2016

E P I C

SYMPOSIUM

STATE OF CALIFORNIA ENERGY COMMISSION SINCE 1975

SOUTHERN CALIFORNIA EDISON®
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Welcome.

The California Energy Commission, with Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company, is pleased to showcase new clean energy technologies, and bring together leading energy experts to discuss innovative strategies to help evolve California's electricity system for the 21st Century.

The Electric Program Investment Charge (EPIC) provides approximately $160 million in funding to California's clean-energy entrepreneurs, researchers, and businesses each year. EPIC takes an energy pipeline approach to creating new energy solutions, fostering regional innovation, investing in cutting-edge emerging energy solutions that enhance safety, reliability and affordability, and bringing clean energy ideas to the marketplace.

AGENDA

9:00-9:20 Opening Plenary

9:30-10:45 Panel Session 1

11:00-12:00 Thought Leaders Discussion

12:00-1:30 Lunch & EPIC Showcase

1:30-2:45 Panel Session 2

3:00-4:15 Panel Session 3

4:15-4:30 Closing Remarks

Find your track.

1
Energy Efficiency

2
Electricity Generation

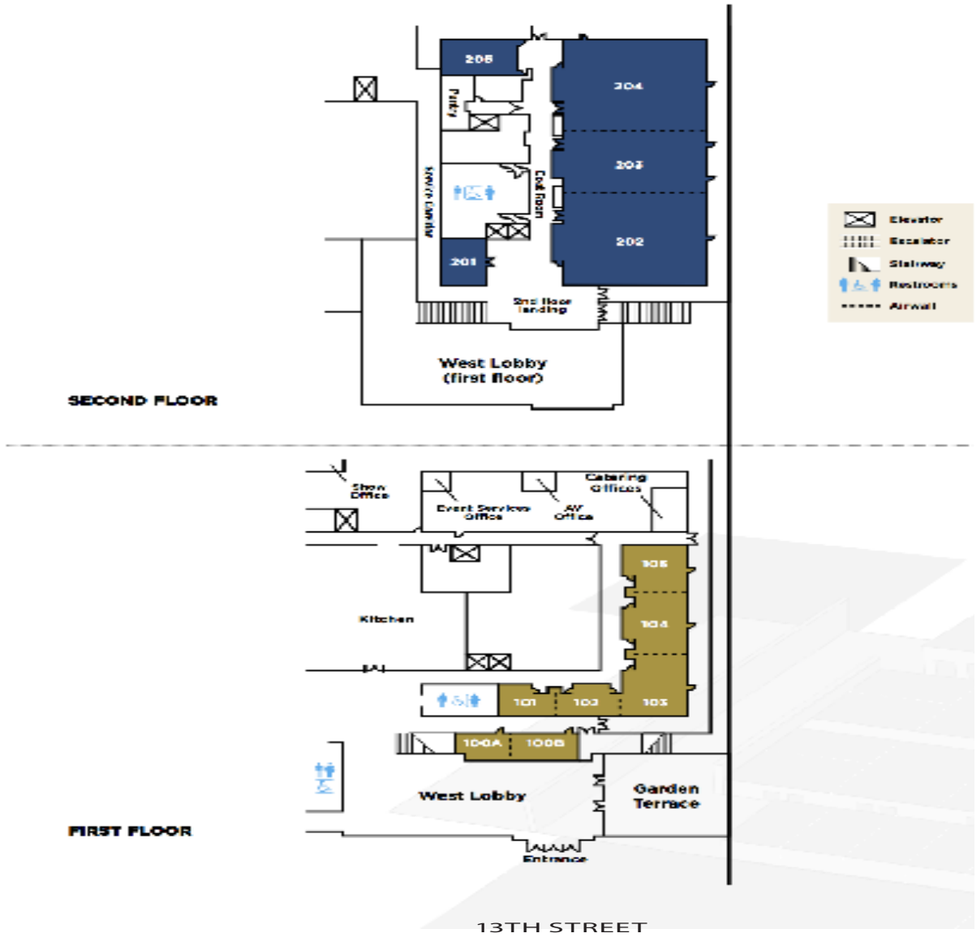
3
Power System Modernization

	1 ENERGY EFFICIENCY	2 ELECTRICITY GENERATION	3 POWER SYSTEM MODERNIZATION
SESSION ONE 9:30-10:45am	**Getting to Zero Net Energy Buildings** This session will explore the challenges of implementing ZNE in homes and commercial and municipal buildings. Each project uses a different ZNE strategy, but all will document the process, measure the outcomes and share the lessons learned with the building community.	**Planning for a Clean and Resilient Electricity System** This session will highlight research on the pathways for the electricity system to reach California's clean energy goals and reduce greenhouse gas emissions, and share how one utility is using the information to make their system less vulnerable to climate impacts.	**Advancing Field Safety and Securing Power Systems** This session will include presentations pertaining to power system electrical safety and fault detection. It will also include a presentation on pilot testing new communication architecture standards for power systems.
SESSION TWO 1:30-2:45pm	**Bringing Emerging Energy Efficiency Tech to Low Income or Disadvantaged Communities** This session will explore strategies to target low income or disadvantaged communities and how the projects will help these communities and its occupants lower energy costs and provide other benefits. This session will discuss how best to reach this sector to ensure sustainable benefits.	**Microgrids Accelerating Adoption of Renewables** This session will showcase five low carbon microgrids from design to construction with the goal of demonstrating the microgrids' ability to utilize local renewable resources, provide grid resiliency in emergency situations, and provide repeatable solutions that can be tailored for use in similar areas in California.	**Enabling Distributed Energy Resources (DER) Growth** This session will include presentations on demonstrations to advance infrastructure for electric vehicles, high penetration of photovoltaics, and advanced power system protection.
