COMMITTEE REPORT

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CALIFORNIA
ENERGY COMMISSION

Arnold Schwarzenegger, Governor

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This draft report was prepared by the California Energy Commission's Integrated Energy Policy Report Committee as part of the 2010 Integrated Energy Policy Report proceeding, Docket #10-IEP-1. The report will be considered for adoption by the full Energy Commission at its Business Meeting on December 29, 2010. The views and recommendations contained in this document are not official policy of the Energy Commission until the report is adopted.

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PREFACE

Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) requires the California Energy Commission to prepare a biennial integrated energy policy report that contains an assessment of major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety (Public Resources Code § 25301[a]). The Energy Commission prepares these assessments and associated policy recommendations every two years in the *Integrated Energy Policy Report*, with updates in alternate years.

This report fulfills the requirement of SB 1389 by providing an update on how energy-related funding from the American Recovery and Reinvestment Act (ARRA) of 2009 that is coming to California will affect the state's electricity, natural gas, and transportation sectors and achievement of long-standing energy policy goals to increase energy efficiency and the use of renewable resources, decrease petroleum dependence, and reduce climate change impacts from California's energy sectors.

ABSTRACT

Of the $36.7 billion in federal economic stimulus funding dedicated to energy-related projects nationwide, California has been awarded $4.7 billion to date through formula-based grants based on population, federal competitive solicitations, and tax credits and loan guarantees. The Energy Commission is administering $314.5 million of that amount in formula-based grants, and has provided funding from existing programs as cost-share to bring additional federal dollars to California. The *2010 Integrated Energy Policy Report Update* describes the Energy Commission's economic stimulus funding programs and the goals behind their design, summarizes the various projects that have been awarded funding, and discusses expected results in terms of jobs, energy savings, and greenhouse gas emission reductions as well as the contribution to California's energy and environmental policy goals. The report also briefly describes the Energy Commission's efforts to bring additional stimulus funding to California and how those projects will advance the state's research, development, demonstration, and deployment of clean energy technologies and shape the state's energy sector in the future. Finally, the report describes unique issues associated with renewable power plants under the Energy Commission's power plant siting jurisdiction that must meet specific permitting deadlines to apply for and receive federal stimulus funding.

Keywords:

Alternative and Renewable Fuel and Vehicle Technology Program, alternative transportation fuels, American Recovery and Reinvestment Act, building retrofits, Clean Energy Workforce Training Program, Department of General Services, Energy Conservation Assistance Act, Energy Efficiency and Conservation Block Grant Program, energy efficiency, Energy Upgrade California, greenhouse gas emissions, Public Interest Energy Research Program, renewable energy, research and development, State Energy Program.

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NOTE TO READERS

This document contains descriptions of the California Energy Commission's *Energy Upgrade California* Program, funded under the American Recovery and Reinvestment Act of 2009, which unites residential and commercial energy efficiency retrofit efforts under a single brand to reduce confusion and create a one-stop shop for consumers and contractors.

On October 14, 2010, the Western Riverside Council of Governments obtained an injunction against the Energy Commission implementing the *Energy Upgrade California* program or otherwise making use of the $33 million dedicated to the administration of this program. The descriptions of *Energy Upgrade California* in this draft report assume this injunction is lifted and the funds are not revoked by the United States Department of Energy.

Executive Summary

Introduction

President Obama signed the American Recovery and Reinvestment Act of 2009 (ARRA) on February 13, 2009. ARRA is providing $787 billion nationwide to create new jobs, jump start the flagging economy, and invest in long-term growth. To date, California has been awarded approximately $4.7 billion to foster energy efficiency, build the domestic renewable industry, modernize the electric transmission grid, and increase the use of alternative transportation fuels and vehicles.

California's energy-related ARRA awards are coming from three sources: formula grants based on California's population ($808 million); direct awards from competitive federal solicitations ($1 billion); and loan guarantees and clean energy tax credits ($2.9 billion). The latter total does not include additional ARRA tax credits and loan guarantees being sought by renewable power plant developers in the state.

With its long history of aggressive clean energy policies, California is well-positioned to use these funds not only to create thousands of jobs and bring billions of dollars in new energy investments to the economy, but also to speed up achievement of the state's long-standing energy and environmental goals. These goals include reducing energy use in existing homes and commercial buildings, generating a third of the state's electricity using renewable resources, decreasing petroleum dependence through the use of alternative transportation fuels and vehicles, and reducing greenhouse gas emissions to 1990 levels by 2020.

As the state's primary energy agency, the Energy Commission is directly administering $314.5 million in federal formula grants through a balanced portfolio of programs intended to support comprehensive energy efficiency retrofits to existing buildings, develop renewable resources, replace inefficient appliances, bring clean energy manufacturing to the state, and provide the skilled workforce to support each of these activities at the scale needed to achieve California's energy and environmental policy goals.

Cost-share funding from the Energy Commission's existing research, development, demonstration, and deployment programs has also helped to secure more than $620 million of ARRA awards for California clean energy companies and projects along with more than $1 billion in private investment matching funds.

In addition, the Energy Commission has worked diligently with state and federal agencies and a wide variety of stakeholders to expedite review of power plant licensing applications for nine solar thermal power plants seeking ARRA funding in the form of tax credits and loan guarantees. If built, these plants could provide thousands of construction and operation jobs and inject millions of dollars into local economies while also significantly contributing to the state's renewable electricity goals.

The Energy Commission awarded ARRA funding based on five distinct priorities:

- Stimulate the economy, and create and retain jobs in California.

- Achieve lasting and measurable energy benefits.
- Spend money efficiently, with accountability and minimal administrative burden.
- Contribute to meeting California's energy and environmental policy goals.
- Leverage other federal, state, local, and private financing through partnerships.

Formula Funding

Overall, the Energy Commission's formula-based funding awards are expected to provide nearly 6,000 jobs, train more than 9,000 workers, leverage more than $660 million of public/private investment, save more than 170 million kilowatt hours of electricity and 3 million therms of natural gas each year, and reduce greenhouse gas emissions by 370,000 tons annually.

Because energy efficiency creates more jobs per dollar than other energy investments, the Energy Commission is devoting much of its formula-based funding to energy efficiency retrofit programs. These programs will create thousands of jobs for workers in the efficiency retrofit sector and provide the skilled training needed to do those jobs. Programs are designed to create jobs in communities hardest hit by the economic downturn and to support clean energy companies that will create manufacturing jobs in economically disadvantaged areas.

The Energy Commission also focused its formula-based funding programs on energy efficiency because it is California's top priority resource for meeting new energy needs and has the biggest potential for long-term and lasting energy savings. Several programs include revolving loans which will channel loan repayments into new projects to provide ongoing benefits from a relatively small investment of ARRA funding. In addition, the energy efficiency measures installed through these programs will continue to provide annual energy and cost savings long after ARRA funds are exhausted.

Formula-based programs include existing programs with a past history of success to get funding out quickly combined with new and innovative programs to transform the energy market and provide long-term and lasting energy and financial benefits. To spend money efficiently, the Energy Commission worked closely with the California Legislature and state control agencies to streamline solicitation processes and expedite contract review and approval. When designing its new programs, the Energy Commission conducted extensive public outreach through public forums and engagement with a wide variety of stakeholders including the energy industry, environmental groups, labor unions, environmental justice organizations, educational institutions, workforce investment boards, and other state agencies.

Prevention of waste, fraud, and abuse was another top priority. The Energy Commission has established a rigorous measurement, verification, and evaluation effort to monitor and report on awardees' progress toward delivering expected jobs, energy savings, and greenhouse gas emissions reductions. This effort began in September 2010 and will continue until projects are completed, no later than March 2012.

Formula-based programs are also addressing barriers to achieving California's energy goals by providing low-cost

financing options, developing a well-trained clean energy workforce, educating consumers about the energy reduction benefits and cost savings achievable through the use of clean energy technologies, and providing quality assurance to ensure that programs are delivering those benefits.

ARRA funding has led to an unprecedented level of partnerships among government and the private sector to leverage funding and expertise. Awardees under the formula-based programs are in many cases providing match funding and also taking advantage of utility and other incentive programs. Projects and programs are also benefiting from extensive public/private partnerships among cities and counties, state and local government agencies, workforce development agencies, labor unions, manufacturers, community colleges, low-income housing agencies, and private companies. These relationships will strengthen the energy sector by establishing crucial links between government and business and between workforce training agencies and the industries they serve.

Competitive Funding

The Energy Commission allocated approximately $73 million of funding from two of its existing research, development, and demonstration programs – the Public Interest Energy Research Program and the Alternative and Renewable Fuel and Vehicle Technology Program – as cost-share funding that is bringing more than $620 million in competitive ARRA dollars to California projects as well as more than $1 billion in private investment funding.

The Energy Commission quickly took advantage of the opportunity to leverage additional ARRA dollars for California and identified competitive federal solicitations best aligned with California's research priorities, rapidly reallocated program funds for cost-share purposes, and provided letters of support to applicants contingent on their selection for federal ARRA awards. As new solicitations were announced, the Energy Commission revised its cost-share solicitations accordingly to increase the likelihood of California projects securing federal funding.

Projects awarded match funding from the Energy Commission will provide lasting benefits by significantly accelerating efforts to upgrade and modernize California's electricity grid and develop the alternative fuel and vehicle infrastructure needed to meet the state's clean transportation goals, while providing jobs in the manufacture, installation, and operation of clean energy technologies.

For more than 10 years, the Energy Commission's Public Interest Energy Research Program has funded energy research, development, and demonstration projects that are in the public interest but are not adequately funded by competitive or regulated markets. The cost share funding provided by the Public Interest Energy Research Program to ARRA award recipients will help create the "smart grid" of the future, which will increase electricity reliability, reduce peak demand, and facilitate the integration of the large amounts of renewable resources needed to meet the state's renewable energy goals.

Projects awarded cost-share funding from the Alternative and Renewable Fuel and Vehicle Technology Program will create more than 1,300 jobs, demonstrate 1,600 alternative fuel vehicles, add nearly 4,000

alternative vehicle fueling and charging stations, displace more than 35 million gallons of petroleum-based fuel each year, and reduce GHG emissions by 181,000 tons. These projects will lay the foundation for the expected large roll-outs of electric vehicles by auto manufacturers over the next few years that will help to reduce California's dependence on imported fuels and greenhouse gas emissions associated with the transportation sector.

Loan Guarantees and Tax Credits

California is receiving more than $2 billion in ARRA-funded loan guarantees and tax credits for energy projects. ARRA expanded the Department of Energy's Loan Guarantee Program to support clean energy through investments in new and innovative technologies. Federal tax credits are also helping to incentivize new renewable generation by allowing companies to receive cash assistance from the United States Treasury Department in lieu of an investment tax credit for as much as 30 percent of the qualifying cost of the facility.

