmers who may use Wexus Software solution to monitor their onsite electricity and water use.

Greater Reliability:

The project could reduce the demand on the grid from California farms that may use the Wexus Software solution to make informed decisions on the cost/benefit of participating in utility sponsored demand response programs.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $571,397
EPIC Funds Encumbered: $4,000,000	**EPIC Funds Spent:** $1,574,757
Match Partner and Funding Split: Wexus Technologies, Incorporated: $1,000,000 (20.0 %)	**Match Funding:** $1,000,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-070 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team has deployed the software and hardware solution to four sites and has started engaging the farmers in effective ways to manage on-site energy and water usage for their operations. Project team has started the baseline energy (and water where possible) use.

71. EPC-14-071

Project Name:

Rotor-Mounted Bat Impact Deterrence System Design and Testing

[EPC-14-071]

Recipient/Contractor:

Frontier Wind

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Measures put in place to mitigate the impact of wind generation facilities on wildlife species, including bats, limit the achievement of key state objectives. These mitigation measures serve to limit the productivity and ability to develop and construct new wind energy projects. Developing more effective technology and methods to mitigate fatal interaction of bat species with wind turbine facilities could enable wider deployment of wind energy with less curtailment.

Project Description:

The project is designing, lab testing, and field testing a new bat deterrence system utilizing ultrasound transmitters mounted in an array along the rotor blades, providing complete coverage over the entire rotor/nacelle envelope. A field test study utilizing substantially similar methods to prior bat impact studies is being implemented post-installation at the test site to measure the effectiveness of the new ultrasound system.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

A key benefit of the project is the ability to avoid the need to curtail California wind turbine capacity to mitigate against potentially fatal bat interactions. A second key benefit of the project is the ability to enable an increase in installed California wind generation capacity. Wildlife concerns limit the in-state geographies where wind power facilities can be sited.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 3a, 4g

Lower Costs:

Currently available mitigation measures can be costly to ratepayers through forced curtailments and limit pursuit of State renewable capacity expansion goals. As such, the project benefits ratepayers by providing a less costly alternative approach.

Environmental Benefits:

The project will develop new technology that could significantly reduce bat fatalities at wind energy facilities.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $29,547
Generation	

EPIC Funds Encumbered: $862,875		**EPIC Funds Spent:** $592,701	
Match Partner and Funding Split: Frontier Wind: $22,313 (2.5 %) Bruce Walker: $14,000 (1.6 %)		**Match Funding:** $36,313	
Leverage Contributors: United States Department of Energy: $249,000		**Leveraged Funds:** $249,000	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-071 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions. Patent for project-relevant independently funded intellectual property for an invention.			
Update: Researchers have completed the design stage for the system and tested it in their lab. The full system was installed on twelve turbines at Hatchet Ridge in 2016. Bat fatality surveys were conducted on the test turbines and control turbines during the bat migration season. The results are being analyzed as of Fall 2016. Problems with the power supplies are being diagnosed in preparation for the 2017 migration season.			

72. EPC-14-072

Project Name:

Building a Healthier and More Robust Future: 2050 Low Carbon Energy Scenarios for California

[EPC-14-072]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 12/30/2017

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

California has set an aggressive long-term climate goal of 80% GHG reduction in 2050 relative to the 1990 level. Several studies have been conducted on how to achieve this goal but they have not considered some important factors such as aggressive demand response options, plug-in electric vehicle (PEV) adoption, and more realistic energy efficiency scenarios.

Project Description:

This project will significantly expand prior studies using stochastic modeling capabilities of the electricity system, simulating more comprehensive demand response options, and more realistic PEV modeling. The project will also include more realistic simulations of the potential for energy efficiency and consider the impacts of climate change on energy resources.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Long-term energy scenario analysis contributes multiple benefits to California's ratepayers by providing guidance for future electricity system investment that can meet carbon limits at the lowest cost. In addition, the energy system resilience analysis will help to ensure the electricity system is more robust to future external shocks.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Long-Term Procurement Proceeding (LTPP): R.13-12-010 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 2a, 3f, 3h, 4a

Lower Costs:

The proposed analysis will provide guidance for future electricity investment that can meet carbon limits at the lowest cost.

Greater Reliability:

Energy system resilience analysis will help to ensure the electricity system is more robust to future external shocks.

Energy Security:

Studying the optimal paths for developing California's energy system to meet its GHG goals may prevent inefficiency in the energy system investments and potentially avert stranded investments.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $236,701
EPIC Funds Encumbered: $700,000	**EPIC Funds Spent:** $658,620
Match Partner and Funding Split: University of California, Berkeley: $65,000 (8.5 %)	**Match Funding:** $65,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-072 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project began in June 2015. It is part of a coordinated effort to develop comprehensive long term energy scenarios that take into account both climate change impacts and climate policy changes to the electricity system. The August 2016 Policy Advisory Committee requested an increased focus on environmental justice communities. In response, the researchers are planning to refocus efforts on examining the air quality implications of different energy scenarios in disadvantaged communities. Early model runs demonstrated that it is more economical to aim for 2050 energy sector targets rather than aiming for 2030 targets, and then 2050 targets.

73. EPC-14-073

Project Name:

Monitoring the Urban Heat Island Effect and the Efficiency of Future Countermeasures [EPC-14-073]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/29/2015 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

The prevalence of dark, dry surfaces and man-made heat in cities creates Urban Heat Islands (UHIs) of elevated near-surface air temperature. UHI countermeasures, such as reflective surfaces and urban vegetation, can save cooling energy, improve indoor and outdoor thermal comfort in summer, reduce pollutant emissions, and improve health. Implementation of these measures can also help counter potential microclimate, emissions, and air-quality impacts of climate change. An empirical, real-world, and fine-resolution observational characterization of UHIs, using strategically placed, research-grade weather stations, is needed.

Project Description:

This project will improve understanding of the distribution of near-surface air temperatures within urban heat islands in California, identify and quantify the determinants of local temperatures, and enhance the foundation for location-specific assessments of mitigation strategies. In collaboration with local governments and organizations in the Los Angeles Basin, the research team will design and implement a network of fixed monitoring stations, supplemented with mobile monitoring and data from existing weather-station networks. This research will (a) assess spatial and temporal variations in near-surface air temperature; (b) monitor the effects of urban heat island countermeasures, such as cool surfaces and urban vegetation, on urban air temperature; and (c) recast these observations for use in validating and calibrating the climate/meteorological models applied to assess potential benefits of urban heat island countermeasures throughout the state.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Research will maximize benefits from urban heat island (UHI) mitigation by verifying relationships between the UHI effect and land use/land cover; using these measurements to calibrate and validate models that estimate benefits of mitigation measures; establishing a baseline of today's UHI effect against which the efficacy of future UHI mitigation (cool community) programs can measured; and leaving in place a set of research-grade monitors that can be used to track changes in the UHI effect.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 4a

Greater Reliability:

Extensive prior research indicates that urban heat island (UHI) mitigation attainable through cool community strategies can save electricity, reduce peak power demand, lower strain on the electrical grid, and increase reliability. Research project will facilitate regionally optimized deployment of UHI mitigation technologies.

Public Health:

UHI mitigation can reduce air pollutant emissions and slow production of ground-level ozone, thus improving air quality and protecting public health. The research project will help ensure that future UHI mitigation efforts maximize public health benefits associated with reducing ground-level ozone concentrations and improving air quality.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $116,818
EPIC Funds Encumbered: $500,000	**EPIC Funds Spent:** $366,348
Match Partner and Funding Split: Altostratus, Inc.: $4,000 (0.8 %)	**Match Funding:** $4,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 14 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-073 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

In 2016, the team performed analyses of land-use, land-cover, and historical weather observation data to support modeling efforts to identify good sites for urban heat island monitoring. The team selected monitoring sites in the Los Angeles air basin where the urban heat signal is conducive to research efforts, specifically, where the urban heat signal was sufficiently clear to enable new empirical understandings and model improvements. The team also developed a mobile monitoring platform and used it to help identify study areas, finalized design of rooftop weather stations, and began station installation. The Advisory Committee continued to engage key stakeholders as well as scientists.

74. EPC-14-074

Project Name:

Building a Climate Change Resilient Electricity System for Meeting California's Energy and Environmental Goals

[EPC-14-074]

Recipient/Contractor:

The Regents of the University of California, Irvine Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 7/2/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

The energy system needs to respond to the impacts of climate change such as increased precipitation extremes, higher peak energy demand from hotter and more frequent temperature extremes, and damage to energy infrastructure. At the same time, the energy sector must comply with mandates to reduce greenhouse gas emissions. These two pressures (climate impacts and changes in energy policy) interact in complex ways on the existing grid. In order to support future planning, this project will estimate how climate change would interact with efforts to reduce GHG emissions and to comply with renewable energy targets.

Project Description:

The project will utilize climate change simulations to produce modeled conditions that disrupt electricity system generation, renewable capacity potential, and demand for the years of 2030, 2040, and 2050. The combined effect of these impacts then will be simulated on the electricity system using an integrated electric grid modeling platform.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will help limit the costs of energy while complying with GHG goals.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Long-Term Procurement Proceeding (LTPP): R.13-12-010

Applicable Metrics: CPUC Metrics- 2a, 4a

Environmental Benefits:

The project will estimate the potential environmental benefits of different energy scenarios. This project is partnered with two other long term energy scenarios projects that will use a common base set of assumptions (based on prior work by E3 for the energy principals). This project is aimed at understanding impacts from changes in hydrology.

Energy Security:

The project includes analyses of robust energy systems. Robustness can be simulated and tested to produce results to inform which set of technologies in which places are the most protected from climate change, and therefore more energy secure.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Generation</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $181,613</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$698,792</td><td colspan="2">EPIC Funds Spent:
$171,426</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
Southern California Edison: $150,000 (15.0 %)
Southern California Gas Company (SoCalGas): $150,000 (15.0 %)</td><td colspan="2">Match Funding:
$300,000</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
12 out of 14 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 5</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-14-074 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The basis for the model construction is nearly complete. The researchers have presented their work to a high level policy advisory committee led by Chairman Weisenmiller. They received feedback requesting an increased focus on environmental justice communities. In response, the researchers will be connecting with EJ advocacy groups as part of an expanded Technical Advisory Committee in January 2017. The expanded TAC is intended to help shape the model so that results are usable by EJ communities and advocates.</td></tr>
</table>

75. EPC-14-075

Project Name:

Unlocking Industrial Energy Efficiency Through Optimized Energy Management Systems [EPC-14-075]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/15/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Historically, industrial facilities have paid little attention to electricity consumption. Many industrial customers are unaware of low-cost energy conservation and energy efficiency opportunities. Often the only electricity data available is at the whole facility level and cannot be easily analyzed to find energy-saving opportunities. Process-level sub-metering has been rare due to its historically high costs and it is typically not used to find ways to lower energy costs. Energy management systems that use real-time data and analysis to identify energy savings are not available in the market.

Project Description:

The University of California at Berkeley, Massachusetts Institute of Technology, and the University of Chicago, have partnered with Lightapp Technologies to demonstrate a pre-commercial, software-based, optimized energy management system in industrial facilities. The Lightapp technology takes an innovative approach by relating electricity use and operating measurements to the production outputs of specific facility systems. The software tool then identifies anomalies and makes recommendations to lower the overall energy intensity of production and save energy and money. This project demonstrates the operational effectiveness and financial viability of deploying a more developed version of the technology in California industries. This project focuses on optimizing electricity consumption in compressed air systems, a common system in many industries.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, the proposed technology could reduce the energy intensity of industrial facilities by 5% to 26% by reducing energy inefficiencies. Market assessments have estimated savings of 15% to 17% in compressed air system energy use with paybacks of less than 2 to 3 years, respectively.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

The project could lower energy use and costs by optimizing industrial processes in a variety of manufacturing sectors.

Environmental Benefits:

The project could potentially have environmental benefits as increased energy efficiency could result in lower greenhouse gas emissions.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $451,253
EPIC Funds Encumbered: $4,981,729	**EPIC Funds Spent:** $835,595
Match Partner and Funding Split: University of California, Berkeley: $1,530,590 (23.5 %)	**Match Funding:** $1,530,590
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-075 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Progress has been delayed. Recruitment of sites to participate has not proceeded at the pace needed to meet the ultimate goal of 100 sites. As of mid-summer 2016, only six sites had agreed to participate. A Critical Project Review was held on September 2, 2016 to explore solutions to the recruitment problem. It was determined that the business plans of the installation subcontractors, who were focused equipment sales, were at odds with project recruitment. The recipient decided that the remaining installation company (Osterbauer now Ingersoll Rand) would concentrate on installations and that the technology developer, Lightapp, would take over all recruitment duties.

76. EPC-14-076

Project Name:

Raw Wastewater Filtration to Increase Organic Removal Efficiency and Achieve Significant Electrical Savings

[EPC-14-076]

Recipient/Contractor:

Kennedy/Jenks Consultants, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

The secondary biological wastewater treatment process is usually the most energy intensive process of a wastewater treatment plant (WWTP). The most common secondary biological treatment method is called the "activated sludge process", and is accomplished by aerating wastewater. On average the activated sludge process accounts for 40 to 60 percent of total WWTP electricity consumption. The electricity used for aeration is proportional to the organic load entering the aerated activated sludge process. Achieving a higher degree of removal of the organic load before the aerated activated sludge process provides a breakthrough opportunity to reduce electricity consumption.

Project Description:

This project is extending the application of Cloth Depth Filters (CDF) to raw wastewater filtration at three wastewater treatment plants in California. The CDF concept replaces the current technology of primary clarification by offering the following advantages: (1) substantially higher removal of organic load resulting in significantly lower aeration electrical power demand, and (2) smaller footprint requirements both for primary and secondary treatment steps. CDF employs established principles of gravitational forces which results in minimal operational and maintenance complexities. The unique attribute which offers promise for CDF technology in raw wastewater is the vertical placement of the filter medium and flow direction of this filtration process. Unlike prevailing filtration systems, the vertical orientation of the filter medium permits heavy solids to settle within the tank.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If the project is successful, the application of CDF to wastewater filtration could result in 35 percent aeration electrical savings. Assuming 10 percent market implementation by the wastewater treatment sector, this could result in annual savings of 34 million kWh and $3.6 million in reduced operating costs.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

The project could reduce the cost of wastewater plant operations within California by reducing wastewater treatment plant electricity consumption (CPUC Metrics 1f and 1h).

Environmental Benefits:

By reducing electricity consumption, this project could reduce greenhouse gas emissions.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,184,735
EPIC Funds Encumbered: $3,476,085	**EPIC Funds Spent:** $442,677
Match Partner and Funding Split: Kennedy/Jenks Consultants: $38,400 (0.8 %) Aqua-Aerobic Systems, Inc.: $631,000 (13.2 %) Process Wastewater Technologies LLC: $552,300 (11.6 %) Linda County Water District: $29,640 (0.6 %) Water Environment Research Foundation: $25,000 (0.5 %) Regents of the University of California (University of California, Davis): $12,000 (0.3 %)	**Match Funding:** $1,288,340
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-076 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The contractor has finalized the design for the first deployment site and anticipates construction to begin in the fourth quarter of 2016 or first quarter of 2017.

77. EPC-14-077

Project Name:

Enable Standardized Vehicle-Grid Integration through Development of Universal Standard [EPC-14-077]

Recipient/Contractor:

Center for Sustainable Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S9: Advance Technologies and Strategies That Optimize the Benefits of Plug in Electric Vehicles to the Electricity System

Issue:

California utilities are currently working to meet the State's Renewables Portfolio Standard of 33% by 2020, while simultaneously planning for the 1.5 million zero-emission vehicles that will be deployed by 2025, with over 130,000 plug-in vehicles (PEVs) sold since 2011. The State's vision to achieve cross-cutting benefits from these two separate yet interconnected efforts, however, requires new thinking on precisely how electric system operators can leverage and utilize PEVs as beneficial Distributed Energy Resources without compromising safety, data security, consumer simplicity or the mobility needs of the PEV owner.

Project Description:

The project will design and develop a Demand Clearing House (DCH) to monitor published energy pricing from the California Independent System Operator's Fifteen-Minute Energy Market as well as load forecasts from San Diego Gas & Electric and other participating utilities through an Application Programming Interface translation from Open ADR 2.0b, a Demand Response protocol used by all California Investor Owned Utilities. The DCH will then use algorithms that convert grid conditions into ISO/IEC 15118 "grid profiles," or Tariff Tables, which in turn will be communicated to 15118-capable charging stations and vehicles. The DCH will allow utilities to respond to supplemental energy market prices, proving a viable and scalable pathway toward using plug-in electric vehicles to manage variable grid conditions, solar oversupply, and other system wide challenges.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will provide greater reliability, lower costs, and increased safety for California IOU ratepayer. The project will provide California with an open protocol that enables large amounts of new, low cost flexible capacity on the grid. It will minimize potential stranded investments in less cost effective forms of flexible grid resources, maximize renewable and PEV integration, and promote a safer, more reliable low carbon future.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Smart grid: R.08-12-009

Applicable Metrics: CPUC Metrics- 4a, 4b

Lower Costs:

By enabling large amounts of low cost flexible capacity on the grid, this project will lower costs for both utilities and customers.

Greater Reliability:

This project will foster better integration of more plug-in electric vehicles onto the grid as distributed energy resources will help address renewable energy intermittency.

Environmental Benefits:

This project will maximize renewable and PV integration, providing safe and reliable low carbon energy.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $193,033	
EPIC Funds Encumbered: $1,499,999		**EPIC Funds Spent:** $346,772	
Match Partner and Funding Split: KnGrid: $100,000 (6.3%)		**Match Funding:** $100,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 25 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-077 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Pre-'Demand Clearing House' intellectual property delivered 'energy limits' based on inputs from a local grid operator. A building energy management (BEM) system was linked to a cluster of local charging stations. RWE's 'Demand Energy Management' system connected to the BEM system via SFTP and received a forecast of available power limits to the local charging stations.

Update:

CSE is refining the Demand Clearing House specifications and have begun recruiting participants for the demonstration phase. CSE continues to develop the M&V plan. CSE is engaged in discussions with Daimler to implement and release ISO/IEC 15118 enabled PEVs for the demonstration study.

78. EPC-14-078

Project Name:

Next-Generation Grid Communication for Residential PEVs

[EPC-14-078]

Recipient/Contractor:

ChargePoint, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S9: Advance Technologies and Strategies That Optimize the Benefits of Plug in Electric Vehicles to the Electricity System

Issue:

Currently there are no adequate communication interfaces that allow communication between utilities, charging stations, and residential plug-in electric vehicle (PEV) customers. While there is some capability for aggregated commercial charging applications to provide grid stability, residential PEV participation in grid stabilization requires significantly more fine-grained data collection, coordination of charging at stations owned by different parties, and sensitivity to each driver's needs and preferences as well as a real-time understanding of each vehicle's state of charge or charge needed before next departure.

Project Description:

The project will develop communication interfaces between PEV customers and utilities using cloud-to-cloud OpenADR 2.0b communication with a vehicle charging network and will leverage emerging means for retrieving vehicle information via the ISO/IEC 15118 standard for consideration in the decision process. The communication will be able to gather customer data and receive signals from a third party (utility) for the purpose of optimizing PEV charging in a mutually beneficial manner to the customer and the utility. In addition to investigation and implementation of the ISO/IEC 15118 standard, the project will also investigate using control methods that do not require having vehicle charging information. This may be done through statistical estimation, rate of charge output from charging stations or driver opt-in based on maximum charge needed.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will result in the ratepayer benefits of greater electricity reliability and lower or deferred costs in upgrading local distribution infrastructure by providing a mechanism for demand management for local distribution networks, specifically managing PEV charging with input from PEV customers, vehicles, and utility signals.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Smart grid: R.08-12-009

Applicable Metrics: CPUC Metrics- 1g, 1h, 3f, 4a, 4b, 5b

Lower Costs:

This project will result in lower costs for customers and utilities as customers will be able to optimize their PEV charging through demand management.

Greater Reliability:

The methodology developed under this project will assess and test the real time potential for residential smart chargers to respond to utility signaling to support grid stabilization.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $139,418	
EPIC Funds Encumbered: $1,500,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: ChargePoint, Inc.: $142,500 (8.7 %)		**Match Funding:** $142,500	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 25 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-078 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

ChargePoint completed the development of the communication interface and testing protocols to enable level 2 alternating current chargers to exchange data and control messages with plug-in electric vehicles. The network simulation and pilot testing research test plan has been completed. ChargePoint will begin screening for qualified testing participants and EVSE installers. ISO/IEC 15118 testing and hardware integration will continue.

79. EPC-14-079

Project Name:

Assessing the Ability of Smart Inverters and Smart Consumer Devices to Enable more Residential Solar Energy

[EPC-14-079]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S3: Develop Innovative Technologies, Tools, and Strategies to Make Distributed Generation More Affordable

Issue:

One of the most prominent limiting factors for solar generation on California distribution systems occurs when multiple PV systems are installed behind a single distribution transformer. Limitations have already occurred in which consumers were not permitted to add solar, or inverters experienced shutdown due to local overvoltage conditions. It is not known whether multiple inverters can operate side-by-side in stable conditions when each one is performing smart-inverter functions. High PV penetration on the feeder and the voltage profile may be fine, but local over-voltage, variability, and equipment stress occurs on the customer side, limiting PV deployments and production.

Project Description:

The purpose of this project is to resolve the limiting conditions that occur on California distribution systems when many PV systems are installed behind a single residential distribution transformer by evaluating advanced inverter functionality with specific goal of enabling higher penetration of photovoltaic on the grid. The project will identify, implement, and test (both in lab and field) optimal methods by which smart inverters can mitigate the issues that otherwise would limit local high penetrations of residential PV. The process will identify how California Rule 21 functions can be used and configured so that multiple smart inverters work in harmony (supporting one another actions) and will also identify how other naturally-occurring consumer devices, such as electric vehicle chargers and other smart loads, can serve to further enable high-levels of solar PV.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

A key benefit of this project to California IOU ratepayers is to find the upper limits of solar PV hosting that may be achieved using smart inverters and naturally occurring products, thereby providing insight into the necessity and timing in which such additional DER devices may be required in addition to lower costs and greater electricity reliability.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Distribution Level Interconnection (Rule 21): R.11-09-011 Smart Inverter: D.14-12-035 (in R.11-09-011) Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1b, 3d, 4a, 5a, 5b

Lower Costs:

The use of smart inverter functions, together with smart (PV-optimized) behavior of loads, can increase production (KWh) of residential systems by 15%. For an affected consumer on a constrained distribution circuit, this means more annual savings.

Greater Reliability:

The multi-inverter interaction testing and evaluation of smart inverter functions and smart management of consumer loads under this projects can minimize stress on grid equipment and will further improve reliability.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $400,537
EPIC Funds Encumbered: $1,705,478	**EPIC Funds Spent:** $61,236
Match Partner and Funding Split: Electric Power Research Institute, Inc.: $149,452 (5.8 %) Underwriters Laboratories, Inc.: $78,174 (3.0 %) Southern California Edison Advanced Technology Organization: $260,000 (10.0 %) Intwine Connect: $107,758 (4.1 %) ClipperCreek, INC.: $66,480 (2.6 %) Sacramento Municipal Utility District: $156,000 (6.0 %) Pentair: $50,000 (1.9 %) Emerson Climate Technologies: $8,550 (0.3 %) A. O. Smith Corporate Technology Center: $15,000 (0.6 %)	**Match Funding:** $891,414
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 27 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 11

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-079 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

As of October 2016, subcontract with SCE was complete; however, UL and SMUD subcontracts are both delayed in their respective legal departments. The Intwine's testing lab is fully equipped with the four DER devices required to be tested. A fully-distributed load-coordinating algorithm aimed at coordinating loads with expected solar PV output was developed and under review for implementation. The late adoption of UL 1741SA requirements is delaying availability of conforming inverters. Participating utility partners will require UL certification before the inverters can be placed in residences for the field trials. This may delay selection and commitment of field trial locations.

80. EPC-14-080

Project Name:

Renewable Microgrid for a Medical Center

[EPC-14-080]

Recipient/Contractor:

Charge Bliss, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/17/2015 to 3/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California needs to make better use of locally available renewable energy to increase resiliency and address climate change impacts such as increased fires, severe storms, and heatwaves. Critical facilities are especially vulnerable to climate change impacts that disrupt the normal delivery of energy needed for their operation. A demonstration of a renewable-based microgrid at a hospital will develop a case study to assess their ability to support hospital operations, and convince the Office of Statewide Health Planning and Development to allow microgrids for hospitals.

Project Description:

This project consists of a full-scale demonstration of a renewable-based microgrid for a hospital. The microgrid consists of a solar photovoltaic array, battery energy storage, and a microgrid controller integrated with an existing combined heat and power system. The microgrid will provide at least three hours of power during a utility outage and will also use automated demand response to reduce electrical demand.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The microgrid will demonstrate reduced electrical system downtime for the hospital in critical areas. The microgrid and controller will showcase reduced greenhouse gas emissions, reduced electrical demand, save direct energy costs, and provide grid support.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1e, 1h, 2a, 3f, 4a, 5a, 5f, 5h

Lower Costs:

This project expects to save $141,000 per year in direct energy costs for the site owner (997,000 kWh/yr x $0.1418/kWh) and create efficiencies in both usage and demand (automated demand response).

Greater Reliability:

This microgrid plans to increase electric reliability by participating in the CA Independent System Operator's fast power quality regulation to mitigate large power quality fluctuations. A 250 kW output from the microgrid could mitigate up to a 6 MW oscillation in the larger grid.

Environmental Benefits:

The microgrid plans to provide environmental benefits by attempting to reduce greenhouse gas emissions by 263 tons of carbon dioxide per year (997,000 kWh/yr x 0.5888 lbs/kWh) through the use of renewables.

Public Health:

The microgrid will be designed to provide at least three hours of power during a utility outage for critical hospital facilities that are essential during mass casualties or illnesses.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $729,842
Distribution	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$4,776,171	$2,138,839
Match Partner and Funding Split:	**Match Funding:**
OSISoft, LLC: $1,119,560 (16.3 %) Kaiser Permanente Medical Center: $576,275 (8.4 %) Princeton Power Systems, Inc.: $400,000 (5.8 %)	$2,095,835
Leverage Contributors:	**Leveraged Funds:**
None	$0

Funding Method:	**Funding Mechanism:**	**No. of Initial Passing Applicants/ Bidders:**	**Rank of Selected Applicant/ Bidder:**
Competitive	Grant	31 out of 40 bidders	Ranked # 11

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-080 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The Charge Bliss renewable energy microgrid for a hospital was designed to demonstrate the feasibility, safety, and efficacy of these systems in a highly constrained environment and to design a novel microgrid controller. Working with diverse stakeholders from a large healthcare organization to several oversight entities (OSHPD, PG&E, and the City of Richmond) and a comprehensive team of designers, Charge Bliss has completed all systems engineering, obtained all necessary permits, and initiated construction. Controller design is slated to begin in December 2017 with completion expected by early Second Quarter 2017. Microgrid system commissioning is planned for First Quarter 2017.

81. EPC-14-081

Project Name:

Irrigation Optimization and Well Pump Monitoring to Reduce Energy and Water Consumption [EPC-14-081]

Recipient/Contractor:

PowWow Energy, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/15/2015 to 4/1/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Annual electricity used to supply water to farms is estimated to be 10 TWh per year, or about 4% of California's total electricity usage. This usage increases significantly in drought years due to the need to pump water from increasingly deeper wells. In 2014, California growers extracted an estimated additional 5 million acre-feet of groundwater from aquifers to compensate for the lack of surface water and rain, resulting in an additional $454 million of energy costs for water pumping. This usage of groundwater is not sustainable, and resulted in the Governor signing a law (SB1168) to require growers to monitor groundwater extraction.

Project Description:

This project is demonstrating a software tool that links groundwater extraction with smart meter data to provide growers with automated information on energy and water consumption. This data is augmented by weather data and optional soil moisture data from local sensors to provide information to growers regarding irrigation needs. Use of the software program could help inform growers and reduce irrigation while maintaining or optimizing yield. This technology is being applied over 1,000 acres of farms owned by several growers of alfalfa, tomato, pistachios and almonds.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The deployment of this technology will result in energy savings of approximately 20 percent due to reduction in pumping energy. For the affected demonstration farms, this could annually save approximately 400,000 kWh and 1,000 Acre-feet of water.

CPUC Proceedings addressing issues related to this EPIC project:

Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11 Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 4c

Lower Costs:

Supplying water for on-farm irrigation is an energy intensive task (especially for groundwater pumped from wells) that results in a large expense for growers. This technology could lower electricity costs associated with water pumping for farms. Additionally, optimized irrigation may reduce water use and could increase crop yield.

Environmental Benefits:

Reduction in energy use will result in reductions in greenhouse gas emissions. Reduction in water use will lessen the impact on ground water pumping and issues associated with subsidence, especially in the Central Valley.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $332,162	
EPIC Funds Encumbered: $2,292,829		**EPIC Funds Spent:** $1,389,517	
Match Partner and Funding Split: UC Santa Barbara: $83,401 (2.9 %) UC Davis: $83,469 (3.0 %) PowWow Energy, Inc.: $368,698 (13.0 %)		**Match Funding:** $535,568	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-081 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The Recipient has begun deploying the software (and hardware) at each deployment site and engaging the growers to optimize their irrigation plans for the year based on crop needs. Two field days were held in 2016 to demonstrate the technology to farmers and other interested parties.			

82. EPC-14-082

Project Name:

Advancing Biomass Combined Heat and Power Technology to Support Rural California, the Environment, and the Electrical Grid
[EPC-14-082]

Recipient/Contractor:

Sierra Institute for Community and Environment

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	7/10/2015 to 7/31/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

Communities in the colder high Sierra regions of California often experience peak electrical loads during the winter due to a reliance on electric resistance heating, heat pumps with poor performance, and fuel switching from oil and propane to electricity when fossil fuel prices spike. These regions are also prone to catastrophic wildfires due to overstocked forests that exacerbate drought conditions. Electric and thermal energy from forest biomass clearing operations offer a unique opportunity to reduce peak loads using local renewable resources.

Project Description:

This project will deploy a biomass-fired combined heat and power system to provide heat and power to Plumas County health facilities and to dormitories at Feather River College. Biomass from local forest clearing operations will be used by a new biomass boiler to supply heat to an Organic Rankine Cycle (ORC) power unit. Waste heat from the ORC will be piped to all buildings to provide source heat for heat pumps, improving their performance for the winter heating season. New heat pumps will be deployed in dormitories to replace existing propane/electric resistance heaters.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will result in greater electricity reliability, lower costs, and increased safety by decreasing peak demand. Reducing electricity consumption at peak and off-peak times at a public facility will lower costs to ratepayers locally and on the grid in general. Reducing risk of catastrophic wildfire in a fire-prone and drought-stricken region will increase safety. Wildfires can affect infrastructure such as electric transmission lines, as well as threatening human life and safety.

CPUC Proceedings addressing issues related to this EPIC project:

SB 1122 Bioenergy feed-in tariff: R.11-05-005 Combined heat and power: D.10-12-035., R.08-06-024.

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 4b

Greater Reliability:

Electricity reliability will be enhanced by decreasing consumption of grid electricity during winter peak periods.

Increase Safety:

Safety will be improved by reducing both the risk and destructiveness of wildfires in forest communities.

Environmental Benefits:

Burning biomass in a controlled setting rather than in the field will result in fewer pollutants (CO2, NOx, VOC and CO) being released into the environment.

Energy Security:

Energy security is enhanced by deploying a source of distributed electricity that will reduce load on the local grid.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $262,813	
EPIC Funds Encumbered: $2,603,228		**EPIC Funds Spent:** $246,343	
Match Partner and Funding Split: Plumas County: $400,000 (12.3 %) Feather River College: $247,400 (7.6 %) Sierra Institute for Community and Environment: $5,000 (0.2 %)		**Match Funding:** $652,400	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 16 out of 22 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-082 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project construction is delayed due to feedback from qualifying bid package responders, which showed current planned work is too costly for a general contractor to take on. Currently, the team is performing value engineering on the project and is exploring other contracting strategies to stay within budgeted amounts. Construction is being pushed back to March 2017 or later pending resolution and subsequent approval of the approach by the Energy Commission.

83. EPC-14-083

Project Name:

College of San Mateo Internet of Energy

[EPC-14-083]

Recipient/Contractor:

Prospect Silicon Valley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/29/2015 to 9/30/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

As the California grid continues to increase intermittent renewable generation, approaches are needed to solve critical issues of grid stability and efficient utilization of distributed energy resources. Batteries can provide dispatchable load-following power to address some of these issues. However, current battery storage technologies are not cost competitive with conventional generation sources and have limited deployment, which leads to potential risks. Other mitigation strategies, such as demand response and load shifting, are growing but still limited and largely uncoordinated across assets, limiting the effectiveness thus far.

Project Description:

This project aims to demonstrate an integrated solar PV, energy storage, and advanced power electronics within a single module to significantly increase overall efficiencies by minimizing conversion losses. The demonstration will include the integration of a 250 kW pre-commercial high-yield PV system from Flex, a 500 kWh stationary battery energy storage system, and advanced HVAC system and controls, with advanced energy management system that uses the Internet of Energy concept to optimize performance of distributed energy resources and the local grid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will offer immediate benefits to the College of San Mateo campus by saving a projected 10% reduction in utility demand charges for the campus in addition to saving another 8% in energy charges from peak demand reduction and efficient energy management measures. In addition, the PV and energy storage system will be designed in a modular fashion by housing the Energy Storage System and Power Conversion System in a standard 20-foot container enclosure that is being productized to dramatically reduce balance of system costs. The system will also capture significantly more energy than a traditional solar module over the course of a year (up to 25% more energy).

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Demand Response (DR): R.13-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1b, 1c, 1e, 1f, 1h, 1i, 2a, 3a, 3c, 4a

Lower Costs:

The integrate PV-storage system is projected to produce as much as 25% more energy over a traditional PV system with storage, while reducing power loss 12% and reducing installed costs.

Greater Reliability:

Energy storage is a key component to maintain reliability in microgrids and community-based energy generation/management systems. This project will reduce the relative costs of maintaining that reliability by reducing the relative costs of storage.

Environmental Benefits:

The additional energy generation and energy savings expected from this integrated PV-storage system compared to traditional PV and energy storage system will translate to greenhouse gas emissions associated with the replaced grid-purchase power.

Energy Security:

This system will enable energy security by enabling reliable power with PV and energy storage, while reducing overall costs and increasing total system efficiency.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $411,350
EPIC Funds Encumbered: $2,999,601	**EPIC Funds Spent:** $60,138
Match Partner and Funding Split: San Mateo County Community College District: $1,200,000 (28.3 %) Growing Energy Labs, Inc.: $35,000 (0.8 %)	**Match Funding:** $1,235,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 16 out of 22 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-083 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

An amendment to the agreement, adding a new subcontractor and modifying the scope of work and budget, was approved at the November 9, 2016, business meeting and fully executed on November 22, 2016. The project team is finalizing the procurement approach, putting together a preliminary "Basis of Design" which will detail the project hardware and configuration for use to inform the construction partner, and is beginning the subcontracting process.

84. EPC-14-084

Project Name:

ABEC #4 Renewable Combined Heat and Power Project

[EPC-14-084]

Recipient/Contractor:

ABEC #4 LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

California has had a lack of success in the dairy biogas industry. Issues include permitting obstacles and complexities, high environmental compliance costs, lack of long-term economic power purchase agreements, high financing risk and costs, and little commercialization of the industry. Further, dairy farmers typically are not experienced in building and operating digesters and generation systems. Combined Heat and Power (CHP) has the potential to increase dairy farm energy efficiency and reduce peak demand and dairy operation electricity costs. Projects demonstrating how dairies can benefit from CHP are critical to the success of future dairy digester-to-electricity projects.

Project Description:

The project will use biogas derived from on-site dairy manure to generate low-carbon, renewable electricity and achieve high overall efficiency by capturing waste heat from the power generation system, and using it to drive an absorption chiller. The absorption chiller will convert waste heat into chilling capacity, which will be used to chill milk produced by the dairy cows. New absorption chiller capacity will directly offset electricity consumption from existing electric chillers. Combining renewable generation with waste heat collection and cooling, the project will increase energy efficiency of the existing dairy by an estimated 10% or more, while also reducing peak grid power demand. The project will represent a significant advance in dairy energy management. Other project benefits include substantial reductions in greenhouse gas emissions, lowering of manure handling costs, and generation and distribution of technical and economic data on community scale power production.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Combining renewable generation with waste heat collection and cooling, the project will increase energy efficiency of the existing dairy by an estimated 10% or more, while also reducing peak grid power demand. The project benefits include substantial reductions in greenhouse gas emissions, lower manure handling costs, and provide technical and economic data on community-scale biopower production.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 SB 1122 Bioenergy feed-in tariff: R.11-05-005

Applicable Metrics: CPUC Metrics- 3a, 4a, 4e

Greater Reliability:

The project aims to provide greater reliability during peaking periods due to reduced peaking power demand on site, increased peak-power-period generation potential, and possible implementation of demand response.

Environmental Benefits:

The project supports implementation of California's statutory energy and GHG management goals and targets through the incremental deployment of new renewable power generation capacity and the capture and destruction of methane. The double-lined lagoon enhances groundwater protection by minimizing leaching of manure into groundwater.

Consumer Appeal:

The project will improve odor control, through hydrogen sulfide removal, an issue important to the dairy employees and benefits the local community.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $3,000,000		**EPIC Funds Spent:** $907,161	
Match Partner and Funding Split: ABEC #4 LLC CE&S Dairy Biogas: $4,983,619 (62.4 %)		**Match Funding:** $4,983,619	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 16 out of 22 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-084 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Proprietary designs, processes, expertise and operational procedures include, for example, developed digester systems to support gas storage, energy storage, flexible liquid and gas volumes, co-digestates, clustered generator configurations, H2S reduction, improved effluent value, farmer savings, use of waste heat via absorption chillers to cool milk, and integration with fuel programs.

Update:

There was a Technical Advisory Committee (TAC) meeting in March 2016 and a Critical Project Review (CPR) meeting in August 2016. The project is progressing and broke ground fall 2016. Monthly invoicing and progress reports are being submitted and the project is expected to complete as planned.

85. EPC-14-085

Project Name:

Demonstration of Community Scale Low Cost Highly Efficient PV and Energy Management System

[EPC-14-085]

Recipient/Contractor:

The Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2015 to 9/28/2018

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S13: Demonstrate and Evaluate Emerging Clean Energy Generation Technologies and Deployment Strategies

Issue:

The intermittent nature of solar energy generation requires special attention when connecting to the grid. Critical issues include the grid instability of the distributed energy resources, and imbalance between energy demand and production, especially during periods of overgeneration. Although energy storage has the potential to serve multiple valuable functions in a microgrid setting, it is currently a very expensive resource because it is generally in the early stages of technology development. Renewable-based microgrids also require a reliable control system since they have insufficient inertia to dampen disturbances from distributed generation.

Project Description:

This project will demonstrate that the combination of advanced PV generation and an energy management system can reduce the community's average daily power and daily peak energy demand by more than 10%. The project includes a smart electrical energy storage system that integrates retired electric vehicle batteries. The generator and storage system will be controlled by a commercial-grade microgrid controller, with the three levels of hierarchy. The demonstration site is located in the Robert Mondavi Institute at the UC Davis campus.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will result in an estimated reduction in annual electricity consumption of up to 87% (at least greater than 10%), for a cost savings of roughly $29,000 per year and associated greenhouse gas reductions of up to 253 tons per year. Furthermore, the success of this project will provide follow-on benefits to California's large wine industry by proving that winemaking can be an environmentally-friendly process.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Smart grid: R.08-12-009 Smart Inverter: D.14-12-035 (in R.11-09-011) Demand Response (DR): R.13-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1b, 1e, 1f, 1h, 2a, 3b, 4a

Lower Costs:

The project aims to reduce the high costs of energy storage by using second-life electric vehicle batteries and an advanced energy management system.

Economic Development:

Proving the concept of a high-penetration renewable microgrid at the Robert Mondavi Institute is expected to lead to adoption of similar concepts at a number of vineyards and breweries across California.

Consumer Appeal:

California's wine and brewery market represents a significant market. The Robert Mondavi institute is generally considered a leader in this area, and if this concept is demonstrated successfully at this site, it is expected to be adopted elsewhere.

Energy Security:

This project will increase energy security on the UC Davis campus by enabling a microgrid with the potential to function during outages of the larger grid.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $124,883	
EPIC Funds Encumbered: $1,238,491		**EPIC Funds Spent:** $18,284	
Match Partner and Funding Split: Solexel: $12,000 (0.6 %) UC Davis: $167,262 (8.8 %) OSISoft, LLC: $479,467 (25.3 %)		**Match Funding:** $658,729	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 16 out of 22 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-14-085 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project has now developed a program to optimize the matching of similar battery modules and is being tested and improved. The assembly production guide was updated to reflect the minor design changes to improve maintainability and reduce assembly time. The project also has now tested 853 battery modules. The technical requirements for the solar-battery hybrid inverters were reviewed and approved. However, the installation of the Pre-commercial PV panels was delayed. The project PV subcontractor, Solexel, is no longer manufacturing the type of solar panels that are suitable for the demonstration building's roof. Selection to replace Solexel is underway.