SESSION THREE 3:00-4:15pm	**Increasing California's Water Supply through Energy Innovation** This session will explore novel technologies and strategies that provide an integrated approach to addressing California's energy and water saving needs. Technologies and strategies that leverage both energy and water savings simultaneously provide a dual benefit to California and help maximize the potential value of investments.	**Creating Advanced Energy Communities** Local jurisdictions are increasingly looking to emerging energy technology solutions to help meet their community goals. This session will explore creative approaches being taken at the local levels to increase community-wide deployment of emerging energy technologies.	**Demonstrating System Simulation** This session will include presentations on demonstrations of new concepts for modeling, simulation, visualization and situational awareness to support power system operations.

Find your place.

The 2016 Symposium will be held in the Meeting Rooms of the Sacramento Convention Center, located on the second floor of the building.

EPIC Showcase Room 201	Main Session & Energy Efficiency Room 202
Power System Modernization Room 203	Electricity Generation Room 204



SESSION 1

Getting to Zero Net Energy Buildings

This session will explore the challenges of implementing ZNE in homes and commercial and municipal buildings. Each project uses a different ZNE strategy, but all will document the process, measure the outcomes, and share the lessons learned with the building community.

Building Affordable Zero Net Energy

1 This project will implement lessons learned from previous high performance housing research and incorporate them in two new houses built in partnership with Habitat for Humanity and homeowners. The houses will be built in a disadvantaged community in Stockton, California. Each house will include advanced architectural design features, high performance enclosures, advanced heating, ventilating and air conditioning systems, and low-cost water heating systems. One all-electric home and one electric and natural gas home will demonstrate the respective cost-effectiveness of each set of features. The project will develop a guide to affordable residential design and construction, and provide training to building practitioners.

Demonstrating a Cost-Competitive Zero Net Energy Community

2 This 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.

Innovative Strategies to Achieve Zero Net Energy in Grocery Stores

3 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 in the design.