To qualify for federal tax credits, projects must be either placed in-service in 2009 or 2010, start construction by the end of 2010, or spend 5 percent of project cost by the end of 2010. Applicants for loan guarantees must meet stringent risk assessment criteria and begin construction by September 30, 2011. Because of this later deadline, projects that are unable to meet the construction deadlines for the tax credits can still benefit from a loan guarantee.

Given California's longstanding efforts to attract renewable energy projects, the state could benefit tremendously from these two programs. Renewable power plants under the Energy Commission's licensing jurisdiction seeking tax credits and loan guarantees are expected to provide substantial job and economic benefits to the communities in which they are located. If built, projects could provide more than 10,000 temporary construction jobs and nearly 1,400 full-time operation jobs. Other economic benefits include increased revenue to California from $48 million in property taxes, $247 million in sales taxes during construction, and $11 million annually in sales taxes during operation. Projects also expect to spend more than $2 billion in purchases of materials during construction, providing significant benefits to local economies.

These projects will also add more than 4,000 megawatts of new renewable generating capacity to the state, a major contribution toward achieving California's renewable energy goals.

Recognizing the potential benefits from these facilities, the Energy Commission worked closely with state and federal agencies, project developers, environmental groups, investor- and publicly owned utilities, and other stakeholders to facilitate timely consideration of the permitting applications for renewable projects to meet the ARRA deadlines. To date, the Energy Commission has certified six solar thermal power plants seeking ARRA funding and is scheduled to reach decisions on three more by the end of 2010.

Conclusion

California has led the nation for the past 30 years in its clean energy policies. ARRA is building on that foundation by providing an exponential increase in funding for clean energy projects, manufacturing, and

research. ARRA-funded projects will provide jobs in regions of the state with the highest unemployment rates and will also provide the skilled training for the workers who will fill those jobs. Lasting energy and economic benefits will be provided through revolving loans, through pilot programs to lay the foundation for more comprehensive energy efficiency retrofit programs, and through major improvements to the state's transmission and alternative fuel and vehicle infrastructures.

ARRA will also help transform California's energy sector by accelerating achievement of the state's ambitious energy goals such as achieving average energy savings of 40 percent per home, generating 33 percent of the state's electricity from renewable resources, and reducing dependence on foreign oil imports by replacing petroleum fuels with alternative sources. ARRA funding is also allowing California to use its financial resources to bring billions of dollars to the state from private investors, and to bring together diverse partners to ensure the success of the state's clean energy development efforts.

Finally, California's robust measurement, verification, and evaluation effort for ARRA-funded projects will ensure that these efforts are on track and deliver expected job, energy, and greenhouse gas emission reduction benefits. This effort will also provide important lessons about which programs are more successful and why to help design more effective energy programs and standards in the future.

Chapter 1: Introduction

Since the beginning in 2007 of what is being called the Great Recession, California has experienced some the highest foreclosure and unemployment rates in the nation. Yet at a time when much of the nation's economic news is grim, the American Recovery and Reinvestment Act of 2009 (ARRA) is providing tremendous opportunities to reinvigorate California's economy through new jobs, investment prospects, and energy cost savings for the state and its citizens.

Nationwide, ARRA is providing an unprecedented $787 billion of economic stimulus funding in direct response to the recession. The federal government allocated approximately 5 percent of total ARRA funds to energy-related activities as part of a nationwide push to create jobs, stimulate the economy, reduce dependence on imported fuels, modernize aging energy infrastructure, and reduce the potentially catastrophic effects of climate change.

California has been awarded $4.7 billion to date for energy-related projects. This massive influx of stimulus funding will provide benefits far beyond job creation and other economic benefits. ARRA will also accelerate achievement of California's long-standing policies to use energy as efficiently as possible, develop alternative and renewable electricity resources and transportation fuels, and minimize the environmental impacts of energy production and use.

ARRA funding will contribute to California's energy goals of achieving all cost-effective energy efficiency in existing buildings, meeting the 33 percent Renewable Portfolio Standard (RPS) target, and reducing the state's dependence on petroleum fuels. It will create the clean energy workforce needed to achieve these policy goals. And it will create sustainable programs that will continue to deliver energy efficiency savings, promote renewable energy, expand research and development to identify new and innovative energy technologies, and provide the financing needed to grow the green economy.

The California Energy Commission is playing an important role in the administration and distribution of ARRA energy funding. Because of ARRA's expected impact on the state's economic, energy, and environmental sectors, this *2010 Integrated Energy Policy Report Update* (*2010 IEPR Update*) focuses on the benefits of ARRA funding administered or leveraged by the Energy Commission, how funded projects meet the ARRA goals for creating jobs and stimulating the economy, and how funding will advance California's energy and environmental goals.

In addition, this report discusses the Energy Commission's efforts to expedite the power plant permitting process for renewable facilities under its jurisdiction to allow those plants to meet federal deadlines to receive ARRA tax credits and loan guarantees.

Growth of California's Clean Energy Economy

In his 2010 State of the Union address, President Obama said, "…energy efficiency and clean energy are the right thing to do for our future – because the nation that leads the clean energy economy will be the nation that leads the global economy."

California has been a national leader in promoting clean energy policies over the past 30 years with a strong commitment to protect the environment while providing secure and diverse energy supplies for its citizens. As a result of unstable gasoline prices, climate change, political instability in oil-producing nations, and the economic recession, other states are now following California's lead in a nationwide push to achieve the dual goals of economic growth and environmental sustainability.

As this trend continues, it is increasingly important for policy makers and others to understand what the clean energy economy is, where and how many "green collar" jobs are being created to support that economy, and what strategies are needed to maintain the momentum of this new industrial revolution. A report by the Pew Charitable Trusts, *The Clean Energy Economy: Repowering Jobs, Businesses, and Investments Across America,* defines "clean energy economy" as one that "generates jobs, businesses, and investments while expanding clean energy production, increasing energy efficiency, reducing greenhouse gas (GHG) emissions, waste and pollution, and conserving water and other natural resources."[1]

The Pew report divided the clean energy economy into five distinct categories:

- **Clean energy:** jobs, businesses, and investments that produce, transmit and store clean, renewable power from solar, wind, low-impact hydroelectric power, hydrogen fuel cells, marine and tidal, geothermal, and small-scale biopower energy sources.
- **Energy efficiency:** jobs and businesses that help consumers reduce the amount of energy use for running a manufacturing plant or heating and cooling an office building or home.
- **Environmentally friendly production:** jobs, businesses, and investments that seek to reduce the harmful environmental impacts of existing products and develop and supply alternatives that require less energy and emit fewer greenhouse gases.
- **Conservation and pollution mitigation:** jobs, businesses, and investments that enable the United States to manage water and other finite natural resources more effectively and to reduce emissions of GHGs and other pollutants that result from the continued use of fossil fuels.
- **Training and support:** jobs, businesses, and investments that provide specialized services to the other four categories of the clean energy economy.

The report also outlined a method for measuring the actual number of clean energy jobs, businesses, patent registrations, and venture capital investments in the United States and individual states based on these five categories. By 2007, California had more jobs in clean energy — in excess of 125,000 — than any other state, a number that increased an average of 0.9 percent per year between 1998 and 2007.

Another important study on green jobs is Next 10's *Many Shades of Green: Diversity and*

1 The Pew Charitable Trusts, *The Clean Energy Economy: Repowering Jobs, Businesses, and Investments Across America*, June 2009, available at: http://www.pewcenteronthestates.org/uploadedfiles/clean_economy_report_web.pdf

Distribution of California's Green Jobs.[2] The report provides a comprehensive accounting of green jobs based on the most recent data on green companies and job type, location, and growth across every region and sector of California. It also focuses on "core green economy" businesses with products and services that provide alternatives to carbon-based energy sources, conserve the use of energy and all natural resources, and reduce pollution and repurpose waste. The core green economy is broken into 15 broad segments that reflect the many different factors associated with mitigating the sources and impacts of climate change.[3]

Between January 2007 and 2008, the number of green jobs in California grew by 5 percent and was distributed throughout the state, with each region focusing on its existing strengths. In the northern part of the state, the San Francisco Bay Area has the highest employment concentrations in the segments of energy research, hydrogen, and energy consulting due to its strong research and development base and consulting industry. In Southern California, Los Angeles County's implementation of aggressive energy efficiency measures since the mid-1990s, resulting in millions of dollars in energy savings and market growth for energy efficient products and consulting services, is supporting the bulk of energy efficiency jobs in the state.[4] And in Sacramento, the highest job growth is in the air and environment sector as a result of the state capital's longstanding history of improving air quality and public health through innovative air quality policies, extensive community outreach, frequent air quality inspections, and incentive programs.[5]

California's forward-thinking energy policies continue to be instrumental in encouraging venture capital investments, attracting new companies, and growing new industries and jobs by creating market demand for clean energy technologies, products, and services. California has the most aggressive energy efficiency standards in the nation, which continue to increase consumer demand for energy-efficient products like high-efficiency air conditioners and furnaces, high-performance windows, ENERGY STAR® appliances, cool roofs, and cost-effective lighting. The standards are also driving the need for a workforce that can provide the energy audits, home energy ratings, and building commissioning to identify needed energy efficiency improvements and products, support the installation and testing of energy efficient products and technologies, and perform quality assurance and commissioning of new and existing buildings. According to another report by Next 10, *Energy Efficiency, Innovation, and Job Creation in California*,

2 Next10, *Many Shades of Green: Diversity and Distribution of California's Green Jobs*, December 2009, http://www.next10.org/next10/pdf/Many_Shades_of_Green_1209.pdf.

3 The segments are: Energy Generation, Energy Efficiency, Transportation, Energy Storage, Air and Environment, Recycling and Waste, Waste and Wastewater, Agriculture, Research and Advocacy, Business Services, Finance and Investment, Advanced Materials, Green Building, Manufacturing and Industrial, and Energy Infrastructure. See: http://www.next10.org/next10/pdf/Many_Shades_of_Green_1209.pdf

4 Los Angeles County website: http://green.lacounty.gov/energy.asp

5 Sacramento Metropolitan Air Quality Management District website: http://www.airquality.org/

California's energy efficiency policies over the last 30 years have created 1.5 million full-time equivalent jobs with a total payroll of more than $45 billion, and saved California consumers more than $56 billion on energy costs.[6]

California's renewable electricity goals are among the highest in the nation. The RPS, established in 2002, aims to increase the percentage of renewable energy in the state's electricity mix to 20 percent by 2010. Governor Schwarzenegger's Executive Orders S-14-08 and S-21-09 established a further goal of 33 percent renewable energy by 2020. These targets are sending clear market signals to investors and project developers regarding the state's support for renewable energy. Two-thirds of California's venture capital investment in clean technology is in energy generation, storage, and infrastructure and the state is the national leader in wind and solar patents.[7] As of October 2010, project developers are proposing 249 new renewable power plants in California, which could generate millions of dollars in new property taxes and equipment sales as well as thousands of construction and operations jobs.[8] According to a University of California Berkeley report on energy and the California economy, renewable energy generation is more job-intensive than the traditional carbon fuel supply chain.[9]

With its pioneering GHG emission reduction goals and commitment to alternative fuels and vehicles, California is an important market for automobile manufacturers and their future roll-outs of alternative vehicles. California's goals to reduce GHG emissions, decrease petroleum dependence, increase vehicle efficiency, and promote alternative fuels led to the creation of the Alternative and Renewable Fuel and Vehicle Technology (ARFVT) Program, which invests $100 million annually in alternative and renewable transportation fuels and technologies with a long-term goal of achieving 20 percent alternative fuel use by 2020.[10] This program is supporting the clean energy workforce training, job creation, and infrastructure needed to support the future transportation system. Green transportation jobs overall have increased 152 percent since 1995, with alternative fuels employment increasing 201 percent in that period.[11] Recent private

6 David Roland-Holst, Next Ten, *Energy Efficiency, Innovation, and Job Creation in California*, October 2008, http://www.nextten.org/research/research_eeijc.html

7 Collaborative Economics, *Many Shades of Green: Diversity and Distribution of California's Green Jobs*, Next 10, December 2009, http://www.next10.org/next10/pdf/Many_Shades_of_Green_1209.pdf

8 California Energy Commission, listing of projects available at: http://www.energy.ca.gov/33by2020/documents/renewable_projects/Renewable_Projects_Currently_Proposing_to_Operate_in_California.pdf.