86. EPC-14-086

Project Name:

Distribution System Aware Vehicle to Grid Services for Improved Grid Stability and Reliability [EPC-14-086]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	8/1/2015 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S9: Advance Technologies and Strategies That Optimize the Benefits of Plug in Electric Vehicles to the Electricity System

Issue:

Several barriers must be overcome for plug-in electric vehicles to become viable distributed energy resources, including inconsistent data communication approaches among PEVs, a lack of situational awareness of the PEVs relative to grid state, fragmented technology and standards preventing interoperability and inclusion of vehicle-to-grid (V2G) resources into applicable distribution and independent system operator grid services related programs. In addition, there is limited availability of on- or off-vehicle V2G systems on scale from original equipment manufacturers (OEMs) because OEMs do not see their value to end customers.

Project Description:

The project will develop an integrated vehicle-to-grid (V2G) system that can be tested and demonstrated to be distribution-aware, self-regulating, interoperable, secure and open as well as scalable and flexible. These real-world tests and demonstrations will provide confidence in the V2G systems that provide grid support functions and possibly influence investor owned utilities (IOUs) to add them to their Assembly Bill 2514 Storage Mandate compliance plans. The data gathered will also enable validation of cost effectiveness models through direct engagement with the IOUs' existing infrastructure and distribution networks, combined with simulated independent system operator interaction.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Plug-in electric vehicles with integrated vehicle-to-grid systems have the potential to simultaneously improve air quality, reduce vehicle operational costs and have the potential to reduce grid stress and increase grid reliability and stability.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Smart grid: R.08-12-009

Applicable Metrics: CPUC Metrics- 1c, 1e, 3f

Lower Costs:

IOUs can ensure cost effectiveness by applying the gathered data on the V2G system for proper distribution of energy on the grid.

Greater Reliability:

Vehicle to grid technologies provide ancillary support to the grid during gaps in service and when addressing renewable generation intermittency.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $666,988	
EPIC Funds Encumbered: $1,499,977		**EPIC Funds Spent:** $288,832	
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $795,754 (53.1 %)		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 25 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-14-086 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: EPRI is developing an end-to-end capable V2G system that demonstrates grid condition awareness in a safe and outage-immune method. The project has developed the system requirements, architecture, and design parameters as well as the test protocols for the proposed V2G communication system that factors in grid conditions and user mobility needs. The technical parameters and protocols set the framework and capabilities for the EPRI V2G system. EPRI has also completed implementation of SEP2 into the transformer monitoring system that meters grid conditions to better enable aggregating PEVs for more efficient charging and discharging.			

87. EPC-14-088

Project Name:

Demonstration of Low-Cost Liquid Cooling Technology for Data Centers

[EPC-14-088]

Recipient/Contractor:

Asetek USA, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/13/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Data centers consume a disproportionate amount of electricity in California. As traditional building efficiency improves, data centers continue to grow in size and power. Approximately 40% of the electricity used in data centers is used for cooling. Since California is home to many data centers, improving data center cooling efficiency represents one of the major energy efficiency measures for this sector.

Project Description:

This project will validate the performance, reliability, cost savings and payback of a data center efficiency technology that uses direct-to-chip liquid-cooling to cut data center cooling energy use. The technology will be demonstrated at two full scale data centers and the deployment will occur with minimal operational disruptions during installation. Energy consumption, load, reliability and server performance will be monitored. The results of the demonstrations, along with "lessons learned", will be made broadly available to the data center community and public-policy makers to stimulate adoption of this technology.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, the project would validate the performance, reliability, cost savings and payback of a data center efficiency technology that could reduce cooling costs while being able to be installed as a retrofit. This could lead to overcoming barriers to adoption by minimizing operational disruptions and costs compared with conventional installations and retrofits.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

This technology could reduce electricity use and cost for cooling data centers.

Environmental Benefits:

The reduction of statewide data center annual energy consumption could result in significant GHG savings.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $1,038,931
Demand-side Management	

<table>
<tr><td colspan="2">EPIC Funds Encumbered:
$3,552,678</td><td colspan="2">EPIC Funds Spent:
$1,111,806</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
Asetek USA, Inc.: $303,726 (6.0 %)
Lawrence Livermore National Laboratory: $1,216,012 (24.0 %)</td><td colspan="2">Match Funding:
$1,519,738</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
Phase1:
14 out of 46 bidders
Phase 2:
10 out of 13 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 3</td></tr>
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Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-14-088 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
One of the project sites has been changed from UC San Diego to Lawrence Berkeley National Laboratories (LBNL). The contractor has completed the retrofits at Lawrence Livermore National Laboratories and testing has begun. At LBNL, facility preparation and pre-installation monitoring systems have been completed and facility design is starting.</td></tr>
</table>

88. EPC-15-003

Project Name:

Demonstration of Community Scale Generation System at the Chemehuevi Community Center [EPC-15-003]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Riverside Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	10/29/2015 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

California's electricity grid is undergoing significant changes. With major reductions in the cost of solar, customers are choosing distributed generation to meet their electricity needs. All these developments are crucial for California to meet its AB 32 goals, but they come with a number of challenges such as supply uncertainty, changing demand patterns, continual increase in energy consumption and ramping demands. New solutions will be required for the future electricity grid to continue providing reliable and cost effective electricity.

Project Description:

This project will deploy and demonstrate a community energy generation system at the Chemehuevi Indian Tribe Community Center. The energy system will incorporate two pre-commercial solar technologies with flow-battery energy storage integrated with energy management system. The integration of the energy management system components will reduce peak energy demand for the center by utilizing battery storage to shift building and community loads and provides an uninterruptable power for the center when it is used as an Emergency Response Center for the tribe.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This system will result in greater electricity reliability, lower electricity costs, reduced peak energy demand and avoidance of failures and outages. The project is scalable in both size and quantity. Therefore, this effort will demonstrate the commercial feasibility to deploy many megawatt hours of dispatchable energy integrated in a photovoltaic/battery storage configuration.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Demand Response (DR): R.13-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1e, 1g, 1h, 3f, 4a

Lower Costs:

The system is designed to lower the kW demand by more than 10 percent of the daily average energy demand during peak times. This will result in a reduction of costs associated with procuring additional energy during periods of peak demand.

Greater Reliability:

Greater electricity reliability is achieved by managing energy use associated with PV generation and battery storage during daily energy use profiles. This will reduce failures and outages associated with demand response.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $525,157
EPIC Funds Encumbered: $2,588,906	**EPIC Funds Spent:** $241,307
Match Partner and Funding Split: The Regents of the University of California - Riverside: $77,451 (2.4 %) OSISoft, LLC: $479,467 (14.5 %) Primus Power: $21,780 (0.7 %) Chemehuevi Indian Tribe: $91,000 (2.8 %) Solexel: $12,000 (0.4 %) SunPower Systems: $25,000 (0.8 %)	**Match Funding:** $706,698
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 16 out of 22 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-003 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

As of September 2016, UC Riverside secured Chemehuevi Tribe Council and Executive Committee approval to pay for the carport structure which was not previously budgeted. Discussions are still underway to finalize subcontracts and MOUs with all industry partners (SunPower, Solaire, EnSync, Masters Electric, GRID Alternatives, and local contractors). The researchers performed solar generation simulations for the proposed 90 kW solar carport system and prepared initial recommendations for implementing energy strategies. The project is on schedule and under budget.

89. EPC-15-004

Project Name:

Climate appropriate HVAC Systems for Commercial Buildings to Reduce Energy Use and Demand

[EPC-15-004]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	8/3/2015 to 12/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Cooling and heating buildings contribute to a large portion of the electricity bills for California ratepayers. Traditional heating, ventilating and air conditioning (HVAC) systems waste energy. Innovations in HVAC systems, such as variable refrigerant flow and advanced indirect evaporative cooling systems are well suited for California climates. However the full potential of these innovations has not been realized.

Project Description:

This project will develop and demonstrate a Climate Appropriate Air Conditioning system for commercial buildings. The heart of this system is an intelligent HVAC controller that processes signals from building sensors and system feed-back to maximize system efficiency. This control system will manage two technologies to optimize building energy and peak demand reduction. Getting fresh air into commercial buildings is a code requirement. However, the ingress of hot air into a cooling system and vice versa presents an inefficiency problem. This project will evaluate heat-recovery ventilation (HRV) and indirect evaporative cooling (IEC) to decrease the temperature of the incoming air in the summer and increase it in the winter. Both technologies can be intelligently controlled by the building controller to reduce cooling and heating costs. This project will also research low global warming refrigerants for commercial buildings.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will benefit small and medium commercial buildings, such as retail stores, offices buildings and food service. It is estimated that the HVAC systems for these sectors use 7,000 GWh and contributes 5 GW of peak demand. This project could reduce HVAC energy consumption and peak demand by as much as 40 percent and could be implemented in existing and new commercial buildings through direct replacement of rooftop packaged air conditioners.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

This project could reduce electricity use for HVAC systems. This could mean lower energy costs for commercial building owners or occupants that pay utility bills.

Environmental Benefits:

This project could reduce electricity use in HVAC systems which could reduce greenhouse gas emissions.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,088,673
EPIC Funds Encumbered: $2,834,721	**EPIC Funds Spent:** $63,512
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $440,509 (13.4 %)	**Match Funding:** $440,509
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-004 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Recipient is reviewing Southern California locations for a second demonstration site with assistance from SCE, SDG&E, equipment vendors, and commercial HVAC contractors. As of late October 2016, a potential second demonstration site was identified in Chula Vista. Subcontractor, Western Cooling Efficiency Center, continues to work on the ventilation and variable refrigerant flow (VRF) system using the EnergyPlus model for the Northern California demonstration site.

90. EPC-15-005

Project Name:

Potential Impacts and Adaptation Options for the Electricity System from Sea Level Rise in the San Diego Area.

[EPC-15-005]

Recipient/Contractor:

ICF Incorporated, L.L.C.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	12/4/2015 to 5/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Sea-level rise (SLR) presents a critical threat to California's low-lying coastal areas and the energy infrastructure located there. The reliability of California's electricity service could be threatened by either permanent inundation from SLR, or through temporary coastal flooding events that cause disruptions to generation, transmission and distribution.

Project Description:

The project evaluates SLR vulnerability and adaptation options at a level of detail appropriate for informing electricity sector policy and planning. ICF International is partnering with SDG&E to conduct a detailed, robust, sea level rise vulnerability assessment and to identify and evaluate appropriate adaptation measures. Detailed sea level rise inundation modeling that builds on previous studies is used to identify the SDG&E infrastructure that will be exposed to coastal flooding, and assess how the electricity system could be affected. Impacts of coastal inundation, and possible adaptation measures, are determined using literature reviews, interviews with key experts, modeling and workshop elicitation. Potential direct and indirect impacts are used at an asset-by-asset level, and through system-wide assessment, including power flow modeling to support Value of Lost Load analysis.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will identify adaptation measures for electrical system that are practical and aligned with existing policies, based on a comprehensive understanding of the vulnerabilities of specific assets and how these combine at a system level. This work will further the state of knowledge by employing improved modeling techniques that take into account protective structures and coastal processes.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 5a, 5d

Greater Reliability:

This project is expected to result in the greater electricity reliability and lower costs by establishing a better understanding of vulnerabilities and adaptation measures for the electrical system that benefit SDG&E, the San Diego area, as well as other IOUs in California and the United States.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $240,425	
EPIC Funds Encumbered: $499,929		**EPIC Funds Spent:** $150,666	
Match Partner and Funding Split: San Diego Gas & Electric Company: $166,200 (25.0 %)		**Match Funding:** $166,200	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-005 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: Partnering with SDG&E, the recipient has completed the foundational literature review and expert interviews to ensure the project is built on the latest research. The recipient reviewed previous sea level rise (SLR) modeling efforts and explored SLR scenarios in San Diego region. Working closely with SDG&E, the research team collected information on specific infrastructure assets and operations. A matrix that list asset and electricity service categories is developed. Research team also collected information on electric system adaptation measures that have already been identified or considered. The results are presented in a technical memorandum to the Energy Commission.			

91. EPC-15-006

Project Name:

Modeling the Impact of Wildfires on California's Transmission and Distribution Grid

[EPC-15-006]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	11/1/2015 to 6/1/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Climate projections indicate longer, warmer dry seasons in California, thus increasing the risk of large wildfires. Previous research funded by the Energy Commission established that some climate change scenarios could cause a substantial increase in exposure of major existing transmission lines to wildfire, but the vulnerability of distribution circuits has yet to be investigated. Research is needed to extend this previous assessment of vulnerability of the transmission system in California to include the distribution system.

Project Description:

This study will advance scientific knowledge by combining and enhancing several state-of-the-art models to produce the most detailed analysis to-date of California's future electric grid and fire risk under alternative conditions of climate change and grid evolution, including changes in the use of demand response, renewables, and distributed generation.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will lead to technological advancement and breakthroughs to overcome barriers to the achievement of California's statutory energy goals--namely to maintain grid reliability and safety while adapting to the challenge of changing climate and wildfire risk. Researchers will apply a unique methodology to measure wildfire risk, allowing them to match an evolving wildfire probability over time with an evolving electricity grid.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 2a, 5a, 5d

Lower Costs:

The study will use modeling to minimize the cost of maintaining a reliable electricity supply in the face of increased wildfire risk.

Greater Reliability:

The study is designed to increase reliability and the capacity of the electricity system to respond to increasing climate change-related wildfire risk. The project will explore adaptation strategies for minimizing impacts of wildfire, including well-designed transmission and distribution system paths and better located generation assets.

Increase Safety:

Greater ratepayer safety follows from improved electricity system reliability because that reduces the potential hazards associated with power outages, such as public health and operations of critical facilities.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $169,786
EPIC Funds Encumbered: $500,000	**EPIC Funds Spent:** $150,000
Match Partner and Funding Split: University of Hawaii at Manoa: $17,157 (3.3 %)	**Match Funding:** $17,157
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-006 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The researchers have been refining their methodology and begun conducting preliminary analyses while working to acquire final data on outages and fire risk.

92. EPC-15-007

Project Name:

Climate Change in Los Angeles County: Grid Vulnerability to Extreme Heat

[EPC-15-007]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	12/1/2015 to 9/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Because Los Angeles County is such a geographically diverse region, the impacts of climate change will be experienced differently across neighborhoods. Understanding the localized effects of climate change and the impacts on communities has been difficult to assess. Research predicts the Los Angeles region will be warmer by 3-5 degrees F annually by mid-century, and will have an increase in the number of "extreme heat days" varying regionally, with some cities experiencing up to 5-6 times their current levels. What is still unknown however, and what remains to be studied, is how and where these increases in temperature will impact the electric grid.

Project Description:

This project is developing a sophisticated and in depth description of future electric grid demand, response, and vulnerability due to increased (and prolonged) heat events in Southern California Edison territory under current and future climate scenarios. It will enable innovative grid management and operation strategies and will identify adaptation guidance. Ultimately, researchers will provide the information to local governments, regional and state agencies, utilities, and the general public in tangible, easy-to-understand formats to enhance local and state capacity to respond to potential disruptions in transmission due to climate change.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Local and regional governments and utilities will gain an understanding of the capacity of substations and transmission lines and how those capacities might be impacted by extreme heat events. Doing so will create a greater level of understanding on where the grid is most vulnerable, which neighborhoods they serve, and what types of adaptation measures need to be taken by the utility as well as state, regional, and local actors. It can equally help guide investments in distributed generation.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 1e, 5a, 5d

Lower Costs:

The study will provide information to support decisions that would result in lowered costs for ratepayers, by providing utilities and policymakers with further information on where and how they can prioritize investments in the grid moving forward.

Greater Reliability:

By evaluating the vulnerability of critical substations and transmission lines during future projected heat scenarios, the study will identify problem spots in the grid in Los Angeles County. This is turn will provide a greater understanding to the utilities of localized risk, such that they can plan for a more reliable energy system.

Increase Safety:

Identifying grid vulnerabilities can help utilities and decision-makers better plan for potential outages, and resultant ratepayer safety risks. As this analysis will be mapped out geographically, it will facilitate the identification of and planning for those ratepayer communities at greatest risk.

Public Health:

Extreme heat events can worsen numerous health problems, which can be exacerbated by grid outages. This project will identify vulnerable segments of the grid to guide decisions about adaptation measures to minimize these health risks.

Assignment to Value Chain: Distribution		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $500,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: The Regents of the University of California, Los Angeles: $168,753 (24.7 %) County of Los Angeles: $15,000 (2.2 %)		**Match Funding:** $183,753	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 12 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-007 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The research team has modeled temperature projections to the end of the century for Los Angeles County and extracted data on the increased number of extreme heat days for each 2km grid cell. They are developing their model relating monthly energy usage at the building level to temperature and building characteristics. They are beginning to develop a model of peak demand in response to increased air conditioning load due to climate change. The team is also planning an extensive outreach effort to inform utilities, local governments, and ratepayers.

93. EPC-15-008

Project Name:

Visualizing Climate-Related Risks to the Electricity System using Cal-Adapt

[EPC-15-008]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	11/16/2015 to 6/28/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

California's electricity system is vulnerable to a variety of weather- and climate-related events, and stakeholders involved in electricity system management, operations, and planning must have timely access to relevant, best available, peer-reviewed data in a form that is easy to understand and useful for timely decision-support.

Project Description:

This project develops a suite of analytical and outreach approaches to provide electricity system stakeholders with actionable data pertaining to local climate risks. The project is organized around three technical tasks. The first is developing interactive, visually compelling, and useful web-based visualization applications depicting climate-related risks to the electricity infrastructure. The second is to build focused toolsets to support planning to protect energy infrastructure. Finally, the project includes outreach and training with energy stakeholders, climate practitioners, planners, managers, educators and ratepayers in the state through targeted workshops, webinars, and presentations.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Cal-Adapt will provide integrated tools that will support planners and managers as they protect and plan for future electricity infrastructure reliability and stability. Such integrated planning will contribute multiple benefits to California's electricity ratepayers by helping to stabilize the grid, improve service reliability, and reduce financial losses associated with power outages.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 5a, 5d

Greater Reliability:

Integrated planning supported by this project will help improve service reliability and reduce financial losses associated with power outages.

Energy Security:

Integrated planning supported by this project will help stabilize the grid.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $74,324
Grid Operations/Market Design	

<table>
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$400,000</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
None</td><td colspan="2">Match Funding:
$0</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
12 out of 13 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 1</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-15-008 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
Since mid-2016, the research team has enhanced a new beta version of Cal-Adapt with an improved tool for visualizing extreme heat (projected future as well as historical observed) and a new visualization tool portraying the most comprehensive, high-resolution, hydrodynamic dataset available for exploring potential inundation associated with sea level rise along entire coast of California as well as the Bay Area and Sacramento/San Joaquin Delta. The Cal-Adapt team also worked to support several aggregation options and to refine its data download options, as requested by the Technical Advisory Committee, which includes all IOUs a POU, and CAISO.</td></tr>
</table>

94. EPC-15-009

Project Name:

Workforce Instruction for Standards and Efficiency (WISE)

[EPC-15-009]

Recipient/Contractor:

California Homebuilding Foundation (CHF)

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	11/30/2015 to 3/31/2020

Program Area and Strategic Objective:

Market Facilitation

S17: Strengthen the Clean Energy Workforce by Creating Tools and Resources that Connect the Clean Energy Industry to the Labor Market

Issue:

California's homebuilding market is emerging from the recession to find that many skilled tradespeople have permanently left the residential construction market. Meanwhile, techniques for constructing high performance attics, walls, and roof assemblies that were once considered "advanced practices" employed by few builders will soon become code requirements for high performance attics and walls. The lack of skilled labor, coupled with increased demand for high-performance insulation techniques, could disrupt the rate of adoption of these measures or lead to poor installation of them. This may result in lower than expected energy savings and construction defects that impose safety risks.

Project Description:

This project will provide education, tools and on-the-job training to homebuilders in California's residential construction market on High Performance Attics (HPAs) and High Performance Walls (HPWs), two new requirements in California's Building Energy Efficiency Standards for 2016. The project will help homebuilders better understand the new requirements and options for compliance, as well as provide technical support to enable the transition to the new requirements. Additionally, the project team will provide on-the-job training to homebuilders, installing trades, subcontractors and field crews on the proper installation of insulation and changes to other building systems that will be necessary to meet the new requirements.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The California Energy Code will soon require new homes to be constructed with high performance walls and attics to meet energy efficiency standards. This project will help overcome market barriers for high-performance walls and attics by providing the construction industry with access to on-the-job training and tools on the best available technologies, techniques, and practices for complying with the new requirements.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1c, 1e, 1f, 1h, 2a, 3c, 4a, 4b

Greater Reliability:

Proper installation of HPAs and HPWs will reduce electricity consumption for air conditioning during peak demand periods.

Increase Safety:

Training will improve safety by ensuring builders follow code-compliant manufacturers' installation guidelines to reduce the risk of construction and structural defects.

Environmental Benefits:

Lower energy consumption for heating and cooling will reduce greenhouse gas emissions and other air pollutants.

Public Health:

Supplemental ventilation training will ensure indoor air quality is unaffected or improved by changes to construction practices.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,667,291
EPIC Funds Encumbered: $4,431,918	**EPIC Funds Spent:** $693,450
Match Partner and Funding Split: APA - Engineered Wood Association: $473,710 (2.4 %) BASF: $990,000 (4.9 %) Bayer Material Science: $1,230,290 (6.1 %) California Building Industry Association (CBIA): $58,110 (0.3 %) Ensoltis Green Hybrid Roofing: $631,600 (3.1 %) KB Home: $3,043,500 (15.1 %) Owens Corning: $2,327,444 (11.6 %) Panasonic Eco Solutions North America: $265,200 (1.3 %) PCBC: $151,200 (0.8 %) QC Manufacturing: $785,220 (3.9 %) Shea Homes: $2,248,622 (11.2 %) SIPA - Structural Insulated Panel Association: $303,000 (1.5 %) SPFA - Spray Polyurethane Foam Alliance: $239,000 (1.2 %) Taylor Morrison Homes of California, LLC: $1,929,494 (9.6 %) Tru Team of California: $1,008,684 (5.0 %)	**Match Funding:** $15,685,075
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method:	Funding Mechanism:	No. of Initial Passing Applicants/ Bidders:	Rank of Selected Applicant/ Bidder:
Competitive	Grant	4 out of 4 bidders	Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-009 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project was approved at the November 2015 Energy Commission Business Meeting. Work began in January 2016. In 2016, the contractors held 6 forums throughout California and engaged with the building industry to promote adopting High Performance Attics and High Performance Walls. The contractors have started hands-on training with a few builders and holding discussions with several more. An online clearinghouse (www.wisewarehouse.org) was created to share information with the new residential building industry. It was launched in June 2016 and is updated with various informational and training materials on a regular basis.

95. EPC-15-010

Project Name:

Increasing Workforce Development Opportunities in Disadvantaged Communities through Automated Demand Response Communication Equipment Training

[EPC-15-010]

Recipient/Contractor:

Center for Sustainable Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	12/8/2015 to 3/31/2020

Program Area and Strategic Objective:

Market Facilitation

S17: Strengthen the Clean Energy Workforce by Creating Tools and Resources that Connect the Clean Energy Industry to the Labor Market

Issue:

Automated demand response (AutoDR) equipment and communications standards have evolved significantly over the past decade. However, these advances and standards have not been adequately translated into training programs to help facilitate the widespread deployment of AutoDR communication equipment. Lack of an adequately trained workforce could limit the benefits provided by demand response to electric customers and the larger grid.

Project Description:

The project will recruit workers from disadvantaged communities into an apprenticeship program, and provide them with comprehensive classroom and on-the-job training on the installation and maintenance of AutoDR communications equipment. The project will pilot a new California Advanced Lighting Controls Training Program course focused on installation and maintenance of AutoDR communications equipment for lighting applications. In addition, this project will recruit small and medium buildings located in disadvantaged communities to serve as on-the-job training sites for the apprentices enrolled in the program.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The California Energy Code was updated in 2013 to require lighting systems in large buildings to be capable of receiving and automatically responding to at least one standards-based messaging protocol which enables demand response. This project will help ensure a workforce that is trained in the proper installation and maintenance of AutoDR communications equipment exists to meet California Energy Code requirements for commercial buildings.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1e, 1g, 1h, 2a, 3f

Lower Costs:

Proper installation of AutoDR communications equipment will facilitate greater levels of demand response by reducing the transaction costs for participating customers.

Greater Reliability:

Compared to manual response, properly installed AutoDR communications equipment increases customer response to utility or system operator messages about a demand response event.

Economic Development:

Training on the proper installation and maintenance of AutoDR communications can provide increased employment opportunities for workers in disadvantaged communities.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $863,874
EPIC Funds Encumbered: $4,476,189	**EPIC Funds Spent:** $83,544
Match Partner and Funding Split: California LMCC IBEW-NECA: $16,165,080 (78.3 %)	**Match Funding:** $16,165,080
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 4 out of 4 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-010 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Subcontractors ASWB Engineering and UC Davis CLTC have developed early drafts of the training curriculum for the AutoDR apprenticeship program, and intend to begin classes in Fall 2017.

96. EPC-15-011

Project Name:

Isothermal Compressed Air Energy Storage with Solar and Load Forecasting Integration [EPC-15-011]

Recipient/Contractor:

LightSail Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	2/1/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

This project will help solve several barriers preventing the widespread incorporation of energy storage assets into the grid. This project will provide California utilities with information that can be used in assessing the costs and benefits of isothermal compressed air energy storage (I-CAES) for various use cases as well characterizing the operation of I-CAES. Results will be used to reduce the capital, installation and operation costs of the system, as well as determine areas for performance improvement.

Project Description:

LightSail Energy, along with its partner, the University of California San Diego (UCSD), will design build, operate, monitor, and analyze an I-CAES system on the Eliot Field PV station owned by UCSD. The energy storage system will be a pilot unit for testing the capabilities and performance potential of I-CAES for load following and ancillary services, as well as renewable integration. The project will also gather data needed to reduce the cost of I-CAES, increase its efficiency, and support its incorporation into the California electric grid. The installed energy storage system will be capable of charging from both the installed PV on site and the electric grid (operated by SDG&E) and will be capable of 200kW of discharging power and will store up 800kWh of energy.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will provide California utilities with information that can be used in assessing the costs and benefits of I-CAES to reduce the capital, installation and operation costs of the system. This constitutes a step towards meeting the Energy Commission targets of $1,000/kW, $200/kWh, and 80% round trip efficiency for energy storage.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1e, 1i, 4a, 5b

Lower Costs:

Lowering the cost of energy storage to $1,000/kW$200kWh (installed). The high capital costs of energy storage due to the lack of information regarding performance, and limited operational experience is a significant barrier to its use.

Greater Reliability:

Reduce distributed PV impact on the grid. Due to the intermittent nature of renewable energy (PV) as well as the increased ramping requirements it places on the grid, reducing these impacts will increase grid reliability.

Economic Development:

I-CAES' potential to be the lowest-cost and longest-lifetime energy storage system on the market can provide beneficial impact on: End-user Bill Management, Resource Adequacy, Flexible Capacity and T&D Support/Deferral.

Consumer Appeal:

The I-CAES system can be sited almost anywhere, including in dense urban areas where traditional energy storage and generation facilities could not be sited due to size, safety and use of hazardous chemicals.

Assignment to Value Chain: Distribution		**Total Budgeted Project Admin and Overhead Costs:** $102,846	
EPIC Funds Encumbered: $1,200,276		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: LightSail Energy: $779,400 (39.4 %)		**Match Funding:** $779,400	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 35 out of 38 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-011 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was terminated. LightSail Energy Inc. closed its energy storage division. No work was completed and no funds were disbursed for this project.

97. EPC-15-012

Project Name:

Improving Membrane Treatment Energy Efficiency through Monitoring the Removal of Colloidal Particle Foulants

[EPC-15-012]

Recipient/Contractor:

Kennedy/Jenks Consultants, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/30/2016 to 3/29/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Membrane treatment processes are highly energy intensive due to the fouling of the membranes over time. The high energy demand of low pressure membranes is caused by the accumulation of colloidal particles in the feedwater inside the membrane pores which increases the transmembrane pressure. There are no techniques to measure the levels of colloidal particles directly in wastewater, and minimize their deposition in membrane pores. As a result, many utilities do not pretreat the entering wastewater prior to membrane treatment. This results in membrane fouling and high energy use.

Project Description:

This project will demonstrate a technology that directly measures the colloidal particle concentration and size in treated wastewater prior to going through membranes that are used in water reclamation facilities. This will reduce energy use by identifying appropriate pre-treatment needed to minimize membrane fouling.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If this project is successful, it will overcome barriers to the use of membrane treatment and could reduce energy use by reducing the build-up in membrane pores and removing colloidal particles in the feed water. The anticipated benefits include reducing the energy associated with the membrane treatment process.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4c

Lower Costs:

The project could reduce the frequency of cleaning and membrane replacement, reduce energy use and reduce wastewater treatment plant operating costs.

Economic Development:

The technology could lower the overall cost of water reclamation due to improvement in energy efficiency, reduction in membrane cleaning frequency, and reduction in membrane replacement frequency. Therefore, this will help to provide a reliable local source of water.

Environmental Benefits:

By reducing energy use, the project could reduce greenhouse gas emissions.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $429,784
EPIC Funds Encumbered: $1,167,034	**EPIC Funds Spent:** $50,129
Match Partner and Funding Split: Orange County Water District: $60,000 (4.0 %) West Basin Municipal Water District: $50,000 (3.3 %) Evoqua Water Technologies: $126,000 (8.4 %) Malvern: $100,000 (6.7 %)	**Match Funding:** $336,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 14 out of 46 bidders Phase 2: 10 out of 13 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-012 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

a) Bench scale studies have been performed at Orange County Water District to develop preliminary relationship between coagulant dose and colloidal particle removal; b) Recipient started coordination with Malvern Instruments; c) Both the microfiltration and reverse osmosis pilot units were refurbished at the demonstration site; d) On-site safety training was completed and the health and safety plan and chemical handling plans were developed; and e) Instruments and chemicals for initial testing have been procured.

The next steps for the contractor are to perform the second membrane Clean-In-Place (CIP) and initiate testing to evaluate additional coagulants.

98. EPC-15-013

Project Name:

Open Source Platform For Plug-in Electric Vehicle Smart Charging in California

[EPC-15-013]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	2/1/2016 to 1/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S9: Advance Technologies and Strategies That Optimize the Benefits of Plug in Electric Vehicles to the Electricity System

Issue:

Plug-in electric vehicles (PEVs) represent a rapidly proliferating new vehicle technology and source of utility grid load. Currently only pilot concepts exist for actively managing PEV charge control for the benefit of California's grid and ratepayers. Meanwhile California's electrical grid is evolving to rely more on intermittent renewable power sources, with different "grid acceptance" issues than more traditional generation sources, driven by the state Renewable Portfolio Standard (RPS), creating a unique opportunity for PEV charging and the "greening of the grid" to go hand-in-hand.

Project Description:

The purpose of this project is to develop a one-way charging concept for PEVs that maximizes accommodation of intermittent renewable generation and minimizes impacts to the distribution grid. The project will focus on controlling the charging of PEVs in residential and small commercial settings using a novel and flexible open-source, open-software architecture charge communication and control platform. This software-based platform will be embedded in the context of overall utility and residential/business electrical and building automation systems, lending itself to potential broad implementation by commercial interests due to its flexible architecture and "agnostic" approach to communications standards. Control strategies and applications will be guided by an assessment of user needs and grid operation and ratepayer benefits, and the potential for one-way PEV charge control to lead to increased ability to accept intermittent renewable energy for California's electrical grid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will focus on controlling the charging of PEVs in residential and small commercial settings using a novel and flexible open-source, open-software architecture charge communication and control platform. This software-based platform will be embedded in the context of overall utility and residential/business electrical and building automation systems.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Smart grid: R.08-12-009

Applicable Metrics: CPUC Metrics- 3h, 4a

Lower Costs:

$176 million per year reduction in electricity costs for ratepayers in 2024 derived from: lower electric distribution system upgrade and operating costs, increased electric distribution system energy efficiency, increased PEV charging energy efficiency, and lower electricity generation costs (from lower-cost intermittent greenhouse gas (GHG)-free

Greater Reliability:

Greater reliability of the electric distribution grid, reducing frequency of outages by 25%, in residential areas. Potential impacts on reliability of the electric distribution grid in commercial areas and on the electric transmission grid will be assessed in the course of the project.

Environmental Benefits:

340,000 metric tons of carbon dioxide (CO2e) emissions per year avoided in 2024 from: increased electric distribution system energy efficiency, increased PEV charging efficiency, increased fraction of intermittent operationally GHG-free renewable electricity generation (and decreased need for GHG-intensive supplemental peaking generation).

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $549,477	
EPIC Funds Encumbered: $1,500,000		**EPIC Funds Spent:** $34,614	
Match Partner and Funding Split: BMW of North America: $90,000 (5.7 %)		**Match Funding:** $90,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 25 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-013 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

UC Berkeley initiated the BMW subcontract and developed a list of TAC members with formal invitations coming in Q1 2017. UCB also developed a draft focus group protocol. Final research procedures are expected to be approved by early 2017 and the focus group is planned for February 2017. Initial field work for the EVSE test bed has begun. UCB is examining the potential for VGI to provide congestion relief, potential relief to strained transformers, and local grid support services through local load management.

99. EPC-15-015

Project Name:

Grid Communication Interface for Smart Electric Vehicle Services Research and Development [EPC-15-015]

Recipient/Contractor:

Andromeda Power, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	2/1/2016 to 1/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S9: Advance Technologies and Strategies That Optimize the Benefits of Plug in Electric Vehicles to the Electricity System

Issue:

The increase of distributed energy resources, including intermitting renewables and storage in PEVs, makes the coordination of supply and demand to maintain the reliability of the distribution network challenging. PEVs are rapidly expanding in California and this will proportionally increase the installation of bidirectional stations, creating additional demand and stress on the grid. In order to effectively implement V2G services the grid has to be capable of effective machine-to-machine and user-to-machine communication.

Project Description:

Andromeda Power will develop an advanced smart grid communication interface that allows utilities to send dispatch signals to PEVs in real-time to optimize the bidirectional power flow of PEV battery packs depending on local power conditions such as congestion, power quality, voltage and frequency, while maintaining the driver's mobility needs. The grid communication interface operates with a virtual machine able to interface PEVs of any standard. The real time monitor and control of the stations will provide to the California Electrical Investor Owned Utilities a means of quick Automatic Demand Response.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project enables the harmonization of V2G services, removing the communication barrier between PEVs of different standards and the grid. The communication interface enables the possibility of using PEVs as distributed energy storage and controllable load, creating a Smart Demand Side Management.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1g, 4a, 5b

Lower Costs:

The annual energy shift capacity introduced by InCISIVE is about 8.2 MWh/year (= 22.5 kWh x 365) toward the end of On-Peak period and in the following Mid-Peak period when marginal electricity is produced by natural gas peaker plants.

Environmental Benefits:

California also benefits of more than 1.3 metric tons / year of additional GHG reduction for each PEV energy storage.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $304,177	
EPIC Funds Encumbered: $681,693		**EPIC Funds Spent:** $252,015	
Match Partner and Funding Split: Verdek: $125,000 (10.9 %) Suncharge: $340,000 (29.7 %)		**Match Funding:** $465,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 25 out of 25 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-015 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The project team has completed the Grid Communication Design and Network Interface Design. The Grid Communication Design and Network Interface Design describe the technical layout and energy management system software code that allows the communication system to interface with the grid to accelerate bidirectional power flow between PEVs and the grid.			

100. EPC-15-016

Project Name:

A Transformative Flywheel R&D Project

[EPC-15-016]

Recipient/Contractor:

Amber Kinetics, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	1/27/2016 to 3/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

Many of the promising energy storage solutions - those with the potential to dramatically reduce cost - are still in the early stages of development. Amber Kinetics is working to advance flywheel energy storage technology to provide safety, reliability, fast response, long cycle life, long discharge duration, and most importantly, low cost.

Project Description:

This project will fully develop advanced manufacturing processes and improve the flywheel rotor geometries. The project will seek to build on developments that the Amber Kinetics flywheel engineering team made in the areas of improved materials processing for better strength, longer life, and improved rotor geometries to maximize energy storage density and reduce costs. Amber Kinetics' projected flywheel manufacturing cost targets are below $150/kWh, inclusive of power electronics.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by demonstrating that long-duration flywheel energy storage can meet both its technical and cost objectives.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011

Applicable Metrics: CPUC Metrics- 1c, 1i, 2a, 4a, 5b

Lower Costs:

Develop a low-cost flywheel energy storage system capable of being manufactured for less than $150 per kilowatt-hour. Validate the economic value by selling the storage system at a low competitive price point.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $388,000
Demand-side Management	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$2,000,000	$872,243

Match Partner and Funding Split: Amber Kinetics, Inc.: $12,000,000 (85.7 %)		**Match Funding:** $12,000,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 35 out of 38 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-016 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: As June 2016, Amber Kinetics, Inc. has upgraded the flywheel's electronics and performed spin and cycle tests. The unit is performing well and has been accumulating hours of operation. A total of 5,426 operating hours have been accumulated on the fleet of flywheel units with 77 compete charge/discharge cycles and 39 partial cycles as of November, 2016. Complete assembly of flywheels is expected by December 30, 2016.			

101. EPC-15-017

Project Name:

Utilizing Waste Heat to Increase Efficiency of Isothermal Compressed Air Energy Storage in a Smart Microgrid Environment

[EPC-15-017]

Recipient/Contractor:

LightSail Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	3/1/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

Due to the increasing threat of climate change and the non-renewable nature of fossil fuels, there is increased impetus to generate electricity from clean, renewable sources, such as solar photovoltaic (PV) and wind. However, these progressive energy sources come with inherent attributes that, with high enough penetration, could pose significant risk to the reliability, safety, and cost of the California electric grid. In order for California to reach its statutory energy goals (specifically those specified in AB32, AB2514, and the RPS), the grid will need extensive penetration of low-cost, high efficiency energy storage.

Project Description:

LightSail Energy will install and pilot test a 200kW I-CAES system at the UCI campus in Irvine California. The storage unit will be operated in conjunction with UCI's 1,000kW solar PV array and 300kW advanced natural gas turbine, all interconnected through an advanced "smart" microgrid. The I-CAES system will use waste heat from the gas turbine to increase round-trip efficiency. This is possible because I-CAES uses large water tanks as thermal storage, capturing and storing the heat of compression for use when the system is expanding air and producing electricity. The waste heat from the gas turbine will be captured and stored in the I-CAES thermal storage tanks and later converted into electricity. This project will provide the state's first real-world data on the operation and performance of an isothermal compressed air energy storage system and its ability to utilize waste heat for increased efficiency.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

To meet California's statutory energy goals AB32, AB2514, and the RPS extensive penetration of low-cost, high efficiency energy storage is needed. This project will provide California utilities with valuable information that can be used in assessing the costs, benefits and identifying the highest value applications of I-CAES for the California grid.

CPUC Proceedings addressing issues related to this EPIC project:

Self-Generation Incentive Program: R.12-11-005 Energy storage: R.15-03-011 Smart grid: R.08-12-009 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1e, 1i, 4a, 5b

Lower Costs:

The proposed I-CAES system will be capable of cutting peak load by 200kW every day, saving thousands of dollars per month in demand charges. Potentially lowering the levelized cost of energy (LCOE) by as much as 22% in microgrid settings. And with the addition of heat, the LCOE could be lowered an additional 9%.

Increase Safety:

I-CAES is one of the few purely mechanical means of storing energy, thus no toxic or flammable chemicals used in the system, which lowers risk of catastrophic failure. As energy storage continues to become a more prevalent asset on the grid, I-CAES provides the safest means of storing electrical energy.

Environmental Benefits:

I-CASE will reduce need for "peaker" plants and expects the first generation commercial product will have a carbon footprint which is 15-50% lower than conventional CAES. This represents a significant technological advancement as well as a marked improvement overall grid efficiency and GHG emissions.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $89,979	
EPIC Funds Encumbered: $1,085,125		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: LightSail Energy: $811,645 (42.8 %)		**Match Funding:** $811,645	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 35 out of 38 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-017 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was terminated. LightSail Energy Inc. closed its energy storage division. No work was completed and no funds were disbursed for this project.

102. EPC-15-018

Project Name:

Pilot Testing of Eos' Znyth Battery Technology in Distributed Energy Storage Systems [EPC-15-018]

Recipient/Contractor:

Eos Energy Storage, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	3/22/2016 to 3/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S8: Integrate Grid Level Energy Storage Technologies and Determine Best Applications That Provide Locational Benefits

Issue:

Utilities are looking for alternative solutions to address load growth. Customer rates are increasing rapidly as a result of the utilities' increasing costs of service. Distributed energy storage can provide fast-responding grid services and much needed locational capacity to integrate high penetrations of renewables while helping utilities during 4-6 hour system peaks. Current commercial energy storage technologies are uneconomical because of their high cost and short life. Also, safety and energy density limitations have prevented wide-spread deployment of energy storage on a distributed basis or at the point of consumption.