Planning for a Clean and Resilient Electricity System

This session will highlight research on the pathways for the electricity system to reach California's clean energy goals and reduce greenhouse gas emissions, and share how one utility is using the information to make their system less vulnerable to climate impacts.

Low Carbon Energy Scenario Insights for a Robust Electricity System

1 LBNL, in collaboration with UC Berkeley, is developing long-term energy scenarios that consider the impacts of climate change on the energy system. For example, increased temperatures will lower the efficiency of thermal power plants and increased electricity demand for cooling. At the same time, without proper planning, climate change will increase the vulnerability of the energy system to weather-related extreme events such as the effects of wildfires on transmission and distribution lines. This project is also exploring ways to minimize the vulnerability of the energy system to climate change.

Technology and Risk Assessment in GHG Mitigation Pathways

2 This project is a companion study to the project with Lawrence Berkeley National Laboratory in developing long-term energy scenarios for California. As part of this project, E3 is investigating what critical energy technologies need research support to lower compliance costs of meeting the state-mandated greenhouse gas reduction targets.

Tackling Climate Vulnerability in San Diego

3 ICF, in collaboration with the San Diego Gas & Electric Company, is studying how climate change would increase the vulnerability of the electricity and natural gas systems to weather-related extreme events such as wildfires and heat waves. ICF is also investigating the effect of sea level rise to coastal energy infrastructure. Together, ICF and SDG&E are working to identify cost-effective measures to reduce or eliminate these vulnerabilities.

This session will include presentations pertaining to power system electrical safety and fault detection. It will also include a presentation on pilot testing new communication architecture standards for power systems.

Advancing Field Safety and Securing Power Systems

Smart Grid Architecture Demonstrations

1 This project is focused on pre-commercial demonstration of new communication standards for improving inter-operability of distribution system infrastructure.

Close Proximity Switching

2 The primary goals of this EPIC project were to increase system reliability and to improve the safe operation of three-phase Load Break Oil Rotary switches, which are used for making or breaking the path in an electrical circuit. In both a lab and field setting, this project successfully demonstrated and evaluated various robotics that would allow PG&E workers to more safely operate certain subsurface or underground (UG) oil switches.

High Impedance Fault Detection System

3 This project demonstrates an innovative approach to improve public safety by detecting wiredown on high impedance surface (asphalt, concrete, sand, etc.). The High Impedance Detector system will detect an anomaly due to wiredown using Spread-Spectrum Time-Domain Reflectometry (SSTDR) techniques. The detection system will have the ability to identify high impedances on electrical distribution lines and their corresponding location. The detector will inject a low power SSTDR signal operating at a frequency between 2 MHz – 40 MHz onto an energized electrical distribution conductor.

SESSION 2

Bringing Emerging Energy Efficiency Technologies to Low Income or Disadvantaged Communities

This session will explore projects and strategies that target low income disadvantaged communities and how the projects will help communities lower energy costs, provide building improvements, and increase access to education and training opportunities. This session will also discuss how best to reach this sector to ensure long lasting and sustainable benefits.

Maximizing Energy Efficiency in an Existing Low-Income Mixed Use Residential and Commercial Building

1 This project will demonstrate and install innovative technologies to retrofit an existing low-income, mixed-use multi-family building to become zero net energy. 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.

Retrofitting Multifamily Properties for Sustainable and Persistence Savings

2 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.

Integrating Smart Ceiling Fans and Communicating Thermostats to Provide Energy Efficient Comfort

3 This project will develop a configuration for smart comfort-controlled ceiling fans integrated with learning thermostats that will be demonstrated in low-income, multi-family residential buildings in disadvantaged communities.

SESSION 2

Accelerating the Adoption of Renewable-Powered Microgrids

This session will showcase five low carbon microgrids from design to construction with the goal of demonstrating the microgrids' ability to utilize local renewable resources, provide grid resiliency in emergency situations, and provide repeatable solutions that can be tailored for use in similar areas in California.