9 David Roland-Holst and Fredrich Kahrl, *Energy Pathways for the California Economy*, Department of Agricultural and Research Economics, University of California, Berkeley, June 2009, http://www.next10.org/next10/pdf/PDF_energy/energy_pathways_full_report.pdf

10 Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) mandated an increase in California's vehicle registration fees to fund the Alternative and Renewable Fuel and Vehicle Technology Program. See: http://www.energy.ca.gov/ab118/index.html

11 The Pew Charitable Trusts, *The Clean Energy Economy: Repowering Jobs, Businesses, and Investments Across America*, June 2009, http://www.pewcenteronthestates.org/uploadedfiles/clean_economy_report_web.pdf

Bringing New Investment to California

The PIER Program is an excellent example of how leveraged funding can be a major incentive for companies to locate and invest in California. In 2008, PIER's Energy Innovations Small Grants program awarded funding to CHA Corporation for research on a microwave technology that will reduce GHG emissions from dairy digester biogas and diesel engine exhaust. CHA Corporation's successful research and subsequent field demonstration at a dairy farm near Sacramento led to negotiations with the California Air Resources Board to permit the technology. Thanks to funding assistance and commitment from the PIER Program and the Sacramento Municipal Utility District, CHA Corporation has moved its demonstration project from Wyoming to California, paving the way for as much as 140 megawatts of additional renewable generation in California.

investments in alternative and renewable fuel and vehicle technologies – such as electric vehicles, advanced batteries, charging stations, and ethanol and natural gas fueling infrastructure – indicate that alternative transportation technology is increasingly attractive to investors.

Research and development of new and innovative energy technologies are essential to achieving California's energy goals. The Energy Commission's Public Interest Energy Research (PIER) Program, established in 1996, provides up to $62 million each year for research, development, and demonstration (RD&D), including funding for projects that expand the use of clean and innovative energy technologies. The Energy Commission relies on PIER's strategic partnerships to carry out RD&D activities and to leverage private and public investments.

At $6.6 billion, California has the highest level of venture capital investment in the United States.[12] During this critical phase of emerging clean technologies, government will continue to play a crucial role in establishing policies that provide long-term market signals, performance standards, and incentives to encourage private investments. Strong policies are essential for California and the nation to remain competitive in a global clean energy economy. China, Brazil, Spain, Britain, and Germany have the most robust clean energy sectors as a percentage of their economies because of strong policies encouraging green investments.[13] China's $34.6 billion investment in clean energy over the past year was almost double that of the United States at $18.6 billion. With the United States falling behind in clean energy investments, it is more important than ever for states like California to lead the way.

Building on California's Clean Energy Foundation

California's decades-long history of environmental responsibility was driven by a commitment to protect air and water quality and reduce dependence on foreign oil. The state's long-standing power plant

12 The Pew Charitable Trusts, *The Clean Energy Economy: Repowering Jobs, Businesses, and Investments Across America*, http://www.pewcenteronthestates.org/uploadedfiles/clean_economy_report_web.pdf

13 United Press International, "China Overtakes U.S. in Green Investments", March 26, 2010, http://www.upi.com/Science_News/Resource-Wars/2010/03/26/China-overtakes-US-in-green-investments/UPI-12551269617060/, accessed on May 11, 2010.

licensing process ensures balanced, independent evaluations of complex and controversial projects in an open and public forum. California's leadership in promoting energy efficiency has resulted in the lowest per capita electricity use of any state in the nation. The state's RPS is one of the most aggressive in the nation, and state agencies working with a wide variety of stakeholders to determine how best to develop and integrate high levels of renewable energy into the electricity grid while minimizing environmental impacts and maintaining grid reliability. To reduce harmful impacts to fragile marine life along California's coastline, the state has initiated a plan to phase out power plant cooling technologies that use ocean water. And California's landmark legislation to reduce emissions from passenger cars through higher vehicle efficiency standards inspired the federal government's establishment of higher national standards in 2009.

The creation of the Energy Commission in 1975 marked the beginning of California's role as a national leader in developing forward-thinking energy policies. The California Legislature established the Energy Commission to address the energy challenges facing the state at that time, including the oil crisis of 1973 and subsequent efforts to shift from oil-fired power plants to nuclear power plants located along the California coastline. Before 1975, utilities were required to go through a multi-year process to get permits to build new power plants from a variety of federal, state, and local agencies. The Legislature consolidated that process by authorizing the Energy Commission to license thermal power plants of 50 megawatts or greater in size, which streamlined permitting and allowed for meaningful public input and a comprehensive review of potential environmental impacts.

California's aggressive RPS policies have led to increased numbers of renewable energy developers seeking power plant certification from the Energy Commission. From 2007 to 2009, the Energy Commission received applications for 12 solar thermal projects, nine of which are seeking ARRA incentives. These power plants could have a major effect on the state's ability to meet its RPS goals, potentially providing as much as 17 percent of the renewable energy needed to achieve 33 percent renewables by 2020. As of October 2010, the Energy Commission has approved six solar thermal projects totaling 2,800 MW and is currently reviewing applications for three additional projects totaling 1,500 MW.

These plants, seven of which are proposed on federal lands, must meet federal deadlines to receive ARRA funding. To expedite consideration of their applications, the Energy Commission has worked closely with state and federal agencies along with a wide variety of stakeholders to ensure that these projects meet California's environmental and reliability needs without drastically impacting sensitive desert habitats.

In addition to its power plant licensing responsibilities, the Energy Commission has set building and appliance efficiency standards since 1978. From the time when these standards took effect, Californians have reduced their utility bills by an estimated $15.8 billion, with an additional $43 billion in savings predicted by 2011.[14]

14 California Energy Commission, Buildings and Appliances Program,

The Energy Commission continuously updates the standards to reflect the latest technologies and strategies to reduce energy use; for example, the latest vintage of building standards is requiring, on average, 15 percent more energy savings for new residential buildings compared with previous standards.

California's transportation sector uses roughly half of the energy consumed in the state and represents about 36 percent of the state's GHG emissions.[15] The Energy Commission has since its inception repeatedly stressed the importance of reducing California's dependence on petroleum fuels, and more recently has highlighted the need to increase the efficiency of the transportation sector. In 2007, the Energy Commission, in partnership with the California Air Resources Board (ARB) and other state, federal, and local agencies, prepared the *State Alternative Fuels Plan*, which identifies strategies to increase the use of alternative fuels to meet California's goals for reducing petroleum consumption, improving energy security, increasing in-state production of biofuels, and reducing GHG emissions.[16]

While the Energy Commission is the state's primary energy planning and policy agency, other agencies like the State Water Resources Control Board (SWRCB), the California Public Utilities Commission

PIER and Energy Efficiency Standards

Research from the PIER program supports California's Title 24 Building Efficiency Standards and Title 20 Appliance Efficiency Regulations. For example, PIER research led to state-of-the-art fault detection and diagnostics procedures for heating, ventilation, and air conditioning systems that are now required under the Title 24 Standards and are resulting in energy savings of up to 10 percent in each unit being commissioned using the procedures.

Other examples of energy efficiency measures in the Title 24 Building Efficiency Standards that resulted from PIER research include:

- Light Emitting Diode (LED) exterior lighting
- LED night lighting in hotel bathrooms
- Load shedding fluorescent ballasts
- Cool roofs for residential buildings
- Integrated classroom lighting system design
- Measures to improve indoor air quality and ventilation efficiency
- Duct sealing measures to reduce energy losses.

PIER research on more energy-efficient external power supplies for a wide range of consumer electronic devices led to their inclusion into the Title 20 Appliance Efficiency Regulations which in turn supported incorporation of specifications into federal product standards that took effect in 2008.

http://www.energy.ca.gov/efficiency/buildings_appliances.html.

15 California Air Resources Board, Greenhouse Gas Inventory Data – Graphs, http://www.arb.ca.gov/cc/inventory/data/graph/graph.htm.>

16 California Energy Commission, *State Alternative Fuels Plan*, December 2007, http://www.energy.ca.gov/ab1007/index.html

(CPUC), the ARB, and the California Independent System Operator (California ISO) also play fundamental roles in California's energy sector.

The SWRCB, created in 1967, protects water quality by setting statewide policy and coordinating and supporting regional water board efforts. Since 2006, the SWRCB has led an interagency working group – consisting of the Energy Commission, the California ISO, and the CPUC – to develop a policy for the phase out of once-through cooling (OTC) at the 2 nuclear and 17 natural gas power plants along California's coast. The schedule for this phase out is intended to balance electric reliability with addressing the harmful effects of OTC on marine life. On May 4, 2010, the SWRCB adopted its policy to phase out OTC, which was then submitted to the Office of Administrative Law on August 13, 2010. If approved, the policy will allow most plants until at least 2015 to comply, with plants in the Los Angeles area having until 2020 because of local electricity reliability requirements.

The CPUC, established in 1911, regulates privately owned electric and natural gas utility companies and is a key partner in California's clean energy initiatives and policies that benefit consumers, the environment, and the economy. For more than 30 years, the CPUC has approved the use of ratepayer funds to promote energy efficiency activities, and authorized the major investor-owned utilities (IOUs) under its jurisdiction to administer a wide variety of energy efficiency programs. The 2006-2008 cycle of utility efficiency programs achieved electricity savings of 10,341 gigawatt hours (GWhs),[17] and the 2010-2012 utility energy efficiency portfolio is expected to save almost 7,000 GWhs of electricity, 150 million metric therms of natural gas, and avoid 3 million tons of GHG emissions.[18] The CPUC's *Long-Term Energy Efficiency Strategic Plan*, adopted in September 2008, identifies goals, strategies, and a long-term vision for energy efficiency in California through 2020 and beyond.[19]

The CPUC also administers the state's RPS program for the IOUs in conjunction with the Energy Commission. As reported in the third quarter of 2010, the IOUs as a group served 15.4 percent of their 2009 electricity demand with renewable energy.[20] Based on contracts signed to date, the utilities expect to reach about 18 percent renewable in 2010 and 21 percent in 2011.[21]

The ARB, established in 1968, also has a role in the RPS through its enforcement of

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17 California Public Utilities Commission, Energy Efficiency Groupware Application, Energy Efficiency Program reports (2006-2008), http://eega2006.cpuc.ca.gov/ReportsDisplay.aspx.