Project Description:

The goal of this project is to develop and test behind-the-meter residential and commercial battery storage applications, each on both a stand-alone basis and integrated with solar PV. This project will utilize several kW-scale, AC-integrated Znyth (Trademark) battery technology energy storage systems. The solar PV and stand-alone residential and commercial systems will be located at the University of California, San Diego (UCSD) campus. The project team will also develop, model, and test experimental rate designs and evaluate the impact on customer load profiles; develop control algorithms and demonstrate aggregation of multiple storage units to create virtual power plants that maximize the value of behind-the-meter storage to the utilities; and model, simulate, and extrapolate the economic impacts of installed systems and quantify the benefits to CA utilities and ratepayers.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This demonstration will provide operational experience and data to better determine the value and cost savings of battery energy storage for residential and commercial customers.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013

Applicable Metrics: CPUC Metrics- 1c, 1i, 2a, 4a, 5b

Lower Costs:

This project will determine any cost savings by testing this battery system and determining how well the battery can cost effectively provide the customer with time of use energy arbitrage, peak time rebates, and demand charge reduction.

Environmental Benefits:

Greenhouse gas, NOx, and SO2 reductions will be calculated from measured battery performance based on peak loads shifted.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $218,866
EPIC Funds Encumbered: $1,894,866	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Eos Energy Storage, LLC: $1,436,801 (43.1 %)	**Match Funding:** $1,436,801
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 35 out of 38 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-018 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The first draft of the Test Plan was completed. Eos submitted the Site License Agreement and Payment to UC San Diego for installation and testing the battery storage system.

103. EPC-15-019

Project Name:

Low Cost, Large Diameter, Shallow Ground Loops for Ground-Coupled Heat Pumps

[EPC-15-019]

Recipient/Contractor:

The Regents of the University of California on behalf of the Davis campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Ground-coupled heat pumps (GCHPs) have been proven to deliver heating and cooling at much higher levels of efficiency than air-source air conditioners and heat pumps. However, their application in relatively mild climates, like California, is limited by the very high cost of conventional ground heat exchangers (GHEs).

Project Description:

This project will address the high cost of ground heat exchangers (GHEs) for water-to-water and water-to-air heat pumps to facilitate the application of efficient ground-coupled heat pumps in California. The project will focus on shallow (20-30 feet deep) and large diameter (2-3 feet diameter) ground heat exchanger designs using helical coil heat exchangers. The project team will develop models, validate them with field data from two existing sites, identify optimal designs, and develop modeling methods that can be adapted for use with Title 24 standards compliance tools. The project will also produce typical design specifications that will support future Title 24 eligibility criteria. A design guide will be developed for use by the industry as a training aid, and a position paper will be prepared for the Department of Water Resources' California Geothermal Heat Exchange Well (GHEW) Standards Stakeholder Advisory Group.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The market for high efficiency ground coupled heat pumps could be increased by reducing the cost of ground heat exchangers. Annual energy savings is estimated to be over 67 billion BTU, based on the 2013 construction rate of 40,000 single family homes per year and if 10% of new homes were equipped with ground source heat pumps. Electricity savings from improved cooling efficiency is estimated at 1.2 million kWh per year. Assuming a two-ton ground source heat pump is operated outside the critical peak period, demand would be reduced by about 2 kW for a 2,100 square foot house and statewide peak load would be reduced by 5 MW annually.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 4a

Lower Costs:

This project could lower the cost of installing ground coupled heat pumps and result in lower utility costs for heating and cooling, lower maintenance costs, improved system reliability, and improved comfort for ratepayers.

Environmental Benefits:

Assuming a 10 percent market penetration on new homes, estimated greenhouse gas emissions would be reduced by over 6 million pounds per year.

Consumer Appeal:

Increased use of ground coupled heat pumps would eliminate noisy and visually unappealing outdoor condensing units.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $361,292
EPIC Funds Encumbered: $1,212,186	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Davis Energy Group, Inc.: $18,826 (1.5 %)	**Match Funding:** $18,826
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 14

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-019 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Work started in July, 2016. The project is on schedule and on budget. The first Technical Advisory Committee meeting was held and a literature search on previous ground heat exchangers has been completed. A Literature Review Summary of prior field work on helical ground heat exchangers and the Monitoring and Verification Plan Summary have been drafted. The literature review and summary on prior modeling work have been initiated.

104. EPC-15-020

Project Name:

Intelligent HVAC Controls for Low Income Households: A Low Cost Non-connected Device that Understands Consumer Preferences and Performs Adaptive Optimization

[EPC-15-020]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	3/1/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

In low income housing, HVAC energy use, in many cases is the largest component of energy use. However, the efficiency issues associated with HVAC units are largely unaddressed due to cost, ownership and complexity of the systems. By targeting the so called "low hanging fruit", such as control mechanisms, energy savings could be realized with minimal cost to the tenant. However, monitoring and verification of energy savings is needed before building owners/operators are convinced of the benefits and savings.

Project Description:

This project will develop a low cost smart thermostat unit that will have simple user interface. Though the test sites are low-income and senior housing, this technology could be adapted to other residential sectors. The smart thermostat will understand user preferences and manage indoor conditions to optimize energy use without requiring internet connectivity. HVAC energy use can be traced to three factors: losses in the ducting system, substandard equipment efficiency and occupant settings. Low income households are mostly renters which makes changes to the duct system or HVAC unit not feasible. By providing automatically optimized thermostat settings this project will determine if smart thermostats are a cost effective method to address HVAC energy use in the low-income and senior housing sectors.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will bridge a technology gap that exists in low-income and senior communities. Current smart thermostats are expensive, and a lack of broadband (Internet) access causes these devices to be unfeasible in the low-income market. Developing a low-cost and internet independent device creates new opportunities to expand the smart infrastructure and related energy saving automation in sectors that have been considered unreachable in the past.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1g, 1h, 3a, 4a

Lower Costs:

Traditional smart thermostats are not cost effective options in low-income communities. This project will leverage lower cost hardware and software platforms to develop a cost effective smart thermostat option for approximately $60. This project could leverage utility and other

incentives for a net no-cost option for homeowners. This project could reduce HVAC energy consumption and costs.

Economic Development:

Development of a smart thermostat which uses built-in smart algorithms and leverages learned occupant behavior could reduce HVAC costs. Money traditionally spent on HVAC energy use could be spent in the local economy.

Environmental Benefits:

This project could reduce HVAC energy use and by so doing reduce greenhouse gas emissions.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $903,766	
EPIC Funds Encumbered: $2,705,759		**EPIC Funds Spent:** $19,577	
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $427,072 (13.6 %)		**Match Funding:** $427,072	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant - NOT Pay for Performance	**No. of Initial Passing Applicants/ Bidders:** Phase 1: 48 out of 120 bidders Phase 2: 32 out of 44 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 13

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-020 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient continues to work on establishing its subcontractor team, although there have been delays due to requested budgetary changes. A draft target market and customer research report has been submitted and is on track for completion in Q1 of 2017. The recipient is working to develop and finalize BOM (Bill of Materials) for the thermostat device, as this is a rapidly moving market, and new approaches are being discovered that may better suit the application. Work is also progressing on development of user interface requirements for the thermostat application.

105. EPC-15-021

Project Name:

Mobile Efficiency for Plug Load Devices

[EPC-15-021]

Recipient/Contractor:

AGGIOS, Inc

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/1/2016 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Typical smartphones consume 0.03 W when idle and less than 1W when in use. In comparison, typical set top devices, like satellite, cable or IP devices or home and office computers, use 100-1000 times more power when idle and 5-50 times more power when in use. From end user's perspective those devices are converging and increasingly offer similar information, video, audio and other services. Therefore, research is needed to improve power management on the major types of plug load devices so that they can approach the efficiency equivalent of mobile devices.

Project Description:

The goal of the project is to reduce the energy consumption of residential and commercial plug load devices, such as set-top boxes, TVs, computers and game consoles. The project will leverage mobile design practices, hardware components and energy management software kernels, and prove their effectiveness on virtual prototypes and reference designs of targeted plug load devices. Based on these findings, the recipient will develop, tune and deploy the design methodology guidelines for energy efficient plug load designs to the manufacturers of plug load devices and their hardware, software and tools suppliers. The recipient will also define and introduce a widely accepted industry standard through the Institute of Electrical and Electronics Engineers (IEEE) to support the newly developed unified design methodology and secure its long-term adoption and further evolution.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If the research is successful, the estimated potential savings beyond today's average unit energy consumption range from 20 to 50%. It is also estimated that stock turnover due to "mobile efficiency" will occur between 2023 and 2030 based on an overall average product lifetime of 5 years. This project will accelerate adoption of mobile efficiency technologies across multiple product categories.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h

Lower Costs:

This project has the potential for long term, deep savings across a broad array of plug load devices and thus, has the potential to lower customer electric bills.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $136,800
EPIC Funds Encumbered: $1,996,999	**EPIC Funds Spent:** $538,440
Match Partner and Funding Split: AGGIOS, Inc.: $225,000 (2.8 %) Freescale: $20,000 (0.2 %) International Rectifier: $225,000 (2.8 %) Keysight: $65,000 (0.8 %) Mentor Graphics: $4,350,300 (54.2 %) Synopsys: $1,145,150 (14.3 %)	**Match Funding:** $6,030,450
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-021 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

- Functional Specification Document Architecture Specification Document
- Automatic Energy Design and Management System
- SEED - Software Defined Power Manager
- EnergyLab - Software Toolkit for Energy Analysis and Software Generation
- UHAL - Unified Hardware Abstraction Language
- Functional Specification Document Architect

Update:

The recipient has conducted the analysis of the IOS and Android operating systems used in the majority of today's mobile devices with the focus on their power management capabilities. The recipient has further analyzed the techniques for achieving energy proportionality in plug-load electronic devices and how those can be folded into the existing design methodology. The next step is to plan to finalize the IEEE P2415 draft and complete the first virtual prototypes. A presentation about the progress was presented at the CalPlug workshop at UC Irvine on November 2016. Staff conducted a site visit of the testing facility to verify work and progress.

106. EPC-15-022

Project Name:

Power Management User Interface

[EPC-15-022]

Recipient/Contractor:

The Regents of the University of California, Irvine Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/1/2016 to 4/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Personal computers typically do not employ existing power management capabilities and are left on idle mode. This practice results in an increasingly large proportion of energy consumption in homes and businesses.

Project Description:

This project seeks to reduce computers' energy consumption by improving how users employ existing power management capabilities. Although all computers have the capacity to enter low-power modes such as sleep, and can be shut down when not in use, this potential for energy savings has not been realized in the majority of desktop computers. The majority of desktop computers remain on at full power when they are not being used. The problem is one of user behavior. The project will use a software solution to change user behavior by changing the tool they are using. This approach is firmly based in behavior theory and human-computer interaction research, which have long demonstrated that the interface of a device can change users' behavior. The energy savings of applying such an interface is estimated to be as high as 50 percent per computer, between 139 and 321 kWh per year.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The Recipient will develop and test a user interface designed to facilitate and encourage greater utilization of low-power modes by computer users. The interface design will incorporate lessons from the fields of human-computer interaction and behavior theory. The field test will provide data that will improve understanding of user behavior toward computer power management. If successful, this project has the potential of cutting energy use by 50 percent per personal computer.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h

Lower Costs:

Lower energy use results in reducing operating costs for consumers.

Environmental Benefits:

Reducing energy use will result in greenhouse gas emission reductions.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $300,159	
EPIC Funds Encumbered: $785,124		**EPIC Funds Spent:** $20,723	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-022 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: As of January 30, 2017 - UCI has produced a fully functional draft of the prototype with constructed data to be used for the pilot test. They have conducted pretest of software demo and selected survey questions and processed the results and have started making revisions to software based on pretesting results.			

107. EPC-15-023

Project Name:

Gaming System Energy Efficiency without Performance Compromises

[EPC-15-023]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 12/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

More than 1 billion people around the world engage in digital gaming. The approximately 20 million gaming platforms in use in California include 7 million mainstream personal computers used partly for gaming, 1.5 million specialized high-power PCs known as Gaming PCs (GPCs), and 12 million Video Game Consoles (VGCs). It is estimate that these platforms collectively consume 5% of total residential electricity and 18% of residential miscellaneous plug loads in California (and an unknown share of non-residential plug loads).

Project Description:

This project will provide a detailed market segmentation and baseline energy demand assessment of the gaming market, including development of measurement and benchmarking protocols for gaming software and hardware. Top-selling gaming PCs and games are then cross-benchmarked and retrofitted to achieve maximum energy savings beyond what commercialized products currently can attain.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Research results could spur component and integrated system manufacturers and game developers to bring more efficient offerings to the market without sacrificing the gaming experience. The project could also identify potential opportunities for codes and standards improvements and/or utility incentives. California ratepayers could benefit by having lower energy use and costs associated with their gaming systems without compromising their video game choices and experience.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h

Lower Costs:

If successful, this project could reduce the energy "bill" for a typical gaming personal computer by $236/year (assuming a 75% savings potential), which is more than any other miscellaneous plug load.

Environmental Benefits:

By reducing energy use, the project will also reduce greenhouse gas emissions.

Consumer Appeal:

Gamers are intently focused on noise, heat management, and thermal comfort. Energy efficiency improvements will not impact these elements but could result in less heat and increased thermal comfort.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $658,250
EPIC Funds Encumbered: $1,386,530	**EPIC Funds Spent:** $726,765
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-023 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Team attended the Electronic Entertainment Expo on June 2016. They observed current trends and opportunities in the gaming industry, identified options to improve energy performance, interviewed various technical gaming experts about different energy saving approaches and strategies and made contact with industry representatives to inform them of the research project and opportunities for future technical input and outreach. The first Technical Advisory Committee meeting was held in January 2017 to get industry input of testing methodologies and analysis procedures. Procurement of equipment is completed and the building of the testing lab has started.

108. EPC-15-024

Project Name:

Efficient and ZNE-Ready Plug Loads

[EPC-15-024]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/11/2016 to 4/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Plug load devices require the conversion of grid power from alternating current (AC) to direct current (DC) and these devices spend long periods of time in standby mode, creating inefficiency in current plug load devices. There is a need for energy efficient plug load technologies and strategies to reduce electrical consumption.

Project Description:

This project will research and develop new technologies and strategies to eliminate or significantly reduce energy use in standby mode by redesigning the power supply for plug load devices. This research project will also develop and demonstrate strategies to remove plug load devices from grid AC power by redesigning these devices to use DC power from photovoltaic power sources.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, this project could provide significant electrical savings from plug load power supplies and contribute to plug load and energy reductions in zero net energy buildings.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a

Lower Costs:

The project could lower the cost of electricity to the consumer through the elimination of standby power and electrical losses from converting DC to AC.

Environmental Benefits:

The general benefits of this research project are that the energy saving technologies could save up to 5,100 GWh/ year, which is equivalent to 3,600 metric tons of greenhouse gas.

Energy Security:

The project could increase energy security by switching some plug load devices and equipment from grid AC power to photovoltaic DC power.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $634,531	
EPIC Funds Encumbered: $1,600,000		**EPIC Funds Spent:** $541,352	
Match Partner and Funding Split: EMerge Alliance: $50,000 (2.4 %) Power Integrations: $75,000 (3.6 %) Delta Electronics: $100,000 (4.8 %) United States Environmental Protection Agency: $270,000 (12.9 %)		**Match Funding:** $495,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-024 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The researchers are reviewing technologies for energy harvesting and energy storage and identify those most suitable for pairing with a power supply. They are also working on identifying energy efficiency technologies to integrate into selected plug loads that take into account human behaviors and device functionalities.			

109. EPC-15-025

Project Name:

Plug Load Reduction App: RYPL

[EPC-15-025]

Recipient/Contractor:

Home Energy Analytics, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	4/11/2016 to 12/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Plug loads or miscellaneous electrical loads (MELs) are the fastest growing category of residential electricity consumption and the idle load represents a surprisingly large percentage of the electricity used in California homes - on average 218 Watts across 70,000 homes. In addition, there is no accurate and reliable way to guide residents in choosing actions to reduce the idle load and no accurate way to track their progress if actions are taken to reduce the idle load.

Project Description:

This project will research methods to reduce home idle loads by utilizing smart meter analytics, an engaging smart phone app, a new online crowd-sourced database of miscellaneous electric loads, and an online efficient product marketplace to educate California residents about the idle load of their home and ways to reduce it. The system will be piloted within all three electric investor owned utility territories and measure actual energy savings through smart meter data.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Though there have been successful energy reduction programs to reduce energy use, none has specifically targeted plug loads. This project will bring forth consumer awareness and education to reduce idle loads through an engaging energy efficiency tool.

CPUC Proceedings addressing issues related to this EPIC project:

Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a

Lower Costs:

Project could lower energy bills by reducing idle loads.

Environmental Benefits:

Reduced GHG emissions through reduced energy usage

Consumer Appeal:

Due to the number of smart phones, a mobile app will provide actionable recommendations and follow-up.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $884,100	**EPIC Funds Spent:** $253,303
Match Partner and Funding Split: Enervee Corporation: $300,000 (24.3 %) Home Energy Analytics, Inc.: $50,000 (4.1 %)	**Match Funding:** $350,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-025 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The research team is continuing development of the iPhone application version, and continuing work on the Plug Load Data Base (PLDB) interface and the Reduce Your Plug Load (RYPL) server for the text-based inventory of home devices.

110. EPC-15-026

Project Name:

Unlocking Plug Load Energy Savings through Energy Reporting

[EPC-15-026]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/1/2016 to 4/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Plug loads account for an increasing portion of electricity consumption in both residential and commercial buildings. Recent surveys indicate that plug loads are responsible for at least 25 percent of building electricity use nationally, and even more in California.

Project Description:

This project will develop an interoperable protocol that can be implemented in all plug-load devices, unhampered by proprietary restrictions which will implement energy reporting to enable plug-load devices to transmit operating information - such as identity, power consumption, and functional state - through a communications network to a central entity. After a communication infrastructure is established for plug-load devices, the data flow can be reversed to send control signals to individual devices. The central management system that this project will demonstrate is well positioned to provide comprehensive control over diverse plug-load devices.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, the project could conservatively result in a 10-percent reduction in plug-load energy use. Half of that reduction will derive from the insight end-users gain from the energy reporting that identifies devices that are using an abnormally large amount of energy. The other half will derive from the ability to use an interoperable platform to control plug loads for all such devices.

The technology could be incorporated directly into California's building codes and other energy standards.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 3a, 4a

Lower Costs:

In California, energy savings could exceed 5 TWh/year in residential and commercial buildings. More savings should result from applying the technology to other plug load devices such as appliances. The technology will result in a demand reduction of more than 700 megawatts. The energy savings will result in lower energy costs for consumers.

Greater Reliability:

This project advances lighting system controls via 1) increased control granularity, 2) increased sensor availability and use, 3) pervasive communication through wireless networks, and 4) low-cost computation, making lighting systems more adaptable, flexible, and easier to use.

Environmental Benefits:

The project could reduce energy consumption and greenhouse gas emissions by more than 1.7 gigatons per year.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $123,700
EPIC Funds Encumbered: $1,630,699	**EPIC Funds Spent:** $698,910
Match Partner and Funding Split: Energy Solutions: $94,318 (4.4 %) The Watt Stopper: $50,000 (2.4 %) Lawrence Berkeley National Laboratory: $350,000 (16.5 %)	**Match Funding:** $494,318
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-026 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

List of device types created by LBNL with funding from Northwest Energy Efficiency Alliance. Made available for use by UPnP (Universal Plug and Play) which has been since merged into OIC (Open Interconnect Consortium). This list will be recommended for incorporation into other technology standards. A report on this at: http://nordman.lbl.gov/docs/lbnl-classification-v1.pdf.

Update:

The kickoff meeting occurred on September 16, 2016. The recipient is currently creating and testing devices that implement energy reporting technology.

111. EPC-15-027

Project Name:

Electric Plug Load Savings Potential of Commercial Foodservice Equipment

[EPC-15-027]

Recipient/Contractor:

Fisher-Nickel, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/16/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

The main barriers preventing adoption of advanced appliances in commercial food service has been a combination of the industry's lack of knowledge and energy data. An equally important barrier to the adoption of optimized energy mode technologies is the operator's apprehension that the appliance will not be ready to use when needed; that the amount of time required to heat the appliance will delay product delivery and hinder the "speed of service" to the customer. Another operator concern is that that product quality will suffer when this type of technology is applied to appliances that are designed to maintain food-safe temperatures.

Project Description:

This project will assess the energy reduction potential of electric commercial plug load foodservice equipment at five different commercial kitchens and demonstrate reduced energy consumption through the use of pre-commercial appliance designs and control technologies.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project aims to bridge the knowledge gap and support the accelerated adoption of advanced appliances and controls. The results of this effort will be used to justify development of utility incentives for purchasing and installing energy efficient foodservice equipment and can act as a catalyst for further product development, thereby making the technology more accessible to California food service operators.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h

Lower Costs:

This agreement could lower energy costs by encouraging the adoption and implementation of advanced design and controls for commercial food service plug load appliances that use less energy than conventional systems. On a per-appliance basis, amounts would range from $71/year for a single hot plate to $950/yr for a single espresso machine. Savings on the equipment could total up to $2,643 annually of energy saving controls were optimized for each appliance and the site has a combination of a vertical toaster, food warmer, hot plate, rice cooker, and soup warmer in their kitchen.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Demand-side Management</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $392,763</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$937,469</td><td colspan="2">EPIC Funds Spent:
$6,421</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
Fisher-Nickel, Inc.: $1,377 (0.1 %)
Pacific Gas and Electric Company: $148,623 (13.0 %)
Dalla Corte: $20,000 (1.8 %)
Nuova Simonelli: $18,350 (1.6 %)
Hatco: $4,100 (0.4 %)
NAFEM: $10,000 (0.9 %)</td><td colspan="2">Match Funding:
$202,450</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
19 out of 19 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 6</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-15-027 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
Recipient has accomplished the following:
Finalized all technical advisory committee members
Received signed access agreements from the San Ramon Conference Center
Collected baseline data for Rebecca's Cafe (coffee brewer and conveyor toaster); Mills College (monitoring soup warmers, conveyor toaster, refrigerator merchandisers, tea brewers, coffee brewers and heat lamp); Panera Bread (Panini makers, conveyor toaster, rethermalizer, steam table for soup, shelf warmer, batch coffee maker and tea brewer)</td></tr>
</table>

112. EPC-15-028

Project Name:

Real World Electrification Options of Energy Services and Environmental Justice (EJ) Considerations

[EPC-15-028]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/13/2016 to 5/13/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Electrification of customer energy technologies and services can create a number of benefits for California ratepayers and residents, including improved air quality, reduced greenhouse gas emissions, and significant cost savings. However, not all electric technologies are automatically beneficial. The cost-to-benefit ratio varies widely with each application--and there are many different technologies and hundreds of applications. Understanding how each electric technologies contributes to a significant electrification scenario is critical to both understanding the societal benefits and to real world implementation of programs designed to achieve electrification objectives.

Project Description:

The research team will conduct a statewide assessment - at the zip code level - of the potential for electrification (e.g., use of electricity for space heating) to generate benefits to customer cost savings, socio-economic, climate, and air quality. The assessment will feed a comprehensive climate and energy model and a subsequent air quality analysis that will help determine very precise environmental benefits--with a focus on Environmental Justice (EJ) areas.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Environmental Assessment of a Full Electric Transportation Portfolio found widespread air quality and greenhouse gas emissions benefits from the electrification of on-road light and medium duty vehicles and a modest number of non-road vehicles. Peak ozone concentrations in the South Coast Air Basin will be reduced by up to 5 parts per billion by 2030 and transportation greenhouse gas emissions will be reduced by up to 65% by 2050.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a, 4b

Lower Costs:

Electrification of customer energy technologies and services can create a number of benefits for California ratepayers and residents, including improved air quality, reduced greenhouse gas emissions, and significant cost savings. The project will show that electrification of on and off road vehicles and conversion to efficient residential heat pumps will produce a cost benefit to the utility customer.

Environmental Benefits:

Electrification of customer energy technologies, including homes, businesses, industry, and mobile sources reducing greenhouse gas emissions. The project calls for collaboration with local stakeholders to understand the different technologies, their costs, performance, and benefits to design real world implementation programs that will contribute to the greenhouse reduction that meet the state's goal.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $234,351
EPIC Funds Encumbered: $799,444	**EPIC Funds Spent:** $10,496
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $609,213 (39.1 %) South Coast Air Quality Management District: $150,000 (9.6 %)	**Match Funding:** $759,213
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-028 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The researchers for this project met with the three research teams (UC Berkeley with LBNL, E3, and UC Irvine) that are developing the long-term energy scenarios for the electricity sector. Those scenarios may be used as inputs to this research on benefits from electrification. The researchers from EPRI are also involved as Technical Advisory Committee members on the long-term energy scenarios in order to facilitate integration between results and include salient metrics for environmental justice benefits.

113. EPC-15-029

Project Name:

Distributed Generation Environmental Planner

[EPC-15-029]

Recipient/Contractor:

Black & Veatch Corporation

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 1/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Site information needed for project siting and permitting of solar photovoltaic (PV), in particular environmental and distribution system interconnection information, are not widely available or accessible to project developers, local planners, utilities, landowners, and other stakeholders in an organized, centralized location. Having this information early in the siting process could reduce project development costs, and could reduce uncertainty of lengthy and complicated environmental permitting processes. Tools exist to perform similar functions for landscape scale planning, but it is not known whether they can be successfully adapted for local distributed generation (DG) PV planning.

Project Description:

The goal of this project is to identify environmentally preferred areas for distributed generation and demonstrate how the spatial information, factors, and analytical approach could be applied effectively for local distributed generation planning. The proposed scope of work will pilot the inclusion of DG into energy planning at the local level in parallel with the ongoing development of the statewide planning tool being developed by the Conservation Biology Institute. The statewide tool (prototype currently called the "RE Infrastructure Planning Assistant") focuses primarily on environmental screening for utility scale renewable energy development. This project adds more detailed energy and economic data and information appropriate for utility-scale planning, but most importantly incorporates distributed generation into the prototype interactive mapping tool and tests it in Lancaster, California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This agreement will lead to technological advancement by creating a prototype, public tool that enables DG PV site selection by providing users both environmental and engineering geospatial data. Once the concept is proven in Lancaster, CA, it can be expanded to the rest of California. Making information more comprehensive and accessible at the DG level will improve market functioning, while also enabling better DG infrastructure planning that incorporates environmental conservation.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1b, 2a, 4f

Lower Costs:

Benefits include reduced siting and permitting risk, reduced development risk, and time and cost savings in the development cycle. Cost savings will accrue to permitting agencies, utilities, ratepayers, and other stakeholders, especially in regions vulnerable to environmental conflict.

Environmental Benefits:

The tool will help identify areas with low conservation value for species and habitats that could be suitable for renewable energy with least impact or conflict.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $44,350	
EPIC Funds Encumbered: $199,976		**EPIC Funds Spent:** $17,583	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant - Pay for Performance	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 12

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-029 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The research team has drafted the technical specification of the planning tool and compiled spatial data for it. They solicited feedback from the technical advisory committee on the technical specification and datasets and are making revisions prior to developing the software for the application.

114. EPC-15-030

Project Name:

San Diego Regional Energy Innovation Cluster

[EPC-15-030]

Recipient/Contractor:

Cleantech San Diego Association

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan 2015-2017 Triennial Investment Plan	7/15/2016 to 3/31/2022

Program Area and Strategic Objective:

Applied Research and Development

S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies

Market Facilitation

S18: Foster the Development of the Most Promising Energy Technologies into Successful Businesses

Issue:

Clean energy startups face difficulties in making use of the existing programs and resources available in the area, and accessing technology validation facilities, business training, market intelligence, and capital. They also experience increasing challenges navigating regulatory barriers to development and commercialization of entrepreneur's innovations. In order to facilitate the development of new energy innovations and their entry into the market, the various entrepreneurial support services available in the region must be coordinated under one directive, optimizing key services to meet the needs of individual businesses.

Project Description:

This project will develop a collaboration of clean energy organizations in the San Diego Region to provide and coordinate key services, resources, and infrastructure needed by entrepreneurs and researchers in the region. The project aims to accelerate the successful market entry of energy innovations that can benefit Investor Owned Utility (IOU) electric ratepayers. This project will also work with businesses, local jurisdictions and other organizations in the region to connect emerging technologies to region specific-needs.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will help advanced the goals of SB 350 (2015) by accelerating the commercialization of new smart grid technologies that can enable the integration of high-penetrations of renewables and distributed energy resources. This project will increase the probability of commercialization and deployment of a portfolio of technologies that can reduce electricity costs, decrease peak demand, and improve system reliability and safety. Intangible benefits to California ratepayers will result from broader, indirect, and multiplicative economic effects that occur from the successful establishment of California-based technology companies.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will help shorten technology development time and costs by providing a one-stop shop for entrepreneurs to quickly find and access the right services and resources.

Economic Development:

This project will help facilitate successful clean energy entrepreneurship, leading to increased private sector investment and local job creation.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $880,681
EPIC Funds Encumbered: 2012-2014 Plan: $3,000,000 2015-2017 Plan: $2,000,000 Total: $5,000,000	**EPIC Funds Spent:** $17,069
Match Partner and Funding Split: Cleantech San Diego Association: $2,876,060 (35.5 %) CONNECT: $221,874 (2.7 %)	**Match Funding:** $3,097,934
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 6 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-030 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Cleantech San Diego hosted a launch event on October 6, 2016 with regional stakeholder, including entrepreneurs and startup companies, to provide information about the San Diego Regional Energy Innovation Cluster and how it will support clean energy entrepreneurs on their path to commercialization. Cleantech San Diego has also launched a new website for the Innovation Cluster which can be found at http://cleantechsandiego.org/sdreic/.

115. EPC-15-031

Project Name:

Flexible Control Strategies for Plug Loads with Context-Aware Smart Power Outlets to Mitigate Electricity Waste and Support Demand Response

[EPC-15-031]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/2/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Develop Next-Generation End-Use Energy Efficiency Technologies and Strategies for the Building Sector

Issue:

Electronic and miscellaneous plug loads pose uncertainty in regards to customer power consumption and device load profiles. Plug loads are not typically targeted by utility energy efficiency nor demand response programs. Consequently, plug load energy consumption is not well-understood across building types and spaces within commercial buildings. Moreover, integrated plug load control strategies for achieving energy savings and supporting demand response across building types and space within buildings are yet to be developed. However, California's policies are driving the need to better manage plug load growth.

Project Description:

This project will develop integrated plug load control strategies appropriate for different spaces within multiple types of commercial buildings. The project will implement a flexible energy management system (FEMS) to demonstrate the integrated control strategies for plug loads at pilot sites, including installation of smart power outlets and integration of various plug load control strategies with building energy management and/or lighting control systems. The project is designed to demonstrate and measure the degree of effectiveness of the flexible control strategies developed for integrally managing operation of plug loads to achieve energy efficiency and demand reductions.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project has the potential of reducing electricity use in commercial buildings, particularly during low-occupancy times and in user-assigned spaces, thereby achieving lower electricity costs for the ratepayer.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Demand Response (DR): R.13-09-011 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h

Lower Costs:

The developed cost-saving plug load control strategies will clarify display designs, control settings and incorporate behavioral considerations and could reduce electricity use and cost of commercial buildings.

Greater Reliability:

The developed strategy will include demand response capabilities that will be integrated into the plug load systems in an integrated building system environment. Demand response capability could provide flexible load reduction capabilities and provide grid benefits.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $1,050,022	**EPIC Funds Spent:** $52,014
Match Partner and Funding Split: Enmetrics Systems: $24,120 (1.7 %) Ibis Networks: $51,000 (3.7 %) SkyCentrics: $10,000 (0.7 %) San Diego Gas & Electric Company: $30,000 (2.2 %) To Be Determined: $30,000 (2.2 %) TBD - Technical Writer: $25,000 (1.8 %) Electric Power Research Institute (EPRI): $165,000 (11.9 %)	**Match Funding:** $335,120
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 19 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-031 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient continues to evaluate methods to encourage participants to be part of the plug load testing research. The first Technical Advisory Committee meeting was held on January 17, 2017 to discuss the project.

116. EPC-15-032

Project Name:

Bay Area Regional Energy Innovation Cluster

[EPC-15-032]

Recipient/Contractor:

Activation Energy, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan 2015-2017 Triennial Investment Plan	5/12/2016 to 3/31/2022

Program Area and Strategic Objective:

Applied Research and Development

S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies

Market Facilitation

S18: Foster the Development of the Most Promising Energy Technologies into Successful Businesses

Issue:

Long development times, high capital requirements, and long sales cycles for hard energy technologies have all contributed to an extremely difficult financing environment for hard energy innovators. In particular, venture capital (VC) investment, the main source of private sector support for early stage technology companies, has declined sharply for hard energy technology in the past several years. Unfortunately, no reliable, alternate source of private capital has emerged, due to the high risks associated with early stage energy technology development.

Project Description:

This project will establish a Bay Area Regional Energy Innovation Cluster by expanding the Cyclotron Road program to provide commercialization support services to Bay Area entrepreneurs developing breakthrough materials and hardware devices in energy efficiency, energy storage, distribution, grid management, and power generation. This project will provide key services, infrastructure, expertise, and resources to energy entrepreneurs in the Bay Area region to successfully deploy and commercialize their innovations.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will help advance the goals of Senate Bill 350 (De Leon, 2015) by accelerating the commercialization of new smart grid technologies that can enable the integration of high-penetrations of renewables and distributed energy resources. This project will increase the probability of commercialization and deployment of a portfolio of technologies that can reduce electricity costs, decrease peak demand, and improve system reliability and safety. Intangible benefits to California ratepayers will result from broader, indirect, and multiplicative economic effects that occur from the successful establishment of California-based technology companies.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will decrease the time and costs for new technology development by providing entrepreneurs with the services and facilities they need to commercialize their technology.

Economic Development:

This project will help facilitate successful clean energy entrepreneurship, leading to increased private sector investment and local job creation.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $282,411
EPIC Funds Encumbered: 2012-2014 Plan: $2,000,000 2015-2017 Plan: $2,980,000 Total: $4,980,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: DLA Piper LLP: $90,000 (0.6 %) Lawrence Berkeley National Laboratory: $4,150,000 (29.7 %) Activation Energy, Inc.: $260,000 (1.9 %) Autodesk, Inc.: $4,500,000 (32.2 %)	**Match Funding:** $9,000,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 6 out of 12 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-032 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This agreement was approved at the May 2016 Energy Commission Business Meeting. A group kick-off meeting with all members of the Energy Innovation Ecosystem was held in September 2016. A launch event for the project was also held in September 2016, which included a rollout of a project website (http://www.activationenergy.org/). The project team has begun work on the first technical task, developing the intake criteria that will be used to accept entrepreneurs into the innovation cluster program. This task is expected to be completed in the first quarter of 2017, and the project is expected to accept its first round of entrepreneurs in mid-2017.

117. EPC-15-033

Project Name:

Ventilation Solutions for Energy Efficient California Schools: Improving Indoor Air Quality through Advanced, High Performance HVAC

[EPC-15-033]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Research indicates that many California classrooms are under-ventilated relative to rates specified in Title 24 and ASHRAE 62.1. Simply increasing outdoor air ventilations rates in classrooms has pitfalls, it will increase energy use and it can have the unintended negative consequence of increasing student exposures to outdoor air pollutants. Finally, as California looks ahead to achieving 50% energy use reductions in existing and future ZNE schools, there is a need to demonstrate ventilation approaches that are substantially more energy efficient than current, minimally code-compliant systems.

Project Description:

Several technologies that deliver HVAC services and energy savings are been field tested at several schools in California. The technologies currently identified included in this study include heat recovery ventilators, air economizers, demand control ventilation, displacement ventilation, high performance filtration, and learning thermostats. These are advancements that are over and above the technologies typically used in California schools, and can greatly improve the energy efficiency of providing heating, cooling and ventilation in classrooms.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement leads to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by advancing the use of currently available but underutilized technologies and technology combinations for ventilation, thermal conditioning and filtration integrated with energy efficient systems.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 4b, 5d

Lower Costs:

By field testing several HVAC technologies that provide significant savings over existing systems will provide the California rate payer with following benefits: energy savings resulting from improved equipment performance and lower costs associated with delivering thermal comfort and improved IEQ in classrooms.

Environmental Benefits:

By field testing the performance of several HVAC technologies implemented in California's schools, this project provide real-world information on energy saving resulting from improved equipment performance, lower costs associated with delivering thermal comfort, and improved indoor air quality in the classrooms.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $1,500,000	**EPIC Funds Spent:** $34,419
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-033 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project has conducted the first Technical Advisory Committee meeting, IRB review and recruited four schools: Temecula, Santa Ana (2), and Stockton. The subcontract with LBNL is executed. The research team also developed teacher survey questions and completed initial visit to the school in Stockton and Temecula.

118. EPC-15-034

Project Name:

Emerging Energy Public Health Research Roadmap

[EPC-15-034]

Recipient/Contractor:

Public Health Institute

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 7/31/2017

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

The energy system is rapidly evolving under efforts to reduce greenhouse gas emissions and develop resilience to climate impacts. The rapid evolution of the energy system may yield unexpected public health impacts unless proactive measures are taken to identify potential health risks and develop strategies to avoid undesirable impacts.

Project Description:

The Recipient is developing a research needs assessment that focuses on the known and potential public health impacts of emerging energy systems. The needs assessment is based on consultation with experts in emerging energy systems and occupational and environmental health (OEH), and stakeholder representatives from labor, business, government, and community-based organizations.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project is expected to identify potential public health issues related to Emerging Electricity-Generating Systems.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 4b, 5d

Public Health:

The project will mutually educate leading researchers and advance a health lens into evolving energy technology, with the expectation of correcting or preventing adverse health effects which could prevent the widespread adoption of technological advancements in the energy arena.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $0
Generation	

<table>
<tr><td colspan="2">EPIC Funds Encumbered:
$151,000</td><td colspan="2">EPIC Funds Spent:
$6,375</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
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$0</td></tr>
<tr><td colspan="2">Leverage Contributors:
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$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
45 out of 45 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 2</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-15-034 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The research team has held 22 meetings with 34 experts throughout the energy, life cycle assessment, health, labor, and environmental justice field for total for over 30 hours. The team has also created a growing database of peer-reviewed and grey literature. The database currently houses 165 documents on Emerging Electricity-Generating Systems and related health and equity topics.</td></tr>
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119. EPC-15-035

Project Name:

Clarifying and Quantifying Current and Near-Term Groundwater Pumping Energy Use and Costs in California to Improve Energy and Water Systems Reliability

[EPC-15-035]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 6/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

The current lack of empirical research aimed at characterizing the relationship between energy use and groundwater pumping prevents accurate resource planning. Previous studies show that the water sector represents at least 7.7 percent of statewide electricity needs. The percentage of energy used for groundwater pumping is unknown. Similarly, the social barriers to decreasing pumping related energy use are poorly understood, as are options for overcoming those barriers.

Project Description:

The project is quantifying current statewide energy use and costs attributable to groundwater pumping and developing near-term projections of energy use and statewide costs. The projections will factor in groundwater demand, groundwater levels, climate change scenarios, energy prices, and obstacles to implementing energy-efficient pumping and groundwater conservation measures. By expanding knowledge of the relationship between groundwater pumping and energy use, the proposed project will enhance the ability of the State of California and other stakeholders to coordinate water and energy resources planning. In addition, the project will provide key insights on how best to intervene to improve groundwater use and pumping efficiency.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This study will produce the necessary fundamental information about energy used for pumping groundwater in order to increase the efficiency of the energy, and decrease greenhouse gas emissions, from this type of demand.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 2a, 4c

Environmental Benefits:

This study will produce information necessary to develop tools and techniques (technology) to increase energy efficiency and decrease greenhouse gas emissions from pumping groundwater.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $625,000		**EPIC Funds Spent:** $285,058	
Match Partner and Funding Split: Michael Hanneman: $22,550 (3.5 %)		**Match Funding:** $22,550	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-035 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The kick-off meeting for this project occurred on October 13, 2016. The "WET CAT" team, especially CPUC, DWR, and SWRCB have expressed interest in this study and will be supporting it through representation in the technical advisory committee. The project is delayed due to ongoing negotiations between LBNL and PG&E over terms of a non-disclosure agreement in order to obtain necessary data from PG&E.			

120. EPC-15-036

Project Name:

Probabilistic Seasonal and Decadal Forecasts for the Electricity System Using Linear Inverse Modeling

[EPC-15-036]

Recipient/Contractor:

Eagle Rock Analytics

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/13/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

As California moves towards a diverse energy future, with a focus on renewables, the need for improved weather/climate forecasts will increase. These forecasts/scenarios are needed at the seasonal and decadal scales to address operational and planning issues.

Project Description:

The research team will develop and test new forecast methods for temperature and humidity. The forecasts will be provided in the format used by energy planners and managers. The researchers will explore the forecasting utility of parameters such as sea surface temperatures in the middle of the Pacific Ocean that can influence summer conditions in California months in advance. The decadal forecasts will be done using forecasts of large-scale predictor variables of climate from different research centers downscaled to the California region.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project has the potential to reduce ratepayer rates and increase the reliability of the electricity sector via the creation of improved weather/climate forecasts.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 5c

Greater Reliability:

Improved forecast should result in greater reliability if energy managers use the forecasts.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $26,899
Generation	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$400,000	$0

Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-036 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The research team has put together a technical advisory committee (TAC) composed by representatives from three IOUs, CaISO, and the CEC Demand Forecasting Office. The researchers are testing and improving a linear model that can link conditions in the Pacific Ocean and other factors with expected temperatures in California. The research team will describe the model and its capabilities to the TAC on January 11, 2017.Â Together with the TAC, the researchers will select the parameters to be forecasted, the format to use to present these forecasts, and the time when they are needed (e.g., early in the spring for summer seasonal forecasts).			