Anchoring Downtown Berkeley's Urban Energy Community

1 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.

Designing Santa Monica's Municipal and Mixed-Use Advanced Energy District

2 The City of Santa Monica will plan, design, and permit a multiuser microgrid to be installed at the City Yards, where most of the city's municipal operations are located. The microgrid will include the integration of renewable energy, energy storage, and electric vehicle charging; providing a clean, sustainable, and cost-efficient energy supply. The team will collaborate with the city's key stakeholders, private developers, and financiers, as well as Southern California Edison.

Laguna Subregional Wastewater Treatment Plant Microgrid – Sustainable Water Treatment and Ancillary Services

3 This project will upgrade an existing wastewater treatment plant to act as a microgrid with the ability to provide ancillary services in the form of dispatchable, curtailable loads. Critical facilities such as wastewater treatment plants are vulnerable to climate change impacts including fires, severe storms, and heat waves that could jeopardize electricity supply. This microgrid demonstration is needed to develop a case study on a wastewater treatment plant's ability to provide sanitary services to maintain public health during times of emergency, and to maximize on-site renewable energy use. The project will lower the facility peak load using on-site renewables and demand response, reducing operating costs.

Fremont Fire Station's Low-Carbon Microgrid Maintaining Emergency Services

4 This project will design and build low carbon-based microgrids at three fire stations in Fremont, California. The microgrids will demonstrate their ability to improve energy efficiency for critical infrastructures by optimizing power generation and loads using advanced microgrid control. Local, renewable photovoltaic generation and energy storage also provide increased energy security during utility power outages and reduce carbon dioxide emissions.

Kaiser Richmond Microgrid Focusing on Resilient Hospital Services

5 This project is a demonstration of a renewable-based microgrid at a hospital. The project aims to develop a case study to assess a microgrid's ability to support critical hospital operations, and, if successful, serve as a demonstration of microgrids' potential for hospital-use for the Office of Statewide Health Planning and Development.

SESSION 2

Enabling Distributed Energy Resources (DER) Growth

This session will include presentations on demonstrations to advance infrastructure for electric vehicles, high penetration of photovoltaics, and advanced power system protection.

Modernization of Distributed System and Integration of Distributed Generation and Storage

1 This project is focused on pre-commercial demonstration of IEC 61850 in a substation network, including use cases for resolving issues with interoperability of merging units, legacy analog devices, sampled values and broadcast to protective devices.

Direct Current (DC) Fast Charging Mapping

2 This project worked with industry experts to understand the current DCFC landscape, forecast California's EV adoption rate through 2025, conduct interviews to develop important criteria for siting DCFCs from the driver, site host and developers, identify locations of highest unmet public charging need (forecasted out to 2025), and identify available service transformer capacity that does not require an upgrade for the installation of two or more DCFCs. Using these inputs, the project then identified over 14,000 individual potential charger host sites such as businesses, parking lots and public places. An interactive map (posted on the PG&E website) was created to visualize the 300 1-mile radius locations based on the expected unmet need for DC fast charging stations by 2025. Guidelines surrounding best practices for siting DCFCs were developed to accompany an online map of the 300 optimal DCFC locations.

Advanced Distribution Analytic Services Enabling High PV Penetration

3 Achieving universally high penetration levels of solar PV at the distribution level is challenging because of the diversity of infrastructure, variation of load composition, and the large number of distribution feeders. The goal of this project was to develop a streamlined process for evaluating the impact of high penetrations of solar PV, and build potential upgrade paths for enabling 100 percent penetration levels on any California feeder using traditional and non-traditional technologies such as advanced inverter controls and storage deployment.

SESSION 3

Increasing California's Water Supply

This session will explore novel technologies and strategies that provide an integrated approach to addressing both California's energy and water saving needs. Technologies and strategies that leverage both energy and water savings simultaneously provide a dual benefit to California and help maximize the potential value of investments.