18 California Public Utilities Commission, Fact Sheet, California's Long-Term Energy Efficiency Strategic Plan, September 24, 2009, http://www.californiaenergyefficiency.com/docs/EEFactSheet092409.pdf.

19 California Public Utilities Commission, *California Long-Term Energy Efficiency Strategic Plan*, September 2008, http://www.californiaenergyefficiency.com/docs/EEStrategicPlan.pdf.

20 California Public Utilities Commission, *3rd Quarter 2010 RPS Report to the Legislature*, http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm.

21 California Public Utilities Commission, 2*rd Quarter 2010 RPS Report to the Legislature*, http://www.cpuc.ca.gov/PUC/energy/Renewables/documents.htm.

California's Renewable Electricity Standard, which expands the current RPS and requires the state's load-serving entities to meet a 33 percent renewable energy target by 2020. The ARB unanimously adopted regulations establishing the 33 percent standard on September 23, 2010.[22] Because adding this much renewable energy to the state's electricity system can have significant impacts on the grid, the California ISO, a non-profit public benefit corporation that oversees the safe and reliable operation of the transmission grid, continues to evaluate these impacts as part of its transmission planning efforts.

The ARB is also tasked with monitoring and reducing GHG emissions by 25 percent by 2020, and achieving 80 percent more in reductions by 2050. Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006), the Global Warming Solutions Act of 2006, established the mandate to reduce GHG emissions in California to 1990 levels by 2020 using a portfolio of strategies, with strong emphasis on increased energy efficiency and the use of renewable energy. The ARB's *Climate Change Scoping Plan,* released in 2008, is the state's roadmap to reach the GHG reduction goals required in AB 32.[23]

Because AB 32 does not directly address GHG emissions in the transportation sector, reductions are addressed through the ARB's Low Carbon Fuel Standard,[24] the Pavley vehicle emission standards,[25] and the Energy Commission's *State Alternative Fuels Plan* and ARFVT Program.[26] The ARB continues to focus on reducing transportation emissions to improve the state's air quality, and in 2004 established stringent vehicle emission standards that are the basis for similar standards in many other states.

ARRA funding is enhancing and accelerating many of the energy functions being carried out by the Energy Commission in collaboration with these key California agencies. The Energy Commission is administering a large portion of the ARRA funds, and in doing so is ensuring that the ARRA-funded programs are consistent with California's long-established clean energy policies.

California's Share of the American Recovery and Reinvestment Act of 2009

President Obama signed the American Recovery and Reinvestment Act of 2009 on February 13, 2009, with the goal of creating jobs, jump-starting the economy, and investing in long-term growth.

Of the $787 billion in federal economic stimulus funding, the government dedicated $36.7 billion to energy-related projects under the oversight of the United

22 California Air Resources Board, "California Commits to More Clean, Green Energy," September 23, 2010, http://www.arb.ca.gov/newsrel/newsrelease.php?id=155.

23 California Air Resources Board, *Climate Change Scoping Plan*, December 2008, http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm.

24 California Air Resources Board, Low Carbon Fuel Standard Program, http://www.arb.ca.gov/fuels/lcfs/lcfs.htm.

25 California Air Resources Board, Clean Car Standards, http://www.arb.ca.gov/cc/ccms/ccms.htm.

26 California Energy Commission, Alternative and Renewable Fuel and Vehicle Technology Program, http://www.energy.ca.gov/altfuels/index.html.

States Department of Energy (DOE). This amount includes $16.49 billion to increase energy efficiency, build the domestic renewable energy industry, and restructure the transportation industry to increase global competitiveness; $6 billion for nuclear waste clean-up; $4.5 billion for electric grid modernization; $3.4 billion for carbon capture and sequestration; and $2 billion for scientific innovation in technology research.[27]

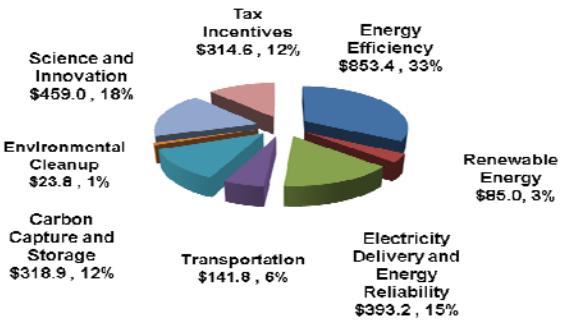
Of the ARRA funding available for energy-related activities, California has been awarded approximately $4.7 billion to date from three sources: formula grants based on population ($808 million), direct awards as a result of competitive federal solicitations ($1 billion), and loan guarantees and clean energy tax credits from the DOE, the United States Department of the Treasury, and the Internal Revenue Service ($2.9 billion). The breakdown of funding to California shown in Figure 1 includes the formula and competitive funding and a portion of the clean energy tax credits, but does not include more than $2 billion in conditional loan guarantees that have been made to California companies.

Formula Grants

The Energy Commission is administering $314.5 million in ARRA grants awarded to California based on federal formulas and the state's population. These funds are supporting energy efficiency, renewable energy, clean transportation, and contingency planning through the following four programs that are designed to work together to provide a solid and sustainable foundation for California's clean energy economy:

- State Energy Program ($226 million)
- Energy Efficiency and Conservation Block Grant Program ($49.6 million)
- Appliance Rebate Program ($35.2 million)
- Energy Assurance Planning ($3.6 million)

Figure 1. California's Energy-Related ARRA Funds



Source: United States Department of Energy

The Energy Commission's programs to administer the funding in these four areas include strategies to get funding out quickly using existing program designs and processes combined with new and innovative programs that will deliver sustainable benefits long after the ARRA funds are spent. Consistent with federal goals, the primary focus of the programs is job creation and economic stimulus, but programs were also designed to accelerate the California's achievement of its clean energy goals through efficiency retrofits to existing buildings, appliance rebates, development of the smart grid,[28] production

27 United States Department of Energy, http://www.energy.gov/recovery/pillars.htm.

28 "Smart grid" refers to a distribution system that allows for flow of information from a customer's meter in two directions: both inside the house to thermostats, appliances, and other devices, and from

of alternative and renewable transportation fuels, development of alternative vehicles, energy security planning, and workforce training.

Competitive Funds

California has received more than $1 billion as a result of federal competitive ARRA solicitations for a wide variety of innovative clean technology projects, including investments in renewable energy, smart grid, transportation electrification, and carbon capture and storage.[29] To help California secure as much competitive federal funding as possible, the Energy Commission used its two existing research and development funding programs, the PIER Program and the Alternative and Renewable Fuel and Vehicle Technology Program, to provide technical support and $57 million in match funding that helped leverage $620 million in federal funds, about half of the competitive funds coming to California, along with more than $1 billion in private investment funding.

Loan Guarantees and Tax Credits

California has received $2.4 billion of ARRA funds in the form of conditional loan guarantees and tax credits for clean energy projects. This amount does not include ARRA-funded loan guarantees and tax credits being sought by the large solar thermal facilities being proposed in California that are discussed in Chapter 3.

DOE's Loan Guarantee Program is intended to restore the United States to a position of global leadership in clean energy through investments in new and innovative technologies. Under this program, the federal government will cover a borrower's debt in case of default. Three projects in California have received conditional loan guarantees: a solar thermal power plant, a solar photovoltaic panel manufacturer, and a manufacturer of electric vehicle battery packs and drive trains.

California has also received millions of dollars of federal tax credits to incentivize new renewable generation. Federal law currently allows project developers to claim a 30 percent investment tax credit for certain renewable energy property. However, the downturn in the economy has limited the opportunities for investors to use the tax credit. ARRA therefore allows taxpayers to receive cash assistance from the United States Treasury Department in lieu of the tax credit for as much as 30 percent of the qualifying cost of the renewable energy facility. To date, 157 California entities have received in-lieu tax credits totaling $240 million.[30]

There are a variety of other tax credits and incentives being funded by ARRA targeting energy efficiency, renewables, and clean transportation. Information about these credits and incentives is available on the DOE's Recovery Act website.[31]

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the house back to the utility. Smart grid can include a variety of operational and energy measures, like smart meters, smart appliances, renewable energy resources, energy efficiency resources, demand response measures, and energy storage.

29 United States Department of Energy, http://www.energy.gov/recovery/ca.htm

30 For a list of California entities receiving these tax credits, please see United States Department of the Treasury, http://www.treasury.gov/recovery/1603.shtml

31 United States Department of Energy, http://www.recovery.gov.

California's Stimulus Funding Priorities

In awarding and distributing ARRA stimulus funding, the Energy Commission had five distinct priorities:

- Stimulate the economy, and create and retain jobs in California.
- Achieve lasting and measurable energy benefits.
- Spend money efficiently, with accountability and minimal administrative burden.
- Contribute to meeting California's energy and environmental policy goals.
- Leverage other federal, state, local, and private financing through partnerships.

Jobs and Economic Benefits

Energy-related formula grants coming to California are contributing to the state's economic recovery by creating new jobs, investment opportunities, and tax benefits.

To provide the skilled workforce to fill the jobs being created by these programs and projects, the Energy Commission established the Clean Energy Workforce Training Program, the largest state-sponsored green jobs training program in the nation. This program will train the workers needed to do energy efficiency audits and retrofits, operate large-scale renewable power plants, and service and operate alternative and renewable vehicles and fueling stations.

The Energy Commission chose to devote a large portion of the formula-based ARRA funding to energy efficiency programs because energy efficiency creates more jobs per dollar than other energy investments.[32] Energy efficiency retrofit programs provide jobs to workers in the construction industry who are unemployed due to the downturn in the economy but can be retrained for new clean energy jobs. Increased demand for energy efficiency equipment and services will also generate jobs for building energy auditors and raters to work with building owners to identify necessary upgrades and provide quality assurance that measures are installed correctly, and for skilled manufacturing workers to produce the products that will be installed.