121. EPC-15-037

Project Name:

Smart Ventilation for Advanced California Homes

[EPC-15-037]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/13/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

As California approaches zero net energy (ZNE) homes, heating and cooling loads and systems get smaller but the need to provide acceptable indoor air quality (IAQ) remains unchanged. Business as usual will result in ventilation contributing a larger fractional load, which counters ZNE goals. In addition, current approaches that specify ventilation per hour are not responsive to occupant needs or contaminants of concern (COC) levels

Project Description:

The Recipient is developing approaches and tools to enable smart ventilation techniques suitable for new and existing, advanced and ZNE homes. Smart ventilation systems use information about current thermal, occupancy, system, and air quality conditions to optimize performance of ventilation-related equipment. This work builds on efforts of the past decade that have facilitated dynamic ventilation approaches. The project uses informed simulation approaches to determine how energy, IAQ, demand, and comfort can be optimized using smart ventilation.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to achievement of the State of California's statutory energy goals by providing acceptable IAQ in air-tight homes.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 4b, 5d

Lower Costs:

This Agreement will result in the ratepayer benefits of reduced electricity consumption because of the direct and indirect effects of improved ventilation performance.

Public Health:

This Agreement will result in the ratepayer benefits of enhanced IAQ (and thus reduced health risk/increased safety) from the direct and indirect effects of improved ventilation.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Distribution</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $0</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$1,500,000</td><td colspan="2">EPIC Funds Spent:
$366,240</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
United States Department of Energy: $1,000,000 (35.7 %)
Aereco S.A.: $200,000 (7.1 %)
Lawrence Berkeley National Laboratory: $100,000 (3.6 %)</td><td colspan="2">Match Funding:
$1,300,000</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
45 out of 45 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 3</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-15-037 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The research team has submitted the draft of building energy simulation test plan. The team is working the literature review of the project. The project is delayed about three months by administrative issues at LBNL.</td></tr>
</table>

122. EPC-15-038

Project Name:

Central Valley Energy Innovation Cluster: BlueTechValley Energy Cluster

[EPC-15-038]

Recipient/Contractor:

California State University, Fresno Foundation

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/16/2016 to 3/31/2022
2015-2017 Triennial Investment Plan	

Program Area and Strategic Objective:

Applied Research and Development

S10: Leverage California's Regional Innovation Clusters to Accelerate the Deployment of Early Stage Clean Energy Technologies and Companies

Market Facilitation

S18: Foster the Development of the Most Promising Energy Technologies into Successful Businesses

Issue:

Current drought conditions in the Central Valley have critically reduced available surface water supplies and increased electricity demand due to increased groundwater pumping. While the region's entrepreneurs are helping to drive new and effective energy and water innovations, many are still significantly limited by technical and non-technical hurdles on the road to commercialization. On their own, many do not have sufficient resources to fully test their technologies, develop fundable business plans, grow entrepreneurial networks, or transition technologies from trial or demonstration scale to real-world deployment and commercialization.

Project Description:

This project will expand access for clean energy entrepreneurs to a region-wide energy-water-food nexus incubator and commercialization services in California's Central Valley and North State regions. The Central Valley Energy Innovation Cluster will provide entrepreneurs with a variety of services, including technology evaluation, proof-of-concept validation and advisory support as well as opportunities to connect with investors, industry leaders and potential customers. The Project will also provide benefits to IOU ratepayers by incubating and supporting the deployment of technologies and services that increase energy efficiency, safety and reliability.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

By providing and coordinating key services, assistance, resources, and infrastructure needed by entrepreneurs and researchers this cluster to create and develop advanced energy technologies that will help the state meet the targets Senate Bill 350 to increase both renewable electricity generation and energy efficiency to 50 percent by 2030.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 2a, 3e, 4c, 4d

Economic Development:

This project will help facilitate successful clean energy entrepreneurship, leading to increased private sector investment and local job creation.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $718,347
Demand-side Management	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
2012-2014 Plan: $3,000,000 2015-2017 Plan: $2,000,000 Total: $5,000,000	$102,907
Match Partner and Funding Split:	**Match Funding:**
California State University, Fresno Foundation: $2,350,112 (30.7 %) Child Family Institute for Innovation and Entrepreneurship - UC Davis: $200,000 (2.6 %) Schatz Energy Research Center: $35,772 (0.5 %) The Cleantech Open: $19,900 (0.3 %) Kern Economic Development Corporation: $49,900 (0.7 %)	$2,655,684
Leverage Contributors:	**Leveraged Funds:**
None	$0

Funding Method:	**Funding Mechanism:**	**No. of Initial Passing Applicants/ Bidders:**	**Rank of Selected Applicant/ Bidder:**
Competitive	Grant	6 out of 12 bidders	Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-038 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved at a Business Meeting on April 13, 2016, and has since established an internet presence at http://bluetechvalley.org/.

Due in part to the funding provided by this project, CSU Fresno Foundation was able to secure an additional $500,000 in federal funding from the U.S. Department of Commerce, Economic Development Administration i6 Challenge, to significantly expand the accelerator program run by the Central Valley Cluster.

In May 2017, the first UC Davis Big Bang! Business Competition with Central Valley Cluster involvement will be held, this will allow the competition to expand and make it accessible to a broader audience.

123. EPC-15-039

Project Name:

Carbon Balance with Renewable Energy: Effects of Solar Installations on Desert Soil Carbon Cycle

[EPC-15-039]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/24/2016 to 8/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Deserts are impacted by both the development of large scale solar installations, and by the temperature changes associated with human induced climate change. The effects of these on the soil organic (biomass) and inorganic (calcium carbonate) carbon budget is unknown. It is crucial to gain quantitative understanding whether desert ecosystems will lose carbon as a result of solar field installations and climate change to identify the environmental costs and benefits of renewable energy development in terms of GHG emissions.

Project Description:

This project will quantify the impacts of large-scale solar arrays and long-term climate change on desert soil conditions (*i.e.* vegetation, microclimate, hydrology, and biogeochemistry) using coupled *in-* and *ex-situ* monitoring and analytical techniques, and determine the soil carbon budget response to these perturbations using climosequence analysis and advanced biogeochemical modeling. Data gathered in the course of this investigation will provide the most comprehensive information to date on the influence of local soil surface and regional climate conditions on arid soil carbon storage and on soil biogeochemical processes more generally. The modeling and analytical work will be at the forefront of studies on the desert soil carbon cycle and promises to yield fundamental insights into the terrestrial carbon budget in arid environments.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The proposed research will determine the impact of large solar arrays on the carbon storage of desert soil ecosystems. Results will provide data and modeling results that will provide insights into the most effective ways to design and manage solar production facilities for maximum net carbon benefits.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 1h, 2a, 3b

Lower Costs:

The proposed research will estimate the mass (and market-based value) of net carbon change in desert soils due to solar sites development and climate change. These metrics for soil carbon gains and losses could be incorporated into renewable energy credits (RECs) and would constitute a direct monetary benefit to California IOU ratepayers.

Environmental Benefits:

The proposed research will estimate GHG emissions arising from net changes to the natural soil carbon cycle caused by utility scale solar installations, reduce regulatory uncertainty, facilitate more efficient environmental approval procedures for solar energy companies, and help to meet state's renewable energy goals.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $80,312	
EPIC Funds Encumbered: $499,181		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: SunPower Corporation: $72,000 (12.6 %)		**Match Funding:** $72,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-039 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The Project was kicked off on June 24, 2016 at the California Energy Commission. The Recipient has selected one of the Sun Power's sites with solar installations for planned studies and outlined the scope of a climosequence of adjacent soils (soils of similar age, lithology, slope - but differing elevations and thus climate). Additionally, the Recipient started collecting and formatting of data of soil's chronosequence (available at Desert Research Institute) and their physical and chemical properties (available from National Resource Conservation Service, USDA). Preliminary geochemical model is being developed.

124. EPC-15-040

Project Name:

Assessing California's Mitigation Guidelines for Burrowing Owls Impacted by Renewable Energy

[EPC-15-040]

Recipient/Contractor:

Zoological Society of San Diego d/b/a San Diego Zoo Global

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 9/2/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

In California, western burrowing owls (*Athene cunicularia hypugaea*) have been designated with the conservation status of Species of Special Concern, mainly due to habitat loss. With planned facility expansions in burrowing owl habitat, renewable energy projects potentially represent a major contributing factor in the continued decline of the species. Translocation away from project sites is an important mitigation method for owls impacted by development, but there is significant uncertainty around the effectiveness of the main two approaches (active and passive translocation) due to the difficulty of tracking owls long enough to determine post-translocation fates.

Project Description:

The project is studying and testing the consequences of both passive and active relocation methods for burrowing owls, and will fill an existing need for robust scientific data on the relative effectiveness of relocation as a conservation method. Secondary goals will provide data on owl movements and habitat use that will inform collision risk models and site selection decisions for renewable energy-generating facilities. The work will be beneficial to energy ratepayers by making mitigation more cost-effective, reducing obstacles to alternative energy generation, helping to maintain a healthy ecosystem for nearby human communities, and to ensure the continued persistence of a California Species of Special Concern.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement to overcome barriers to the achievement of statutory energy goals by increasing the effectiveness of actions designed to mitigate renewable energy impacts on burrowing owls. This will be achieved by evaluating the relative effectiveness of primary translocation methods in an experimental framework. Improvements to the effectiveness of existing translocation methods will also be tested experimentally.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 2a, 4f, 4g

Environmental Benefits:

The project will identify the most effective method for translocation of burrowing owls that are displaced from renewable energy development areas. This may lead to better guidelines for mitigating impacts on this California Species of Special Concern.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $54,425	
EPIC Funds Encumbered: $598,671		**EPIC Funds Spent:** $3,478	
Match Partner and Funding Split: Western Riverside County Regional Conservation Authority: $127,315 (10.6 %) United States Department Fish and Wildlife Service: $35,022 (2.9 %) Zoological Society of San Diego d/b/a San Diego Zoo Global: $407,161 (33.9 %) Coachella Valley Conservation Commission: $33,438 (2.8 %)		**Match Funding:** $602,936	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-040 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The research team is meeting with land managers and regulatory agencies and conducting site visits to identify potential study areas. In conjunction with their technical advisory committee, they have refined the study design and research protocols. In addition, they have tested GPS units and modified their design for use with burrowing owls.			

125. EPC-15-041

Project Name:

MarketZero: Taking an existing grocery store to scalable near-ZNE

[EPC-15-041]

Recipient/Contractor:

Prospect Silicon Valley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/1/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Supermarkets and grocery stores have the highest energy use indices of commercial building types. They are also the most challenging cases to achieve zero net energy among commercial buildings. This is due to the high process energy use of refrigeration and commercial kitchen systems. The 2006 California Commercial End-Use Survey (CEUS) indicated a statewide average of approximately 210 Kbtu/SF/yr in existing grocery stores.

Project Description:

This project will demonstrate a cost-effective pathway to achieving maximum energy efficiency in a grocery store. The project will identify and install a comprehensive cost-effective energy efficiency upgrade package that utilizes innovative strategies such as advanced heating, ventilating and air conditioning systems, refrigerants, fans, air curtains, phase change materials, occupancy sensing measures and advanced lighting and controls. The project will also provide new design approaches that allow for rapid technology discovery and incorporation to ensure the most current technologies are implemented into the design.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will identify cost-effective energy upgrade package that utilizes innovative strategies and pre-commercial technologies such as advanced refrigerants, phase change materials, occupancy sensing measures and advanced controls. The solution also requires new design approaches that allow for rapid technology discovery and incorporation to ensure the most current technologies are implemented into the design.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 4a

Lower Costs:

Implementing energy efficiency could lower future costs for building owners and operators and is scalable to other grocery stores. Estimated state-wide reduction of at least 2,400 GWh and 15 million therms across California grocery stores.

Environmental Benefits:

Implementing the measures could reduce resource consumption (energy, water), reduced greenhouse gas emissions, while improving indoor air and environmental quality.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $846,723	
EPIC Funds Encumbered: $2,999,591		**EPIC Funds Spent:** $110,756	
Match Partner and Funding Split: Whole Foods Market: $650,000 (17.8 %)		**Match Funding:** $650,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-041 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The project kick-off took place on August 17, 2016. The recipient is completing all sub agreements and in the final stages of finalizing agreements for Whole Foods. The recipient is conducting analysis of the energy systems in the grocery store. Additionally, the TAC responded to a Call for Innovations and 40 ideas are being considered for incorporation into the New Technology and Strategy Identification phase of the design process. Twelve companies are now being considered to supply products. LBNL will start model calibration in January and then run several analyses.			

126. EPC-15-042

Project Name:

Zero Energy Residential Optimization - Community Achievement (ZERO-CA)

[EPC-15-042]

Recipient/Contractor:

California Homebuilding Foundation (CHF)

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/1/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

Issue:

Although the construction of a number of single (one-off) zero net energy (ZNE) homes has established that this is a technically feasible goal, it is less clear whether ZNE construction can cost-effectively be brought to scale, especially within the context of the Title 24 Building Energy Efficiency Standards. There is a need for significant increase in the efficiency of California new construction - without significant increases in cost. Additionally, the State will need improved methods for estimating and controlling the unregulated loads, which have grown and will continue to grow over the coming decades.

Project Description:

The project will serve as proof of concept for large-scale deployment of zero net energy (ZNE) single-family homes in California. The objective is to construct ZNE homes without creating undue cost burdens on businesses or consumers, while assuring that changes to home design do not pose health, safety or other risks to occupants. Additionally, the project will provide industry and regulators with a better understanding of the assumptions associated with site energy use and renewable energy generation and will provide resources to builders to assist them with controlling costs on ZNE home construction.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project hopes to overcome cost barriers of Zero Net Energy (ZNE) homes by learning how to construct without creating undue cost burdens and assuring that changes to design do not pose health and safety or other risks to occupants. Additional benefit will provide regulators with a better understanding underlying the equation for site energy use and renewable generation, which can be used to determine when a home has achieved ZNE status.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 1f, 1h, 3b, 4a

Lower Costs:

This project will provide a pathway to the most cost effective energy efficiency measures required to reach a Zero Net Energy home in the new construction market. Providing a roadmap toward the most effective ways to implement ZNE homes will reduce capital costs for ZNE homes.

Environmental Benefits:

This project will reduce greenhouse gas (GHG) emissions by integrating renewable energy and other energy efficiency measures into approximately 40-50 homes within a community development project. This offset of end-use demand will result in an avoided capacity needed at the generation level and the reduction of GHG emissions associated with that demand.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $1,488,701	
EPIC Funds Encumbered: $4,819,805		**EPIC Funds Spent:** $17,799	
Match Partner and Funding Split: California Homebuilding Foundation (CHF): $2,611,014 (35.1 %)		**Match Funding:** $2,611,014	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-042 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Kick-off meeting was held on September 2016. Contractor is establishing subcontracts and assembling the technical advisory committee. Contractor is expected to hold a TAC meeting within the next two months. Energy modeling and cost database work in underway. First phase of construction of ZNE homes is on track and scheduled to begin in the summer of 2017.

127. EPC-15-043

Project Name:

Development of a Genoscape Framework for Assessing Population-Level Impacts of Renewable Energy Development on Migratory Bird Species in California

[EPC-15-043]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

While renewable energy facilities offer clean alternatives to our growing energy needs, they have recently come under scrutiny for their impacts on native wildlife. In particular, tens of thousands of protected birds are killed at solar and wind facilities each year. Assessment of the overall impact of these facilities has been hampered because 1) population-level distributions are poorly understood (i.e. do killed individuals come from vulnerable populations?) and 2) current methods for identifying migration routes have low resolution and are extremely costly.

Project Description:

The Recipient has developed a low-cost method that capitalizes on genomic data to create high-resolution spatial maps of bird populations and migration routes. This technology will be extended to identify migration routes for additional vulnerable and endangered species, assess population-level impacts of fatalities at renewable energy facilities, and map migration hotspots. This information will help with siting decisions of new facilities as well as operational decisions, such as when to turn off wind turbines to avoid vulnerable population fatalities, reducing the overall number of bird losses at renewable energy facilities. Accurate understanding of the distributions of vulnerable populations in space and time will lead to more effective siting, monitoring, and operation, ultimately lowering costs to California ratepayers.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project harnesses the power of genomic data to develop genetic assays for quick, low cost screening of thousands of individuals. Researchers will create high-resolution maps of population structure and apply this information to assess population-level impacts by screening carcasses collected from renewable energy facilities. Genoscape maps can be merged with existing spatial data on energy potential to make siting recommendations for new facilities in areas with minimal impact on wildlife.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 4g

Environmental Benefits:

Improved mapping of migration routes and their timing of bird populations of concern will inform renewable energy siting decisions and target mitigation strategies.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $114,850
EPIC Funds Encumbered: $599,236	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Regents of the University of California, Los Angeles: $888,250 (59.7 %)	**Match Funding:** $888,250
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-043 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The research team is collecting samples from the selected set of birds to begin genetic analysis to determine migration routes and timing relative to renewable energy sites. They have also begun collecting carcasses from solar facilities so that they can use the genetic methods to determine which population the dead birds belonged to.

128. EPC-15-044

Project Name:

Certified Open-Source Software to Support the Interconnection Compliance of Distributed Energy Resources

[EPC-15-044]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/18/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S7: Develop Operational Tools, Models, and Simulations to Improve Grid Resource Planning

Issue:

Revisions being made to Rule 21 require grid-supportive functionality and communication interfaces, and specify the IEEE 2030.5 communication protocol for monitoring and managing distributed energy resources (DER). This protocol is complex, making the development of products difficult and putting interoperability at risk. The application of the IEEE 2030.5 protocol to DER is new, and certification procedures and test software for this application do not exist. These challenges translate to reduced value to owners of distributed energy resources and delay in the availability of products and programs that provide grid-support opportunities.

Project Description:

This project will develop two key open-source software technologies:

1. Implementation of a complete, certified IEEE 2030.5 communication protocol that companies can freely take and incorporate into their products. This reduces the cost and complexity of bringing systems to market, streamlines the certification process, and helps ensure that products can successfully connect and participate in grid programs.

2. A certification procedure and associated test software by which any system or device can be checked for compliance to the standard. Independent evaluation provides manufacturers with an unbiased assessment of their products and provides both business and individual consumers with assurance that their purchases will work as expected.

The project will validate the completeness and quality of these technologies by implementing the open-source client in a commercial DER system and performing field testing.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will accelerate availability of products and systems that allow California ratepayers to install and operate as much grid-tied solar generation as they wish, and to ensure their purchases remain compatible with value-added opportunities over their service life. This directly contributes to achieving California's renewable energy goal of 50% by 2030.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1a, 1h, 1i, 2a, 3a, 5a

Lower Costs:

The cost of product development and system integration is reduced through the availability of free open source software. These cost savings are reflected in retail costs and program incentives that directly benefit California ratepayers.

Consumer Appeal:

Customers of all types require their investments to be compatible with utility communication systems to enable more solar energy on the grid and to maximize the range of value-added services that their products can provide.

Energy Security:

Emergency backup power and smart home systems that aid consumers during disasters become practical because of the accessibility and interoperability of systems provided by a successful open communication protocol.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $203,973
EPIC Funds Encumbered: $816,539	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $92,153 (8.7 %) Enphase Energy: $24,000 (2.3 %) QualityLogic: $32,519 (3.1 %) SunSpec Alliance: $65,050 (6.1 %) Xanthus Consulting International: $30,000 (2.8 %)	**Match Funding:** $243,722
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 23 out of 29 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-044 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The agreement was approved at the May 2016 Energy Commission Business Meeting, and the kickoff meeting was held in August 2016. As of late 2016, project work is continuing in its early phases. Additionally, a report "Standard Communication Interface and Certification Test Program for Smart Inverters" was recently published as part of a complementary project. Certain personnel and subcontractors from this project contributed to that report. Elements of this current project will build upon the report's findings.

129. EPC-15-045

Project Name:

Transactive Incentive Signals to Manage Electricity Consumption for Demand Response [EPC-15-045]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/18/2016 to 6/28/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

Demand response (DR) has substantial potential to act as either a demand-side or a supply-side resource. However, existing programs and rates do not provide a participation incentive structure that accurately reflects system conditions or system costs, a suboptimal situation that results in higher ratepayer costs, low DR participation and an inability for system operators to regularly utilize demand-side resources. As the state moves toward more distributed generation and intermittent renewable energy generation, integration of those generation resources will further increase costs in the absence of significantly expanded DR resources responding to actual system needs in real time.

Project Description:

The Recipient will develop Transactive Load management (TLM) signals, expressed in the form of proxy prices reflective of current and future grid conditions, and implement software to calculate such signals. These signals will be designed to provide customers sufficient information to optimize their energy costs by managing their demand in response to system needs. The signals will be transported via proven and available protocols and networks for use by projects that will test the efficacy of the TLM signals using the demand response projects awarded under agreement EPC-15-054.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will benefit California electric investor owned utility ratepayers by facilitating greater demand response participation, which will reduce costs and improve reliability.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Smart grid: R.08-12-009 Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11 Distribution Level Interconnection (Rule 21): R.11-09-011 Demand Response (DR): R.13-09-011 Net energy metering: R.14-07-002 Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1c, 1d, 1e, 1f, 1g, 1h, 3c, 3e, 3f, 3h, 4a, 5a, 5b

Lower Costs:

Demand Response lowers costs for both the system and individual customers. Procurement costs are reduced when wholesale energy prices are attenuated by price-responsive demand; customer costs are reduced when they either shift consumption to lower-priced times or receive payment for participating load reduction.

Greater Reliability:

High levels of demand can stress grid assets, and increased stress could lead to outages if left unchecked. To the extent that a TLM signal and smart management of consumer loads can minimize stress on grid equipment, reliability is improved.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $126,585	
EPIC Funds Encumbered: $498,054		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Greenlots: $110,450 (18.2 %)		**Match Funding:** $110,450	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-045 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

In the time between proposal submission in January and approval at the May business meeting, an individual who had been part of the proposal team left their position with a small firm included as one of the proposal contractors. EPRI subsequently hired that individual, requiring a budget change. The changes were approved and the agreement has been finalized and approved by all parties. Kickoff meeting planned in Spring 2017.

130. EPC-15-046

Project Name:

Developing a Distribution Substation Management System

[EPC-15-046]

Recipient/Contractor:

Siemens Corporation

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/24/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S6: Develop Technologies, Tools, and Strategies to Enable the Smart Grid of 2020

Issue:

As the electric distribution system becomes increasingly complex with the integration of more distributed energy resources, existing distribution automation systems need to be enhanced with functions to manage increasing amounts of renewable energy connected at the distribution level and to provide greater control over the operation of distributed energy resources. Distribution management systems need to automate more monitoring and control operations at substations using standard communication protocols to quickly respond to changes and problems to reduce outage times.

Project Description:

This project will develop an operational display for electrical distribution substations. This display along with the supporting software will show the current state of the distribution system, detect problems, and automatically suggest potential solutions to reduce outage times. The software will also automate routine and non-routine engineering and maintenance tasks that are performed on substation equipment.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will provide greater electric reliability, reduced electrical losses, better asset utilization, and enable better planning.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1g, 2a, 3a, 3d, 3f, 5f, 5h

Lower Costs:

A greater degree of automation for grid operation processes will lead to reduced grid operation costs that potentially translate into lower rates for California ratepayers.

Greater Reliability:

The main benefit of this project is that it will allow grid problems to be resolved automatically, thus averting power outages.

Energy Security:

A greater degree of grid automation enables faster reactions to shifts in electricity production, thereby permitting a higher percentage of distributed renewable energy resources.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $171,526
EPIC Funds Encumbered: $500,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Siemens Corporation, Corporate Technology: $455,000 (47.6 %)	**Match Funding:** $455,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 23 out of 29 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-046 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Since the project kick-off in June 2016, the recipient has focused on extending the smart grid knowledge model with information that is relevant for the operational automation of the distribution grid. The recipient began by adding the concepts of voltage and power data streams and implemented a prototype of a classification algorithm that classifies incoming streams according to statistical parameters. In the future, this classifier will enable the semantically integrated operational dashboard to automatically identify relevant streams that exhibit undesired behavior, display these streams, and provide the operator with an interface to create monitoring rules.

131. EPC-15-047

Project Name:

Powernet - A Cloud Based Method for Managing Distribution Resources

[EPC-15-047]

Recipient/Contractor:

SLAC National Accelerator Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/18/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S6: Develop Technologies, Tools, and Strategies to Enable the Smart Grid of 2020

Issue:

In California, renewables on the utility side of the meter are expected to provide 50% or more of load by 2030. In addition, greatly expanded numbers of distributed energy resources, such as distributed solar, storage, and electric vehicles, are expected on the customer side of the meter to connect to the distribution grid. There is an urgent need for methods that utilities can use to coordinate these resources.

Project Description:

This project will further develop Powernet, a cloud-based method to manage energy resources in homes and businesses. Powernet, originally funded by ARPA-e, will control and coordinate energy resources both behind the meter and at the distribution system for residential and commercial ratepayers.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The Powernet technology developed in this project will defer distribution upgrades while enabling renewable operation above 50%.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1g, 2a, 3a, 3d, 3f, 5f, 5h

Lower Costs:

Powernet will lower connection costs to $800 if successful.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $865,939
Distribution	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$2,210,720	$502,644
Match Partner and Funding Split:	**Match Funding:**
None	$0

Leverage Contributors: United States Department of Energy: $3,500,000		**Leveraged Funds:** $3,500,000	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 23 out of 29 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-047 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The areas of progress for the project are: 1) finalize the site location, 2) finalize and purchase measurement equipment and 3) staffing. SLAC is making progress in finalizing the location. The original location had limited cooling loads and PV deployments so they are in the process of finalizing the selection of sites in San Diego. They will equip each site with a measuring device to collect electricity consumption data. They will install meters and will also have granular data from appliances. Each house will have Nest thermostats. They will visit sites the first week of December. Finally, they have posted a project engineer position and will be hiring by the end of 2016.			

132. EPC-15-048

Project Name:

Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed Energy Resources

[EPC-15-048]

Recipient/Contractor:

Alternative Energy Systems Consulting, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/30/2016 to 3/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

Excessive solar generation during the daytime creates a net load profile that is very challenging for the utilities to support due to the steep ramp down and up in the morning and evening. Significant contribution from renewable energy sources cannot be realized unless there is a significant transformation of how energy is being managed from a few centralized generators into a mesh of millions of distributed generators. Additional effort is needed on how to proliferate this mass of distributed generators that can interact with energy storage, shift loads, and curtail production during periods of peak generation.

Project Description:

This project will test and validate an Intelligent Energy Management Solution (iEMS) in 100 residences to communicate with a variety of distributed energy resources over different climate zones and behavioral patterns. The intent of the project is to model and measure the potential energy and cost impact associated with the use of the iEMS in homes without affecting occupant comfort. The project will also integrate the use of pilot time-of-use utility rates in conjunction with simulated dynamic pricing signals to optimize customer cost savings.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This system has the potential to reduce peak demand without impacting consumer comfort and convenience, while stabilizing the aggregate demand on the grid by allowing the load to react to dynamic pricing.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1e, 1h, 2a, 4a

Lower Costs:

Based on initial estimates, the proposed solution may reduce annual electricity costs by 36 to 41 percent.

Greater Reliability:

By distributing the electricity storage and usage across millions of homes, it prevents a single point of failure such as large battery storage farm, thus offering substantially greater reliability.

Environmental Benefits:

Contributes to California's goal of 50 percent renewable energy by 2030 by intelligently using the residential market to absorb additional renewable electricity. Benefits of 50 percent renewable energy production will greatly contribute to reduced GHG emissions.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $938,190	
EPIC Funds Encumbered: $3,996,560		**EPIC Funds Spent:** $58,273	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-048 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project kicked off August 23, 2016. Current project efforts include finalizing subcontracts, and developing Technical Advisory Committee. Significant effort has been dedicated to finding a replacement for a subcontractor.

133. EPC-15-049

Project Name:

Electricity Pumped Storage Systems Using Underground Reservoirs: A Feasibility Study for the Antelope Valley Water Storage System

[EPC-15-049]

Recipient/Contractor:

Antelope Valley Water Storage, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 9/29/2017

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

In recent years, incorporation of renewable energy into the electric grid has made the development of energy storage important. Conventional pumped hydroelectric storage has been the dominant energy storage technology in the United States. The technology is limited by topography, environmental concerns, high cost, and the large size requirements needed to make conventional pumped hydroelectric storage practical. The primary limits to pumped storage are that most of the best sites for surface reservoirs have already been taken. Sites with the requisite elevation difference and existing facilities limit the wider use of pumped storage in California.

Project Description:

The project conducts a feasibility study that determines the value of energy storage and optimizing associated grid support benefits provided by Peak Hour Pumped Storage and Aquifer Pumped Hydro applications at an existing water bank. The feasibility study also identifies critical parameters for success for both technologies and identifies other water banking sites in the state where these technologies are likely to be successful.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by enabling assessment of Aquifer Pumped Hydro and Peak Hour Pumped Storage for energy storage purposes. The study will also identify groundwater banks across the State where the application of the above two energy storage systems (ESSs) is likely to result in optimized benefits to the grid.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011

Applicable Metrics: CPUC Metrics- 1e, 3f

Greater Reliability:

This Agreement will result in the ratepayer benefits of greater electricity reliability, by assessing two promising energy storage technologies.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Generation</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $15,276</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$197,300</td><td colspan="2">EPIC Funds Spent:
$20,972</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
CIM Group: $199,353 (50.3 %)</td><td colspan="2">Match Funding:
$199,353</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
45 out of 45 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 2</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-15-049 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The research team has conducted preliminary field test at the water bank. The results show low efficiency and revealed water quality issues as a potential barrier for implementation. A TAC meeting has been conducted to discuss options and seek expert input. Using the results, the research team will work on identifying physical parameters that will make the storage method feasible and potential sites in California.</td></tr>
</table>

134. EPC-15-050

Project Name:

Winery Water and Energy Savings

[EPC-15-050]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 12/31/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

California is the fourth largest producer of wine in the world (Wine Institute, 2015). The California wine industry is a significant water consumer and is the second largest electricity consumer in the state's food and beverage industry. As the wine industry continues to grow, so does the need for technologies and strategies that could significantly reduce energy and water use. Potential strategies include indoor water reuse and heat exchanger technologies. Although water reuse strategies could significantly decrease fresh water use in wine production, barriers to implementation and widespread adoption must be addressed and overcome.

Project Description:

This project will install two energy and water saving technologies that will include equipment to be delivered on a pre-assembled skid and hooked into the plumbing and electrical connections at the Skylane facility owned by Jackson Family Wines, Inc., in Sonoma County. The systems to be installed will consist of: 1) a process water treatment and reuse technology called the Vibratory Shear Enhanced Process technology to recycle process wastewater for indoor use, such as barrel washing; and, 2) an energy efficient white wine "cold stabilization" technology called the PEI Wine-to-Wine Heat Exchanger. The project also includes installation of equipment necessary to conduct extensive monitoring and verification and development of technology transfer materials.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will focus on full-scale technology demonstrations of two technologies to increase water and energy efficiency in wine production. An efficient reverse osmosis water treatment technology will be used to treat wine barrel wash water to potable standards and reused for barrel washing and is estimated to reduce 90 percent of the fresh groundwater used annually for barrel washing. The second technology will reduce the energy used for stabilizing white wine. For both projects anticipated benefits include annual savings of over 1.4 million gallons of fresh water, and energy savings of approximately 246,000 kWh and 28,000 therms.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a, 4c

Lower Costs:

The project could increase energy and water efficiency in the wine production industry. The increased efficiencies could lower production costs for winemakers. The water cycle for washing wine barrels creates energy demand for pumping water, treating water, distributing the water to the barrel washing stations, collecting and treating barrel washing wastewater, and

irrigating the facility's on-site vineyards to dispose of the treated water. Treating and reusing barrel wash water includes embedded energy savings and greenhouse gas (GHG) emissions savings.

Greater Reliability:

This project will directly benefit ratepayers by avoiding the marginal costs of electricity supply expansion and improving electricity reliability by reducing energy demand on the regional grid.

Environmental Benefits:

This project is estimated to reduce by 90 percent the amount of fresh groundwater used annually for barrel washing. The normal water cycle for washing wine barrels creates energy demands for pumping, treating and distributing the water to the barrel washing stations and then collecting and treating the wastewater. The potential ability to reuse the treated wastewater for barrel washing will save over 1.4 million gallons of fresh water annually. The estimated embedded energy of the water is 42,459 kWh/yr, and 30,995 pounds of CO2e/yr.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $157,088	
EPIC Funds Encumbered: $1,989,201		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Jackson Family Wines: $404,625 (16.9 %)		**Match Funding:** $404,625	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-050 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Name: Vibratory Shear Enhanced Processing (VSEP). **Type:** Project-relevant pre-existing IP - Technology, Design, Drawing. The proprietary technology was fully developed and patented by the owner, New Logic Research Inc., prior to the start of this Agreement. Name and date of Copyright and Patent to be provided.

Update:

Kickoff Meeting held September 1, 2016. The recipient is in the process of assembling its team and developing the implementation plan. Jackson Family Wines, demo site, started development of construction schedule and obtaining project bids from contractors and engineers. Final construction schedule completed. UC Davis started development of a water quality analysis lab on campus, and a list of which constituents to test for, identified an off campus lab for certain element testing, and a full list of testing methodology, equipment, and consumables for each constituent to be tested. The Recipient submitted first Invoice and Progress Report in December (2016 Quarter, September - November).

135. EPC-15-051

Project Name:

The Value Proposition for Cost-Effective, DR-Enabling, Nonresidential Lighting System Retrofits in California Buildings

[EPC-15-051]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 6/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

Advanced lighting controls are among the rapidly evolving technologies that utilize wireless communications, embedded sensors, data analytics and controls to optimize building systems in real time. Energy benefits due to lighting controls are becoming a smaller piece of the technology overall value proposition. This project seeks to quantify the demand response (DR) value (energy and non-energy benefits/costs) for networked lighting systems in addition to their energy-efficiency benefits, and integrate this DR value into a broader advanced lighting controls value proposition framework that can be employed as a tool for the future.

Project Description:

This project will identify, quantify and evaluate the incremental costs and benefits of demand responsive (DR) lighting controls system requirements in the California Energy Code across existing, non-residential building stock. The project will focus on the incremental costs and benefits associated with adding the DR functionality to enhance general lighting upgrades in existing, non-residential buildings to enable them to act as DR resources.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project has the potential of providing greater electricity grid resiliency and flexibility due to the fast, dynamically controllable and functionality provided by demand response-enabled, advanced lighting controls.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 2a, 5e

Lower Costs:

Demand response enabled, advanced lighting controls can significantly reduce customer energy consumption (50% - 70% in offices) and costs by optimizing light output when and where it is needed, and by minimizing its use when not needed through the deployment of highly granular networked sensors and efficient light sources.

Greater Reliability:

Increased customer participation in demand response programs can increase grid reliability

and reduce utilities' need for purchasing expensive electricity during periods of high demand.

Increase Safety:

Improved lighting quality can increase employee safety.

Environmental Benefits:

Lower energy consumption can reduce power plant emissions, improving air quality.

Consumer Appeal:

Improved lighting quality can increase employee productivity and occupant satisfaction.

Energy Security:

Reduced energy consumption and dispatchable grid resource.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $500,000		**EPIC Funds Spent:** $327,875	
Match Partner and Funding Split: Energy Solutions: $138,648 (21.7 %)		**Match Funding:** $138,648	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-051 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Both LBNL and their subcontractor (Energy Solutions) are currently working on analyzing statewide Demand Response potential from lighting for commercial buildings per customer type (office building, school, health care facility, etc.) and per each of California's 12 climate zones.

136. EPC-15-052

Project Name:

ZipPower San Leandro

[EPC-15-052]

Recipient/Contractor:

ZipPower, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Traditionally, renewable energy in communities has been implemented one rooftop at a time without basing investment decisions on an assessment of the community's energy system as a whole or the integration and automation of all required components. The absence of an integrated, community-wide energy planning and implementation process results in a lost opportunity to increase distributed renewable energy output in a more efficient, scalable, and strategic manner.

Project Description:

This project will develop and pilot a platform that optimizes distributed energy resource planning by integrating and automating all the data required to target optimal sites across city areas, and streamline pre-approval of the permitting and interconnection at those sites. The project will also use aggregated customer financing as an option to design, finance, deploy, scale, and replicate Advanced Energy Communities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings in existing buildings by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of advanced energy technologies at a community scale will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in communities deploying advanced energy technologies.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $158,370
EPIC Funds Encumbered: $1,495,338	**EPIC Funds Spent:** $0
Match Partner and Funding Split: ZipPower, LLC: $486,000 (24.5 %)	**Match Funding:** $486,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-052 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved at a Business Meeting on May 17, 2016. Work is expected to begin June 2016.

137. EPC-15-053

Project Name:

Customer-Centric Approach to Scaling IDSM Retrofits

[EPC-15-053]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

The California retrofit goal is to reduce 50% of existing buildings' energy use by 2030. Disadvantaged, low-income, multifamily communities are one of the most important retrofit targets, yet have no cost-effective pathways to achieve these goals. Multifamily housing is a very difficult market segment to address due to split incentives as retrofits are the responsibility of a property owner but he/she does not pay the energy bill. Limited technical and financial knowledge for owners also plays a role.

Project Description:

This project will develop and demonstrate an approach to scale residential retrofits for disadvantaged communities that will focus on customer-centric solutions. This project will develop and demonstrate an innovative approach, focusing on energy efficient retrofit packages that are non-intrusive to occupants and have the potential of reducing energy use by 30 to 40 percent.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will provide new data, analysis, and designs for cost effective integrated demand side management retrofits for residential communities. These integrated retrofits could reduce energy use by 30 to 40% in multifamily buildings.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 5b

Lower Costs:

The project could result in significant savings in energy and operating costs to building owners and residents.

Greater Reliability:

Improve the reliability with the integration of energy efficiency, demand control, and renewable power with buildings and the Smart Grid.

Increase Safety:

IDSM retrofits have the potential to increase safety due to the improved ability to control and integrate buildings' use of renewable power, storage, electric vehicle charging, and the Smart Grid. In addition, many of the networked IDSM technologies have additional monitoring and safety features.

Environmental Benefits:

This project has the potential to reduce greenhouse gas emissions by demonstrating a combination of energy efficient technologies in multi-family buildings.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,316,714
EPIC Funds Encumbered: $3,894,721	**EPIC Funds Spent:** $19,728
Match Partner and Funding Split: BIRA Energy: $25,000 (0.5 %) Southern California Edison: $312,572 (6.7 %) LINC Housing Corporation: $461,987 (9.8 %)	**Match Funding:** $799,559
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-053 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient is finalizing subcontracts and developing the project plans in coordination with its subcontractors. An audit report has been submitted which outlines existing conditions and a list of recommended energy efficient measures for each site. Staff and project team have conducted a site visit and tour.

138. EPC-15-054

Project Name:

Complete and Low Cost Retail Automated Transactive Energy System (RATES)

[EPC-15-054]

Recipient/Contractor:

Universal Devices, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

Existing Demand Response programs, tariffs and wholesale markets in California are focused primarily on reliability and peak load reduction. The end-use loads enrolled in these programs tend to have high opportunity costs so participation in these programs is low. Participation logistics - including metering, telemetry, baseline estimation, verification and settlement - still serve as a barrier to wider participation. Substantial research and technology development over the past decade have pointed toward a vast untapped potential for balancing electricity supply and demand in near-real time through better management of customer loads and distributed energy assets.

Project Description:

This project will develop and pilot-test a complete, low cost, and standards based Retail Automated Transactive Energy System (RATES), and behind the meter energy management solution, that minimizes the cost and complexity of customer participation in energy efficiency programs, while maximizing the potential of large numbers of small loads to improve system load factor, shave peaks, integrate renewable generation and otherwise provide low opportunity-cost resources to the grid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Greater electricity reliability will result as customers respond to variable spot prices that reflect grid conditions and spot costs. Lower costs of electricity will result from reduced investment in wholesale generation, energy storage capacity, and transmission and distribution capacity because the investments and operations of retail customers will be better coordinated with the wholesale energy market and grid operations.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011 Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1c, 1e, 1f, 1g, 1h, 3f, 4a

Lower Costs:

Lower costs of electricity will result from reduced investment in wholesale generation and more efficient utilization of energy.

Greater Reliability:

Greater electricity reliability will result as customers respond to variable prices that reflect grid conditions.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $3,187,370	**EPIC Funds Spent:** $281,646
Match Partner and Funding Split: TeMix, Inc.: $919,325 (21.5 %) TBD Electrical Contractor: $7,000 (0.2 %) TBD - Controls: $1,150 (0.0 %) Universal Devices, Inc.: $160,235 (3.7 %)	**Match Funding:** $1,087,710
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-054 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project began on 6/30/2016. Both TeMix and Universal Devices have dedicated resources assigned to requirement analysis for system high level design and have begun working with Southern California Edison to develop the pilot.