California's Groundwater Pumping: The Energy Perspective

1 This project will revise prior estimates of the energy used to pump groundwater in California, especially in the Central Valley. Prior estimates, completed before the prolonged drought, done by the California Public Utilities Commission, the Energy Commission, and others, have noted that their estimates were likely under-estimating the amount of energy used. Researchers will also examine which technologies are being employed to pump ground water, and what considerations lead to choices of pumping technology.

Accelerating Drought Resilience Through Innovative Technologies

2 This project will design and demonstrate a self-sustaining and replicable regional-scale planning, permitting and financing model for California's rural agricultural communities, to accelerate the successful integration of high -potential efficiency technologies that achieve the region's long-term drought resilience vision, goals and objectives. This project will develop the policy and program infrastructure needed to implement this model in Tulare County and throughout California's other agricultural communities.

Demonstrating a Low Energy Biofiltration System for Groundwater Contaminant Removal

3 This project focuses on demonstrating a novel biofiltration system that reduces the energy used in treating contaminated water, compared to current technology. The goal is to treat water and remove nitrates, perchlorate, and turbidity so that it can be used for drinking or for industrial and/or agricultural applications.

Improving Water and Energy Efficiency in California's Dairy Industry

4 This project will test two novel approaches to cooling livestock. In the first approach, bedding areas beneath cows will be cooled using heat exchange mats embedded in the soil. Water flowing through the heat exchange mats will be chilled using a novel Sub-Wet Bulb Evaporative Chiller. The second approach will use fabric ducting to direct cool air on cows. The air will be cooled using a high-efficiency direct evaporative cooler. Both approaches promise significant water and energy savings compared to standard practice.

Creating Advanced Energy Communities

Local jurisdictions are increasingly looking to emerging energy technology solutions to help meet their community goals. This session will explore creative approaches being taken at the local levels to increase community-wide deployment of emerging energy technologies.

An Integrated System Platform for Fresno's Blackstone Corridor

1 Focused on Fresno's Blackstone Corridor, this project will create a new platform for local governments and developers to identify and secure private and public financing for a suite of projects that will comprise an advanced energy community. This platform could significantly streamline the process for local governments to finance and deploy emerging energy technologies.

Creating a Zero Net Energy Farm in the Central Valley

2 As an agricultural Advanced Energy Community, Biodico will develop and pilot a Project Management Application tool that uses a Geographic Information System to help streamline the permitting, financing, and interconnection of multiple distributed energy resources. The Project Management Application tool will be developed and tested in collaboration with four local jurisdictions in the Central Valley, as well as the San Joaquin Valley Air Pollution Control District, and the US Navy.

Transforming Lancaster into a Zero Net Energy City

3 In an effort to help Lancaster achieve its goal of becoming the first zero net energy (ZNE) city, this project will develop innovative distributed energy resources and ZNE planning and permitting resources to lower interconnection costs and increase energy resiliency in the community. This includes developing a flexible and transparent financial model to assess the economic viability of using land-secured financing for solar and other technologies.

From the Community Up: Building a Clean Energy Model for San Diego

4 This project aims to transform a neighborhood located in Southeastern San Diego. The plan includes near-ZNE buildings, distributed energy resources, an electric transportation system, highly efficient businesses, and no- and low-carbon generation of local resources such as sustainable bioenergy. Working through the school districts, multiple partners and community stakeholders will be engaged during the planning to ensure it best meets the needs of the residents.

Demonstration System Simulation

This session will include presentations on demonstrations of new concepts for modeling, simulation, visualization and situational awareness to support power system operations.

Restoration Workplan and Resource Modeling

1 This project is in the planning stage, which seeks to incorporate natural hazard damage model information into one integrated tool. This would provide the ability to quickly estimate the impacts of natural hazards (e.g., earthquake, tsunami, flooding, rising sea levels, wild land fires) on PG&E facilities, status of resources, and to perform analysis to provide recommendations to enable faster response and restoration.