The Energy Commission designed programs to target a diverse set of potential employees – including unskilled, semi-skilled, and skilled workers – for a wide variety of permanent clean energy jobs. The Energy Commission structured its formula-based programs to provide jobs and economic benefits throughout California, particularly in those communities hit hardest by the economic downturn. Energy retrofit programs include elements focusing on lower-income neighborhoods and affordable housing which are often underserved by energy efficiency programs. Energy Commission funding solicitations for the retrofit programs required bidders to identify program activities that would provide positive impacts for economically disadvantaged areas of the state. Similarly, the Energy Commission awarded block grant funding to cities and counties based on a formula that included an "adder" for areas with higher-than-statewide

32 Center for American Progress, Robert Pollin, James Heintz, and Heidi Garrett-Peltire, *The Economic Benefits of Investing in Clean Energy*, June 2009, http://www.americanprogress.org/issues/2009/06/pdf/peri_report.pdf

Clean Energy Jobs

A partial list of jobs being created in the energy efficiency sector as a result of ARRA-funded programs includes:

- Contractors (HVAC, insulation, roofing, solar, building performance)
- Technicians and laborers that work for contractors
- Lighting equipment/control and HVAC control installers
- Home energy raters, energy auditors, retrocommissioning agents
- Manufacturing jobs for production of energy efficiency measures such as insulation, efficient windows, efficient HVAC and water heating equipment, lighting equipment, and cool roofing
- Support staff at local governments, technical consulting firms, and financing providers

unemployment rates. The Clean Energy Business Finance Program also targeted economically disadvantaged areas when awarding low-interest loans to manufacturing companies that are leveraging $85 million in private investment and expect to provide 1,588 jobs.

Funds coming to California through federal competitive solicitations are also providing important job and economic benefits throughout the state. Through its leveraging efforts, the Energy Commission is bringing nearly $1 billion to California to upgrade its transmission infrastructure and help create the "smart grid" of the future. This represents a tenfold increase in smart grid research funding compared to past levels, which will lead to manufacturing jobs and installation of smart grid technologies and products.

The Energy Commission is also leveraging more than $105 million in DOE competitive funds along with $106 million in private funds for alternative fuel and vehicle projects that are estimated to create more than 900 jobs and replace more than 36 million gallons of petroleum-based fuel each year. This will not only reduce California's dependence on petroleum imports, but it will also reduce the export of capital out-of-state to pay for those imports.

Nine renewable power plants being proposed in California are under the Energy Commission's licensing jurisdiction and are seeking federal ARRA loan guarantees and tax credits. If completed, these power plants will provide significant jobs and economic benefits to the communities in which they are located. Based on projections submitted by the project developers in their applications to the Energy Commission, these power plants could provide more than 10,000 temporary construction jobs, with an expected construction payroll of more than $3 billion, and nearly 1,400 full-time plant operation jobs, with expected annual payroll of $219 million. The projects will generate $48 million in property taxes, $247 million in sales taxes during construction, and $11 million annually in sales taxes during operation. In addition to the tax and payroll benefits, the projects expect to spend more than $2 billion in purchases of materials during construction, providing significant benefits to local economies. Numerous renewable power plants not directly under the Energy Commission's jurisdiction are also in line for ARRA incentives.

Finally, companies like Solyndra Inc., and Tesla Motors are using ARRA-funded loan guarantees from DOE to establish or

expand manufacturing facilities that will 2,000 direct jobs and provide other economic benefits like increased tax revenues.

Lasting and Measurable Energy Benefits

ARRA-funded projects are designed to continue to provide energy and economic benefits long after the ARRA funding is spent. The Energy Commission used revolving loans to fund energy efficiency improvements in public buildings, with the repayments dedicated to fund future energy efficiency investments. The Energy Conservation Assistance Act (ECAA) Low Interest Loan Program uses energy savings for loan repayments that are then recycled to fund new projects, ensuring that the program will continue to provide energy benefits over the long term. In addition, measures funded through this program will provide energy savings over the lifetime of the equipment, which can be as long as 25 years.

Similarly, the Department of General Services (DGS) Revolving Loan Fund channels loan repayments into new projects to improve the efficiency of state buildings, provide jobs for auditors and installers of efficiency measures, and reduce the energy costs of operating state buildings. Two programs under the Energy Commission's residential and municipal efficiency retrofit programs also intend to use revolving loans so that loan payments can be returned to their communities for additional projects.

The Energy Efficiency and Conservation Block Grant (EECBG) Program is providing funds for energy efficiency improvements in streetlights, traffic signals, heating, ventilation, and air conditioning systems, and water pumping in hundreds of cities and counties throughout the state. These improvements will provide immediate benefits and will continue to yield energy and cost savings for local jurisdictions in the future.

In addition to funding the immediate installation of energy efficiency measures, the Energy Commission awarded funding for pilot projects for a comprehensive program to improve energy efficiency in existing buildings that is being developed in response to Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009). There is huge potential for energy savings in existing homes and commercial buildings and, by providing real-world experience with specific strategies and programs, these pilot projects will lay the foundation to achieve these savings in the most efficient and cost-effective way possible. The Energy Upgrade California Program, an umbrella program encompassing the California Comprehensive Residential Building Retrofit Program, the Municipal and Commercial Building Targeted Measure Retrofit Program, and the Clean Energy Workforce Training Program, was designed to provide energy and economic benefits that would outlive ARRA funding.

Other formula-based programs will also yield benefits far beyond the ARRA funding period. The Clean Energy Business Finance Program is providing low-cost revolving loans to eight manufacturing companies that will produce nearly 500 MW of new solar PV panels every each year. Expanding PV manufacturing capacity will provide sustainable jobs and economic benefits to California while also reducing the costs of these solar technologies over time through economies of scale. These loans will be

repaid over time, sustaining the program and supporting new manufacturing companies on the state.

The Energy Commission's formula-based programs also include a quality assurance component to ensure that energy efficiency measures are properly installed, function correctly, and have verified energy savings. The Energy Commission is also providing quality assurance with technical assistance to small cities and counties through the EECBG Program on their project designs to ensure effective projects and by helping small jurisdictions in calculating estimated energy savings from their projects. Further, the Energy Commission designed a detailed tracking system that requires awardees to submit monthly reports to ensure they are achieving the lasting energy savings proposed in their applications. To provide maximum accountability, all projects receiving ARRA funds from the Energy Commission will be subject to a massive measurement, verification, and evaluation effort.

The Energy Commission is using a similar tracking system for projects receiving cost share funding from the PIER and ARFVT Programs. California's success in competing for smart grid funding will lead to new infrastructure investments that will provide benefits for decades. Similarly, the ARFVT Program electric vehicle infrastructure investments will lay the foundation for large roll-outs of electric vehicles by auto manufacturers in the next few years as well as other alternative fuel infrastructure upgrades and additions.

Finally, investments in energy generation infrastructure like renewable power plants through tax credits and loan guarantees will benefit the state for decades to come and provide from 15 to 17 percent of the renewable generation needed to meet the state's RPS goals. Tax credits and loan guarantees will also help expand California's clean technology manufacturing base, providing jobs and the equipment to support the state's clean energy economy.

Accountability and Administrative Efficiency

To administer its formula-based ARRA funding, the Energy Commission developed a balanced portfolio of existing programs with a past history of success combined with new and innovative programs that will deliver sustainable and long-term benefits to California's economy.

The existing programs and processes used to quickly distribute the ARRA funding include ECAA, the DGS Energy Efficient State Property Revolving Loan Fund, and the Clean Energy Workforce Training Program. Using existing programs minimized administrative delays in awarding ARRA funding. The Energy Commission also worked closely with the Legislature to get the necessary statutory authority to spend the funds and approval to implement new programs using guidelines rather than regulations that can take as long as 18 months to develop and get approved. In addition, the Energy Commission worked with DGS and the Department of Finance to streamline the state solicitation process and expedite contract review and approval while still complying with California law, promoting stakeholder engagement, and adhering to evolving guidance from the federal government.

The Energy Commission also conducted extensive outreach, including 35 public workshops held in urban and rural areas throughout the state to get stakeholder feedback and buy-in on program designs and priorities. Through the Clean Energy Workforce Development Program, the Energy Commission also conducted public outreach with an unprecedented level of participation from the energy industry, environmental groups, labor unions, environmental justice organizations, educational institutions, workforce investment boards, and state agencies. Nine retrofit summits were sponsored across the state, providing program information to more than 1,200 contractors in every major population center on how ARRA programs will increase the demand for building retrofit and renewable energy technologies; how to become certified for these programs; how small business development centers can help with business plan development, access to capital, and other incentives; and how to get training through various workforce training programs.

The process to leverage federal competitive funding was streamlined by rapidly reallocating existing program dollars for match funding, identifying DOE ARRA solicitations that aligned with California's research agenda and priorities, providing letters of support to applicants contingent on their selection for federal funding, and modifying the Energy Commission's cost-share solicitations to reflect numerous changes and additions to federal solicitations.

Preventing waste, fraud, and abuse is a key component of both the formula-based and competitive cost-share ARRA funding activities at the Energy Commission. Early on, the Energy Commission contracted with Perry-Smith, LLP, to conduct an organizational assessment of the agency's ARRA funding activities and make recommendations to improve internal controls that are now being implemented. To closely monitor each project's progress, the Energy Commission also developed a tracking database with detailed project information based on monthly reports submitted by award recipients. The Energy Commission submits this information to the State of California's Office of the Chief Informational Officer, and for the block grant program, directly to the DOE. The State of California then submits data from individual state departments to the federal Office of Management and Budgets.

The Energy Commission is also using its existing Program Information Management System database to track all PIER and ARFVT projects, including those receiving cost-share funding. Staff has been collecting data for ARRA-funded projects from when proposals were submitted and continues to maintain, update, track, and report data and progress.

To comply with federal ARRA requirements for maximum accountability, the Energy Commission contracted with KEMA, Inc., to conduct extensive auditing, measurement, verification, and evaluation (MV&E) of ARRA-funded projects starting in September 2010 and continuing until projects are completed, no later than March 2012.

The auditing and MV&E elements of the Energy Commission's ARRA-funded programs will go beyond simple verification that program funds are being used appropriately. They will verify that these projects deliver expected benefits in

terms of the number and type of jobs that are being created, the amount of energy that is being saved, and the amount of GHG emissions that are being reduced. The MV&E process will also provide important insight into why some program efforts are more successful than others so that knowledge can be applied to the design of future energy programs and standards, contributing to the long-term transformation of California's energy sector.

Energy and Environmental Policy Goals

Because energy efficiency is a critical element of meeting California's energy and climate change policy goals, the Energy Commission focused its formula-based programs on energy efficiency retrofits to existing residential, municipal, and commercial buildings. The DGS, ECAA, and EECBG programs also funded energy efficiency retrofits throughout the state from streetlights to buildings to pumping equipment in wastewater treatment plants.