139. EPC-15-055

Project Name:

The Charge Bliss Advanced Renewable Energy Community for a Disadvantaged Southern California Community

[EPC-15-055]

Recipient/Contractor:

Charge Bliss, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

As California adopts aggressive statutory clean energy goals, new communities in California must incorporate energy efficiency standards, distributed generation, storage, EV charging infrastructure, and smart grid elements. To accomplish this, communities seeking to incorporate advanced clean energy technology must innovate with respect to the planning and permitting of these communities at the local and regional levels of government; the design, engineering, and financing of these communities; and the roles and coordination of stakeholders involved in the deployment process.

Project Description:

This project will design a replicable case study for communities seeking to incorporate high penetrations of photovoltaic (PV) generation that is being balanced with an extensive electric vehicle charging network and stationary battery storage. The team will conduct planning, permitting, financial modeling, and engineering design for over three megawatts of PVs and 100+ charging stations for a disadvantaged public sector and commercial area in the City of Carson. Charge Bliss will be collaborating with two local government entities, South Bay Cities Council of Governments, and Southern California Association of Governments, as well as a collection of universities and private companies on this effort.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (2015) sets a 50 percent renewable energy standard by 2030 standard and a doubling of energy efficiency savings in buildings by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3c

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of advanced energy technologies at a community scale will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in communities deploying advanced energy technologies.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $197,815
EPIC Funds Encumbered: $1,500,000	**EPIC Funds Spent:** $58,132
Match Partner and Funding Split: Efacec: $20,000 (1.3 %) Ji Min: $25,000 (1.6 %) Edward Kjaer: $8,325 (0.5 %) Tanner Engineering: $43,612 (2.7 %)	**Match Funding:** $96,937
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-055 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team is working with the City of Carson to select the best public buildings that can be used to research permitting, planning, and engineering innovations that can be replicated by other cities looking to build advanced energy communities.

140. EPC-15-056

Project Name:

Peninsula Advanced Energy Community (PAEC)

[EPC-15-056]

Recipient/Contractor:

Natural Capitalism Solutions, dba Clean Coalition

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/27/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

In order to meet future state mandated energy and environmental goals, significant improvements are needed in the way California generates, transmits, and uses electricity. There simply needs to be an increase in the amount of power generated from local renewables and better use made of the power we consume. However, the widespread adoption of the enabling technological solutions-- local renewables, ZNE buildings, solar emergency microgrids, EV chargers-- requires fundamental changes to the way these projects are planned, financed, approved and deployed. Finding viable sites, securing project financing, and connecting clean energy projects to the grid all represent significant challenges.

Project Description:

This project will accelerate the planning, approval, and deployment of an Advanced Energy Community (AEC), including a planned and designed Solar Emergency Microgrid, within a diverse community in the southern portion of San Mateo County. The master plan will include the analysis of deep energy efficiency retrofit strategies, an integrated electrical system, and an electric vehicle charging system network. The development of this plan will also inform recommendations for local planning and building departments to streamline the regulatory environment surrounding these types of developments.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving this goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting, and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

Streamlined planning and permitting, as well as new financial models will lower the time and capital costs associated with the AEC developments. This will make AECs more affordable for both developers and consumers.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of AECs will increase consumer familiarity and comfort with Zero Net Energy homes and communities, increasing the likelihood of consumers choosing to live in an AEC.

Energy Security:

Microgrids using renewable energy generation, coupled with storage systems, allows consumers to generate their own energy locally.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $312,711
EPIC Funds Encumbered: $1,318,997	**EPIC Funds Spent:** $61,824
Match Partner and Funding Split: Natural Capitalism Solutions, dba Clean Coalition: $330,000 (20.0 %)	**Match Funding:** $330,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-056 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project was approved at the May 2016 Energy Commission Business Meeting. The project began work in September 2016, with a Project Kickoff Meeting held on September 29th, 2016. The Recipient has created a project-specific page on their website, which can be seen at: http://www.clean-coalition.org/our-work/peninsula-advanced-energy-community/.

141. EPC-15-057

Project Name:

Customer-controlled, Price-mediated, Automated Demand Response for Commercial Buildings [EPC-15-057]

Recipient/Contractor:

The Regents of the University of California on behalf of the California Institute for Energy and Environment

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

The services demanded of commercial building customers require significant energy and contribute to peak energy demand. Few demand response (DR) solutions address the complexity and heterogeneity for commercial customers. Large commercial customers typically have a building management system (BMS) that controls HVAC and lighting in order to respond to price signals. Small commercial customers do not have BMS, and thus cannot easily participate in DR. This problem has not been addressed because an open source and open architecture enabling platform runs counter to the business model of many companies, who want to maintain a single vendor, proprietary solution.

Project Description:

The purpose of this project is to improve small and large commercial customer participation in demand response programs by providing a cost-effective energy management system that allows a wide range of hardware and service offerings as well as effective and automated price-based management.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

A software solution is a much more nimble and cost-effective approach to achieve energy goals versus high cost of technological upgrades. Another major barrier is single-vendor, single communication protocol integrated solutions. The open architecture of XBOS/DR, augmented by the information exchanger allowing interoperability with other standards, will foster technical innovation by third-party vendors and HVAC, lighting, and other manufacturers in providing energy services.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1c, 1e, 1g, 1h, 4a

Lower Costs:

$260 million per year reduction in energy costs for ratepayers in 2024 - derived from: lower demand charges, increased electric grid energy efficiency, reduced energy end-use from persistent efficiency in parallel with DR, and lower generation costs.

Greater Reliability:

450 MW of avoided or shifted peak electric demand in 2024. This is a 150% increase beyond the 293 MW of DR from a combination of nonevent-based programs, critical peak pricing, and peak-time rebates estimated by the California Energy Demand 2016-2026 Revised Forecast.

Environmental Benefits:

930,000 metric tons of CO2e and 130 metric tons of NOx emissions per year avoided in 2024 from: increased electric grid energy efficiency, increased end-use energy efficiency in parallel with demand-management, and increased fraction of intermittent operationally GHG-free renewable electricity generation.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,373,762
EPIC Funds Encumbered: $4,000,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Siemens Corporation, Corporate Technology: $400,000 (9.0 %) Quantum Energy Services & Technologies, Inc. (DBA: QuEST): $24,000 (0.5 %)	**Match Funding:** $424,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-057 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

There are several open source IP being used, including: the eXtensible Building Operating System, the Monitoring and Actuation Profile, the Building Operating System Services Wide Area Verified Exchange, the Berkeley Tree Database, Giles, and OpenBAS.

Other IP include: Semantic Integration of Wearable Sensors into Professional Healthcare, EnergyOP, and OWL implementation of SPC201.

Update:

The recipient wrote and submitted a Customer Value Needs and Preferences Memo and the Customer Value Use Case Report, which included a list of devices/appliances, in November 2016. The Information Exchange Module report, which describes the high-level system architecture, was submitted in January 2017. They plan to develop and submit a Pilot Test Plan for Small-Medium Commercial Buildings in the first quarter of 2017, as well as complete their site selection criteria.

142. EPC-15-058

Project Name:

The Oakland EcoBlock - A Zero Net Energy, Low Water Use Retrofit Neighborhood Demonstration Project

[EPC-15-058]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/27/2016 to 3/23/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Significant improvements are needed in the way California generates, transmits, and uses electricity to meet future state mandated energy and environmental goals. Innovative Advanced Energy Community (AEC) developments that deploy a wide mix of clean energy technologies on a medium-to-large scale offer a way to further those improvements. However, local governments, developers, and other stakeholders do not have standards for planning, permitting, and funding these types of developments, making their realization difficult. Streamlining the regulatory and financing aspects of AEC deployment can lead to significant increases in similar developments throughout California.

Project Description:

This proposal will develop a retrofit master plan of a block-scale development. The plan will range from a schematic level all the way to a design development level for cost modeling and final system selection. The master plan will include the analysis of deep energy efficiency retrofit strategies, an integrated electrical system, and an integrated water conservation and capture system. The development of this plan will also inform new financial and business models that can finance similar projects, as well as recommendations for local planning and building departments to streamline the regulatory environment surrounding these types of developments.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (De Leon, 2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Water-Energy Nexus: R.13-12-011 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

Streamlined planning and permitting, as well as new financial models will lower the time and capital costs associated with AEC developments. This will make AECs more affordable for both developers and consumers.

Economic Development:

Increased AEC deployments can lead to increased demand in clean energy technologies and services resulting in broad economic benefits to the clean energy sector.

Consumer Appeal:

Greater deployment of AECs will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in an AEC.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $117,432
Demand-side Management	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$1,500,000	$1,566
Match Partner and Funding Split:	**Match Funding:**
Rexel Foundation: $140,000 (6.2 %) Morgan, Lewis & Bockius LLP: $412,300 (18.2 %) Arnold & Porter LLP: $150,000 (6.6 %) Perkins Coie: $41,250 (1.8 %) The Regents of the University of California on behalf of the Berkeley campus: $26,296 (1.2 %)	$769,846
Leverage Contributors:	**Leveraged Funds:**
None	$0

Funding Method:	**Funding Mechanism:**	**No. of Initial Passing Applicants/ Bidders:**	**Rank of Selected Applicant/ Bidder:**
Competitive	Grant	27 out of 28 bidders	Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-058 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This agreement was adopted at an Energy Commission Business Meeting on May 17, 2016. A group kick-off meeting with all Advanced Energy Community award recipients was held in September 2016. The project team has begun work on the first technical tasks examining potential energy efficiency, renewable generation and water saving technologies to implement into the community plan.

143. EPC-15-059

Project Name:

UniGen Smart System for Renewable Integration

[EPC-15-059]

Recipient/Contractor:

Onset, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/24/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S6: Develop Technologies, Tools, and Strategies to Enable the Smart Grid of 2020

Issue:

The electric grid was designed on the presumption that load and generation were both predictable and relatively slow-moving. Grid operators waited for an energy management system to identify changes and the resources available, and then responded by manually dispatching the generation resources necessary to balance the system. Variable, renewable energy resources change quicker and are less predictable, which challenge the engineering/planning of the grid. This variability results in increased threats to electricity reliability and costs to California ratepayers or limits in the amount of renewable electricity generation. These outcomes are barriers to greenhouse gas reduction goals.

Project Description:

This project will develop software called the UniGen Smart System to resolve issues at the generator-level that are associated with integrating 33 percent to 50 percent of Variable Energy Resources (VERs) representative of the Renewables Portfolio Standard goals for 2020 and 2030, respectively. The Recipient will perform laboratory simulations to test the validity of the software in lieu of a field test with actual power plants.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The UniGen Smart System has the potential to save California ratepayers an estimated $100 million annually in reduced renewable integration charges. This software will help the California ISO avoid having costly penalties associated with non-compliance of NERC standards being passed onto ratepayers, and be an important tool for California IOUs and others to meet aggressive goals for clean renewable generation and support California's initiative to reduce greenhouse gas emissions.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1a, 1h, 2a, 3a, 5a

Lower Costs:

The UniGen Smart System software could save California IOU ratepayers an estimated $100 million annually that is otherwise spent on integrating renewables. Ratepayers' bills would be lower relative to "business as usual" for deploying renewables, thereby increasing the acceptance of more renewable energy in the state.

Greater Reliability:

The software could help the California ISO maintain grid reliability and avoid non-compliance with NERC standards despite the increase in renewable energy to unprecedented levels.

Environmental Benefits:

The software helps enable achievement of California's aggressive climate change goals by accelerating the penetration of higher levels of renewable energy sources.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $638,993		**EPIC Funds Spent:** $50,289	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 23 out of 29 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-059 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Onset completed the technical and economic feasibility of the UniGen Smart System ahead of schedule. Onset presented the results to the California Independent System Operator (California ISO) on October 14, 2016, and received favorable feedback and comments from California ISO staff. Onset and Sacramento State University have initiated work on the Design Review and Model Development Tasks with input from the California ISO.

144. EPC-15-060

Project Name:

Optimizing Solar Facility Configuration Effects on Habitat, Managed Plants, and Essential Species Interactions

[EPC-15-060]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Habitat variation and changes to species interactions within and adjacent to energy installations may regulate impacts to species of concern, including rare and invasive species. Typical management planning for both rare and invasive species takes a single-species approach, and may overlook how species' responses change over the variation in micro-environmental conditions within energy facilities and mitigation areas. In addition, altered species-interactions may drive long-term failure or success of species in landscapes modified by renewable energy development and operation.

Project Description:

This research will quantify how microhabitat conditions that affect rare plants, invasive plants, and a sensitive insect vary across a gradient of solar energy configuration, including sites within a solar field, mitigation areas within a solar field, sites on the margin of a solar field, and similar undisturbed locations. Experiments will be used to determine how habitat variation affects target plant species and their essential species interactions, including herbivory, predation, and pathogens.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by providing methods to decrease adverse environmental impacts of solar energy facilities. This Agreement will enhance the ability to predict and overcome costly invasions of non-native plants in early stages. This research will also advance the effectiveness of mitigation measures, reduce impacts, and overcome barriers to facility siting and design.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 3a, 4f

Lower Costs:

This research will reduce costs in the siting and deployment of renewable energy by assessing the benefits or ecological costs of different facility configurations, providing guidance for the design of future solar facilities and the cost-effective management of native and invasive species in existing facilities.

Environmental Benefits:

This research will benefit ratepayers by providing effective, efficient strategies for the management of state and federally listed species within and adjacent to energy facilities.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $104,801
EPIC Funds Encumbered: $597,865	**EPIC Funds Spent:** $0
Match Partner and Funding Split: The Regents of the University of California, Santa Cruz: $54,940 (7.8 %) Regents of the University of California (University of California, Davis): $48,357 (6.9 %)	**Match Funding:** $103,297
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 19

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-060 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team is refining the study design and setting up the field experimental sites.

145. EPC-15-061

Project Name:

Using Data-Driven Approaches to Design Advanced Energy Communities for Existing Buildings

[EPC-15-061]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/13/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Southern California continues to struggle to upgrade its existing buildings in support of state energy and environmental goals. These limitations are greatest in disadvantaged communities as a result of insufficient community involvement and lack of energy data supporting energy retrofit programs, an absence of planning and permitting guidance for implementation of state energy policies, and inadequate business and financing strategies for engaging target communities. Failure to understand the relationship of disadvantaged communities with energy creates a barrier to advanced energy community adoption in these areas.

Project Description:

This project will develop a master plan addressing the planning and permitting challenges in disadvantaged communities preventing the adoption of clean energy technologies in existing buildings in disadvantaged communities. The master plan will combine meter-level energy data analysis along with community stakeholder engagement to determine the optimal locations for building retrofits. Using these locations, local jurisdictions will create planning and permitting resources that will incorporate a better understanding of community needs, through collected data, to increase the number of building energy efficiency retrofits in disadvantaged communities and contribute to achieving state energy goals.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (2015) sets a 50 percent renewable energy standard by 2030 standard and a doubling of energy efficiency savings in buildings by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) for energy efficiency. This project will pilot innovative planning, permitting, and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Economic Development:

This project is investing in a disadvantaged community in the Los Angeles region by funding the planning, permitting, and preliminary engineering needed for the integration of advanced energy technologies in the area. Additionally, increased demand for AEC deployments can result in broad economic benefits to the clean energy sector.

Consumer Appeal:

Greater deployment of advanced energy technologies at a community scale will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in communities deploying advanced energy technologies.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $449,666
EPIC Funds Encumbered: $1,497,996	**EPIC Funds Spent:** $61,580
Match Partner and Funding Split: Regents of the University of California, Los Angeles: $83,836 (4.5 %) Harvey Mudd College: $10,800 (0.6 %) Los Angeles County Office of Sustainability: $256,793 (13.9 %)	**Match Funding:** $351,429
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-061 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Agreement EPC-15-061 project team is developing the first draft of modeling methodology, doing inventory on energy efficiency data available to the project team, and had first TAC meeting (10/31/16).

146. EPC-15-062

Project Name:

Robust, Low-Cost, Real-Time, NOx Sensor for Optimization of Dispatchable Distributed Generation Systems

[EPC-15-062]

Recipient/Contractor:

The Regents of the University of California, Irvine

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 4/18/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Low emission distributed generation, such as microturbines and reciprocating engines, can improve onsite resiliency and reduce peak demand. However, assuring that these systems produce minimal emissions is paramount. As a result, there is a need for a low cost approach to monitor emissions performance.

Project Description:

The project will test several recently developed sensors with the capability to detect low NOx levels generated by dispatchable generation systems such as internal combustion engines and/or micro-turbines. The NOx sensor is based on ceramic solid-state electrochemical sensor technology, similar to the automotive oxygen sensor. Solid-state NOx sensors have been developed for direct in-situ measurement of exhaust to meet stringent on-board diagnostic requirements for self-diagnosis and reporting, including required sensitivities down to parts-per-million. The NOx sensor combines existing commercial NOx sensors with newly developed electronics for use in applications including dispatchable distributed generation like micro-turbines. Compared to other NOx sensors, the sensor is a simple solid state device, with a single cell and no internal diffusion chambers (electrodes directly in the flow). This gives it faster responsiveness, making it more robust and easier to manufacture.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Deploying clean, efficient, distributed generation systems directly addresses goals stated in AB 32, SB350, and the Clean Energy Jobs Plan. While reducing greenhouse gases and improving efficiency are vital, maintaining strict air emission standards is also important. DG systems often suffer performance degradation over time once deployed. As a result, it is critical that system performance be monitored and maintained. The proposed solution offers a cost effective means to monitor real time emissions performance of the system and information that can be used to optimize system performance and actually maintain low emission performance.

CPUC Proceedings addressing issues related to this EPIC project:

Combined heat and power: D.10-12-035., R.08-06-024.

Applicable Metrics: CPUC Metrics- 2a, 3f, 4b

Lower Costs:

Compared to other NOx sensors, the NOx sensor to be tested is a simple solid state device, with a single cell and no internal diffusion chambers (electrodes directly in the flow). This gives it faster response time, makes it more robust and easier manufacture. The co-fired multi-layer zirconium and aluminum oxide sensor is less expensive to manufacture.

Environmental Benefits:

Based on the current microturbine generator fleet in CA, approximately 13,000 lbs/NOx per year could be avoided with the technology demonstrated. The primary benefit is associated with lower cost to help achieve good air quality and reduced greenhouse gas emissions. The sensors may also help infer equipment reliability.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $53,531	
EPIC Funds Encumbered: $200,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 18

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-062 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The research team is working with project partners to confirm availability of support, equipment, and sensor materials. The sensors are available but the team is also evaluating additional sensors that have been developed in the past six months. The test plan development has started.

147. EPC-15-064

Project Name:

Innovative Net Zero: ZNE Demonstration in Existing Low-Income Mixed-Use Housing [EPC-15-064]

Recipient/Contractor:

Prospect Silicon Valley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

The State of California has set ambitious net-zero energy targets, including that 50% of existing commercial buildings achieve net-zero by 2030. This aggressive target is especially challenging for buildings under 50,000 square feet. Challenges include significant capital costs (labor and equipment); building conditions (conflicting infrastructure energy effects, aging physical conditions which do not easily accommodate state-of-the-art technology); operational considerations (occupant behavior, transaction timing and lack of maintenance expertise); and legal and policy factors (split incentives).

Project Description:

This project will demonstrate the installation of innovative technologies to retrofit an existing, low-income, mixed-use multi-unit building in a dense urban setting to become zero net energy (ZNE). Innovative strategies include a rapid new technology discovery and assessment approach, to ensure the most current emerging technologies are incorporated, as well as innovative measurement and verification. These approaches and other ZNE design process innovations will be packaged into an advanced ZNE design methodology for use in the demonstration project as well as broad dissemination to the design and innovation community. Numerous technical innovations and pre-commercial technologies are planned for inclusion including dynamic chromatic glass, heat recovery ventilators, variable refrigerant flow, occupancy based plug-load management, advanced light emitting diode lighting systems and a combined photovoltaic-thermal system.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project site represents an exemplary test case for many of the complex challenges facing zero net energy retrofits of multi-unit buildings and is relevant to a state-wide greenhouse gas emission and energy efficiency goals such as AB 32, AB 758 and SB 350. These approaches and other zero net energy design process innovations will be packaged for broad dissemination in the design and innovation community.

CPUC Proceedings addressing issues related to this EPIC project:

Resource Adequacy (RA): R.11-10-023 [Closed]

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

Implementing energy efficiency measures will lower future costs for electricity for building occupants and owners.

Environmental Benefits:

With a 5% adoption rate, the project hopes to reduce carbon emission by 580,000,000 metric tons per year.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $408,130
EPIC Funds Encumbered: $2,995,653	**EPIC Funds Spent:** $115,251
Match Partner and Funding Split: Chinatown Community Development Center: $800,000 (21.1 %)	**Match Funding:** $800,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 13

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-064 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The kickoff meeting occurred on August 16, 2016. The recipient is identifying optimal technology strategies in order to bring the building to net-zero energy and is planning to have this analysis completed in early 2017. They are refining the energy model of the building and once calibrated, will work on the Final Measures Report. The energy model is expected to be complete in early 2017.

148. EPC-15-065

Project Name:

Berkeley Energy Assurance Transformation (BEAT) Project

[EPC-15-065]

Recipient/Contractor:

City of Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/31/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Despite much of the State's population living and working in urban centers, there are few viable or replicable microgrid demonstration projects in urban areas. This is in part because it is difficult for a given facility in an urban area, to incorporate the Distributed Energy Resources (DERs) necessary to offset a building's energy load. Other challenges to operationalizing the Clean Energy Microgrid Communities include local government permitting of relatively new technologies, high transaction costs for early adopters, state regulations that limit the ability of multiple entities to share on-site power, and the need to identify a business model that attracts participation and investment.

Project Description:

The City of Berkeley will design a clean energy microgrid community anchored around a public parking garage in the Downtown Berkeley area. This project will include increased renewable resources and EV parking spaces that can power the city's nearby emergency operation centers during blackouts. The design will include a business and financial model, procurement plan, and cost-benefit analysis, providing a model for urban areas similarly looking to transform existing structures into hubs for local clean energy.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

Streamlined planning and permitting, as well as new financial models will lower the time and capital costs associated with Advanced Energy Community developments. This will make Advanced Energy Communities more affordable for both developers and consumers.

Greater Reliability:

The project will increase energy reliability by enabling districts in downtown Berkeley to localize power generation and distribution.

Economic Development:

Increased AEC deployments can lead to increased demand in clean energy technologies and services resulting in broad economic benefits to the clean energy sector.

Energy Security:

Microgrids using renewable energy generation, coupled with storage systems, allows consumers to generate their own energy locally.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $500,070
EPIC Funds Encumbered: $1,499,214	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Office of Energy and Sustainable Development, City of Berkeley: $106,475 (6.1 %) Bay Area Regional Energy Network: $54,000 (3.1 %) Center for Sustainable Energy: $11,200 (0.6 %) NHA Advisors: $7,500 (0.4 %) URS Corporation: $60,946 (3.5 %) West Coast Code Consultants Inc.: $10,000 (0.6 %)	**Match Funding:** $250,121
Leverage Contributors: City of Berkeley: $248,009	**Leveraged Funds:** $248,009

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-065 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project was approved at the May 2016 Energy Commission Business Meeting. Project began work in September 2016, and the Project Kickoff Meeting was held September 26th, 2016. The Berkeley Energy Assurance Transformation (BEAT) project was featured at the 2016 EPIC Symposium in a session focused on accelerating the adoption of renewable-powered microgrids in California.

149. EPC-15-066

Project Name:

Developing an Advanced Energy Master Plan for the Encanto Neighborhood in San Diego [EPC-15-066]

Recipient/Contractor:

Groundwork San Diego-Chollas Creek

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	7/26/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Low income communities are disproportionately affected by climate change, and have limited access to the economic, environmental, and health benefits of many low and no carbon energy technologies. Disadvantaged communities have not been fully engaged in the energy aspects of their communities.

Project Description:

This project will develop a prototype plan called the Encanto Social-Economic Education Development (EnSEED), designed to transform an existing disadvantaged community in Southeastern San Diego into a community of near-zero net energy (ZNE) buildings. This project will include close engagement with the local community, and development of a final system design, financing plan, and plan to obtain all required government review and approvals. A permitting plan will be developed to document the necessary permit processes and prepare permit applications to the point deemed complete by the responsible permitting agency. Upon completion of the permit review process, Groundwork will initiate the environmental review process with the City of San Diego. This process will determine the level of anticipated impact and type of environmental document needed.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving the goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting, and financing approaches and tools to help improve the business case for IDER adoption at the community scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

Streamlined planning and permitting, as well as new financial models will lower the time and capital costs associated with AEC developments. This will make AECs more affordable for both developers and consumers.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of AECs will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in an AEC.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $129,898	
EPIC Funds Encumbered: $1,500,000		**EPIC Funds Spent:** $151,340	
Match Partner and Funding Split: Blue Flame Energy Finance: $520,000 (25.7 %)		**Match Funding:** $520,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-066 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Staff attended an EPIC Community Launch and Media Event sponsored by Groundwork San Diego- Chollas Creek at the Groundwork San Diego-Earth Lab Station. Regional Stakeholders were present and spoke on behalf of the "Chollas Eco-Village" which will be created into a Zero Net Energy Community.

150. EPC-15-067

Project Name:

Integrated Community Resource Marketplace

[EPC-15-067]

Recipient/Contractor:

The Local Government Commission

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

As California adopts aggressive statutory clean energy goals, new communities in California must incorporate energy efficiency standards, distributed generation, storage, EV charging infrastructure, and smart grid elements. To accomplish this, communities seeking to incorporate advanced clean energy technologies must innovate with respect to the planning of these communities at the local and regional levels of government; the design and financing of these communities; and the roles and coordination of stakeholders involved in the deployment process.

Project Description:

This project pilots a new process for local governments and developers to identify and secure financing to optimize the selection and planning process for incorporating advanced clean energy technologies into a community. Typically, local governments approve and finance upgrades in a piecewise fashion, with different departments being responsible for different types of activities. The Local Government Commission's process enables decision makers to easily see combinations of upgrades and new developments that optimizes funding and planning/permitting time when a city seeks to transition to an advanced energy community. This new process will be developed using Fresno's Blackstone Corridor and Downtown Specific Plan as a pilot location.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (2015) sets a 50 percent renewable energy standard by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Economic Development:

This project pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of AECs will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in an AEC.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $432,890	
EPIC Funds Encumbered: $1,500,000		**EPIC Funds Spent:** $145,560	
Match Partner and Funding Split: Local Government Commission: $12,445 (0.8 %)		**Match Funding:** $12,445	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 13

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-067 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team has finished forming its technical advisory committee and is working on drafts for two reports that provide actionable data on the area of Fresno that is looking to upgrade to an advanced energy community.

151. EPC-15-068

Project Name:

Understanding and Mitigating Barriers to Wind Energy Expansion in California

[EPC-15-068]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/30/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

The need to transition from traditional hydrocarbon-based sources of energy becomes ever more compelling as energy demand rises in tandem with the necessity to reduce greenhouse gas emissions. Wind energy already plays a key role in diversifying and greening many energy portfolios. However, wind speeds vary across space and time, which affects where wind farms should be sited, as well as their reliability. Accurate projections of wind energy potential and investment in the industry depend on the stability and predictability of wind resources and the operating environment, which are not well understood in a changing climate.

Project Description:

The research is using a combination of global re-analysis datasets, a unique set of observations and high-resolution global climate model simulations to help identify and characterize the extent to which regions in California may exhibit vulnerability or new opportunity in terms of changes to wind resource magnitude, spatial and temporal variability and/or operating conditions of sufficient magnitude to alter their viability for wind energy development. This will be the first application of this climate-modeling framework for energy research. The unique strength and theme of this research lies in the use of a next generation variable resolution global climate model that has the ability to simulate climate change over a limited area region, i.e. California, in a computationally cost effective manner.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals, including achieving 50% electricity generation from renewables by 2050, by helping overcome a key barrier to long-term wind energy investment. Improving the characterization of uncertainty in wind resource magnitude and variability in the context of climate change can help reduce risk in future wind energy investments in California.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 3a, 5c

Lower Costs:

Better understanding of potential changes in the operating environment of wind turbine installations would help lower operating and maintenance costs, and downtime.

Greater Reliability:

The project will improve the characterization of uncertainty around the magnitude and variability in space and time of California's wind resource in the near and mid-term. Projections of potential changes to the operating environment will reduce downtime and operating and maintenance costs.

Public Health:

Significant health benefits from reduced emissions of harmful pollutants from reduced reliance on electricity generated from fossil fuels.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $74,830	
EPIC Funds Encumbered: $200,000		**EPIC Funds Spent:** $82,374	
Match Partner and Funding Split: UC Davis: $54,000 (20.0 %) DNV GL: $16,000 (5.9 %)		**Match Funding:** $70,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 12

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-068 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This research team is comparing various wind model results and is generating a 30-year wind record for the entire state of California. They are beginning to analyze the variation in annual and seasonal wind power estimates over different timeframes.

152. EPC-15-069

Project Name:

Lancaster Advanced Energy Community (AEC) Project

[EPC-15-069]

Recipient/Contractor:

Zero Net Energy Alliance, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	7/13/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Regulatory and pricing issues, including high up-front costs, interconnection applications, and unproven business models, continue to be significant barriers to deployment of advanced energy technologies. These challenges have significantly affected California's ability to meet its goals for: solar PV, stationary storage, and electric vehicles. Local governments, developers, and other stakeholders do not have standards for planning, permitting, and funding these types of developments, preventing their wider deployment into communities across California.

Project Description:

This project will develop innovative Zero Net Energy and Distributed Energy Resources planning and permitting resources designed to lower interconnection costs and increase energy resiliency in the Lancaster community. The new municipal finance model, and policy framework resulting from this project will allow the Lancaster community to make informed investment decisions in clean energy technologies, Specifically, these products will enable the project team to plan and permit a Zero Net Energy microgrid in an affordable housing community, and Distributed Energy Resources (a community solar project, and 17 energy storage sites) throughout the City of Lancaster. Upon completion of this project, Lancaster can be used as a case study to plan and permit the installation of similar technologies in communities throughout California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (2015) sets a goal to reduce energy demand by 50 percent by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Greater Reliability:

The tools and resources developed under this project will assist in identifying citywide optimal microgrid sites that will have the most local generation potential and are most likely to have the least impact on grid reliability.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of advanced energy technologies at a community scale will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in communities deploying advanced energy technologies.

Energy Security:

Microgrids using renewable energy generation, coupled with storage systems, allows consumers to generate their own energy locally.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $507,982
EPIC Funds Encumbered: $1,469,779	**EPIC Funds Spent:** $42,322
Match Partner and Funding Split: City of Lancaster: $1,500,000 (50.5%)	**Match Funding:** $1,500,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-069 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Agreement EPC-15-069 project team has taken first steps to: align on low-income housing unit design planning, begin identifying project sites, discuss alternative ownership structures for ZNE communities, and continue research on land-secured financing options.

153. EPC-15-070

Project Name:

Intra-urban Enhancements to Probabilistic Climate Forecasting for the Electric System [EPC-15-070]

Recipient/Contractor:

Altostratus, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 5/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Probabilistic seasonal and decadal climate forecasts for the electricity system are typically done at coarse-resolution regional scales and do not incorporate impact from urban areas in models. Intra-urban variations in temperature are on average between 1 and 4 degrees C in most urban areas in California and can be as large as 10 degrees C. It is important to explicitly account for them in the seasonal, decadal, and short-term forecasts of the electric system that serve as a basis for planning by CEC and the utilities.

Project Description:

This project develops and applies methodology to improve the representation of urban effects in probabilistic and short term forecast for the electric system. It quantifies intra-urban climate variability in California for inclusion into forecasts used by the Energy Commission and the utilities. The characterizations are based on state-of-science highly-urbanized atmospheric modeling supplemented by analysis of observational weather data. Detailed statistical correlations and analysis have been undertaken, focusing on summertime conditions, and transfer functions will be developed to facilitate use of results by the Energy Commission and utilities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by adding fine-resolution, intra-urban climate detail to coarse-scale, regional-level probabilistic or deterministic forecasting thus allowing for more accurate, area-specific characterizations and forecasts for the electricity system and better apportionment of electricity generation.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1e

Greater Reliability:

This project is expected to improve electric system reliability by reducing uncertainty in seasonal and decadal probabilistic weather forecasts as well as short-term forecasts used by the Energy Commission and utilities for management of the electric system.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $14,035	
EPIC Funds Encumbered: $193,326		**EPIC Funds Spent:** $15,859	
Match Partner and Funding Split: Altostratus, Inc.: $5,000 (2.5 %)		**Match Funding:** $5,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 16
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-070 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The researcher has identified target databases and downloaded a large amount of weather data. Several scripts and codes were written to handle the analysis of large observational datasets. Hourly data was read and analyzed at each monitoring area (Greater San Francisco Bay Area, Fresno-Bakersfield region, and the Los Angeles Region). The researcher configured the atmospheric model (WRF) so the fine-resolution simulation results generated by the model can be compared with the observational data.			

154. EPC-15-071

Project Name:

Zero Net Energy Farms

[EPC-15-071]

Recipient/Contractor:

Biodico, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/1/2016 to 3/31/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Farms depend on the electricity grid and fossil fuels for everyday operations. These demands continue to increase and expand as new farming technologies are introduced and as ground water pumping demands increase. Many farms lack the tools and knowledge necessary to deploy distributed renewable technology to meet these demands in place of conventional energy systems or increased reliance on the electricity grid. Furthermore, farms need guidance to effectively address permitting requirements and find competitive funding alternatives that will allow them to become leaders in California's distributed and renewable energy future.

Project Description:

This project will develop and pilot a Project Management Application tool for farms and agricultural communities that streamlines the permitting, financing, and interconnection of multiple distributed energy resources. Included in this tool will be information gathered from a trade study of available equipment vendors that will compare cost effectiveness and reliability of technologies for solar, wind, anaerobic digestion, and gasification. A unique feature about this project is that it will integrate Net Energy Metering Aggregation (NEMA), a program through the California Public Utilities Commission (CPUC) that enables agricultural communities to aggregate meters in a continuous property, with various other strategies to maximize the effectiveness of the Project Management Application. Development and testing will be done in collaboration with four local jurisdictions in the Central Valley, the San Joaquin Valley Air Pollution Control District, and the US Navy.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (2015) sets a 50 percent renewable energy standard and a doubling of energy efficiency savings by 2030. Local governments can play a critical role in achieving that goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, and demand response. This project will pilot innovative planning, permitting and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Greater Reliability:

Greater grid reliability through the adoption of more onsite renewable energy generating technology.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Public Health:

Establishing a replicable model for the adoption of renewable energy generating technologies in the Central Valley can lead to an increase in air quality for not just that region, but all of California.

Consumer Appeal:

This project will conduct a case study documenting the steps required to deploy IDER solutions in farms and agricultural communities, creating a roadmap making it easier for similar communities to follow and adopt.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $122,540
Demand-side Management	
EPIC Funds Encumbered:	**EPIC Funds Spent:**
$1,175,919	$121,876
Match Partner and Funding Split:	**Match Funding:**
City of San Joaquin: $25,000 (1.1 %) Fresno Council of Governments: $25,000 (1.1 %) PondelWilkinson: $25,000 (1.1 %) Red Rock Ranch, Inc.: $25,000 (1.1 %) San Joaquin Valley Air Pollution Control District: $47,500 (2.1 %) Office of Community and Economic Development - CSU Fresno: $25,000 (1.1 %) San Joaquin Valley Clean Energy Organization: $25,000 (1.1 %) West Hills Community College District: $25,000 (1.1 %)	$1,140,419

18Thirty Entertainment, LLC: $15,000 (0.6 %) City of Huron: $25,000 (1.1 %) Larry Alberg: $16,000 (0.7 %) Dr. Stephen Kaffka: $16,000 (0.7 %) Chelsea Teall, PE: $16,000 (0.7 %) Leon Woods III: $16,000 (0.7 %) Biodico, Inc.: $813,919 (35.1 %)			
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-071 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: This project was approved at a Business Meeting on May 17, 2016. The agreement was executed on June 1, 2016. Red Rock Ranch site resources assessment: plotted meters' service capacity and historic use. Received vendor quotes and working on finalizing technology selection for solar/wind and battery storage relative to peak shavings opportunities indicted by historic 15 minute peak demand.			

155. EPC-15-072

Project Name:

New Chemical Compounds for Cost-Effective Carbon Capture

[EPC-15-072]

Recipient/Contractor:

The Regents of the University of California, Davis Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 7/1/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities and one of the major contributors to the climate change. The main human activity that emits CO2 is the combustion of fossil fuels (coal, natural gas, and oil) for energy and transportation, certain industrial processes, and land-use. Carbon dioxide capture and sequestration (CCS) could play an important role in reducing greenhouse gas emissions, while enabling low-carbon electricity generation from power plants. The current CO2 capturing compounds have a number of shortcomings. The Recipient will develop new carbon capture solvents that are more efficient and will cost less.

Project Description:

Many technologies for capturing carbon dioxide from fossil fuel energy conversion facilities use amines as solvents for carbon dioxide capture. Many practical shortcomings of amines could possibly be avoided, if a newly discovered naturally-occurring phosphoenol compounds featuring suitable combination of reaction enthalpy, solubility, viscosity and reaction rate would be further characterized and developed to be an inexpensive, non-toxic substitute for amines in carbon capture. The grant recipients will build upon their previous efforts by using sophisticated ab-initio quantum mechanical and molecular dynamics simulations to optimize and design a molecule from the class of phosphoenols by adding and removing different functional groups to make it more reactive with carbon dioxide (CO2) and more water soluble.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Although recent regulations will dramatically reduce greenhouse gas emissions, fossil fuels will remain fundamental to the California energy infrastructure for decades. Carbon capture can reduce the greenhouse gas emissions from power production facilities and other large industrial processes that rely on combustion of fossil fuels as an energy source.

CPUC Proceedings addressing issues related to this EPIC project:

Greenhouse Gas Emission Allowance Cost and Revenue Issues: R.11-03-012

Applicable Metrics: CPUC Metrics- 2a, 4a

Lower Costs:

Improved solubility of potential carbon capturing molecule in water instead of expensive organic solvents would result in significant cost savings if applied in large-scale process.

Environmental Benefits:

A path for a drastic reduction of greenhouse gas emissions from fossil fuel burning energy systems could be developed upon completion of this agreement.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $40,000	
EPIC Funds Encumbered: $200,000		**EPIC Funds Spent:** $146	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 20

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-072 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project was kicked-off on August 2, 2016 and TAC was formed by August 25, 2016. Up-to-date background research on available 3D molecular rendering software, computational chemistry software packages, and available plant process simulators was completed. The research team decided to utilize Chem3D Pro, ChemBioDraw Ultra, Gaussian, and COCO (Cape-Open to Cape-Open) software packages. The Technology Transfer plan was submitted on January 10, 2017.

156. EPC-15-073

Project Name:

Identifying Effective Demand Response Program Designs to Increase Residential Customer Participation

[EPC-15-073]

Recipient/Contractor:

The Regents of the University of California, on behalf of the Los Angeles Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

As the state moves toward more distributed generation and intermittent renewable energy generation, there is a need for smaller resources to play larger roles in distribution and transmission grid management. The end-use loads enrolled in Existing Demand Response (DR) programs have high opportunity costs and participation is low. Some newly-developed market options, such as aggregation programs, could enable large numbers of small loads across multiple customers to participate in wholesale markets. However, participation logistics, including metering, verification and settlement, are barriers to wider participation.

Project Description:

This project will test the effectiveness of innovative designs for demand response programs for residential customers using a behind-the-meter customer engagement platform developed by Chai Energy. Each of these innovative demand response strategies integrates a recent approach that energy researchers have shown to be effective in reducing customer consumption. These strategies include providing households with a) tailored energy-analytic feedback, b) aggregated versus single-period incentive information, c) non-financial environmental health benefit frames and d) social comparisons. An additional strategy will explore how the timing of the delivered demand response information affects the magnitude of household participation and response.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project could result in greater electricity reliability, lower costs and increased safety. Lowering ratepayer costs is accomplished by better utilization of existing generation resources, deferral of transmission and distribution upgrades, load shifting, and lower consumer cost per kWh. Expanded residential demand response permits increase efficiency in the contemplated California ISO Flexible Ramping Product that is designed to deal with uncertainties before binding real-time dispatch.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1c, 1d, 1e, 1h

Lower Costs:

Lowering ratepayer costs is accomplished by better utilization of existing generation resources (including both renewable and fossil) and transmission and distribution (T&D)

assets, deferral of T&D upgrades, load shifting, and lower consumer cost per kWh.

Greater Reliability:

Greater reliability will be achieved through improved residential demand response including greater grid optimization, increased efficiency of fossil generation, reduced renewable energy curtailment, mitigating measures for high renewable energy penetration on the transmission and distribution circuits, and lowering imbalances on the grid.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $203,115
EPIC Funds Encumbered: $2,007,875	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Chai Energy: $288,853 (11.2 %) University of California Los Angeles: $273,780 (10.7 %)	**Match Funding:** $562,633
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-073 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project kick off meeting completed on August 23, 2016. Major subcontractor has hired replacement employees. Work is ongoing to recruit participants in the study by Chai Energy.

157. EPC-15-074

Project Name:

Meeting Customer and Supply-side Market Needs with Electrical and Thermal Storage, Solar, Energy Efficiency and Integrated Load Management Systems

[EPC-15-074]

Recipient/Contractor:

Center for Sustainable Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/18/2016 to 12/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

The State of California has established aggressive goals for incorporating behind-the-meter, customer-sited distributed energy resources (DERs) into the California wholesale energy markets, managed by the California Independent System Operator (California ISO). However, with only limited testing performed to date, the ability of DERs to simultaneously and cost-effectively meet onsite customer electrical needs while providing energy services into the California ISO market is largely unproven.