Power Factory Hardware Simulation

2 SCE has combined the real time dynamic simulation capabilities in DigSILENT Power Factory with Triangle Microwork's SCADA data gateway to create a testbed to evaluate distribution controls systems, DMS systems, and DERMS systems. This testbed is currently being used to test and evaluate the performance distribution control systems in support of SCE's Integrated Grid Project (IGP).

Visualization and Situational Awareness

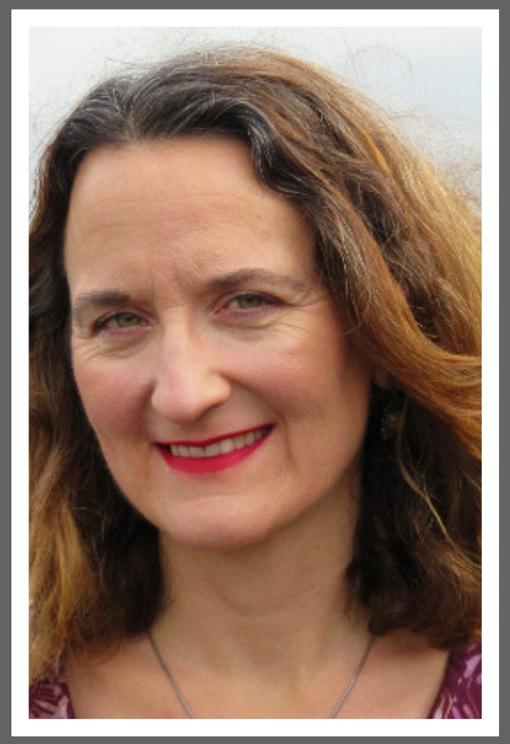
3 This project is focused on pre-commercial demonstration of advanced visualization and situational awareness capabilities for distribution system operations.

EPIC SYMPOSIUM

2016 THOUGHT LEADERS

MODERATOR

Cassandra Sweet



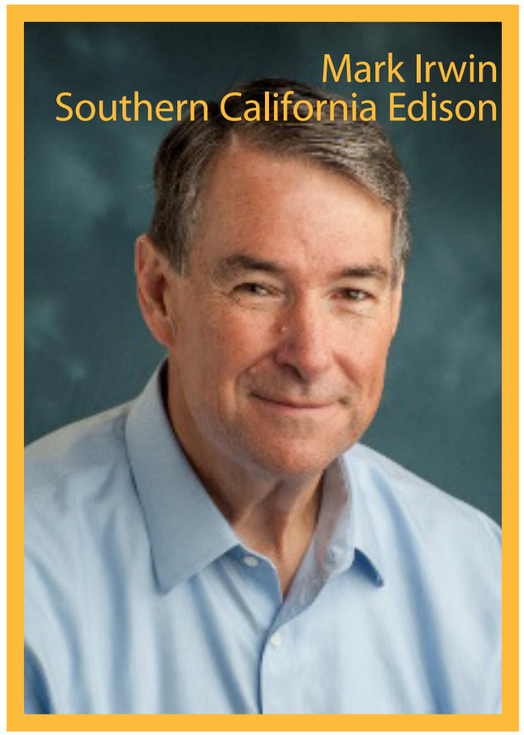
The Wall Street Journal
Reporter
Reneweables & the Environment

Cassandra Sweet writes about the power industry, renewable energy and energy policy as a reporter at The Wall Street Journal. She has written about the rise of investment in U.S. wind and solar power, changing dynamics in the rooftop solar industry and the local push for renewable power in Fukushima, Japan. Prior to her work at the Wall Street Journal and Dow Jones Newswires.
Ms. Sweet wrote for California Energy Markets, National Journal, the Puget Sound Business Journal and The Associated Press.

Previously, Ms. Sweet helped manage real-time energy news coverage as a news editor in New York.