The Energy Commission's residential and commercial building retrofit programs will directly address many of the major barriers to improving energy efficiency in existing buildings. Although California's building efficiency standards ensure that all new residential and commercial buildings meet increasingly stringent targets for energy efficiency, nearly 60 percent of California's housing stock and a comparable percentage of its non-residential buildings were built before the existence of the standards. Applying cost-effective energy efficiency measures to existing buildings will reduce statewide energy use by 9 percent, peak demand by 11 percent, and natural gas use by 5 percent.[33] With forecasted annual growth rates for electricity demand at 1.2 percent per year, peak demand at 1.3 percent per year, and natural gas demand at 0.73 percent between 2010 and 2018, increased energy efficiency in existing buildings will make a measurable contribution to an economic and reliable energy system in California.[34]

ARRA funds are also helping the state's publicly owned utilities meet their energy efficiency goals. Since 2007, the Energy Commission has assessed and reported on the progress of publicly owned utilities and IOUs toward meeting statewide annual targets for energy efficiency and peak reductions that are adopted as required by Assembly Bill 2021 (Levine, Chapter 734, Statutes of 2006).[35] The Energy Commission is currently preparing its annual assessment and anticipates releasing its report on utility energy efficiency progress in late 2010.[36]

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33 California Energy Commission, *Options for Energy Efficiency in Existing Buildings*, December 2005, http://www.energy.ca.gov/2005publications/CEC-400-2005-039/CEC-400-2005-039-CMF.PDF

34 California Energy Commission, *California Energy Demand 2010-2020, Adopted Forecast*, December 2009, http://www.energy.ca.gov/2009publications/CEC-200-2009-012/CEC-200-2009-012-CMF.PDF.

35 Energy efficiency targets for the investor-owned utilities are established by the California Public Utilities Commission. Assembly Bill 2021 requires the Energy Commission, in consultation with the CPUC and publicly owned utilities, to develop a statewide estimate of all energy efficiency savings potential and establish annual targets for energy efficiency savings and demand reduction over 10 years. The Energy Commission's revision of these targets will be completed in 2011. Annual progress toward meeting these targets is reported as part of each year's *Integrated Energy Policy Report* proceeding.

36 California Energy Commission, *2009 AB 2021 Progress Report: Achieving Cost-Effective Energy*

The ARB's *Climate Change Scoping Plan* identified expanding and strengthening California's energy efficiency programs as its top recommendation for meeting the state's GHG emission reduction mandates. Commercial and residential buildings are second only to on-road transportation vehicles as the main source of GHG emissions. The ARB found that energy efficiency in existing buildings provides the greatest potential for GHG emission reductions in the building sector.

Retrofit programs are also funding the installation of on-site solar PV projects and provides mechanisms to help finance these projects. The added renewable generation from these installations will contribute toward California's RPS goals and, by reducing electricity demand, can contribute to achievement of those goals. Because the RPS targets are based on retail sales of electricity, less demand for electricity as a result of increased efficiency means the amount of renewable generation needed to meet those percentages will be proportionally lower, as will the effects on the electricity system from integrating that energy.

Further, the Clean Energy Business Finance Program is funding PV manufacturing facilities that will provide nearly 500 MW of new solar PV capacity each year to support California's goal of installing 3,000 MW of solar energy systems on homes and businesses by the end of 2016.

Competitive ARRA funding is also contributing to California's energy and environmental goals. Smart grid funding will not only help improve the reliability of the state's transmission system, it will also reduce peak energy demand and help integrate renewable resources. Other research and development projects receiving cost-share funding are supporting renewable projects like improvements in geothermal drilling technologies and community scale renewables.

Cost-share funding for transportation projects is advancing the goals of the *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*[37] to reduce GHG emissions and petroleum fuel consumption. These projects will support the alternative refueling and vehicle infrastructure needed to increase alternative transportation fuel use in the state.

Projects seeking tax credits and loan guarantees include large-scale renewable power plants that, if built, will provide more than 4,000 MW of renewable generating capacity to help California meet its renewable electricity goals. Loan guarantees are also supporting the Solyndra, Inc., PV manufacturing facility, which will increase small-scale renewable generating capacity, and the Tesla Motors electric vehicle manufacturing facility, which will increase the number of electric vehicles in the state, further contributing to California's renewable electricity and alternative fuel goals.

Leveraging and Partnerships

The availability of ARRA funding has led to an unprecedented level of partnerships among federal, state, and local governments

Efficiency for California, anticipated release date December 2010.

37 Prepared annually as required by Assembly Bill 118 (Nunez, Chapter 750, Statutes of 2007).

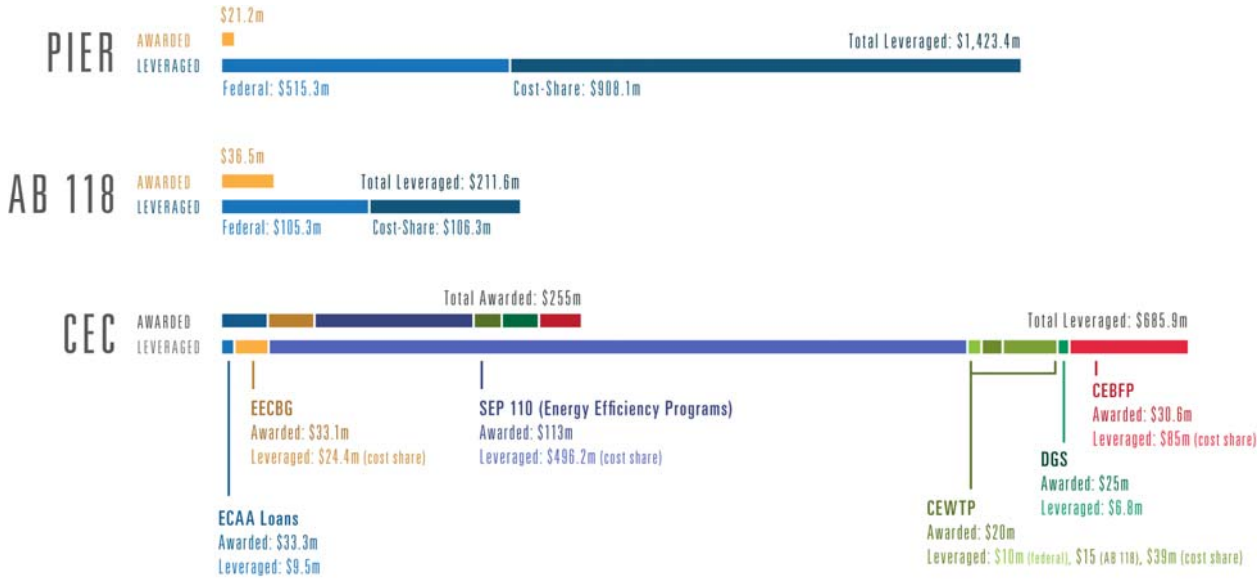
and the private sector to leverage funding and expertise (Figure 2).

In the Energy Commission's formula-based programs, local jurisdictions that have received ECAA loans were also allowed to apply for grants from the EECBG Program to cover a portion of their costs to make their projects more cost-effective. Block grant recipients are also leveraging utility incentive programs and, in many cases, are providing their own match funding.

Energy Upgrade California, a partnership among the Energy Commission, the CPUC, and utilities, wraps all residential and commercial energy efficiency retrofit efforts under a single brand to reduce confusion and create a one-stop shop for consumers and contractors. One of the evaluation criteria in the Energy Commission's solicitation for the residential building retrofit program included the extent to which applicants leveraged other financing, incentives, and program administration resources, including funding from the EECBG Program. These projects are leveraging $85 million, nearly 1.7 times the amount of their total ARRA awards, with other sources of funding.

In addition to leveraged funding, projects in the residential retrofit program are using extensive public/private partnerships among cities and counties, workforce development agencies, community colleges, low-income housing agencies, and private companies to increase the success of their retrofit efforts. While the municipal and commercial building retrofit program solicitation did not include explicit evaluation criteria for leveraging, proposals were scored on their overall cost-effectiveness, which improved proportionally with additional public or private funding. Projects awarded funding under this program are leveraging nearly $17 million. Partnerships are also a crucial element of this program, with project partners that include local government

Figure 2. Energy Commission's ARRA Leveraging Efforts



Source: California Energy Commission

commissions and associations, labor unions,workforce institutes, community college districts, energy efficiency product manufacturers, and local green jobs corps.

The Clean Energy Workforce Training Program is leveraging State Energy Program, federal Workforce Investment Act, and ARFVT Program transportation funding along with public-private partnership matching funds to provide workforce training. In developing this program, the Energy Commission partnered with the California Employment Development Department, the Employment Training Panel, the California Workforce Investment Board, the Green Collar Jobs Council, community colleges, local workforce investment boards, labor unions, employers, and trade and community organizations. These partnerships allowed the Energy Commission to use the expertise of state labor agencies and others to move funding out quickly and ensure training of participants for the clean energy jobs being created by other ARRA programs.

This link between workforce development and energy was a breakthrough because historically there has been little connection between the workforce development, education, and energy communities. The Clean Energy Workforce Training Program brought together these various communities to help design and then implement the program. This collaboration enabled the Energy Commission to access agencies' program infrastructure, connect directly to the workforce development community, and ensure that training programs are providing the most relevant skills to meet industry needs.

The Clean Energy Business Finance Program is an innovative public-private partnership that is leveraging both financing and expertise from program partners, including the California Business, Transportation, and Housing Agency and four statewide Financial Development Corporations, to address financing barriers for new and existing manufacturing companies in California. This program is leveraging more than twice the amount of its ARRA funding from program recipients.

For competitive funding, using federal ARRA funding to advance California's RD&D agenda was one of the Energy Commission's top priorities. Using $57 million from existing program funding, the Energy Commission was able to secure more than $620 million in competitive ARRA funding and $1 billion in private investment for California projects that will accelerate the advancement of the state's energy goals. Chapter 2 describes smart grid deployment and electric vehicle infrastructure development, two areas where the Energy Commission was most successful in bringing competitive ARRA funding to California.

Conclusion

California's clean energy policies have been a national model for the past 30 years. The state's long-standing clean energy policies to reduce the use of petroleum fuels, create a cleaner electricity system, use energy more efficiently, promote renewable energy, and improve air quality are sending the clear market signals needed to encourage development of new and innovative technologies and bring jobs, venture capital, and new companies to the state.

ARRA is building on that foundation by providing an exponential increase in funding for clean energy projects,

manufacturing, and research. ARRA-funded projects are creating clean energy jobs in areas of the state with the highest unemployment rate and providing the workforce training needed to ensure those jobs are filled with skilled workers. ARRA is also bringing private investment in clean energy companies and industries to California along with associated job, tax revenue, and other economic benefits.

ARRA funding will provide lasting benefits through revolving loans, pilot programs that will form the foundation for future comprehensive energy efficiency programs, and major infrastructure improvements like the smart grid, electric vehicle infrastructure, clean energy manufacturing, and renewable power plants, all of which will continue to support California's energy and environmental goals for decades to come. California's robust MV&E of ARRA-funded projects will ensure that these efforts are on track and will deliver expected job, energy, and GHG emission reduction benefits.