Project Description:

This project will develop co-optimization strategies for distributed energy resources (DERs) to maximize customer and system value under existing CPUC-approved retail and California Independent System Operator (California ISO) wholesale tariff structures, future market structures and pricing, and the transactive energy pricing signals developed under agreement EPC-15-054. The project will test and configure two DER portfolios: a) one consisting of large retail customers and schools using battery energy storage, solar photovoltaics, and integrated load management, and b) the other consisting of hotels using passive thermal energy storage and energy efficiency. Both will be coupled with integrated load management, to respond to price signals as well as develop operational strategies that provide best practices for wholesale integration subject to the identified retail and wholesale tariffs and operational constraints.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project could lead to technological advancement and innovation by developing and testing strategies that customers, demand response (DR) aggregators, scheduling coordinators, and policy makers can implement to expand both participation in and the benefits of DR markets. The project will provide comprehensive recommendations on how to overcome technical, institutional and regulatory barriers to facilitating DER participation in supply-side markets.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Energy storage: R.15-03-011 Smart grid: R.08-12-009 Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11 Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011 Demand Response (DR): R.13-09-011 Net energy metering: R.14-07-002 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1c, 1d, 1e, 1f, 1g, 1h, 3e, 3f

Lower Costs:

This project has the potential to lower energy costs for individual customers, as well as system costs for all ratepayers California ISO market participants. On the distribution circuit, storage devices may defer cost of expensive capital upgrade projects such as transformer or line upgrades.

Greater Reliability:

As the penetration of intermittent resources increases in California, energy balancing requirements increase as well. Behind-the-meter storage on the distribution system can increase distribution system reliability issues through services such as local overload relief, power quality and ramp-rate mitigation on circuits with high penetration of photovoltaics.

Increase Safety:

By deploying, testing, and validating system integration, metering, and telemetry, the project will contribute to the safe operation of DER systems in customer-sited locations while maximizing value for these systems to both customers and wholesale market activities.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $746,794	
EPIC Funds Encumbered: $3,960,805		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Solar City Corporation: $1,449,262 DNV GL: $2,000 Conectric Networks, LLC: $530,000		**Match Funding:** $1,981,262	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-074 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Subcontractor Conectric, LLC. will employ patented and unregistered IP in the operation of control systems being used to evaluate different load management strategies and customer impacts in this project.

Update:

The agreement fully executed on January 30, 2017.

158. EPC-15-075

Project Name:

Customer-centric Demand Management using Load Aggregation and Data Analytics

[EPC-15-075]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/18/2016 to 12/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

Load management in buildings has been lagging for decades due to lack of customer acceptance of load control, and of technology that can reliably provide reductions. As the State moves toward high penetration of customer-sited renewables, and an evolving transmission market, it is imperative that load management become mainstream, and include the customer in the transaction. Connectivity of all end use systems is growing, but there is no open standard requirement in T- 24. Incorporating these technology advances is essential to achieve a flexible, reliable, and affordable grid for California.

Project Description:

This project will demonstrate how a large number of small electric loads, each impacted by and tuned to individual customer preferences can provide load management for both utilities and the California Independent System Operator (California ISO). The recipient will work with an extensive spectrum of leading product providers covering all major distributed energy resources (DERs), such as Nest (thermostats), ThinkEco (plug loads), Honda, BMW (auto), EGuana (smart Inverter) and Ice Energy (Thermal Storage). A variety of price signals will be tested for Time-of-Use customers such as Critical Peak Pricing and Demand Rate. The project will use deep analytics to evaluate individual customer preferences for demand management using microdata from devices and aggregate the responses to meet grid needs at different distribution and transmission levels.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will provide California ratepayers methods to control their energy cost using low cost off-the-shelf technologies, and to adopt PV by providing a platform to manage their energy cost as the tariff structures evolve to account for grid costs of distributed generation. This platform enables the technology innovation that defines California without additional and expensive requirements of hardware for grid integration.

CPUC Proceedings addressing issues related to this EPIC project:

Self-Generation Incentive Program: R.12-11-005 Energy storage: R.15-03-011 Smart grid: R.08-12-009 Distribution Level Interconnection (Rule 21): R.11-09-011 Demand Response (DR): R.13-09-011 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Long-Term Procurement Proceeding (LTPP): R.13-12-010 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1c, 1d, 1e, 1f, 1g, 1h, 5c

Lower Costs:

This project could reduce energy consumption by up to12 GW which is equivalent to $1,200,000 annually in today's value based on 20 cents per kWh.

Greater Reliability:

The project could increase adoption of demand response programs from the current 15 percent to 60 percent, managing air-conditioning loads, and newer loads such as plug loads, and electric vehicles could provide up to 12 GW of peak capacity, almost the capacity of the older power plants in the state.

Increase Safety:

By adopting more advanced and easy to use demand response technologies for all power customers, the electric grid system in California will have less stress which increases the safety to all Californians.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,163,894
EPIC Funds Encumbered: $3,998,587	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $979,860 (18.6 %) InTech Energy, Inc.: $280,452 (5.3 %) Pedagogy World, Inc.: $10,000 (0.2 %)	**Match Funding:** $1,270,312
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-075 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

"Energy360 Power Monitoring, Analytics & Controls" software is pre-existing intellectual property trademarked by InTech Energy.

The Chai Energy Logo is trademarked project-relevant pre-existing intellectual property. The Olivine DER Platform and the EPRI Smart Thermostat Collaborative Data are project-relevant, unregistered pre-existing intellectual property.
Update: In the time between the proposal submission in January 2016 and the approval at the May 2016 business meeting, an individual who had been part of the proposal team left their position with a small firm. EPRI hired that individual to work on this project - therefore requiring a budget shift. The agreement has been finalized and approved by all parties. Kickoff meeting planned in Spring 2017.

159. EPC-15-076

Project Name:

Richmond Advanced Energy Community Project

[EPC-15-076]

Recipient/Contractor:

Zero Net Energy Alliance, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/13/2016 to 3/30/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

Due largely to limitations and challenges in design, financing, available professional expertise, and scale-up strategies, zero net energy (ZNE) communities have not yet been developed at a large scale, or applied to infill development. The majority of ZNE buildings have been deployed in more affluent areas that can afford the initially steep ZNE learning curve and higher-cost early-stage technologies. Streamlining the regulatory and financing aspects of ZNE deployment can lead to significant increases in similar developments throughout California.

Project Description:

The City of Richmond Advanced Energy Community project will facilitate adoption of a comprehensive integrated policy, planning, program, and financing framework to transform the City of Richmond into a Zero Net Energy Community, using forward-looking policies that integrate energy, land use, and transportation planning, and progressive municipal financing mechanisms. As part of the project, ZNE Alliance will also facilitate the planning and permitting of approximately 20 abandoned homes to be converted into affordable ZNE homes available to working families via the First-time Home Buyers' Program. This redevelopment project will be accomplished by a Social Impact Bond administered by the Richmond City Council.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving the goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting, and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Integration of Distributed Energy Resources (IDER): R. 14-10-003 Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

Streamlined planning and permitting, as well as new financial models will lower the time and capital costs associated with AEC developments. This will make AECs more affordable for both developers and consumers.

Increase Safety:

Increased safety will be achieved by: identification of hazards and ventilation defects during energy assessments conducted as a result of adoption of the Building Energy Saving Ordinance, (BESO).

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of AECs will increase consumer familiarity and comfort with ZNE homes and communities, increasing the likelihood of consumers choosing to live in an AEC.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $370,990
EPIC Funds Encumbered: $1,480,111	**EPIC Funds Spent:** $112,840
Match Partner and Funding Split: Energy Solutions: $500,084 (12.3 %) City of Richmond: $550,000 (13.5 %) Olivine, Inc.: $40,050 (1.0 %) Richmond Community Foundation: $1,500,000 (36.9 %)	**Match Funding:** $2,590,134
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-076 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This agreement was adopted at an Energy Commission Business Meeting on May 17, 2016. This agreement was signed and executed on June 8th, 2016. A group kick-off meeting with all Advanced Energy Community award recipients was held in September 2016.

160. EPC-15-077

Project Name:

Huntington Beach Advanced Energy Community Blueprint

[EPC-15-077]

Recipient/Contractor:

The Regents of the University of California, Irvine

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/15/2016 to 7/31/2018

Program Area and Strategic Objective:

Market Facilitation

S16: Collaborate With Local Jurisdictions and Stakeholder Groups in IOU Territories to Establish Strategies for Enhancing Current Regulatory Assistance and Permit Streamlining Efforts That Facilitate Coordinated Investments and Widespread Deployment of Clean Energy Infrastructure

Issue:

The intermittent nature of many of the most promising renewable energy technologies causes concerns with grid stability. Smart grids and integrated systems at the community-level (advanced energy communities, or AECs) can help with these concerns. However, in order to accelerate the deployment of AECs, market facilitation is needed to integrate and optimize the promising new energy innovations into a unified system that efficiently interacts with the existing community electrical grid/infrastructure/buildings, serves various end-users, obtains performance data for scale-up, and performs cost-benefit analyses for demonstrating economic feasibility.

Project Description:

This project will plan and design an advanced energy community in the City of Huntington Beach, California. Specifically, this project will develop extensible tools to design the integrated set of energy infrastructure and advanced technology approaches to convert Oak View, a disadvantaged community, into an advanced energy community. The project team will collaborate with the City of Huntington Beach, Southern California Edison, and other key stakeholders, to evaluate multiple case studies for the energy technologies as well as business and financial models. Technologies to be evaluated for integration into a microgrid include combinations of energy efficiency measures, supplemental local renewable energy sources, energy storage systems, electric vehicles and charging stations, clean power generation systems with combined cooling, heating, and power, and smart-grid technologies. A master community design and outreach tools will be developed as a model for other communities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving this goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting, and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Greater Reliability:

The tools and resources developed under this project will assist in identifying citywide optimal microgrid sites that will have the most local generation potential and are most likely to have the least impact on grid reliability.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of advanced energy technologies at a community scale will increase consumer familiarity and comfort with Zero Net Energy homes and communities. This will increase the likelihood of consumers choosing to live in communities deploying advanced energy technologies.

Energy Security:

Microgrids using renewable energy generation, coupled with storage systems, allows consumers to generate their own energy locally.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $508,226
EPIC Funds Encumbered: $1,500,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Southern California Edison: $200,000 (8.7 %) County of Orange/City of Huntington Beach: $152,900 (6.6 %) Altura Associates, Inc.: $62,000 (2.7 %) National Renewable Energy Laboratory (NREL): $200,000 (8.7 %) Southern California Gas Company (SoCalGas): $150,000 (6.5 %) The Regents of the University of California, Irvine Advanced Power and Energy Program: $46,098 (2.0 %)	**Match Funding:** $810,998

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$0</td></tr>
<tr><td>Funding Method:
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Grant</td><td>No. of Initial Passing Applicants/ Bidders:
27 out of 28 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 12</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-15-077 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The agreement was approved at the Energy Commission's May 2016 Business Meeting. Work is expected to begin in December 2016.</td></tr>
</table>

161. EPC-15-078

Project Name:

Risk Modeling and Cognitive Science Characterization of Barriers to Climate Change Adaptation in California Electricity Sector

[EPC-15-078]

Recipient/Contractor:

The Regents of the University of California, Berkeley

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/30/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Climate change adaptation is inherently a risk management strategy that needs to be incorporated with mitigation policies. The proposed research will provide policy makers with a systematic approach to assess and optimize strategies for adaptation to climate change for California's power system. Revision of the existing climate change adaptation literature to the specific case of identifying barriers in California's power sector will be conducted to identify weaknesses in risk management practices. It will help the state meet its statutory CO2 emission reduction goals by ensuring a coherent and barrier-free adaptation strategy, in line with mitigation scenarios.

Project Description:

Researchers will generate a systemic approach to inform policy-making regarding climate change-induced risks and power sector resilience. The approach will look into long-term planning of the power sector, and take into account (1) new risks arising from climate change, both technological and operational, (2) risk quantification and minimization practices, and (3) resilience of the electricity sector against extreme events.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Researchers will develop methods to account for risks, plan for resulting adaptation and account for the barriers that might exist in the system. The proposed research will advance on the general knowledge of framing climate-related policies under uncertainty and examine all aspects of the adaptation planning process: decision-makers involved, stages of decision processes, and the institutional contexts where the decision-makers develop the decision processes.

CPUC Proceedings addressing issues related to this EPIC project:

Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010

Applicable Metrics: CPUC Metrics- 1e, 2a, 3e, 3h

Lower Costs:

The proposed research will improve current adaptation policies by ensuring the affordability of electricity production. The financial and operational-risk minimization method developed for this study will focus on eliminating barriers to climate change adaptation, which will guarantee affordability of the production and supply side.

Greater Reliability:

The proposed work will provide a better understanding on how and where adaptation is needed, as a function of uncertain climate change predictions, and barriers that are likely to arise and thus will ensure the resilience and greater reliability of the power sector.

Assignment to Value Chain: Grid Operations/Market Design	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $350,000	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-078 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The researchers have begun to make connections with the California Public Utilities Commission in order to obtain primary data to feed in to the model.

162. EPC-15-079

Project Name:

Advanced Renewable Energy Storage and Recycled Water Project

[EPC-15-079]

Recipient/Contractor:

Victor Valley Wastewater Reclamation Authority (VVWRA)

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/13/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Several California wastewater treatment plants have on-site power generation systems fueled by biogas. However, many of these systems are unable to respond to variable onsite electrical loads and this can result in tripping off a facility's wastewater treatment equipment. This results in shut downs of the onsite power generation system resulting in increased power costs and reliance on non-renewable power and a corresponding reduced ability to produce recycled water. An effective power control system is needed to demonstrate that it can reliably collect and store excess renewable electricity generated on site and reduce the cost and increase the availability of producing recycled water.

Project Description:

The Victor Valley Wastewater Reclamation Authority (VVWRA), in partnership with Primus Power, University of California Riverside (UCR), and Anaergia, will demonstrate an advanced, pre-commercial flow battery storage and control system at VVWRA's existing Regional Wastewater Treatment Plant, located in a disadvantaged community outside of Victorville. The project deploys Primus Power's ENERGYPOD flow battery system in a 240 kW/1,200 kWh configuration, managed by a UCR-designed controller system that is optimized specifically for management, generation and storage of renewable energy power. The project hopes to alleviate rapid fluctuations in the wastewater treatment plant's power demand that causes disruption of the disinfection system used to treat recycled water to California standards, resulting in the disposal of approximately 2.5 million gallons of water annually.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project would demonstrate an advanced battery storage and control system coupled with on-site renewable energy generation and its ability to control rapid changes in on site power demands. If successful, this project could reduce grid power demand and reduce energy costs to wastewater treatment plants and alleviate disruptions in recycled water production due to high variability of on-site power loads which can cause partial treatment shutdowns. The project results could be applicable to other wastewater treatment and industrial plants in California.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1h, 3c, 4c

Lower Costs:

This project uses a battery storage system combined with an advanced controller to enable the wastewater treatment plant to accommodate variable loads, increase onsite renewable power production, and substantially reduce its reliance on grid power. This project could reduce annual grid power demand by 4.2 million kWh or nearly $473,000 in cost savings to the treatment plant.

Economic Development:

Stored power will be used to meet peak demand on site with 100% renewable energy, reducing grid power consumption by 4,213,416 kWh/yr.

Environmental Benefits:

Under the project, equipment tripping off due to power fluctuations would be curtailed, enabling reuse and water savings of approximately 2.5 million gallons per year. This water could be used by the community in place of fresh water sources.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $220,423	
EPIC Funds Encumbered: $1,734,059		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Victor Valley Wastewater Reclamation Authority (VVWRA): $773,014 (29.3 %) Primus Power Corporation: $129,201 (4.9 %)		**Match Funding:** $902,215	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-079 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Kickoff meeting was held on October 12, 2016. Site visit was conducted by the Energy Commission Contract Manager January 17, 2017. Project is underway.

163. EPC-15-080

Project Name:

Interdependencies of Electric Grid and Critical Lifelines: Identifying Climate Exposure and Adaptation Strategies

[EPC-15-080]

Recipient/Contractor:

Thalassa Research & Consulting, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 1/17/2018

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Climate vulnerability assessments in the energy system by utilities have thus far only examined hazards that they are familiar with and are proximate to their assets. However, what is known from natural disaster research is that hazards can have cascading impacts across sectors. In order to protect the energy sector, it is therefore crucial to develop tools and methodologies to investigate non-proximate catastrophic and cascading risks in a geographically and context specific manner. This research is a first step in developing such methodologies and tools for the greater Los Angeles region.

Project Description:

This is a pilot study for electricity sector climate adaptation that takes into account cascading impacts internal to and outside of the electricity sector. For example, climate impacts to supply chains that are critical for electricity generation and distribution, disruption to telecommunications that the electricity sector relies on in emergencies, and other impacts that may be initially felt far away but have consequences for energy in California. One example of supply chain interruption is manufacturing facilities in East Asia that produce 500kV transformers, which the California distribution system relies on, are susceptible to flooding and extreme events linked to climate change. Building on the energy sector's grid reliability studies already underway, this pilot study will use a systematic framework for assessing such long-distance linkages that can disrupt electricity services and cause ripple or cascading effects on critical infrastructure in the Greater Los Angeles region.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The research will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by addressing challenges in the state's largest metropolitan area -- the study of societal teleconnections. Societal teleconnections are human-created linkages that connect activities, trends, and disruptions across large distances such that locations can experience negative impacts from faraway places. This study is will produce new tools and techniques to assist communities to incorporate climate impacts that are non-local in origin into their traditional climate adaptation planning.

CPUC Proceedings addressing issues related to this EPIC project:

Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 2a, 3a, 3e, 3g, 4a

Increase Safety:

The tools this study will develop and pilot test in the greater Los Angeles area may be used to protect the safety of electricity infrastructure from cascading impacts of climate change related events across sectors.

Public Health:

Public health benefits from this study come from mapping the consequences of interlinked hazardous events across sectors to critical infrastructure that protects public health and safety.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $128,188	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 13

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-080 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project has held its first multi-stakeholder workshop to assess the vulnerabilities of multiple interconnected sectors.

164. EPC-15-081

Project Name:

Historical Insights for Electricity Transition Scenarios in California and Flexible Energy Demand Modeling for Residential Air Conditioning with Improved Behavioral Specificity

[EPC-15-081]

Recipient/Contractor:

Ghoulem Research

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/13/2016 to 6/28/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

Energy and climate change planning depend on anticipated changes in societal use of technology. Energy sector planning to meet challenges of climate change must incorporate lessons from historical technology transitions. One area in which an ahistorical perspective of energy planning prevails is in demand forecasting models. DFMs provide rough approximations of future household energy use and carbon emissions, but do not treat the dynamism and diversity of residential demand in any detail. Climate change policy requires dynamic, flexible simulation tools to address a range of questions about complex social-technological-environmental system dynamics in uncertain conditions.

Project Description:

Analysis of quantitative and qualitative data will shed light on histories of key energy technology changes, planned and unplanned. Interpretation of these histories will provide examples, principles and insights that can be used in future planning. The research team will produce example scenarios that illustrate the differences that these insights can make in planning and technology design. It will pay special attention to developing and disseminating this information in usable ways, via dialogue with policy makers and planners, and through communications with other stakeholders. Leveraging insights from historical technology transitions, the research team will design, deploy and test a flexible modeling platform with which researchers and Energy Commission demand modeling and forecasting staff can draw upon the best available empirical data to simulate dynamic residential demands for AC, as a proof of concept that might later be broadened to other energy uses and demand sectors.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Results will improve the state's ability to estimate timing, benefits, and costs of desirable residential sector technologies. These results will improve the performance of efficiency measures outlined in AB 758 and the California Energy Code. They will also support goals of CPUC's Energy Efficiency Strategic Plan, and inform updated estimates of timing and benefits as appropriate. Results are expected to be of direct use in the scenario development used in the Integrated Energy Policy Report.

CPUC Proceedings addressing issues related to this EPIC project:

Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11 Long-Term Procurement Proceeding (LTPP): R.13-12-010

Applicable Metrics: CPUC Metrics- 5c

Greater Reliability:

This Agreement will result in improved energy demand forecasting that will lead to greater electricity reliability and lower long-run costs by offering more accurate dynamic models that will result in more effective programs and policies, fostering beneficial technology transitions.

Environmental Benefits:

Study will provide a clear understanding of how large-scale technology transitions take place, which is key to supporting realistic, viable energy and climate change planning. Study will also develop a pilot model that enables demand forecasting to investigate impacts of human behavior and policy instruments on residential A/C demand.

Assignment to Value Chain: Grid Operations/Market Design		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $400,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 15

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-081 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

At an August kick-off meeting for the project, the core research team presented the proposed work to a group that included a number of Energy Commission staff (e.g., residential forecasting group) whose expertise and guidance will be instrumental in both supporting a successful project and ensuring that project results are used. The team began identifying Technical Advisory Committee members and undertaking a review of recent energy transitions selected with guidance from Energy Commission staff who participated in the project kick-off.

165. EPC-15-082

Project Name:

Low-Temperature Microplasma-Assisted Hydrogen Production from Biogas for Electricity Generation

[EPC-15-082]

Recipient/Contractor:

The Regents of the University of California on behalf of the Merced Campus

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/1/2016 to 6/24/2019

Program Area and Strategic Objective:

Applied Research and Development

S5: Reduce the Environmental and Public Health Impacts of Electricity Generation and Make the Electricity System Less Vulnerable to Climate Impacts

Issue:

With the growing concern about greenhouse gases and the resulting effects on the environment and public health, including long-term effects such as climate change, there is an emphasis on clean fuels that do not generate harmful pollutants to produce energy. Therefore, low-cost efficient hydrogen production from renewable sources such as biogas is an important challenge that needs to be addressed if it is going to play a major role in satisfying our future clean energy needs.

Project Description:

The proposed project will demonstrate operation of a microplasma array reactor to convert a mixture of carbon dioxide and methane (two potent greenhouse gases) to synthesis gas. The effort will build and characterize a microplasma reactor ignited by high voltage nanosecond pulses to determine dependence of conversion rate, selectivity and energy efficiency on plasma operating parameters. A performance model will also be formulated to optimize the conversion process and design an array reactor comprised of several individual reactors to demonstrate scale-up.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Providing an improved understanding of how various operating parameters affect the conversion efficiency of microplasma array reactors for conversion of biogas to synthesis gas. The production hydrogen from biogas will represent an advancement in meeting California's targets of increasing the production of clean energy from renewable resources by consuming greenhouse gases, thereby reducing the impact of electricity generation on climate change, the environment and public health.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 2a, 4a, 4b

Environmental Benefits:

The production hydrogen from biogas will represent advancement in meeting California's targets in terms of increasing the production of clean energy from renewable resources by consuming greenhouse gases, thereby reducing the impact of electricity generation on climate change.

Assignment to Value Chain: Generation		**Total Budgeted Project Admin and Overhead Costs:** $35,171	
EPIC Funds Encumbered: $200,000		**EPIC Funds Spent:** $4,142	
Match Partner and Funding Split: The Regents of the University of California, Merced: $47,199 (19.1 %)		**Match Funding:** $47,199	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 45 out of 45 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 14
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-082 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The research team is near to completing the nanosecond power supply for the plasma generator. Concurrently the team is looking for suitable Gas Chromatograph designs that will fit the project's needs.			

166. EPC-15-083

Project Name:

Empowering Proactive Consumers to Participate in Demand Response Programs

[EPC-15-083]

Recipient/Contractor:

Ohmconnect, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	5/18/2016 to 6/28/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

The market for third-party demand response (DR) is constrained, severely limiting non-utility resources from contributing to the electricity grid. Although a bi-directional grid is now technically possible, neither prosumers (customers who both draw from and contribute to the grid) nor their devices can be integrated into the energy markets. A chicken and egg situation exists where policymakers and regulators will not open up the market for non-utility energy sources, citing a lack of customer interest, while customers remain unaware of how to contribute to the grid.

Project Description:

This project will contain three elements to provide data for policymakers and businesses to explore this new market. First, this project will determine prosumer (proactive consumer) interest in a third-party demand response market by testing user acquisition via direct and non-direct engagement strategies. Second, experimentation with behavioral and automated users will allow analysis of user yield under a variety of conditions and extract a set of shadow curves that can inform how much energy load shifting can be expected under various price incentives. Finally, this project will create a novel solution for using residential telemetry to connect prosumers and their Internet of Things (IoT) devices to the market operators.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will provide policymakers and regulators with the information they need to develop the policies and limitations for a third-party demand response market. In addition, a solution for residential telemetry will be proposed to empower prosumers to interact effectively with the grid, allowing them to supply electricity and save money.

CPUC Proceedings addressing issues related to this EPIC project:

Smart grid: R.08-12-009 Customer Data Access Program: Applications A.12-03-002, 003, 004. Decisions D.11 Distribution Level Interconnection (Rule 21): R.11-09-011 Demand Response (DR): R.13-09-011 Net energy metering: R.14-07-002 California Solar Initiative: R.12-11-005 Integration of Distributed Energy Resources (IDER): R. 14-10-003 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1c, 1d, 1e, 1f, 1g, 1h, 3e

Lower Costs:

Permanently reduce the economic overhead associated with interfacing with new grid edge technologies; reduce peak demand on California's energy generation facilities; avoid peak demand energy costs; and provide crowdsourced grid services to meet increased demand, rather than relying on construction of new fossil generators.

Greater Reliability:

Reduce the complexity necessary to engage grid-edge resources (including renewables and storage) as grid assets, thereby increasing the pool of accessible grid resources; stabilize the grid by more effectively coordinating demand and supply resources; enable grid services to be crowdsourced to balance increased demand.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $33,903	
EPIC Funds Encumbered: $3,995,028		**EPIC Funds Spent:** $320,045	
Match Partner and Funding Split: Schneider Electric USA Inc.: $120,000 (2.0 %) Honeywell, Inc.: $164,000 (2.8 %) Ohmconnect, Inc.: $1,593,378 (27.1 %)		**Match Funding:** $1,877,378	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-083 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

OhmConnect has built a user experience when registering, engaging, and interacting with the OhmConnect product. This user experience will be modified in ways to incorporate this project's goals for a subset of users. Those modifications are not covered in this Intellectual Property. During this project, certain portions of this user experience will be exposed in various contexts to the CEC.

Update:

This project is on track. The OhmConnect engineering team completed the work to incorporate numerous different transactive signals, including the utility, the CAISO, and EPRI. To implement the experiments laid out by UC Berkeley for Task 3, OhmConnect's engineering team built out an experimental framework that allows changes to only specific pieces within the product. This enables a streamlined implementation of any changes that will be seen by only specific experimental groups. Recruitment is ahead of schedule, with more than 12,500 customers signed-up.

167. EPC-15-084

Project Name:

Total Charge Management: Advanced Charge Management for Renewable Integration [EPC-15-084]

Recipient/Contractor:

Bayerische Motoren Werke of North America, LLC

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2019

Program Area and Strategic Objective:

Applied Research and Development

S2: Develop New Technologies and Applications that Enable Cost-Beneficial Customer-side-of-the-Meter Energy Choices

Issue:

Smart charging is a means of managing charging within a particular charging or parking event, usually at work during the day or at home during the night. The future electricity grid will face new balancing needs that change throughout the day and night as utilities and grid operators attempt to align renewable generation with customer load. As the grid becomes more dynamic, optimizing vehicle charging will require moving charging from night to day, from hour to hour, or from one grid location to another. California faces steadily increasing electric vehicles with larger batteries and utilities continue to add more renewables that will require more means for managing vehicle charging.

Project Description:

This project will explore the benefits and opportunities of Total Charge Management, where electric vehicle charging is managed across multiple charging events to maximize vehicle load flexibility. The project will test how flexible electric vehicle load can be if managed across a driver's daily or weekly charge events. This flexibility will utilize several pricing mechanisms to estimate the benefits of the Total Charge Management approach. The research will develop and evaluate advanced vehicle telematics for utilities and grid operators to align vehicle battery status, driver mobility needs and grid conditions. Collaboration between the grid and the driver can yield a charging load profile that minimizes energy costs by aligning daily and weekly charging events to best meet grid needs.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will help the state understand the flexibility of electric vehicle charging as a grid resource and other potential ratepayer benefits. Optimal charging load patterns will be identified that can capture grid benefits using a variety of grid price signals. The project will pioneer an understanding of not only the temporal benefits of controlled charging, but also the possible benefits that can be derived from being able to influence the location of charging.

CPUC Proceedings addressing issues related to this EPIC project:

Alternative Fueled Vehicles: R.13-11-007 Demand Response (DR): R.13-09-011

Applicable Metrics: CPUC Metrics- 1g

Lower Costs:

The cost of Plug-in Electric Vehicle (PEV) ownership is estimated to fall by $500 per year through grid service payments and reduced electricity bills for PEV drivers. In total, this would provide $4,000 in savings over the 8-year ownership life of a typical vehicle.

Greater Reliability:

Total Charge Management would represent a resource of over 10,000 MWh per day. If 40 percent of that load could be flexibly managed, the following benefits would be realized every day: 3,000 MWh of solar-following load, enough to accommodate 4 million additional solar panels on the grid, and 1,200 MWh of wind-following nighttime load.

Environmental Benefits:

Aligning vehicle charging with renewable energy generation has the potential to reduce carbon emissions associated with vehicle charging by as much as 660,000 metric tons per year, at a scale of 1.5 million vehicles.

Energy Security:

Greater energy security comes from having more diverse distributed resources able to respond to grid needs. The Total Charge Management approach helps utilities and CAISO get more functionality out of electric vehicle load as a grid resource, which contributes to energy security.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $207,398	
EPIC Funds Encumbered: $3,999,900		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Kevala, Inc.: $33,545 (0.8 %) BMW of North America, LLC: $378,386 (8.6 %)		**Match Funding:** $411,931	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 19 out of 21 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-084 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.
The existing iCharge Forward program developed trade secrets related to the vehicle telematics system and software used to administer grid service functionality between BMW's software backend and BMW electric vehicles. These trade secrets will be applied in this CEC project.

Update:

BMW has initiated contracting process with subcontractors. The public outreach plan was developed in coordination with PG&E. PG&E and BMW will release a joint press release at the LA Auto Show. Additional press rollout elements are being jointly developed by BMW and PG&E. BMW has identified 3 TAC members and is now seeking a final member with academic experience in consumer behavior. PG&E and BMW have a draft MOU that will be signed before the press release for the pilot project.

168. EPC-15-085

Project Name:

San Diego Libraries Zero Net Energy and Integrated Demand Side Management Demonstration Project

[EPC-15-085]

Recipient/Contractor:

Center for Sustainable Energy

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

California has set goals for 50% of existing state-owned municipal buildings to be Zero Net Energy (ZNE) by 2025, and for 50% of existing commercial buildings to be ZNE by 2030. Public agencies are in a unique position to demonstrate ZNE and integrated demand side management solutions, and to share lessons learned with other public agencies and the private sector to spur continued growth in these markets. Cost-effective pathways to achieving ZNE through maximum energy efficiency paired with integrated approaches have not been widely proven and further demonstration and analysis is needed to determine market viability and long-term sustainable savings, particularly in the municipal sector.

Project Description:

This project will integrate pre-commercial energy efficiency measures, building automation and controls system, behind the meter solar photovoltaic and energy storage in three existing public libraries in the City of San Diego. In addition to demonstrating cost-effective pathways to achieving maximum energy efficiency in the small commercial/municipal building sector, the recipient will engage in a multiyear, flexible, and transparent collaboration aimed at uncovering, testing, verifying and publicizing strategies for integrating energy efficiency, energy storage, solar photovoltaics, and other demand side resources to achieve near zero net energy in each library and to evaluate the financial value proposition.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Potential on-site energy savings and grid benefits could result due to reduced electricity use from the application of innovative energy efficiency technologies including phase-change materials, integrated wireless monitoring and controls and battery storage. Combining energy efficiency and building automation with solar photovoltaics and storage systems results in an integrated approach could be capable of responding to demand response events, thereby increasing grid reliability for all ratepayers.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h

Lower Costs:

The project could reduce energy and demand costs due to installation of the integrated package of energy efficiency and demand reducing technologies.

Greater Reliability:

The project could result in greater reliability in electrical services through the use of distributed energy resources to reduce electricity demand.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $2,715,516	**EPIC Funds Spent:** $0
Match Partner and Funding Split: San Diego Gas & Electric Company: $60,000 (1.8 %) City of San Diego: $482,000 (14.8 %) San Diego Green Building Council: $1,568 (0.0 %)	**Match Funding:** $543,568
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-085 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The recipient (CSE) is awaiting approval of its subcontract with the City of San Diego. The recipient is working through licensing and bonding requirements associated with the agreement. A kickoff meeting is planned in the 2nd quarter of fiscal year 2016/17.

169. EPC-15-086

Project Name:

Substation Automation and Optimization of Distribution Circuit Operations

[EPC-15-086]

Recipient/Contractor:

The Regents of the University of California, Irvine

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/22/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S6: Develop Technologies, Tools, and Strategies to Enable the Smart Grid of 2020

Issue:

Environmental concerns are driving the evolution of a more efficient and smarter grid with lower emission intensity. In response, distributed and renewable energy are being introduced and integrated into the grid. Currently, distributed energy resources (including distributed generation, energy storage, renewables and controllable loads) are operated by the owners under an interconnection agreement with the utility. As the number of these resources increase, it becomes necessary to manage and control the resources as a single entity to ensure reliability of the grid and to operate them to meet grid performance targets.

Project Description:

This project will provide enhanced electrical substation control over grid assets, including generation resources, energy storage and controllable loads. This will improve grid management at the distribution level through the modification, implementation, and simulation of a Generic Microgrid Controller (GMC). Different tariffs and interconnection agreements will be assessed for a portfolio of scenarios to address the participation of distributed energy resources in the market. In addition, a fictitious retail/distribution market will be developed and assessed.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs by developing a control strategy and simulating a portfolio of scenarios that assess the impact of distributed energy resources on the system, and will ultimately result in increased penetration of distributed energy resources. Also, this project will help in the integration and management of smart grid technologies on the distribution system, which when used has been shown to reduce criteria pollutant and GHG emissions.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1g, 2a, 3a, 3d, 3f, 5f, 5h

Lower Costs:

The controller will optimize dispatch of the available resources on the distribution system, which will lower operation costs.

Greater Reliability:

The controller provides visibility into the distribution system and will enable the operators to identify any issues quickly and respond to maintain the reliability of the system.

Increase Safety:

Enhancing automation and control capabilities of a substation allows for quick resolution of safety issues. Controlling load further allows for ensuring that the critical loads are being served in case of an emergency.

Assignment to Value Chain: Distribution		**Total Budgeted Project Admin and Overhead Costs:** $124,021	
EPIC Funds Encumbered: $932,718		**EPIC Funds Spent:** $28,043	
Match Partner and Funding Split: OPAL-RT Corporation: $35,978 (3.4 %) The Regents of the University of California, Irvine Advanced Power and Energy Program: $76,303 (7.3 %)		**Match Funding:** $112,281	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 23 out of 29 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-086 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project was started in August 2016. The recipient has completed a benefits assessment. The primary focus of the 2016 effort has been the development of the system model. To this end, OPAL-RT hardware and software were acquired to enable real-time modeling and control of the system in simulation and, by the end of 2016, the OPAL-RT system will be commissioned with the students and staff trained. In parallel, data necessary to validate the model have been obtained and archived.

170. EPC-15-087

Project Name:

Cooling Tower Water Treatment using Vortex Process Technology for Energy and Water Savings

[EPC-15-087]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 12/31/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Chemical water treatment systems used to reduce scaling and inhibit biological degradation have typically been used in large central plants, industrial refrigeration plants, and other large cooling systems. Non-chemical treatment systems have the potential to reduce consumption of water by allowing more cycles of concentration in this equipment, as well as reducing the quantity and toxicity of discharge to wastewater treatment plants. The Vortex Process Technology has the potential to increase energy efficiency and reduce water use but there are uncertainties associated with long term performance, effectiveness, energy savings and cost effectiveness.

Project Description:

The purpose of this agreement is to fund the full-scale deployment demonstration of the Vortex Process Technology in cooling towers of commercial buildings. This technology has been used successfully in Europe and will be testing in California to address state specific goals for water and energy savings.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Non-chemical water treatment has the potential to reduce water use, improve quality of water discharged to wastewater stream, reduce scaling in condenser water piping, and increase energy efficiency of chilled water plants.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 1h, 4c, 4d, 4e

Lower Costs:

This project has the potential to reduce energy and water costs in commercial buildings. The energy savings is due to improved cooling tower efficiency and heat transfer in cooling equipment. The water savings is due to allowing higher cycles of concentration and supply water usage.

Increase Safety:

Reduces use of hazardous chemicals, thereby reducing exposure of maintenance personnel.

Environmental Benefits:

As less chemical are used in the treatment of the water in cooling towers, this could reduce discharge of toxic materials into wastewater stream.

Public Health:

Reduces exposure to toxic chemicals related to their manufacture, transport, handling, and disposal or use.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $485,121	
EPIC Funds Encumbered: $1,999,995		**EPIC Funds Spent:** $3,323	
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $324,990 (13.3 %) Cypress LTD: $125,000 (5.1 %)		**Match Funding:** $450,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 6

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-087 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

A kickoff meeting was held on September 15th, 2016. First Invoice received November 15th, 2016. Task completed include EPRI site visits to Westin Hotel and AMGEN (the demonstration sites). EPRI provided Cooling Tower drawings and Utility data to the demonstration sites. Upcoming tasks include preparing sites specific equipment designs.

171. EPC-15-088

Project Name:

Biofiltration as an Advanced Primary Treatment Method to Achieve Substantial Energy Savings

[EPC-15-088]

Recipient/Contractor:

Kennedy/Jenks Consultants, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

The secondary biological treatment process method is accomplished by aerating wastewater and is energy intensive, typically accounting for 40 to 60 percent of the total wastewater treatment plant (WWTP) electricity consumption. Achieving a higher amount of removal of organic material before the aerated activated sludge process provides a breakthrough opportunity to reduce electrical power demand. However biofiltration as an advanced primary treatment method is an emerging technology for removal of total organic load, both soluble and particulate material, and has never been implemented full scale at WWTPs.

Project Description:

The project will demonstrate that Biofiltration is a technically viable and commercially attractive approach to achieve significant electrical energy savings at wastewater treatment plants. This project will quantify the electrical energy reduction and water savings that can be achieved by Biofiltration based on demonstration results at the Linda County Water District plant. This project will provide the cost and performance data to evaluate the benefits from a sustained, full scale validation testing, including quantification of electrical energy savings, determination of water savings, organic solids removal efficiencies, operation and maintenance and design criteria, independent monitoring and verification and technology transfer.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Biofiltration as an advanced primary treatment method could reduce the aeration electrical energy needed for secondary treatment, increase energy production in the anaerobic digester from the removed organic material and increase existing secondary treatment capacity and forestall the need for future treatment plants. Based on pilot studies outside of California, Biofiltration has shown the potential to decrease aeration power by 45 to 60 percent, increase gas production from 25 to 40 percent and increase treatment capacity by 50 percent.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4c

Lower Costs:

Aeration power requirements are estimated to decrease by approximately 45 to 60 percent compared to conventional treatment methods. Assuming 25% implementation of the technology, it is estimated that the annual electrical energy and cost savings for the ratepayers in California will be 110,000,000 kWh and $12,900,000 per year, respectively.

Greater Reliability:

The proposed technology would provide continuous energy savings, without shifting the peak load. Peak load reduction and substantially improved primary treatment performance will result in more reliable and effective treatment at WWTPs.

Increase Safety:

The overall performance of the WWTPs will improve with this emerging technology, resulting in increased safety for the protection of discharge water bodies, which are vital resources for California ratepayers.

Economic Development:

Biofiltration is an emerging technology that would avoid/minimize the considerable capital costs and land usage of conventional primary and secondary treatment units (compared to Biofiltration as an APT).

Environmental Benefits:

Biofiltration will provide improved environmental sustainability of wastewater treatment through reduced energy demand and carbon footprint, as well as improvements to recycled water quantity and quality. Reduced recycled water costs should assist the State in reaching goals for increasing use of recycled water.

Public Health:

WWTPs can have potential large scale impacts to public health through discharge to receiving water bodies and reuse through water recycling. Expected improvements to wastewater quality allows for security in meeting stringent permit requirements implemented to protect public health in the case of incidental contact.

Consumer Appeal:

Rate payers in California should expect to benefit from reduced sewer costs associated with reduction in energy and capital costs at WWTPs. Reduction or elimination of the use of conventional primary clarification has the added benefit of potential for reduced odors from wastewater treatment to communities located nearby.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $442,698
Demand-side Management	

EPIC Funds Encumbered: $1,306,185		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Professor George Tchobanoglous, Ph.D., P.E.: $12,000 (0.8 %) WesTech, Inc.: $194,050 (12.3 %) Linda County Water District: $24,700 (1.6 %) Kennedy/Jenks Consultants: $41,000 (2.6 %)		**Match Funding:** $271,750	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-15-088 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions. The method for backwashing the FlexFilter and the unique nature of the engineered bladder that provides a porosity gradient are both patented features of the FlexFilter. The applicable US Patent numbers are 7,223,347 7,143,781 as well as 7,435,351 and application 13/534,822. Any design criteria or specific information about the pilot unit must remain confidential.			
Update: The agreement has been initiated. A kick-off meeting was held in December 2016. Kennedy/Jenks has been meeting with multiple subcontractors and has begun designing the filtration system.			