Ms. Sweet graduated from Washington University in St. Louis and has a Master's Degree from the University of Missouri Graduate School of Journalism.

2016 Thought Leaders



Director, Contract Origination, Energy Procurement & Management

As Director of Contract Origination, Mr. Irwin leads SCE's Energy Storage procurement activities as well as other energy procurement programs.

Previously, Mr. Irwin led SCE's Energy Storage Ownership Initiative, the energy storage and transportation research and development activities, and the project management of Advanced Technology's research portfolio.

Mr. Irwin has spent over 30 years in the energy business, which includes 24 years with Edison International, leading teams that develop, manage or contract with significant power generation, energy storage and fuel assets.

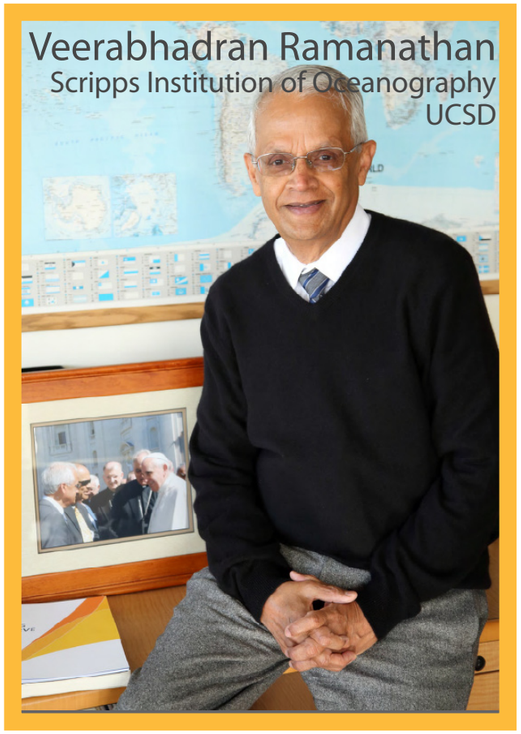
Mr. Irwin earned an MBA in Finance from the Wharton School at the University of Pennsylvania and a Bachelor's of Science degree in Accounting from the University of Southern California.

Senior Vice President,
Regulatory Affairs

Steve Malnight is responsible for developing, coordinating and managing policy with state and federal regulatory agencies, including the California Public Utilities Commission, the Energy Commission and the Federal Energy Regulatory Commission. He also is responsible rate proposals for the CPUC, and for oversight of the company's gas and electric tariffs.

Malnight joined PG&E in 2002 and has held diverse leadership positions within the company. After serving as Director of Customer Strategy and then Senior Director of Finance, he became Special Assistant to the Chairman of PG&E's Corporation. He was appointed Senior Vice President, Regulatory Affairs in September 2014.

Malnight holds a Bachelor of Science in Chemical Engineering from the University of Notre Dame and an MBA from the Tuck School of Business at Dartmouth. He serves as Chairman of the Board of the Smart Electric Power Alliance, an organization focused on facilitating electricity utilities in the transition to a clean energy future through research, education, and stakeholder collaboration.



Distinguished Professor

Professor Veerabhadran Ramanathan discovered the greenhouse effect of Choloro-fluoro-carbons in 1975. His other discoveries include the global cooling effect of clouds, the prediction in 1980 that global warming will be detected by 2000, the widespread atmospheric brown clouds over South Asia, the large global dimming effect of air pollution and the large effects of black carbon on regional and global climate.

Prof. Ramanathan was one of the first to propose that short-lived climate pollutants should be targeted to reduce climate change immediately.

Prof. Ramanathan's research has resulted in major policy actions by the United Nations which named him as the Champion of Earth in 2013. Prof. Ramanathan has advised world leaders, including Pope Francis, Governor Jerry Brown, and the head of UNEP, on climate change and on protecting our world's poorest populations from its effects.