Stimulus funding will help California reach its ambitious energy goals such as retrofitting all existing homes with energy efficiency measures to an average energy savings of 40 percent per home, getting 33 percent of its electricity from renewable sources, and reducing dependence on foreign oil imports by replacing petroleum fuels with alternative sources. Investments in the smart grid will also put California at the forefront of what promises to be a global technology boom.

Finally, ARRA funding is providing huge opportunities to leverage funding and establish crucial partnerships among the public and private sectors. California is using its financial resources to bring billions of dollars to the state from private investors and to bring together diverse partners to ensure the success of the state's clean energy development efforts.

Chapter 2 of this report describes the goals of each of California's ARRA funding programs and how each program promotes the state's clean energy agenda. Chapter 3 discusses unique challenges facing renewable power plants under the Energy Commission's licensing jurisdiction that have applied or intend to apply for ARRA funding. Finally, Chapter 4 provides detailed descriptions of the ARRA-funded programs administered by the Energy Commission and the projects that received awards under those programs, along with expected results.

Chapter 2: Programmatic Goals Addressed by ARRA Funding

Introduction

This chapter briefly describes how the Energy Commission's formula-based ARRA funding and cost-share activities are helping to overcome barriers to achieving California's energy policy goals that were outlined in Chapter 1.

In designing its ARRA funding programs, the Energy Commission focused on a portfolio of existing programs and processes that would get funding into the economy quickly ("first-strike" programs), combined with innovative new programs to provide sustainable and long-term energy savings and job benefits.

The Energy Commission also provided match funding from two existing programs – the Public Interest Energy Research Program and the Alternative and Renewable Fuel and Vehicle Technology Program – to help secure ARRA funding from federal competitive solicitations for California companies. This leveraging effort focused on DOE solicitations whose goals most closely aligned with California's research, development, demonstration, and deployment needs and agenda and with overall state energy policy goals.

Formula-Based Funding Programs

The Energy Commission used three programs to provide quick results:

- The California Clean Energy Workforce Training Program ($20 million), which is providing training and workforce development for clean energy jobs for more than 9,000 participants.
- The Energy Conservation Assistance Act (ECAA) Low-Interest Loan Program ($25 million), a revolving loan program for local jurisdictions to install energy efficiency and energy generation projects and use the energy savings to repay the loans.
- The Department of General Services (DGS) Revolving Loan Program ($25 million), which funds energy efficiency improvements in state-owned buildings.

New programs to stimulate the energy efficiency retrofit and manufacturing sectors include:

- The Energy Upgrade California Program, an umbrella program that includes the California Comprehensive Residential Building Retrofit Program ($50.2 million), which focuses on energy efficiency retrofits in residential buildings; the Discretionary Energy Efficiency and Conservation Block Grant Program ($12.9 million); the Municipal and Commercial Building Targeted Measure Retrofit Program ($29.6 million), which focuses on energy efficiency retrofits in municipal and commercial buildings; and a financing element ($33 million) to help property owners pay for efficiency upgrades.
- The Energy Efficiency and Conservation Small Jurisdiction Block Grant Program ($33.3 million), which provides grants to small cities and counties to install cost-effective energy efficiency measures.
- The Clean Energy Business Finance Program ($30.6 million), a low-interest

loan program for clean energy manufacturers.

The Energy Commission is also administering California's share of ARRA funding for two national programs — the State Energy Efficient Appliance Rebate Program ($35.2 million) and the State Energy Assurance Initiative ($39.5 million) — and is using $15.4 million of ARRA funds for program support and contracts, including activities to ensure transparency and accountability in the use of the funds through extensive auditing, measurement, verification, and evaluation of ARRA-funded programs and projects.

"First Strike" Programs

The Clean Energy Workforce Training Program

The Clean Energy Workforce Training Program (CEWTP), rolled out in August 2009, was the first of the Energy Commission's ARRA programs. California will need an extensive and well-trained workforce to step into the jobs created by the massive expansion of California's clean energy economy resulting from ARRA funding. To meet this need, the Energy Commission created the CEWTP in partnership with a wide variety of public and private entities with workforce development expertise, allowing the Energy Commission to use the existing infrastructure of workforce development and educational organizations to quickly get training programs up and running.

CEWTP will prepare workers for a wide variety of energy-related jobs in energy efficiency retrofits, operation and maintenance of small- and large-scale renewable power plants, and clean transportation. Examples include:

- Accredited Green Plumber
- Biofuel Production and Processing
- Building Analyst/Envelope Specialist
- Building Engineer
- Certified Green Building Professional
- Certified Solar PV/Solar Thermal Installer
- Certified Water/Energy Auditor
- Compressed Natural Gas Vehicle Maintenance/Repair Technician
- Control Room Operator/Supervisor
- Energy Regulation Specialist
- Electric Vehicle Conversion and Maintenance
- Green Landscaping Designer
- Heating and Cooling Professional
- Heavy Electrical Technician
- Home and Building Performance Analyst
- Home Energy Rater
- HVAC Mechanic/Technician/Installer
- Hybrid Automotive Technician
- LEED Green Associate
- Resource Conservation Specialist
- Retrofitting Specialist
- Solar and Wind Operations and Maintenance Technician
- Solar Hot Water Designer/Installer
- Water Quality Specialist
- Weatherization Specialist

Besides providing training to more than 9,000 participants, these grants will also establish community college and other training programs that in many cases will become part of the established curricula, making the ARRA funding the basis for

long-lasting and sustainable changes in clean energy workforce training in California. Training will also provide a foundation for career pathways into higher-skilled specializations within the energy industry, building strong career ladders for workers over time.

The Energy Conservation Assistance Act Low-Interest Loan Program

The ECAA Low Interest Loan Program provides funding to local governments and public hospitals, schools, and colleges for investments in energy efficiency and renewable energy that reduce energy costs, lower greenhouse gas (GHG) emissions, and build jobs and industries in local communities.

A primary barrier to installing energy efficiency measures is cost and the lack of access to low-cost financing. The ECAA Loan Program addresses this by providing local jurisdictions with low-interest loans that are repaid with the energy savings resulting from the installed measures.

The ECAA Loan Program has existed since 1979 with a proven track record of producing quick and verifiable energy and cost savings. To expedite getting ARRA funds into the economy, the Energy Commission augmented this successful program with $25 million in ARRA funding and offered a low interest rate of one percent. By devoting ARRA funds to this program, the Energy Commission was able to give local governments the funding needed to install energy saving measures that provide immediate energy and job benefits.

The program also meets the Energy Commission's sustainability goals because it funds future projects with loan repayments, replenishing the pool of funding from which new loans can be made. This funding program is helping local jurisdictions make communitywide energy efficiency improvements that might otherwise have been impossible given the impacts of the recession and budget cuts on local governments.

Applicants seeking ECAA funding could also obtain funding from the Energy Efficiency and Conservation Block Grant (EECBG) Program, described later in the chapter, to reduce the overall cost of their projects. ECAA loans are leveraging $5.2 million of funding from the EECBG Program.

The augmentation of the ECAA program with ARRA funding created a huge demand for the program, which was fully subscribed almost immediately. The program has awarded 21 loans totaling nearly $20 million, with a waiting list of other projects wishing to apply for funding. The program's success has led to it being further augmented with non-ARRA funding that is available to projects at an interest rate of three percent.

The Department of General Services Revolving Loan Fund

California's Green Building Initiative, established by Governor Schwarzenegger's Executive Order S-20-04, calls for state buildings to be 20 percent more energy efficient by 2015.[38] Electricity costs for California's state buildings total more than $500 million per year, and increasing energy

38 Established through Governor Schwarzenegger's Executive Order S-20-04, December 14, 2004, http://gov.ca.gov/executive-order/3360/

efficiency in those buildings could save taxpayers $100 million per year.

As with local government energy efficiency retrofits, cost and lack of financing are primary barriers to increasing the efficiency in existing state government buildings. In 2009, Assembly Bill X4 11 (Evans, Chapter 11, Statutes of 2009) created the DGS Energy Efficient State Property Revolving Loan Fund to finance energy efficiency retrofits in state buildings. In October 2009, the Energy Commission directed $25 million of ARRA funding to DGS through an interagency agreement to provide the funding for this program.

The DGS program is an example of state agencies forging new partnerships to maximize the use of public funds to achieve energy and economic benefits with ARRA funding. Allowing participating agencies to repay loans with energy savings reduces building operating costs to taxpayers, while the ability to work with private energy service companies will open doors to private financing investments in state buildings.

New and Innovative Funding Programs

In addition to the first-strike programs, the Energy Commission chose to focus half of its State Energy Program funding, $113 million, on retrofits to existing residential and commercial buildings because these projects represent the greatest opportunity for energy savings, reduced emissions, job creation, and economic development. With about 9 million homes and more than 1.25 billion square feet of commercial buildings built before the state's energy efficiency standards took effect, there is a huge untapped opportunity for energy savings that will reduce the need for new ratepayer-funded power plants. In addition, with existing buildings responsible for nearly a quarter of the state's GHG emissions, it is crucial to establish programs and structures to reduce emissions associated with the existing buildings sector.

The intent of these programs was to transform the energy efficiency market using new strategies to overcome barriers to energy retrofit projects. The program emphasizes several critical components, including financing, quality assurance and consumer protection, marketing and consumer information, and workforce development. The program promotes the engagement of local governments to create regional program delivery with public-private partnerships and to leverage ARRA funds with other regionally-available funding.

There were three subprograms in the original State Energy Program solicitation to award the $113 million for energy efficiency retrofits: the California Comprehensive Residential Building Retrofit Program, the Municipal and Commercial Building Targeted Measure Retrofit Program, and the Municipal Financing Program.

The municipal financing program was intended to expand Property-Assessed Clean Energy (PACE) financing, which allows property owners to repay the costs of energy and water efficiency improvements or on-site renewable energy generation through assessments on their property taxes. The Energy Commission announced proposed contract awards to five municipal financing programs in early 2010. However, guidance released in June 2010 by the Federal Housing Financing Agency (FHFA) undermined those programs. FHFA

directed lenders who sell loans to the secondary lenders – Federal National Mortgage Association ("Fannie Mae") and the Federal Home Loan Mortgage Corporation ("Freddie Mac") – not to accept PACE financing that is in priority position ahead of the lender's mortgages in case of default.[39]

The Energy Commission strongly supports PACE programs and objects to FHFA's guidance, but was forced to cancel the municipal financing programs. To obligate ARRA funds by the DOE's September 30, 2010, deadline, the Energy Commission revised its program guidelines to allow more flexibility in the types of financing strategies that would be eligible for funding.

Energy Upgrade California

The Energy Commission responded to the opportunity created by the cancelation of the PACE financing awards to create an entirely new, robust, and comprehensive initiative, Energy Upgrade California. This umbrella program unifies the residential and commercial retrofit programs, discretionary funding for residential retrofits under the Energy Efficiency and Conservation Block Grant Program, and the Clean Energy Workforce Development Program. Energy Upgrade California, developed in conjunction with the California Public Utilities Commission (CPUC), will also provide a suite of energy retrofit financing options to increase the availability and attractiveness of financing, along with a Web portal with comprehensive information on rebates, incentives, qualified contractors, and financing options for consumers.