172. EPC-15-089

Project Name:

Expanding Standards and Developing Tools to Enable DNP3 Support of Energy Storage Use Cases

[EPC-15-089]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/22/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S7: Develop Operational Tools, Models, and Simulations to Improve Grid Resource Planning

Issue:

Significant work to-date has addressed communication standards for "smart inverter" distributed energy resource systems in general, but communication standards to support large scale energy storage systems are still in their infancy. Current protocols are based on a global effort to define standard functions for smart inverters. However, implementation by manufacturers and evaluation within field demonstrations have been primarily focused on solar photovoltaic systems. Battery storage functions are included in the photovoltaic profiles but there is a need to expand and refine the function set with energy storage in mind.

Project Description:

This project will support open communication with energy storage systems by focusing on a Distributed Network Protocol (DNP3) for smart inverters. The Recipient will develop tools to make adoption of DNP3 for communication and controls of distributed energy resource (DER) systems simple and seamless. An ancillary benefit will be to improve communications with stand-alone energy storage systems and control of other inverter-based devices, including solar and plug-in electric vehicle fleets. The approach is to evaluate the current state of communications to DERs and address any gaps in functionality, work with the DNP3 Users Group to update the existing energy storage and solar specifications to support the most advanced energy storage use cases, create an open-source DNP3 client to simplify product development of smart inverters, and develop the appropriate conformance testing tools to ensure interoperability.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will provide benefits to California in the form of greater utilization of energy storage systems which will result in an increase to grid flexibility. Increased grid flexibility will benefit the utility's infrastructure, operations, and energy security. This ultimately benefits ratepayers in the form of lower costs.

CPUC Proceedings addressing issues related to this EPIC project:

Energy storage: R.15-03-011 Distribution Resources Plans (AB 327): R.14-08-013 Distribution Level Interconnection (Rule 21): R.11-09-011

Applicable Metrics: CPUC Metrics- 1a, 1h, 1i, 2a, 3a, 5a

Lower Costs:

This project will lower costs by providing an inexpensive open source software solution to mapping energy storage into a DNP3 client.

Greater Reliability:

Energy storage is a flexible resource that can help utilities maintain grid reliability by allowing them to add energy or consume energy on the electric grid. This project will expand the capability of utilities to control energy storage systems which provides them with opportunities to maximize flexibility and therefore benefits.

Increase Safety:

Ratepayers will realize safety benefits from energy storage systems improving the stability of the grid by offering increased flexibility in the use of energy. Examples of increased flexibility include energy storage systems participation in frequency support, peak load reduction, frequency and voltage anomaly ride-through, and conservation voltage reduction.

Economic Development:

Open-source tools are often associated with economic development because they provide collaboration in innovation. This saves companies money and makes it easier for new companies to compete in this field which can increase the number of products on the market. This results in cheaper products and an increase in innovation and competition.

Environmental Benefits:

Environmental benefits of this project would stem from realizing the advanced use cases for energy storage that help reduce peaks and minimize the need for generators to provide support at peak times.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $187,517
EPIC Funds Encumbered: $873,516	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Electric Power Research Institute (EPRI): $105,228 (8.5 %) MESA Standards Alliance: $75,000 (6.1 %) SunSpec Alliance: $130,100 (10.5 %) Xanthus Consulting International: $50,500 (4.1 %)	**Match Funding:** $360,828
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method:	Funding Mechanism:	No. of Initial Passing Applicants/ Bidders:	Rank of Selected Applicant/ Bidder:
Competitive	Grant	23 out of 29 bidders	Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-089 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project just started. The Kickoff meeting was held on September 20, 2016. Since the kick off meeting, the contractor submitted the Benefits Questionnaire and an updated Fact Sheet. They are working on the Technology/Knowledge Transfer Plan, and will hold their first TAC meeting at the end of January 2017.

173. EPC-15-090

Project Name:

Integrated Distributed Energy Resources Management System (iDERMS)

[EPC-15-090]

Recipient/Contractor:

The Regents of the University of California (UC Riverside)

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/22/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S6: Develop Technologies, Tools, and Strategies to Enable the Smart Grid of 2020

Issue:

The number of distributed energy resources such as solar photovoltaic panels, electric vehicles, energy storage devices, and flexible loads has been increasing exponentially in the past few years. Traditional distribution automation systems designed under a centralized control scheme can no longer handle the task of coordinating the control of thousands of heterogeneous devices

Project Description:

This project will develop an Integrated Distributed Energy Resource Management System (iDERMS) to coordinate the operations of a large number of distributed energy resources (DER). In the normal state, a virtual power plant will be developed by aggregating large amounts of flexible loads, renewable resources, energy storage systems, etc. The DERs will be coordinated through a three-phase distributed optimal power flow algorithm and a distribution electricity market. In the emergency state, a decentralized Volt-Var control will be developed and tested to provide dynamic distributed reactive power support to the distribution grid through smart inverters. In the restorative state, a distribution network reconfiguration algorithm will be developed considering high levels of renewable penetration to make the distribution network a self-healing grid.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project team has estimated that implementing the iDERMS will provide ratepayers with lower costs, greenhouse gas emission reductions, and improved health by coordinating clean renewable generation with loads.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 1g, 2a, 3a, 3d, 3f, 5f, 5h

Lower Costs:

The project team has estimated that the iDERMS will yield annual electricity saving of 4,840 GWh, distribution system peak reduction of 450.9 MW, quantifiable electricity cost reduction of $362.1 Million per year.

Environmental Benefits:

The project team has estimated this project will yield annual greenhouse gas emission reduction of 2,221,560 metric tons.

Public Health:

It is estimated that the reduced electrical generation from fossil fuel power plants due to increased distributed renewable generation will result in cleaner air. This will lead to improvement in health for California residents.

Assignment to Value Chain: Distribution	**Total Budgeted Project Admin and Overhead Costs:** $77,873
EPIC Funds Encumbered: $1,119,437	**EPIC Funds Spent:** $4,012
Match Partner and Funding Split: Lawrence Livermore National Laboratory: $254,161 (14.1 %) PetaPower, Inc.: $49,500 (2.7 %) eMIT, LLC: $100,024 (5.5 %) University of California, Riverside: $282,742 (15.7 %)	**Match Funding:** $686,427
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 23 out of 29 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-090 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project team has been working on 1) collection of the data from Southern California Edison and 2) development of the three-phase iterative direct current optimal power flow (DCOPF) algorithm. The three-phase iterative algorithm is crucial to enable a distribution system operator managed electricity market. A conference paper entitled "LMP decomposition with three-phase DCOPF for distribution system" was written on the developed three-phase DCOPF algorithm and will appear in the IEEE Power and Energy Society Innovative Smart Grid Technologies Conference proceedings.

174. EPC-15-091

Project Name:

Energy Efficiency and Water Savings in Agriculture by Innovative Plant-Aware Irrigation System

[EPC-15-091]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 12/30/2019

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Current irrigation practices in California fruit crops, such as grapevines, is to apply water according to a weekly schedule with a fixed quantity of water each time, or based on climate conditions, regardless of what the actual water needs of the plants are. This method results in over-irrigation and is often detrimental to the quality of the fruit or its yield.

Project Description:

This project will address the specific problem of fixed watering schedules for agricultural crops by demonstrating a new irrigation system that will save both water and energy. This system performs on the principle that crops will be watered only when needed, and not just on a set time-interval. The additional benefits of this system would be the improvement in the quality and yield of the crop. The goals of this project will be to demonstrate the Plant Aware Irrigation (PAI) system on perennial crops, quantify the energy and water savings for at least 12 months, and engage customers' feedback in discussions of perceived benefits while acknowledging the customer's concerns. The technology will be demonstrated in three vineyards.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project anticipates providing energy and potable water savings and increased environmental benefits in irrigation. More energy efficient irrigation lowers the use of electricity, lowering the cost to consumers in the agricultural industry. Use of less water will provide greater reliability in California's drought-stricken environment where municipalities have been tasked with cutting potable water use by 25 percent.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 3g, 4a, 4c

Lower Costs:

The project will lower costs to ratepayers through reduced water consumption and reduced energy consumption from pumping well water.

Greater Reliability:

The project achieves greater reliability by providing irrigation based on plant requirements. This allows for crop quality and yield to be improved through less overwatering.

Environmental Benefits:

The project achieves environmental benefits through reduced water consumption. Water is currently wasted by watering crops on a regular schedule while this technology will save water by watering crop based on plant needs. Reduced water pumping will result in lower greenhouse gas emissions.

Consumer Appeal:

Limiting water to wine grapes could produce higher quality grapes resulting in higher grade wines.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $307,688	
EPIC Funds Encumbered: $1,097,990		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Fruition Sciences: $331,000 (23.2 %)		**Match Funding:** $331,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-091 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project kickoff occurred on September 1, 2016. Industry experts are being invited to join the TAC. Contracting with subcontractors is under way. The first quarterly report was submitted in November 2016.

175. EPC-15-092

Project Name:

Low Energy Biofiltration System with Low Backwash Rate for Groundwater Contaminant Removal

[EPC-15-092]

Recipient/Contractor:

Tomorrow Water dba BKT United

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/31/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Many of California's groundwater aquifers are unused for drinking water due to contamination by nitrate and/or perchlorate. Existing groundwater treatment methods generate a concentrated brine stream that requires disposal measures rendering it unsuitable for inland sites. Existing biological treatment alternatives do not generate a brine stream but are very energy intensive. A cost effective, low energy treatment option for contaminated ground water resources is needed for inland communities in Central and Southern California to increase water supply.

Project Description:

The project will demonstrate a biofiltration system that uses 15-20 percent less energy when compared to conventional fluidized bed technology commonly used to treat contaminated water to drinking water standards or for use in industrial and/or agricultural applications. The technology will be demonstrated in the City of Barstow and will remove nitrate, perchlorate and turbidity from the wastewater. The project includes water testing after treatment that is needed to secure Conditional Acceptance as a Title 22 drinking water treatment technology from the State Water Resources Control Board.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project is anticipated to offer a lower energy alternative for treatment of the most common contaminants preventing use of ground water resources in California. The project could enable the development of new water supplies in many of the drought challenged regions of the State. Local treatment of impaired groundwater will provide additional energy benefits by eliminating the cost associated with transporting clean water from distant sources. The BioFiltration treatment technology has the potential of efficiently treating contaminated water in an energy efficient manner while generating no waste brine.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 4a, 4d

Lower Costs:

The BioFiltration system in this project yields cost savings through reduced energy use because the media used in the system is backwashed by gravity rather than pumping. Additionally, recirculation pumping, common in other biofiltration systems that use activated

carbon, requires regular interval replacement. The BKT BioFiltration technology uses a floating media and does not require regular replacement.

Environmental Benefits:

This low energy system treats contaminated water so that it can be used as drinking water supply. This can provide a source of local drinking water and eliminates the need to transport clean water from distant sources.

Public Health:

This system removes contaminants from polluted groundwater to create additional drinking water supply. The system requires much less energy than conventional treatment systems and does not generate brine - a byproduct of conventional systems, which must be disposed of because it cannot be treated in municipal water treatment facilities.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $9,920
EPIC Funds Encumbered: $1,722,072	**EPIC Funds Spent:** $46,936
Match Partner and Funding Split: Kana Engineering Group, Inc.: $100,000 (4.7 %) City of Barstow: $75,000 (3.5 %) Khalil Kairouz Consulting: $5,000 (0.2 %) Eurofins Eaton Analytical: $49,860 (2.3 %) Tomorrow Water dba BKT United: $172,637 (8.1 %) MWH: $15,000 (0.7 %)	**Match Funding:** $417,497
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 3

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-092 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The Recipient is designing the vessel and has begun to procure materials for assembly of the BioFiltration system. The Recipient has met with State Water Resources Control Board to size the filtration and disinfection unit for future Conditional Permit Acceptance.

176. EPC-15-093

Project Name:

Accelerating Drought Resilience Through Innovative Technologies

[EPC-15-093]

Recipient/Contractor:

Water Energy Innovations, Inc.

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/13/2016 to 10/31/2018

Program Area and Strategic Objective:

Market Facilitation

S20: Accelerate the Deployment of Energy Technologies in IOU Territories Through Innovative Local Planning and Permitting Approaches.

Issue:

California's historic drought has been especially severe in the San Joaquin Valley and rural communities have been significantly affected. Immediate solutions are needed to support the communities that contribute to maintaining California's food security. Unfortunately, traditional water infrastructure solutions are expensive and have long lead times to implementation. Innovative technologies, financing mechanisms, and permitting recommendations can make an impact on expediting drought resiliency.

Project Description:

This project will develop a replicable model for streamlining the planning, permitting, and financing of technologies that save both energy and water. The project will assist local jurisdictions in implementing strategies and measures that reduce development times and costs, as well as assist in developing innovative financing mechanisms that leverage potential sources of co-funding and low-interest loans. The recipient will pilot the model for Tulare County in an effort to develop a roadmap for implementation of the model in other similar rural agricultural communities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

SB 350 (De Leon, 2016) sets new objectives in clean energy, clean air, and pollution reduction for 2030 and beyond, including doubling the electric energy efficiency savings. This project will develop a comprehensive regional drought resilience plan that will match high potential energy and water efficiency technologies with potential adopters, leading to reduced energy demand and greater reliability.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e, 4c

Lower Costs:

The project will help to lower costs by streamlining the deployment of drought resilient technologies that reduce the amount of electricity needed to collect, transport, treat and deliver water to end use customers.

Greater Reliability:

The project will develop a replicable model that matches advanced water and electricity technologies with high priority projects in California's rural agricultural communities. The model will integrate streamlined permitting and approval processes and finance mechanisms, enabling the adoption of innovative technologies that increase water and electricity reliability.

Consumer Appeal:

The project will create strategies, toolkits and technology portfolios that will be easily transferrable to entities in rural and agricultural communities. This project will assess agricultural, residential and non-residential market and customer barriers to adopting advanced water and energy technologies.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $178,824	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $35,076	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-093 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved at a Business Meeting on Jun 14, 2016. Laurene Park, PI, presented this project and served as a panelist in the Efficiency track at the EPIC Symposium on Dec 1, 2016

177. EPC-15-094

Project Name:

Demonstration of Affordable, Comfortable, Grid Integrated Zero Net Energy Communities [EPC-15-094]

Recipient/Contractor:

Electric Power Research Institute, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan 2015-2017 Triennial Investment Plan	6/15/2016 to 3/30/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S14: Demonstrate the Reliable Integration of Energy Efficient Demand-side Resources, Distributed Clean Energy Generation, and Smart Grid Components to Enable Energy Smart Community Development

S12: Overcome Barriers to Emerging Energy Efficiency and Demand-Side Management Solutions through Demonstrations in New and Existing Buildings.

Issue:

California's zero net energy and global climate change goals will require a huge increase in building and end-use system efficiency. The immediate goal of all new homes to be zero net energy by 2020 will require a better understanding of cost effectiveness, technical feasibility and operational performance. Large scale field demonstrations that show integrated technology pathways in multiple climate zones are needed to demonstrate cost effectiveness, monitor and verify energy and cost savings and other benefits, and evaluate new technology and integration strategies, such as community solar and impacts on the distribution grid.

Project Description:

This project will demonstrate cost-competitive ZNE design strategies that combine occupant needs with technology solutions to create new pathways for residential ZNE communities. The project's goals are cost effectiveness for the customer, affordability, overcoming customer apprehension, establishing a track record of new technology for builders, enabling distribution grid integration, creating a planning process for ZNE communities, evaluating community solar and evaluating the impact of future changes to ZNE cost effectiveness. This project will also aim to understand the operation and energy use of the unregulated loads.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This research will provide new methodologies for integrating occupant and technology needs into a cost effective and scalable zero net energy (ZNE) strategy. The project will analyze and define the savings and market barriers in residential communities and provide new, valuable performance data and models from the demonstrations. The products from this research will be essential to identifying the successes and barriers to meeting the ZNE goals for residential communities.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a, 5b

Lower Costs:

Zero net energy (ZNE) homes could result in significant savings in money, resources, operation and maintenance, energy, and greenhouse gas emissions. Both ratepayers and customers benefit from implementing ZNE residential communities. The estimated cost savings related to the energy savings is $1242/year. Over a 50 year life of a ZNE home, this would translate to a net present value of nearly $80,000 in realized value for the homeowners.

Greater Reliability:

This project will provide new data, analysis, and designs for cost effective ZNE residential communities, which will improve the reliability with the integration of energy efficiency, demand control, and renewable power with buildings and the Smart Grid.

Increase Safety:

ZNE residential communities have the potential to increase safety due to the improved ability to control and integrate buildings' use of renewable power, storage, electric vehicle charging, and the Smart Grid. In addition, many of the networked ZNE technologies have additional monitoring and safety features.

Environmental Benefits:

The recipient estimates that a ZNE home in California will reduce electric use by 7000 kWh and gas usage by 200 therms annually per home (for Climate Zone 10). At the current rate of new homes in California (400,000 new homes a year), the potential savings in energy use translate to as much as 2800 GWh of electricity use and as much as 80 million therms of gas usage a year. Every ZNE home will translate to a reduction in in greenhouse gas emissions of 6456 lbs annually which equates to about 3.041 metric tons of emissions. If all new homes were ZNE, that would translate to a reduction of 120,000 metric tons of greenhouse gas emissions every year.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $1,460,838
EPIC Funds Encumbered: 2012-2014 Plan: $3,207,432 2015-2017 Plan: $1,735,377 Total: $4,942,809	**EPIC Funds Spent:** $0
Match Partner and Funding Split: De Young Properties: $200,000 (3.1 %) Electric Power Research Institute (EPRI): $309,482 (4.8 %) Meritage Homes Corporation: $500,000 (7.7 %) Southern California Edison: $500,000 (7.7 %)	**Match Funding:** $1,509,482
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method:	Funding Mechanism:	No. of Initial Passing Applicants/ Bidders:	Rank of Selected Applicant/ Bidder:
Competitive	Grant	39 out of 39 bidders	Ranked # 5

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-094 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project kick-off meeting was held on November 4, 2016. The recipient is working with the building developers to identify the demonstration homes and begin the planning process.

178. EPC-15-096

Project Name:

Demonstrating Innovative Leakage Reduction Strategies: Correlating Continuous Acoustic Monitoring, Satellite Imagery and Flow Sensitive Pressure Reducing Valve System

[EPC-15-096]

Recipient/Contractor:

American Water Works Company, Inc.

Investment Plan:	**Project Term:**
2012-2014 Triennial Investment Plan	6/30/2016 to 3/30/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Demonstrate and Evaluate the Technical and Economic Performance of Emerging Energy Efficiency and Demand-Side Management Technologies and Strategies

Issue:

Water utilities across the country struggle with aging pipe infrastructure, resulting in water loss from leaks. The cost to replace or rehabilitate pipe is often far greater than the cost of repairing pipe leaks, and utilities tend to wait for leaks to be identified before taking action. While reported leakage tends to be associated with surface expression of water and infrastructure damage, background leakage and unreported leakage are particularly difficult to detect and manage. The significant loss of drinking water, before it reaches the customer, is especially critical during California's drought.

Project Description:

This project will demonstrate three leak detection technologies to reduce the amount of water lost from leaks and the amount of embedded energy wasted. The three technologies are satellite imagery leak detection, correlating continuous acoustic monitoring, and flow sensitive pressure reducing valves. These technologies will be demonstrated in four Southern California cities. The Recipient will present achievable and measurable water savings in water distribution systems and show the potential for water and energy savings. An economic analysis of the costs and benefits of the technologies will be developed to assist in considering solutions for water loss reduction and energy efficiency. The project benefits will be quantified through water saved, embedded energy saved, and associated greenhouse gas emissions reduced.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project could improve water leak detection/prevention strategies. By managing and minimizing water leakage in California water distribution systems, this could benefit ratepayers through increased water system reliability, lower emergency and repair costs and lower water and electricity costs. These benefits will be quantified through the volume of water saved and the embedded energy in the saved water.

CPUC Proceedings addressing issues related to this EPIC project:

Demand Response (DR): R.13-09-011 Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 4c

Greater Reliability:

This project promotes greater reliability of the municipal water distribution system by detecting leaks at the early stages and reducing the amount of water lost.

Environmental Benefits:

This project will save water and will help prevent water loss from leaks.

Energy Security:

By reducing the amount of water lost, this project will reduce the amount of embedded energy wasted.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $222,664	
EPIC Funds Encumbered: $1,517,780		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: American Water Works Company, Inc.: $311,641 (16.3 %) Hazen & Sawyer: $3,000 (0.2 %) Echologics: $76,820 (4.0 %)		**Match Funding:** $391,461	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 14

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-096 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This agreement has been initiated and the kick-off meeting was held in December 2016.

179. EPC-15-097

Project Name:

Achieving Zero Net Energy in Multi-family Buildings

[EPC-15-097]

Recipient/Contractor:

Build It Green

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/1/2016 to 3/30/2021

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

There is a critical need for more research and evaluation of zero net energy multifamily design and construction approaches and practices. Many key design issues remain poorly understood in the multifamily sector, particularly for emerging all-electric heating, ventilating and air conditioning and domestic hot water technologies. These include the performance and economic trade-offs of technology solutions, lack of agreement between design and actual performance for key emerging technologies, and a lack of understanding of how these technologies will impact tenants and property managers.

Project Description:

This project will demonstrate the potential of breakthrough electric water heating and space conditioning technologies as a pathway to zero net energy. The project will explore the complex, interdependent systems in multifamily buildings and how they work together to achieve zero net energy status for the buildings in a cost-effective manner. Four multifamily buildings, designed to be affordable, will be evaluated in various stages of design and development. These buildings will share a goal of all electric zero net energy construction with 100 percent renewable energy generation, and will utilize innovative new heat pump technologies to serve the buildings water heating and/or space conditioning needs.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will demonstrate the technical and economic feasibility of zero net energy design for large multifamily projects and establish design and installation best practices that minimize risks for developers. It will identify practices needed to ensure that energy and cost benefits of zero net energy are fully realized and the trade-offs between technology solutions, capital costs, operating and maintenance costs, environmental benefits and grid impacts.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a, 4a

Lower Costs:

This project will help developers make more informed zero net energy design decisions which may reduce construction costs for multifamily buildings and lower future operating (e.g., energy) costs for building owners and occupants.

Greater Reliability:

Electricity reliability may be improved by quantifying the load shifting benefits of thermal storage systems and increasing the energy self-sufficiency of multifamily ZNE developments.

Environmental Benefits:

Optimized all electric strategies for achieving zero net energy may result in reducing greenhouse gas emissions.

Public Health:

Optimized energy using systems may improve indoor air quality in buildings.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $1,955,811		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Resources for Community Development: $45,090 (2.0 %) Corporation for Better Housing: $245,000 (10.9 %)		**Match Funding:** $290,090	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 12

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-15-097 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Product name: Confidential Utility Consumption Data
Patented equipment. High temperature heat storage itself is not a novel or patented concept by GE, but new controls (e.g. software and firmware) and the existing Geospring heat pump are proprietary.

Update:

The research team is currently evaluating the construction documents and energy design and specifications of all four multi-family Zero Net Energy (ZNE) project sites (Oakland, Calistoga, Cloverdale and Atascadero) to investigate ZNE issues in depth and to help identify and optimize energy efficiency technologies.

180. EPC-16-001

Project Name:

Measure Results from Affordable Zero Net Energy Homes

[EPC-16-001]

Recipient/Contractor:

Institute of Gas Technology dba Gas Technology Institute

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/30/2016 to 3/31/2021

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

The California Energy Efficiency Strategic Plan includes four Big Bold Initiatives, one of which states that all new residential construction in California will be zero net energy by 2020. The commercial and jobsite practices of builders required to help achieve this goal will not occur without demonstrated proof, in the form of measured field performance of new and emerging technologies. Measured field performance data of new and emerging technologies can help overcome the skepticism about the magnitude of the energy savings potential in real applications.

Project Description:

The project will implement lessons learned from previous high performance housing research and measure the results in two new houses built in partnership with Habitat for Humanity and homeowners. The houses will be built in a disadvantaged community in Stockton. Each house will include advanced architectural design features, high performance enclosures, advanced heating, ventilating and air conditioning systems, low-cost water heating systems and other advanced energy efficiency measures. One all-electric home and one mixed fuel (combined electric and natural gas) home will be built to demonstrate the respective cost-effectiveness of each set of features. In addition to the measured results from actual occupancy, the project will develop a guide to affordable residential zero net energy design and construction, training curriculum, and new class offerings based on the project results for building practitioners.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will demonstrate that affordable zero net energy houses are readily achievable using low-cost construction techniques and on-site renewable energy in combination with high performance housing approaches. The high performance approaches included in this project will reduce ratepayer (occupant) energy consumption and building design and construction costs.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015)

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 2a

Lower Costs:

The advanced integrated energy efficiency packages included in this project will reduce annual energy costs for occupants.

Consumer Appeal:

This project will use low cost construction techniques and on-site renewable energy in combination with high performance housing approaches to yield affordable zero net energy houses.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $325,815
EPIC Funds Encumbered: $1,000,000	**EPIC Funds Spent:** $12,001
Match Partner and Funding Split: Dettson: $8,500 (0.7 %) Southern California Gas Company: $160,000 (13.7 %)	**Match Funding:** $168,500
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-001 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Kickoff meeting was held on September 27, 2016. Current project efforts include assembling the Technical Advisory Committee (TAC), finalizing subcontracts, and selection of test sites.

181. EPC-16-002

Project Name:

Pathways to More Cost-Effective ZNE Homes

[EPC-16-002]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	9/1/2016 to 6/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

The State of California has set the goal of all residential new construction be zero net energy (ZNE) starting in 2020. This would represent a dramatic increase in volume from approximately 40 units in 2014 to over 150,000 units in 2020. There has been no comprehensive study to date on the cost effectiveness of ZNE homes, the dependence of cost effectiveness on building type (single family versus multifamily; all-electric versus non all-electric) and geographical location, and the impact of high volume production of ZNE components. Such a study would be critically important to help inform policymakers on the best methods for cost effective implementation of ZNE homes.

Project Description:

The project will provide detailed cost effectiveness modeling of all electric zero net energy (ZNE) homes versus ZNE homes with gas-based heating. Evaluation will include costs of building integration, energy efficiency packages, installed equipment and lifetime investment costs such as energy costs, and infrastructure costs (natural gas pipeline and electricity distribution system). The project will provide both spatial and temporal analysis in providing cost effectiveness assessment in four California climate zones and provide cost evolution scenarios as a function of time, for example as the ZNE industry scales up and under various policy and energy cost assumptions. The analysis will provide policymakers with a better understanding of the costs and benefits of ZNE policy choices between today and future ZNE milestones (2020, 2030), and the trade-offs for all electric versus electric and gas households.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will identify key cost-reduction opportunities and guidance for future policies, such as the sensitivity of overall costs to photovoltaic cost reduction, building shell measures, and future end-use appliance costs and performance. It will also estimate cost sensitivities of offsite renewable energy procurement, climate impacts, and policy levers such as mortgage tax credits and incentives for all electric homes and heat pump appliances.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a

Lower Costs:

The project could reduce construction costs for builders and operating costs for homeowners by providing cost-effective zero net energy building designs. This will result in lower product costs due to high volume manufacturing of efficiency technologies and lower utility costs to the consumer due to less energy consumption from the houses.

Greater Reliability:

The project will increase grid reliability by reducing demand side load and increasing adoption of distributed energy resources.

Environmental Benefits:

This project could reduce greenhouse gas (GHG) emissions by providing the building industry with the most cost-effective approaches toward implementing renewable energy and energy efficiency measures into community development projects. This offset of end-use demand will result in an avoided capacity needed at the generation level and potential reduction of GHG emissions associated with that demand.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $436,541	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $559,408	
Match Partner and Funding Split: Lawrence Berkeley National Laboratory: $50,000 (4.8 %)		**Match Funding:** $50,000	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 9

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-002 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Project kick-off meeting was held in early November 2016. Project work has begun including the assembling and scheduling of the technical advisory committee and executing subcontracts.

182. EPC-16-003

Project Name:

Pilot-Scale Evaluation of an Integrated Building Control Retrofit Package

[EPC-16-003]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/18/2016 to 12/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

The traditional approach to building automation consists of a collection of independent control systems, one for each building end use, with limited or no communication among the individual devices. Several research efforts during the past decade were aimed at improving electric lighting or fenestration control methods, increase system reliability and reduce lighting energy use. However, few efforts accounted for the interdependence of lighting, fenestration and space conditioning systems and the consideration of the latter in an integrated approach to optimize whole building energy efficiency via a single, unified control platform.

Project Description:

This project will test an Integrated Building Control Package that maximizes energy efficiency for existing commercial buildings. The project will refine novel control algorithms that utilize shared device state and environmental data for lighting, fenestration and heating, ventilating and air conditioning (HVAC) systems. Sharing and considering data from multiple device types will further improve overall, sustained, system performance and operation. Control algorithms will prioritize lighting or heating/cooling savings based on climate and building design. HVAC system management will leverage passive ventilation through windows and skylights and dynamic adjustment of HVAC set point dead bands.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Much energy is wasted by unnecessarily lighting and cooling indoor spaces which are unoccupied. Sometimes lighting sensors also misinterpret input and dim or brighten lighting because of occupant movements in a space. This project seeks to improve sensor-controlled lighting and air conditioning systems by integrating and sharing information from multiple sensors, resulting in better quality indoor spaces with reduced energy cost.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 3e

Lower Costs:

Greater utilization of natural light and ventilation will reduce energy costs, and improve the quality of indoor lighting. Occupancy sensors for lighting which are integrated with air conditioning systems will reduce unnecessary use of cooling when spaces are not occupied. Reduction in lighting and cooling energy will result in cost savings to building occupants.

Consumer Appeal:

This project will develop systems which improve the functionality of lighting and heating, ventilating and air conditioning controls, and integrate operations with automated shading, natural ventilation, and air conditioning systems, to create more appealing and comfortable indoor environments.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $392,705	
EPIC Funds Encumbered: $1,999,089		**EPIC Funds Spent:** $5,056	
Match Partner and Funding Split: Regents of the University of California, Davis - California Lighting Technology Center: $263,967 (11.7 %)		**Match Funding:** $263,927	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 13

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-003 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The Recipient began design and procurement of individual system components necessary to test the integrated building control retrofit package under controlled laboratory settings. The team expects to continue procurement and commissioning of the individual components. The Recipient is preparing the integrated building control system communication platform. The first Technical Advisory Committee meeting will be held in February.

183. EPC-16-004

Project Name:

Integrated Whole-Building Zero Net Energy Retrofits for Small Commercial Offices

[EPC-16-004]

Recipient/Contractor:

DOE- Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/30/2016 to 12/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

The small commercial office market experiences a number of barriers to achieving energy reductions. The barriers include a lack of awareness on how to achieve energy targets, and affordable access to energy reduction services such as engineering and auditing services. Energy efficiency tools and services currently involve high costs on a per-square-foot or kWh-saved basis. Small commercial offices in California consumed 3,500 GWh of electricity in 2012, and are projected to continue to grow. Meeting the state's energy goals requires whole-building integrated solutions that enable this sector to realize deep energy savings.

Project Description:

This project will develop and evaluate cost-effective packages of pre-commercial integrated energy efficiency measures and controls to achieve zero net energy (ZNE) performance for multi-story small commercial offices in San Francisco and Southern California. The packages will target a minimum of 50 percent energy savings when compared to standard building energy use. The packages of energy efficiency measures will be analyzed at Lawrence Berkeley National Laboratory's FLEXLAB, an advanced facility for testing whole-building integrated systems, to develop and validate solutions under varied climate and use conditions. The simulation models will be validated through results from FLEXLAB testing and a 3-story whole-building demonstration pilot located in San Francisco. Data on energy, occupant comfort, and occupant behavior will be analyzed and packaged into best practices to be replicated elsewhere in the State.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will develop and validate integrated whole building retrofit packages using pre-commercial underutilized technologies and controls with the goal of reducing energy use in small commercial offices by at least 50 percent. The project will also increase system reliability by reducing peak energy loads and supporting AutoDR implementation. Together the energy efficiency and demand components of the project provide a path towards meeting the State's energy efficiency and climate goals along with a means to replicate these strategies. This strategy is an advancement over current retrofit methods which focus only on equipment replacement.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 2a, 4a

Lower Costs:

The project will aim to reduce energy use by at least 50% in small commercial offices.

Environmental Benefits:

Assuming 5 percent of small commercial buildings (less than 30,000 square feet) in California adopt the proposed retrofit measures (including on-site renewable energy generation) by 2030, greenhouse gas emissions could be reduced by 83,238 metric tons per year.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $706,115
EPIC Funds Encumbered: $2,000,000	**EPIC Funds Spent:** $1,175,556
Match Partner and Funding Split: Charles McCabe: $2,000,000 (50.0 %)	**Match Funding:** $2,000,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 2

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-004 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Kickoff meeting was held January 2017. Initial project efforts include establishing the Technical Advisory Committee, finalizing subcontracts, and selecting a test site.

184. EPC-16-005

Project Name:

Energy Efficient HVAC Packages for Existing Residential Buildings

[EPC-16-005]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	8/1/2016 to 6/30/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

To meet California's long term energy efficiency plan, existing buildings must be retrofitted for energy efficiency to bring them on par or exceed current California efficiency building standards. Specifically, cooling of single-family homes will account for more than 5,700 GWh annually by 2024. While several new heating, cooling and ventilation (HVAC) technologies exist for improving energy efficiency, research and development is needed to create cost-effective retrofit packages for existing buildings, and to identify opportunities to encourage widespread adoption of these packages.

Project Description:

This project will develop and demonstrate innovative pre-commercial, cost-effective retrofit packages for cooling and ventilating single family homes. Energy savings, occupant behavior and indoor air quality (IAQ) will be measured for two specific retrofit packages that each includes three innovative technologies: (1) building envelope sealing, (2) two variants of smart mechanical ventilation that include pre-cooling strategies, and (3) compressor-free evaporative air-conditioning. Furthermore, barriers and opportunities towards adoption of such retrofits will be identified through stakeholder interviews.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

To address the current issues with indoor air quality and energy efficiency in existing homes, this project will demonstrate and evaluate two residential retrofit packages that incorporate advanced technologies for achieving both of these goals. Better envelope tightness combined with a dedicated ventilation system and highly efficient evaporative cooler will increase indoor air quality, reduce energy use for air conditioning and reduce overall peak demand. Additionally, the project could increase comfort for building occupants and reduce energy costs for building owners.

CPUC Proceedings addressing issues related to this EPIC project:

Residential Zero Net Energy Action Plan (2015): Residential ZNE Action Plan (June 2015) Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 2a

Lower Costs:

This cost-effective retrofit packages resulting from this project could reduce energy costs in existing buildings and identify opportunities to encourage widespread adoption of these packages, thus potentially reducing deployment costs.

Environmental Benefits:

The demonstration packages could reduce energy consumption and thus reduce greenhouse gas emissions, especially during peak demand hours. The energy savings is estimated to reduce greenhouse gas emissions by 56,000 metric tons per year by 2024. Also the evaporative cooling system provides an alternative to vapor compression cooling that reduces the usage of refrigerants are known to contribute to global warming.

Consumer Appeal:

The increased indoor air quality from a system that actively brings in filtered, fresh air will improve comfort and occupant health over a typical system that relies on uncontrolled building leakage to provide outdoor air.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $366,421	
EPIC Funds Encumbered: $1,200,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: Western Cooling Efficiency Center - UC Davis: $126,000		**Leveraged Funds:** $126,000	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 11

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-005 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Waiting for response from WCEC.

Update:

The kick-off meeting was held on January 26, 2017, and the project is now underway. WCEC is now working with Yolo County to identify future test sites for the two HVAC systems.

185. EPC-16-006

Project Name:

Low Energy, Zero Liquid Discharge Adsorption Technology to Remove Contaminants and Recover Source Water

[EPC-16-006]

Recipient/Contractor:

ES Engineering Services, LLC

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	7/28/2016 to 3/29/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

In California, many groundwater sources cannot be used for drinking water because of arsenic, chromium and other contaminants. Current technologies to treat contaminated drinking water are expensive, complex, and energy intensive, such as reverse osmosis. The other factor driving costs higher for conventional treatment is the need for expensive chemicals, daily management of high volume of waste laden with contaminants, and active process control, monitoring and adjustment. An alternative treatment system is needed that can effectively remove heavy metal contaminants from water, minimize energy, operation and waste disposal costs and meet California drinking water standards.

Project Description:

The project will test an innovative, low energy, zero liquid discharge water treatment system using adsorption process to potentially remove arsenic and other contaminants from a groundwater reservoir. The project will develop a demonstration-scale water treatment system to determine operational costs, energy and water savings of the single use adsorption system The demonstration will validate the reduction in spent adsorption media by natural dehydration to further save energy and water associated with residual solid waste handling. The project will include testing and reporting to secure state mandated acceptance of the novel drinking water treatment technology.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project could result in an innovative way to treat water with high amounts of metal contaminants using a low energy treatment method to restore impaired drinking water sources. The hydrogel adsorption process offers benefits of being simple, with its minimal amount of equipment required and will save water that would normally be too difficult to treat. This treatment method is especially suitable for small inland treatment systems, where liquid backwash and brine disposal may be cost prohibitive or infeasible.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1h, 4c, 4d

Lower Costs:

This project can lower the cost of water by reducing the capital cost for treating water contaminated with heavy metals.

Environmental Benefits:

This project can improve water resources by removing metal contaminants.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $0
EPIC Funds Encumbered: $986,262	**EPIC Funds Spent:** $98,958
Match Partner and Funding Split: Enova Water LLC: $65,000 (5.5 %) AQUAlity Engineering, Inc.: $15,474 (1.3 %) Khalil Kairouz Consulting: $4,000 (0.3 %) Municipal Management Group, Inc.: $5,000 (0.4 %) ES Engineering Services, LLC: $105,430 (8.9 %)	**Match Funding:** $194,904
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-006 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Enova has pre-existing intellectual property that is relevant to the project. The intellectual property is the single use adsorption media for metals, and is currently patented.

Update:

ES Engineering is completing the design for the proposed treatment system and the test plan. They are now beginning to fabricate the parts for the demonstration system.

186. EPC-16-007

Project Name:

Optimization of Energy Efficiency to Achieve Zero-Net Energy in Multifamily and Commercial Buildings

[EPC-16-007]

Recipient/Contractor:

Regents of the University of California, Davis

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	8/1/2016 to 6/30/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Although the technical feasibility of achieving Zero Net Energy (ZNE) in many building types in California has been documented, the optimal cost-effective strategy for reducing net electricity consumption toward ZNE goals remains unclear. The number of building types and technologies are too numerous to answer performance and cost-effectiveness questions through field studies. The open-source software tools and analysis methodologies, being developed as part of this project are difficult to monetize and would require coordination among competitors. Therefore, these tools are not currently being developed nor funded by competitive markets.

Project Description:

The recipient will use EnergyPlus, a building energy modeling tool, to analyze the cost-effectiveness of various electricity saving/generation measures for multifamily and commercial buildings in California. For each building type and climate zone, the results will include a cost-benefit analysis for each measure individually and for an optimized package of measures that reduces net electricity consumption to achieve as close to zero net energy as is cost-effectively possible.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will accelerate the adoption of cost effective electricity saving/generation technologies, equipment, materials and construction practices in California multifamily and commercial buildings. The project will help overcome barriers by identifying and documenting the cost-effectiveness of available energy efficient technologies, equipment, materials and construction practices for multifamily and commercial buildings.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 3e

Lower Costs:

This project could influence construction practices in California and promote the development of affordable energy efficient commercial and multifamily buildings. This project will provide optimized recommendations for cost effective electricity saving solutions for a wide variety of California's building portfolio for all 16 climate zones. Detailed modeling of building energy

<table>
<tr><td colspan="4">modeling packages will allow for accurate determination of cooling and heating loads, enabling right sizing of equipment which could extend equipment life for building owners.</td></tr>
<tr><td colspan="2">Assignment to Value Chain:
Demand-side Management</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $0</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$1,000,000</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
Electric Power Research Institute (EPRI): $25,000 (2.3 %)
University of California, Davis: $80,000 (7.2 %)</td><td colspan="2">Match Funding:
$105,000</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
39 out of 39 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 6</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-16-007 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
The kickoff meeting was held on October 19, 2016. The recipient has begun the technology review of high efficiency measures, updated the DOE reference model of Multi-Tenant Light-Commercial to Title 24 building efficiency standard and identified gaps in cost database that will need to be addressed to be able to estimate the cost of each measure being addressed. The recipient is currently assembling the Technical Advisory committee and beginning preparation for the Technology Review Report.</td></tr>
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187. EPC-16-008

Project Name:

Santa Monica Advanced Energy District

[EPC-16-008]

Recipient/Contractor:

City of Santa Monica

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	9/15/2016 to 12/31/2018

Program Area and Strategic Objective:

Market Facilitation

S20: Accelerate the Deployment of Energy Technologies in IOU Territories Through Innovative Local Planning and Permitting Approaches.