Prof. Ramanthan was chosen to represent the Vatican in the 2015 and 2016 UN Climate negotiations as a council member of the Pontifical Academy of Sciences, and has been elected to the US National Academy of Sciences and the Royal Swedish Academy of Sciences.

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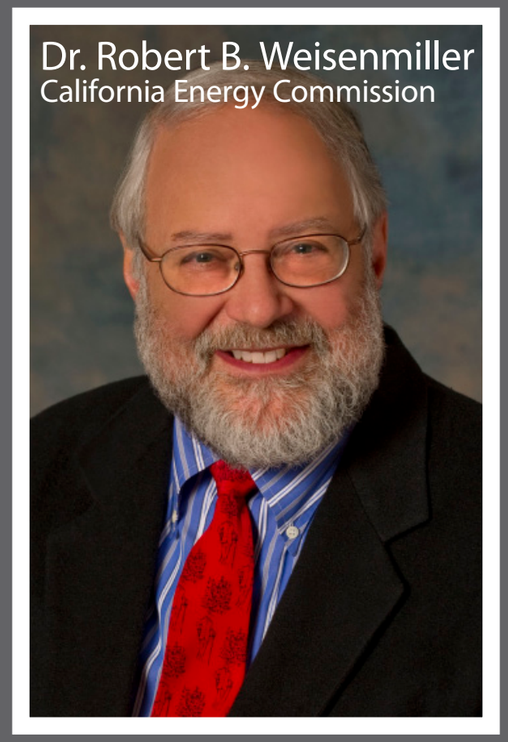

Chair
2010-Present

Chair Robert B. Weisenmiller was appointed as member and Chair to the California Energy Commission in January 2011 by Governor Jerry Brown and re-appointed in January 2015.

Chair Weisenmiller brings more than 30 years' energy experience to the Energy Commission including expertise in electricity and gas markets and California regulatory policies. Chair Weisenmiller has served as an expert witness in more than 100 state and federal regulatory commission proceedings and has authored numerous publications on electricity and natural gas markets.

Chair Weisenmiller is the Lead Commissioner on the Energy Commission's budget and management, legislative and intergovernmental matters, international relations, military partnerships, energy research, development, demonstration and deployment, climate change, combined heat and power, and electricity and natural gas markets.

2016 Thought Leaders

Director of Electric Transmission &
Distribution Engineering

Jonathan T. Woldemariam is Director of San Diego Gas & Electric's Electric Transmission & Distribution Engineering Department which includes Transmission Engineering & Design, Electric Distribution Engineering, Substation Engineering & Design, System Protection & Control Engineering, Civil/Structural Engineering, Electric T&D Project Management Operations, and Customer Generation.

With over 18 years of experience in the electric utility industry, Jonathan has overseen Engineering, Procurement, Construction Services, Vegetation Management, Fire Coordination, Compliance Management, Major Projects, Technical Project Management, Generation Interconnection, Electric Distribution Standards, and Operations.

Jonathan holds a Bachelor of Science in Electrical Engineering, with a major field of study in Electric Power, from San Diego State University and is a licensed Professional Engineer in California.

NOTES

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Southern California Edison
http://on.sce.com/2g4EZBE

California Energy Comission
http://www.energy.ca.gov/research/epic/

Learn more about the Electric Program Investment Charge

The electricity production and delivery system of the last century – characterized by large fossil fuel power plants and one-way transmission – has made vital contributions to California, its economy, and its people. However, this system, with its reliance on increasingly scarce resources, must evolve to meet California's needs in the 21st Century. EPIC-funded projects are helping to accelerate this evolution so that electricity systems optimally provide clean, safe, and affordable energy for California and its electric ratepayers.

To get involved with EPIC, please explore our current projects, and upcoming funding opportunities and events, or contribute to the ongoing development of the EPIC program.

For more information on all EPIC-funded projects from the California Energy Commission, please visit the

Energy Innovation Showcase

http://innovation.energy.ca.gov

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