Issue:

Microgrids have the potential to solve many issues as increasing distributed generation, electric vehicle charging, and plug loads continue to transform and stress the aging electric grid infrastructure. Lack of awareness, regulatory ambiguity, and a high level of perceived risk have all prevented microgrids from becoming commercially viable. While many cities could benefit from a multi-user microgrid, few of them are poised to take advantage of such district-scale energy systems as they lack the technical knowledge, regulatory frameworks, and means to incentivize the private sector to deploy these systems to serve more than one building or entity.

Project Description:

The City of Santa Monica will plan and design an advanced energy community (AEC). Specifically, the City is planning to redevelop approximately 25 acres, including the Santa Monica City Yards and adjacent, public and private properties to incorporate a microgrid, interconnecting renewable energy, energy storage, and EV charging. The project team will work with stakeholders to examine different renewable energy technologies, as well as different financial and business models in order to pursue the most cost efficient plan that achieves a net-zero or near net-zero energy community for the municipal and local participants. A case study and "tool kit" of outreach materials will be developed and shared with stakeholders and other local governments.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

Senate Bill 350 (2015) sets a 50 percent renewable energy standard and a goal of doubling energy efficiency savings by 2030. Local governments can play a critical role in achieving the goal by helping facilitate community-scale deployment of Integrated Distributed Energy Resources (IDER) such as energy efficiency, onsite renewables, demand response, and electric vehicles. This project will pilot innovative planning, permitting, and financing approaches and tools to help improve the business case for IDER adoption at the community-scale.

CPUC Proceedings addressing issues related to this EPIC project:

Distribution Resources Plans (AB 327): R.14-08-013 Integration of Distributed Energy Resources (IDER): R. 14-10-003

Applicable Metrics: CPUC Metrics- 2a, 3b, 3e

Lower Costs:

This project will reduce the time and costs needed to bring community-scale IDER projects to a shovel-ready state.

Greater Reliability:

The tools and resources developed under this project will assist in identifying citywide optimal microgrid sites that will have the most local generation potential and are most likely to have the least impact on grid reliability.

Economic Development:

This project will pilot new approaches that increase the financial attractiveness of community-scale IDER projects, which could lead to increased investment in the community.

Consumer Appeal:

Greater deployment of AECs will increase consumer familiarity and comfort with Zero Net Energy homes and communities, increasing the likelihood of consumers choosing to live in an AEC.

Energy Security:

Microgrids using renewable energy generation, coupled with storage systems, allows critical facilities to generate their own energy locally and be cost competitive to the grid. These systems also reduce transmission losses.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $570,347	
EPIC Funds Encumbered: $1,487,609		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: City of Santa Monica: $217,460 (12.5 %) Arup North America Ltd: $10,970 (0.6 %) Hathaway Dinwiddie Construction Company: $100 (0.0 %) Miller Hull Partnership: $23,500 (1.4 %) Buro Happold Engineering: $1,000 (0.0 %)		**Match Funding:** $253,030	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 28 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 11

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-008 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The project was approved at the August 10, 2016 Business Meeting. Work is expected to begin in January 2017.

188. EPC-16-009

Project Name:

Testing a Low-Energy Water Treatment System for Fail-Safe Direct Potable Reuse [EPC-16-009]

Recipient/Contractor:

Porifera, Inc.

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	8/31/2016 to 8/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Potable water demand in California will continue to grow even as droughts become more common. The main sources for new water supplies in California are importing more water over long distances, desalination, and reuse. Of these three options, reuse requires the least amount of energy. A direct potable reuse (DPR) project has not yet been permitted in California. The main hurdle is public and regulatory concern over the public health risks of implementing DPR, which some call "toilet to tap". This concern is perpetuated by the lack of real-time fail-safe methods to ensure that contaminant barriers are intact at all times and performing as designed.

Project Description:

The project will test a low-energy, dual barrier, direct potable reuse system, known as dprShield, with breach-activated barrier technology. The purpose is to demonstrate that the dprShield can improve public health safeguards and reduce the electrical energy, chemical consumption, maintenance and overall cost for potable reuse of municipal wastewater. While being energy efficient and cost-effective, this system effectively removes trace contaminants through two tight membranes. In the event that one of the membrane barriers is breached, a Breach Activated Barrier is triggered and the contaminants are pushed away from the clean water stream, ensuring safe operation in real time. This direct potable reuse technology could replace more energy intensive processes.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will demonstrate an energy efficient solution for direct potable reuse of municipal wastewater. The dprShield is estimated to use 65 percent less energy than State Water Project transfers, 75 percent less than desalination and more than 50 percent less energy than competing technologies for direct potable reuse of municipal wastewater, removal of contaminants from water and real-time membrane integrity monitoring.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 1h, 4c, 4d

Lower Costs:

This project could provide a reliable and cost effective solution for water and wastewater treatment. This project could reduce water treatment and reuse costs, and reduce energy requirements and emissions when compared to other treatment methods.

Increase Safety:

This project can increase safety and reliability of potable water reuse projects. As potable reuse grows in California, this advancement will help overcome barriers by demonstrating an energy efficient solution for removal of contaminants from water and real time membrane integrity monitoring. This technology could detect and react to small breaches and assure pathogens do not enter the clean product water when there is a breach.

Public Health:

This project can increase safety and reliability of potable water reuse projects. As potable reuse grows in California, this advancement will help overcome barriers by demonstrating an energy efficient solution for removal of contaminants from water and real time membrane integrity monitoring. This technology could detect and react to small breaches and assure pathogens do not enter the clean product water when there is a breach.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $248,634	
EPIC Funds Encumbered: $999,795		**EPIC Funds Spent:** $26,139	
Match Partner and Funding Split: Leland Stanford Junior University: $34,784 (3.0 %) City of Hayward: $10,000 (0.9 %) Orange County Water District: $70,000 (6.1 %) Porifera, Inc.: $30,000 (2.6 %)		**Match Funding:** $144,784	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 5
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-009 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Patents and trade secrets from Porifera, Inc. have been identified as relevant pre-existing intellectual property.

Update:

In September 2016, Recipient began collaboration with its project partners and working on selecting a dye for the detection system. Currently testing the dye that will be used in the draw solution as well as beginning to design the pilot system.

189. EPC-16-010

Project Name:

Improving Water and Energy Efficiency in California's Dairy Industry

[EPC-16-010]

Recipient/Contractor:

The Regents of the University of California on behalf of the Davis campus

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	10/1/2016 to 9/30/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Milk is the most valued agricultural commodity in California. Approximately one of five dairy cows resides in California. Heat stress remains a major cause of diminished milk production and increased disease among lactating dairy cows, with annual losses directly related to heat stress exceeding $800 million. Current methods of reducing thermal stress require significant amounts of energy and water. Evaporative cooling is typically used with water sprayed on the cows using feed line soakers. These approaches require large amounts of energy to pump water and move air in sufficient quantities to reduce heat stress. The resulting hot, moist environment promotes bacterial growth.

Project Description:

This project will test and demonstrate two novel approaches to cooling livestock. In the first approach, conduction cooling, the bedding area beneath the cow will be cooled using heat exchange mats embedded in the soil. In order to reduce energy consumption, water flowing through the heat exchange mats will be chilled using a novel Sub-Wet Bulb Evaporative Chiller. The second approach, targeted convection cooling, will use fabric ducting to direct cool air on the cows. The air will be cooled using a high-efficiency direct evaporative cooler. Both of these approaches promise significant water and energy savings compared to current approaches.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The conduction cooling approach has the potential to reduce water consumption by 73 percent and electricity consumption by 38 percent compared to the baseline. The targeted convection cooling approach has the potential to reduce water consumption by 86 percent and electricity consumption by 28 percent compared to the baseline. In addition to saving electricity, this technology will aim to increase milk production and reduce disease among lactating cows due to heat stress and will reduce peak electricity demand.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1e, 1f, 1h, 4a, 4c

Lower Costs:

By reducing peak demand on the grid this project could lower electricity costs to dairies. This project could also reduce water costs and associated pumping and delivery mechanisms.

Greater Reliability:

By reducing peak demand on the grid this project will improve grid reliability.

Environmental Benefits:

This project could reduce greenhouse gas emissions by integrating novel energy efficiency cow cooling technology at dairies. This technology could reduce energy and water use over traditional cow cooling methods and thus reduce greenhouse gas emissions associated with avoided capacity needed at the generation and associated with the embedded energy in water.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $191,936	
EPIC Funds Encumbered: $1,000,000		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Regents of the University of California (University of California, Davis): $164,710 (14.1 %)		**Match Funding:** $164,710	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-010 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

(1) US Patent 9,207,018 Sub-wet bulb evaporative chiller system with multiple integrated subunits or chillers.

(2) US Patent 8397677 B2 Thermal Conductive Cooling Method and System for Livestock Farm Operations

(3) Targeted Convection and Hybrid Cooling of Dairy Barns

Update:

The Phase I experimental plan was drafted and circulated and feedback has been incorporated from all team members. Site information at the UC Davis Dairy has been collected and design drawings for the project has begun. A draft of potential TAC members has been submitted for CAM review.

190. EPC-16-011

Project Name:

Novel Membrane Technology to Improve Energy Efficiency and Water Savings in Wastewater Treatment Operations

[EPC-16-011]

Recipient/Contractor:

Kennedy/Jenks Consultants, Inc.

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	9/1/2016 to 4/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Low-pressure membrane filtration, such as microfiltration and ultrafiltration, is used for drinking water, wastewater, and industrial water treatment. However, membrane treatment processes are energy intensive, largely due to membrane fouling (organic and inorganic) on the membrane surface and in the membrane pores which results in layered fouling that is difficult to remove and increased transmembrane pressure. The use of membrane treatment is likely to increase due to its ability to remove pathogens during drinking water treatment compared to conventionally used media filters, and recent state initiatives to increase water reuse.

Project Description:

This project will demonstrate the performance of an innovative "amphiphilic" membrane (i.e., a combination of hydrophilic and hydrophobic properties) that keeps organic and inorganic foulants away from the membrane surface by incorporating an anti-adhesive. The amphiphilic membrane retards long-term foulant deposition, which allows for higher water flow through the membranes, increased water yield, and improved energy efficiency. The project will demonstrate the effectiveness of the technology in treating surface water, backwash water and synthetic reclaimed water. The project will also collect and develop data to encourage commercialization. Implementation of this technology does not require capital investment. Instead, treatment facilities could replace existing hydrophilic membranes with the amphiphilic membranes during routine scheduled membrane replacements.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

If successful, the proposed technology could reduce energy demand for membrane treatment processes by 10 to 40 percent and increase water yield during membrane treatment by lowering the reject stream as much as 50 percent. Assuming a 50 percent market penetration, 40 percent energy savings for membrane filtration treatment, and 20 percent energy savings for reverse osmosis treatment, the technology could conserve an estimated 44,000 MWh in California.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 3a, 4a, 4c

Lower Costs:

The technology could reduce the use of chemicals in and the frequency of membrane cleaning as well as reduce the frequency of membrane replacement. The Recipient estimates a 50% reduction in the frequency of membrane cleaning and replacement, resulting in lower operation costs.

Greater Reliability:

The project could promote local use of water if it successfully lowers the cost of water reclamation close to 40% and increases water yield by roughly 12 MGD (for 58,000 people) as projected.

Environmental Benefits:

The technology could minimize chemical use for membrane cleaning. In addition to reducing harm to the environment to public health and safety, resulting reduction in chemical use could save as much as $1.5 million annually.

Energy Security:

Energy security for California ratepayers could be increased if the technology is successful in reducing annual energy use by the projected amount of 44,000 MWh.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $304,611	
EPIC Funds Encumbered: $882,430		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: California Water Services: $20,000 (2.0 %) BASF: $60,000 (6.1 %) Kennedy/Jenks Consultants: $18,600 (1.9 %)		**Match Funding:** $98,600	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-011 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

Kickoff meeting held November 10, 2016. Deliverables provided to date include the list of technical advisory committee members and the match funding letters. Recipient is completing the kickoff benefits questionnaire and updating the work schedule. Recipient anticipates starting the first of three water treatment test by April 2017.

191. EPC-16-012

Project Name:

Power and Water Saving Advanced Hybrid Air/Wet Cooling System

[EPC-16-012]

Recipient/Contractor:

Altex Technologies Corporation

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	9/12/2016 to 9/30/2019

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Advanced hybrid air/water cooling systems for refrigeration and power systems represent an important opportunity, as they have the potential to reduce electricity and water use, an important consideration in California and many other water challenged areas in the United States. However, conventional hybrid air/wet cooling systems have high capital and electric power costs, which constrain their use in many commercial/industrial and utility applications.

Project Description:

This project will integrate water features into a novel heat exchanger which uses high performance porous fins to enhance cooling ability. Bench scale testing has shown the ability of the heat exchanger to enhance cooling through water vaporization and mass transfer. By integrating the proven heat exchanger with water features, this project has the potential to create a low cost and low risk product to reduce electric power and water use of refrigeration systems in California.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The hybrid cooling system will reduce fan power through low pressure drop characteristics and will save water by only using water evaporation when ambient air temperatures are high. The system will improve efficiency in commercial and industrial refrigeration and air conditioning systems. Assuming a 20 percent penetration of commercial and industrial markets, power and water will be reduced by 8,371 megawatt-hours and 725 million gallons per year.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011 Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 4c

Lower Costs:

This project has the potential to lower costs to building operators by reducing energy and water usage, leading to lower utility bills.

Environmental Benefits:

This project has the potential to reduce greenhouse gas emissions by integrating a novel energy efficient heating, ventilating and air conditioning (HVAC) technology. This offset of end-use demand will result in an avoided capacity needed at the generation level and the associated greenhouse gas emission reductions. Additionally, this novel HVAC technology will reduce water demand compared to the baseline water use of standard cooled chillers, and thus reduce the associated impacts of water treatment currently in use.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $529,685
EPIC Funds Encumbered: $999,994	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Altex Technologies Corporation: $187,207 (15.8 %)	**Match Funding:** $187,207
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 10

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-012 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Altex will include pre-existing intellectual property. A patented advanced porous fin heat exchanger technology that enhances wet and dry cooling heat exchanger performance will be adapted for the application of interest by adding water spray features, to produce an effective hybrid air/water cooling system, called Altex Hybrid HEX (AHHEX).

Update:

Project work continues to progress through the assembly of the technical advisor committee and execution of subcontracts. The recipient is working on identifying optimal materials for the new wet/dry cooling coil and has done lab scale evaluation of moisture wicking materials. The recipient is also in the process of updating their proprietary computer model to simulate performance of the new heat exchanger.

192. EPC-16-013

Project Name:

Integrating Smart Ceiling Fans and Communicating Thermostats to Provide Energy-Efficient Comfort

[EPC-16-013]

Recipient/Contractor:

The Regents of the University of California on behalf of the Berkeley campus

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	9/8/2016 to 3/30/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Conventional thermostat-based control strategies for heating, ventilating and air conditioning systems use a narrow range of temperatures year-round that are prescribed by building operators, based on an assumed occupancy schedule. Operators and occupants typically do not optimize these schedules based on actual occupancy or actual occupant preferences for thermal conditions. At low speeds, ceiling fans may reduce heating energy use by de-stratifying room air temperatures. However architects, engineers, and owners do not understand the effects of air movement from ceiling fans to predict energy and comfort impacts that might result from new and innovative approaches to comfort.

Project Description:

This project will develop an optimal system configuration for smart comfort controlled ceiling fans integrated with learning thermostats. This system will be tested and evaluated for energy performance and occupant acceptance in low income multi-family residential and small commercial buildings in disadvantaged communities in California. This research and development will advance the solution's technology readiness level and support market adoption acceleration.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

A 15 percent market penetration of the integrated smart comfort control ceiling fans with learning thermostats could yield an annual reduction of 985 GWh and $167 million. This is achievable because the integrated system is a market-ready, low-risk, high reward technology which provides multiple benefits to customers. The project will develop field-verified best practices for implementation, reducing the uncertainty and perceived risks associated with these products.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Strategic Plan update and action plans: EE Strategic Plan docs

Applicable Metrics: CPUC Metrics- 1f, 1h, 3a, 3e, 4a

Lower Costs:

Developing cost-effective configurations and best practices will reduce the cost of adoption and operation while reducing the simple payback, thus enabling building owners to invest in the technology at lower risk.

Economic Development:

A cost competitive technology, which is easy to install and use, will support a competitive and energy efficient building industry in California.

Environmental Benefits:

Energy savings could add up to 719 million pounds of greenhouse gas emissions assuming a 15 percent market penetration. Also, ceiling fans are enabling technology for compressor-free cooling with passive and/or radiant systems because they provide comfort at higher indoor temperatures, thereby reducing refrigerant purchase, use and disposal.

Consumer Appeal:

Automated learning controls make the technology operation easier for the customer and likely resulting in wider user acceptance. User acceptance is key to achieving broad adoption and meeting energy savings targets.

Energy Security:

The team estimates the integrated solution to provide energy savings up to 37% in cooling and 15% in heating, which could add up to 985 GWh of annual savings for California. The solution is a key component for passive heating and cooling design which supports CA zero-net energy (ZNE) goals and is demand-response ready.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $0	
EPIC Funds Encumbered: $1,888,683		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Center for the Built Environment - UC Berkeley: $112,726 (5.1 %) BIG ASS FANS: $203,200 (9.2 %)		**Match Funding:** $315,926	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 39 out of 39 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 8

If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-16-013 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.
Update: The researchers at UC Berkeley are preparing to conduct laboratory testing of the integrated thermostat system in a test facility designed to be used as a mock up prototype demonstration space.

193. EPC-16-014

Project Name:

A New Solution to California's Energy and Water Challenges: Reducing the Cost of Desalination and Increasing Water Reuse

[EPC-16-014]

Recipient/Contractor:

Lawrence Livermore National Security, LLC

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	9/1/2016 to 12/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S1: Improve Energy Efficiency Technologies and Strategies in California's Building, Industrial, Agriculture, and Water Sectors.

Issue:

Water reuse efforts face several challenges, including the high cost of current approaches to water treatment, such as desalination. Industrial processes and household activities continuously add salt to water, and as a result, the salt content of industrial and municipal waste water is often too high for reuse. The salt content of this waste water must be reduced to enable recycling and to avoid ecological damage. The primary desalination technology used today is reverse osmosis, which incurs high energy costs and is used in large water treatment plants to desalinate sea water and other water with high salt content by pushing water across a membrane to filter out the salt.

Project Description:

This project will test the flow-through electrode capacitive desalination (FTE-CD) technology to remove salt from water by applying an electric field to two porous electrodes. The electrodes act like a magnet for salt while the field is applied and remove the salt from water that flows through the electrodes resulting in a more energy efficient and less expensive approach than reverse osmosis. In this project, the recipient will partner with two water districts to test the use of FTE-CD devices to desalinate the wastewater and determine how this small, flexible device can improve the efficiency of water treatment and provide water treatment solutions for communities. Feedwater from two sectors, the industrial and municipal sector will be used to demonstrate that energy use, and identify fouling and other operation issues. This technology can reduce the cost of desalinating water with low-to-moderate salt content. The efficiency of FTE-CD is independent of plant size.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The ability to recycle water at a low cost will reduce use of fresh water taken from the environment and increase use of recycled water. Every gallon of water that is recycled does not have to be drawn from a reservoir, thus reducing overall water use. Additionally, the relatively small scale of the FTE-CD technology means that it can be deployed locally, in an efficient manner at the scale needed by each community, thereby increasing a community's water reuse and expanding the range of its usable water sources. An efficient, flexible desalination process will advance State energy goals, as well as goals for reducing water consumption, and can dramatically increase drought resilience.

CPUC Proceedings addressing issues related to this EPIC project:

Energy Efficiency Proceedings: R.13-11-005, R. 12-01-005, R.09-11-014

Applicable Metrics: CPUC Metrics- 1f, 1h, 3a, 4d

Lower Costs:

This project could lower the cost of desalination. Projected costs of an FTE-CD system are less than 50 percent of the costs for reverse osmosis system of equal capacity. Operational costs are expected to be lower due to fewer chemicals used.

Economic Development:

Maintain / Reduce operations and maintenance costs. FTE-CD can also be utilized to economically desalinate the brackish aquifer thus providing an additional fresh water resource to some of California's most disadvantaged communities

Environmental Benefits:

FTE-CD is expected to produce less wastewater than reverse osmosis since higher water recovery ratios can be achieved with FTE-CD. Also, FTE-CD can remove toxins from water such as nitrates and heavy metals, and could be deployed specifically to mitigate such hazards.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $448,176	
EPIC Funds Encumbered: $999,040		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: None		**Match Funding:** $0	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 27 out of 35 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 13

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-014 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This agreement was executed by all parties in February 2017. A project kickoff meeting is scheduled for the last week of February.

194. EPC-16-015

Project Name:

Los Angeles Regional Energy Innovation Cluster

[EPC-16-015]

Recipient/Contractor:

Los Angeles Cleantech Incubator

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	8/17/2016 to 3/31/2022

Program Area and Strategic Objective:

Market Facilitation

S18: Foster the Development of the Most Promising Energy Technologies into Successful Businesses.

Issue:

The Los Angeles region lacks necessary coordination of technical, business, and social supports for clean energy researchers and entrepreneurs to develop innovations and advance clean energy development into the regional economy. This lack of organizational support prevents the Los Angeles region from clearly understanding the best direction for its clean energy economy, specifically: regional energy needs, the size and strengths of the region's current clean energy ecosystem, the full range of technical and commercialization services currently available for clean energy entrepreneurs, and what efforts to emphasize in order to advance the region's clean energy economy.

Project Description:

This project will establish the Los Angeles Regional Energy Innovation Cluster to act as a regional hub of clean energy entrepreneurship, and give promising clean energy entrepreneurs direct access to the region's top technical, business, and commercialization clean energy support services. This project will assess and address the region's energy needs, target the most impactful clean energy technologies and facilitate the downstream market adoption of new clean energy technologies.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will benefit California IOU electricity ratepayers through the increased probability of commercialization and deployment of a portfolio of technologies that can reduce electricity costs, decrease peak demand, and improve system reliability and safety. Intangible benefits to California ratepayers will result from broader, indirect, and multiplicative economic effects that occur from the successful establishment of California-based technology companies.

CPUC Proceedings addressing issues related to this EPIC project:

Applicable Metrics: CPUC Metrics- 2a, 3e

Lower Costs:

This project will reduce the time and cost of new energy technology development by providing entrepreneurs with access to facilities and services needed to commercialize their innovation.

Economic Development:

The services provided by this cluster will support the development of local companies and further develop the clean energy economy throughout the Los Angeles region.

Assignment to Value Chain: Demand-side Management		**Total Budgeted Project Admin and Overhead Costs:** $541,645	
EPIC Funds Encumbered: $4,999,247		**EPIC Funds Spent:** $0	
Match Partner and Funding Split: Los Angeles Cleantech Incubator: $165,290 (1.9 %) Los Angeles County Office of Sustainability: $2,104,712 (24.3 %) Southern California Edison: $300,000 (3.5 %) California State Polytechnic University Pomona: $24,625 (0.3 %) CSU Dominguez Hills: $24,625 (0.3 %) California State University, Long Beach Research Foundation: $24,625 (0.3 %) CSU Los Angeles: $24,625 (0.3 %) CSU Water Resources and Policy Initiatives: $5,000 (0.1 %) California State University, Northridge: $24,625 (0.3 %) Cleantech Orange County: $597,998 (6.9 %) CSU Channel Islands: $49,500 (0.6 %) LA Business Technology Center: $99,000 (1.1 %) The Cleantech Open: $99,000 (1.1 %) Economic Development Corporation of Los Angeles County: $99,000 (1.1 %) Community Environmental Council: $15,474 (0.2 %)		**Match Funding:** $3,658,099	
Leverage Contributors: None		**Leveraged Funds:** $0	
Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 2 out of 2 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1
If not the highest scoring applicant/bidder, explain why selected: Funds were awarded to passing proposals in rank order.			
Treatment of Intellectual Property: Pre-existing intellectual property identified in agreement EPC-16-015 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.			
Update: The Los Angeles Cleantech Incubator (LACI) recently had the grand opening (10/21/16) for its new headquarters facility where the project team will be operating and managing the Los Angeles Regional Energy Innovation Cluster.			

195. EPC-16-016

Project Name:

Commercializing a Disruptively Low Cost Solar Collector

[EPC-16-016]

Recipient/Contractor:

Hyperlight Energy

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	10/14/2016 to 8/31/2018

Program Area and Strategic Objective:

Applied Research and Development

S11: Provide Federal Cost Share for Applied Research Awards.

Issue:

Concentrated Solar Power (CSP) is a promising form of renewable energy that has been hampered by high solar collector costs and high power block costs.

Project Description:

This project will develop a low cost Concentrated Solar Power (CSP) collector that will lead to $99/m2 cost (as-built system cost including equipment, logistics, and installation/commissioning) compared to existing $200/m2 for the solar field by the end of this project, and even lower cost by 2020. The system efficiency will be improved to 50 percent from 30 percent. California Energy Commission funds will be used as cost share funding for the recipients federally-funded project, which received an award under federal funding opportunity announcement DOE-FOA 0001268.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The project will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by advancing a low cost CSP collector to commercial availability. Beside physical installation, a front end design study and availability of this low cost collector will allow geothermal power plant owners to buy and use this innovative system to boost the output of their plants and provide more renewable energy to the grid.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 2a, 4a

Lower Costs:

This project will develop collectors that are roughly half the cost of current collectors, reducing overall system costs for concentrated solar. The project will target utility scale market. The increased efficiency will help in reducing the solar field costs as well as land impacts of CSP.

Assignment to Value Chain:	**Total Budgeted Project Admin and Overhead Costs:** $177,896
Generation	

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$750,000</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
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$0</td></tr>
<tr><td colspan="2">Leverage Contributors:
United States Department of Energy: $1,500,000
Combined Power, LLC, dba Hyperlight Energy: $752,694</td><td colspan="2">Leveraged Funds:
$2,252,694</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
35 out of 37 bidders</td><td>Rank of Selected Applicant/ Bidder:
NA</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
The federal cost share solicitation is on-going and funds are awarded to passing proposals on a first-come-first serve basis.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-16-016 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

System and method of generating energy from solar radiation.</td></tr>
<tr><td colspan="4">Update:
The project was approved in the business meeting held on October 19, 2016.</td></tr>
</table>

196. EPC-16-017

Project Name:

Maximizing Energy Efficiency and Reducing Bio-solids Waste from New Anaerobic Wastewater Treatment Technology

[EPC-16-017]

Recipient/Contractor:

Silicon Valley Clean Water

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	11/10/2016 to 3/1/2021

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Overcome Barriers to Emerging Energy Efficiency and Demand-Side Management Solutions through Demonstrations in New and Existing Buildings.

Issue:

Based on 100 year old technology, wastewater treatment has consumed abundant water, energy, and land, and fails to capture the significant energy resource value of wastewater. The result are systems that: 1) are energy-intensive, consuming 3 percent of electricity nationwide and generating significant amounts of greenhouse gas emissions, 2) produce large quantities of biosolids with high energy, greenhouse gas emissions, and monetary disposal costs, 3) neglect the value of wastewater as a reliable local water supply, nutrient resource, and energy supply, and 4) are at the end of their design life.

Project Description:

This project will demonstrate the elimination of aeration and its high energy demands as part of secondary water treatment at the Silicon Valley Clean Water wastewater treatment facility using a novel staged Anaerobic Fluidized Bed Membrane Bioreactor. This System is projected to generate 30 percent less bio-solids than conventional systems that require aeration. This project also seeks to demonstrate the potential for development of a new high quality local water supply through non-potable and advanced potable reuse treatment trains that eliminate process steps that normally precede the use of reverse osmosis.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project has the potential to lower energy costs of wastewater treatment and water recycling. Reduced energy use per unit of water recovered for reuse is a primary benefit. The Staged Anaerobic Fluidized Bed Membrane reactor has the potential to reduce operation and maintenance costs because bio-solids waste that requires off-site disposal is reduced and the effluent does not require the typical microfiltration pre-treatment step in reverse osmosis systems.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f, 1h, 4a, 4c, 4e

Lower Costs:

The technology has the potential to lower facility operating costs due to the removal of the aeration from processing wastewater, the reduction of bio-solids that must be disposed, and the increased yield of methane biogas - a potential fuel source for on-site energy generation.

Environmental Benefits:

The lower energy use will reduce Greenhouse Gas Emissions. This project also will reduce biosolids waste that is typically managed by off-site disposal. Concurrently with less bio-solids waste generated the water yield will increase.

Assignment to Value Chain: Demand-side Management	**Total Budgeted Project Admin and Overhead Costs:** $327,386
EPIC Funds Encumbered: $1,999,962	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Leland Stanford Junior University: $400,000 Santa Clara Valley Water District: $100,000 GE Water: $210,000 LG Water Solutions: $10,000 Silicon Valley Clean Water: $499,943	**Match Funding:** $1,219,943
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 8 out of 8 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 1

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-017 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

The agreement has been delayed due to questions and comments regarding the terms and conditions by a major subcontractor.

197. EPC-16-018

Project Name:

Biological Double-Efficiency Process as an Advanced Wastewater Treatment Method to Achieve Substantial Energy and Water Savings

[EPC-16-018]

Recipient/Contractor:

BDP Technologies

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	11/21/2016 to 4/1/2020

Program Area and Strategic Objective:

Technology Demonstration and Deployment

S12: Overcome Barriers to Emerging Energy Efficiency and Demand-Side Management Solutions through Demonstrations in New and Existing Buildings.

Issue:

The most common secondary wastewater treatment process for nutrients removal is the activated sludge process. Most activated sludge processes are energy and land/space intensive as they include separated anoxic and aerobic tanks with secondary clarifiers. The infrastructure requires high capital, land footprint, and embedded energy and operation and maintenance costs. The current challenge for wastewater treatment plants in California is to meet the demand from population growth, increasingly stringent regulations and aging infrastructure while potentially reducing the energy and water consumption.

Project Description:

This project will demonstrate the Biological Double Efficiency Process (BDP) that combines state of the art, easy to maintain aeration technology, airlift circulation/dilution technology, and an integrated all-in-one bioreactor technology, based on simultaneous nitrification/denitrification principles. The technology has the potential benefits of substantial 50 percent energy reduction, 30 percent less capital, 50 percent less land required, 50 percent reduction in operation and maintenance costs, and water savings opportunities.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

The innovative BDP technology has the potential to provide substantial energy savings to wastewater treatment plants, including reducing 50 percent of the aeration required for secondary treatment, thus decreasing electrical energy requirements and greatly improves oxygen transfer efficiency to 48-52 percent compared to 20-30 percent in conventional technologies.

CPUC Proceedings addressing issues related to this EPIC project:

Water-Energy Nexus: R.13-12-011

Applicable Metrics: CPUC Metrics- 1f

Lower Costs:

The BDP technology could reduce energy and water consumption and costs at wastewater treatment plants while also meeting California's growing water and wastewater needs. In addition, the BDP technology could provide advantages of reduced energy and land use, carbon footprint (CO2 emissions), waste sludge generation, and operation and maintenance costs.

<table>
<tr><td colspan="2">Assignment to Value Chain:
Demand-side Management</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $15,486</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$1,565,400</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
BDP Technologies: $331,062 (17.5 %)</td><td colspan="2">Match Funding:
$330,904</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
8 out of 8 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 2</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-16-018 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
This project was approved at a Business meeting on November 9, 2016. The kickoff meeting was held December 12, 2016. Project has commenced.</td></tr>
</table>

198. EPC-16-020

Project Name:

Recovery of Lithium from Geothermal Brines

[EPC-16-020]

Recipient/Contractor:

SRI International

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	1/16/2017 to 8/12/2019

Program Area and Strategic Objective:

Applied Research and Development

S4: Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems.

Issue:

Expansion of geothermal energy production in California will greatly benefit from the creation of a value stream produced by the recovery of useful metals from geothermal fluids. The efficient separation of metals, such as lithium, from geothermal brines promises to make the production of geothermal power economically favorable, even from low-temperature geothermal fluids. Revenue will be produced from the sale of the marketable metals, and the scaling and re-injection issues associated with the high-solid-content brines will be minimized.

Project Description:

This project aims to demonstrate a cost-effective integrated process for the recovery of lithium from geothermal brines based on: (1) new high-capacity selective composite sorbents comprised of inorganic lithium-ion sieves and lithium-ion-imprinted polymers; and (2) a new sorbent regeneration process using eco-friendly carbon dioxide/carbonic acid that will lead to the direct formation of high-purity lithium carbonate (Li2CO3). Compared to traditional methods of Li recovery from brines, the proposed high-capacity selective sorbents and their regeneration process are expected to lower the cost of Li production by enabling online separation with higher recovery efficiency, using smaller volumes of sorbents and minimizing processing time. The project outcome will be the demonstration of a lab-scale integrated separation process to demonstrate the production of high-purity Li2CO3 from geothermal brines.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by enabling co-production of power and high-value metals from geothermal resources. The co-production of metals will improve the economic viability of geothermal power production, therefore increasing the penetration of geothermal renewable energy, a State of California statutory energy goal.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020

Applicable Metrics: CPUC Metrics- 2a, 3g

Lower Costs:

The proposed technology will lower the cost of geothermal production as a result of the recovery of useful metals from geothermal fluids. The economic value of the Salton Sea minerals is estimated at $1.5 billion dollars. This is higher than the economic value of the net combined 327 MWe produced by the 10 power plants operating in the Salton Sea Known Geothermal Resource Area.

Economic Development:

According to a 2008 feasibility study sponsored by the Imperial Irrigation District, developing geothermal resources could result in creation of some 7,000 to 9,000 jobs, many of which would likely be higher paying than typical jobs in the county. A number of these jobs are likely to be in communities to the north, east, and south of the Salton Sea; areas that meet the CalEnviroScreen designation as disadvantaged communities.

Environmental Benefits:

Additional geothermal energy sources in the Salton Sea Known Geothermal Resource Area will reduce air pollution, which may improve the health of people in affected zones. Revenue from the land leases and mineral recovery is expected to support restoration projects, which some sources estimate may cost on the order of $3 to $9 billion.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $437,858
EPIC Funds Encumbered: $873,387	**EPIC Funds Spent:** $0
Match Partner and Funding Split: None	**Match Funding:** $0
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 30 out of 32 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 7

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-020 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved at the December business meeting. The project kickoff meeting will be scheduled in early 2017.

199. EPC-16-021

Project Name:

High-Resolution Imaging of Geothermal Flow Paths Using a Cost Effective Dense Seismic Network

[EPC-16-021]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	2/13/2017 to 9/30/2020

Program Area and Strategic Objective:

Applied Research and Development

S4: Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems.

Issue:

In operating geothermal fields, there is presently no method for imaging the movement of water and steam in a fractured geothermal reservoir in time and three-dimensional space. Tracer tests provide ground truth information about inter-well connectively, but they do not directly reveal the flow paths in the regions between the wells. Microseismicity mapped in three-dimensions can provide valuable information about fluid movement, but it is possible for water and steam to move through the fractured rock mass without triggering microseismicity, as well for microseismicity to be triggered without fluids.

Project Description:

This project will advance the current state for imaging subsurface flow paths, barriers and heterogeneity in operating geothermal reservoirs through an integrated approach that combines the recent development of low-cost, dense seismic networks together with established state-of-the-art micro-earthquake imaging algorithms and rock physics concepts. The technical advancement of this project is the integration of these components into a system that can be cost-effectively, reliably and routinely deployed in operating geothermal fields to image the movement of fluids in space and time with high-resolution and fast-turnaround time from data collection, to processing, to imaging, to rock physics interpretations.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals required by SB 350. It will assist the continued growth of California's broad portfolio of renewable energy, by providing tools to help geothermal operations to be more productive. This project will demonstrate the advantages of a micro-earthquake imaging system that uses a dense network of seismic stations and automated processing to perform fast-turnaround, high-resolution imaging of fluid movement in producing geothermal reservoirs.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Integrated Resource Planning and Long-Term Procurement Proceeding. LTPP (2016) cycle: R.16-02-007: R.16-02-007

Applicable Metrics: CPUC Metrics- 1c, 3a, 3b

Lower Costs:

The results of this project will enable geothermal operators to more efficiently manage the resource. A better understanding of the subsurface flow paths will allow them to drill more productive wells and optimize production activities.

Assignment to Value Chain: Generation	**Total Budgeted Project Admin and Overhead Costs:** $531,029
EPIC Funds Encumbered: $1,672,639	**EPIC Funds Spent:** $0
Match Partner and Funding Split: Jarpe Data Solutions: $50,000 (2.9 %)	**Match Funding:** $50,000
Leverage Contributors: None	**Leveraged Funds:** $0

Funding Method: Competitive	**Funding Mechanism:** Grant	**No. of Initial Passing Applicants/ Bidders:** 30 out of 32 bidders	**Rank of Selected Applicant/ Bidder:** Ranked # 4

If not the highest scoring applicant/bidder, explain why selected:

Funds were awarded to passing proposals in rank order.

Treatment of Intellectual Property:

Pre-existing intellectual property identified in agreement EPC-16-021 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.

Update:

This project was approved at the December business meeting. The project kickoff meeting will be scheduled in early 2017.

200. EPC-16-022

Project Name:

Comprehensive Physical-Chemical Modeling to Reduce Risks and Costs of Flexible Geothermal Energy Production

[EPC-16-022]

Recipient/Contractor:

Lawrence Berkeley National Laboratory

Investment Plan:	**Project Term:**
2015-2017 Triennial Investment Plan	2/13/2017 to 12/31/2020

Program Area and Strategic Objective:

Applied Research and Development

S4: Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems.

Issue:

The increased use of variable renewable energy (primarily wind and solar) increases the inherent variability and uncertainty in electricity demand and resource availability, and thus drives the need for operational flexibility of other renewable such as geothermal energy. Converting production from (steady) baseload to (variable) flexible production may result in significant changes to the system (good or bad) related to corrosion and mineral deposition (scaling) in wells, mechanical damage fatigue to well components or the reservoir. A better understanding of the impacts of flexible-mode production on the reservoir-wellbore system is needed to assure safe and sustainable production.

Project Description:

This project seeks to address the specific challenges of base-load and flexible-mode geothermal production, including wellbore and reservoir integrity and scaling and corrosion of wellbores. An improved THMC model will be developed and applied to better understand these issues. Flexible mode production typically includes daily cycles in production rate that result in extraordinary stress on the wellbore and reservoir system. The modeling and assessment will be conducted to predict short- and long-term impacts of flexible-mode production from liquid-dominant geothermal reservoir systems representative in California and site-specific vapor-dominated Geysers Geothermal Field with pilot test data on flexible production.

How the Project Leads to Technological Advancement or Breakthroughs to Overcome Barriers to Achieving the State's Statutory Energy Goals:

This project will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by providing modeling tools that can be used by geothermal operators and by a better knowledge of the impacts of flexible-mode production on the reservoir-wellbore system that will assure safe and sustainable production. Such knowledge allows development of power plant and control technology to allow geothermal power plants to operate in different variable modes, and to be both a baseload and flexible renewable resource.

CPUC Proceedings addressing issues related to this EPIC project:

Renewables Portfolio Standard: R.11-05-005 [closed], R.15-02-020 Resource Adequacy (RA) 2016 and 2017 Compliance Years: R.14-10-010 Long-Term Procurement Proceeding (LTPP): R.13-12-010

<table>
<tr><td colspan="4">Applicable Metrics: CPUC Metrics- 3a
Greater Reliability:
Switching baseload production to flexible-mode production for existing geothermal power plants will help stabilize the grid. The installed capacity of geothermal power plants in California is sufficiently large enough to have a significant impact on grid electricity reliability.</td></tr>
<tr><td colspan="2">Assignment to Value Chain:
Generation</td><td colspan="2">Total Budgeted Project Admin and Overhead Costs: $487,197</td></tr>
<tr><td colspan="2">EPIC Funds Encumbered:
$999,032</td><td colspan="2">EPIC Funds Spent:
$0</td></tr>
<tr><td colspan="2">Match Partner and Funding Split:
None</td><td colspan="2">Match Funding:
$0</td></tr>
<tr><td colspan="2">Leverage Contributors:
None</td><td colspan="2">Leveraged Funds:
$0</td></tr>
<tr><td>Funding Method:
Competitive</td><td>Funding Mechanism:
Grant</td><td>No. of Initial Passing Applicants/ Bidders:
30 out of 32 bidders</td><td>Rank of Selected Applicant/ Bidder:
Ranked # 8</td></tr>
<tr><td colspan="4">If not the highest scoring applicant/bidder, explain why selected:
Funds were awarded to passing proposals in rank order.</td></tr>
<tr><td colspan="4">Treatment of Intellectual Property:
Pre-existing intellectual property identified in agreement EPC-16-022 (Confidential Products and Pre-Existing Intellectual Property Lists, Attachment C-2) will reside with the recipient. New intellectual property developed under this agreement will be subject to the agreement Terms and Conditions.</td></tr>
<tr><td colspan="4">Update:
This project was approved at the Energy Commission's business meeting in December 2016. The project kickoff meeting will be scheduled in early 2017.</td></tr>
</table>

APPENDIX C:
CPUC EPIC Project Status Report

Specific information for each project awarded EPIC funds, including new awards, active and completed projects in 2016, is provided in this annual report as Appendix C. An electronic spreadsheet format using the template provided in Attachment 6 of CPUC Decision 13-11-025 is also available as a separate document to this annual report.