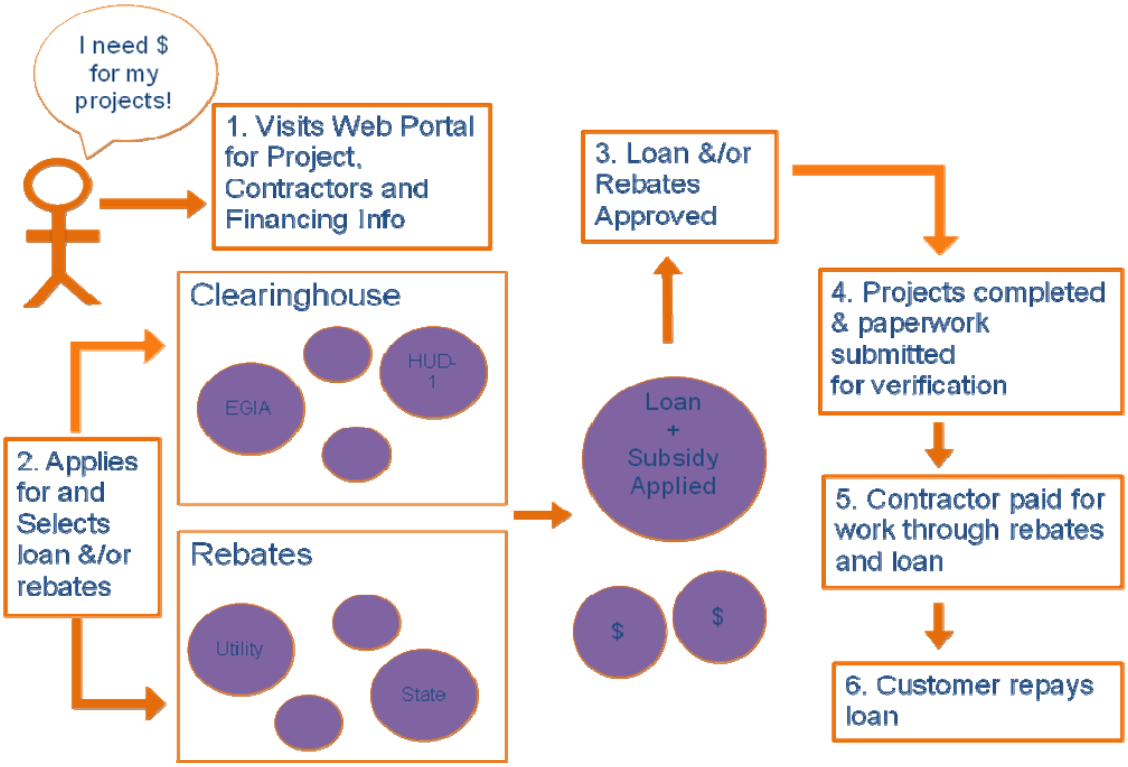
During the first phase of Energy Upgrade California, all 58 counties in the state will be able to participate in and benefit from access to the Energy Upgrade California integrated Web portal (Figure 3) including information about financing options, applicable utility rebates, and complementary state or federal programs; marketing, education and outreach; and quality assurance, including rebates to offset the cost of Home Energy Rating System (HERS) II pre-installation ratings and post-installation verification.[40] This level of services is called "Program Basic."

Counties that have demonstrated strong commitment to the program and invested substantial local resources in comprehensive residential and/or commercial retrofits will be eligible for a higher level of services called "Program Plus." Program Plus counties receive the benefits available to Program Basic counties plus additional program elements like subsidies for homeowners, scholarships for building performance contractor and HERS II trainees, grassroots community development, targeted marketing, and outreach support in the county.

39 For a detailed discussion of the Federal Housing Financing Agency's position, see *Proposed Cancellation of Program Opportunity Notice 400-09-401*, July 28, 2010, http://www.energy.ca.gov/2010publications/CEC-400-2010-009/CEC-400-2010-009.PDF.

40 The Energy Commission established regulations 1999 for a statewide Home Energy Rating System program to certify home energy rating services in the state (HERS I). The program was expanded in 2009 to provide a systematic process for whole house energy ratings (HERS II). For more information, see: http://www.energy.ca.gov/HERS/.

Figure 3. Energy Upgrade California Web Portal Financing Options



Source: Presentation by Mimi Frusha at September 28, 2010 Integrated Energy Policy Report workshop on Energy Efficiency and ARRA.

In addition, Energy Upgrade California will fund the development and implementation of two PACE financing pilot programs, one residential and one commercial, which will develop strategies to pursue PACE programs that can overcome the barriers created by the FHFA's guidance and work with other local governments in California to replicate those strategies.

Key components of Energy Upgrade California include the Municipal and Commercial Building Targeted Measure Retrofit Program, the California Comprehensive Residential Building Retrofit Program, and discretionary grants for residential retrofits in larger cities and counties. Although the latter fall under the EECBG Program, they are intended to achieve the same programmatic goals as the other two retrofit programs and are therefore included here. Energy Upgrade California also includes an alternative financing clearinghouse accessed through the Energy Upgrade California Web portal.

Assembly Bill 758
Comprehensive Program for Energy Efficiency in Existing Buildings

Energy Upgrade California is designed to pilot key components of a "comprehensive program to achieve greater energy savings in California's existing residential and nonresidential building stock" that is required by Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009). Under AB 758, the Energy Commission must consider "a broad range of energy assessments, building benchmarking, energy rating, cost-effective energy efficiency improvements, public and private sector energy efficiency financing options, public outreach and education efforts, and green workforce training." The Energy Commission will develop the regulations for the AB 758 program in coordination with the CPUC, publicly and investor-owned utilities, and stakeholders. In developing the AB 758 regulations, the Energy Commission is committed to leveraging and complementing existing voluntary energy efficiency programs under the CPUC's jurisdiction along with the new programs that have been created with the ARRA funding.

The CPUC has laid important groundwork through its energy efficiency roadmap aimed at reducing energy consumption in residential buildings by 40 percent by 2020 and for 50 percent of commercial buildings to have net zero energy consumption by 2030. In its latest cycle of investor-owned utility efficiency programs, the CPUC is moving from traditional incentive programs to programs that support market transformation.

The CPUC is funding a wide variety of investor-owned utility energy efficiency activities that support the goals of AB 758, including a whole-house retrofit program, a clean energy Web portal to raise public awareness about energy efficiency and demand side options, benchmarking to give utilities the information they need to conduct marketing and public outreach, a non-residential auditing program, on-bill financing programs that offer zero percent financing to creditworthy customers, and a workforce needs assessment.

In developing the AB 758 program, the Energy Commission will focus first on bringing together the investor-owned and publicly owned utility programs with the foundational infrastructure that will be created by Energy Upgrade California, which includes raising public awareness, identifying financing solutions, conducting workforce training, and piloting performance rating programs.

The second phase of the AB 758 program will be development of regulations based on the results of the pilot programs funded by ARRA, including recommendations for any mandatory energy efficiency improvements needed to meet the goals of AB 758. Once regulations are in place, the Energy Commission will work closely with utilities and other stakeholders during the implementation phase.

PIER and Energy Efficiency Retrofits

The PIER Program is an integral part of California's energy efficiency efforts. PIER research identifies the most energy-efficient technologies and measures currently available that save energy and money for California's residential, commercial, industrial and agricultural consumers. Two of the programs that received awards from the municipal retrofit program to deploy cutting edge energy efficiency technologies in municipal buildings will be using technologies that were the result of PIER funding, including parking lot and garage lighting and occupancy controls; office and classroom lighting, and wireless lighting and HVAC controls.

The Municipal and Commercial Building Targeted Measure Retrofit Program

This program is providing $29.6 million focused on low-risk, high return efficiency opportunities that are readily available throughout the state in non-residential buildings. Widespread replacement of inefficient equipment will result in substantial energy savings and will also transform the energy efficiency market by clearly demonstrating the non-energy benefits of energy efficiency (for example, reduced maintenance costs and improved building comfort) to building owners, operators, and occupants. Raising public awareness of these benefits will increase consumer acceptance and demand for energy efficiency measures, which will in turn increase the demand for manufacturers of energy efficiency equipment.

In the solicitation for this program, the Energy Commission received 63 proposals requesting more than $600 million in ARRA funding. Three proposals passed the required minimum score and were awarded $29.6 million for programs to conduct widespread energy efficiency retrofits in existing non-residential buildings, including lighting and heating, ventilation, and air conditioning (HVAC) improvements in classrooms, offices, parking lots, and garages, as well as retrofits to refrigeration systems in the commercial sector. These programs are leveraging more than $16 million through utility incentive funds, block grants, low-interest loans, and private funding, half again as much as their ARRA awards.

Programs are partnering with private sector firms and utilities to provide pre- and post-audits and verification of energy savings to provide quality assurance. In addition, the programs expect to achieve as much as 2-4 times the DOE's cost-effectiveness criteria of 10 million BTUs saved per $1,000 of ARRA funds spent, ensuring that consumers are receiving significant benefits from these projects. To increase building owner and consumer awareness of the energy and non-energy benefits of these retrofits, the programs will monitor the various measures and provide publicity to showcase those that prove performance claims. In addition, at least one program is focusing on a social marketing approach to help ingrain the use of efficiency measures in downtown business corridors.

Each of the three programs receiving funding under the Municipal and Commercial Building Targeted Measure Retrofit Program includes a workforce development component that involves partnering with local green jobs corps, the California Conservation Corps, community colleges, and other workforce training providers, as well as training for electrical

and HVAC installation contractors and internships for community college green certification program participants.

The California Comprehensive Residential Building Retrofit Program

This program is providing $50.2 million to create jobs and stimulate the economy through comprehensive energy retrofits in existing residential buildings, including single-family homes, low-rise multi-family buildings, and high-rise multi-family buildings. The program will use entry-level labor, single-trade contractors with training in energy efficiency, and training and support to develop the highly skilled workforce needed to make the transition to the whole-house, deep saving retrofits that are critical to achieving state and national energy and climate change goals.

There were 19 applicants requesting more than $150 million in ARRA funding in this solicitation, with four programs passing the required minimum technical score. These four programs will use a variety of strategies to address barriers to residential retrofits. To overcome financial barriers, programs will leverage existing financing programs and performance-based incentives as well as providing low-interest revolving loan programs in which energy savings are used to repay the loans. Programs will also support quality assurance and consumer protection through building energy audits and HERS ratings and by increasing the number of certified contractors and HERS raters.

The programs will conduct extensive marketing and outreach activities to motivate property owner participation and raise awareness of the benefits of energy efficiency. Programs will also create auditing, rating, contracting, and retrofitting jobs in various parts of the state, including rural counties with high rates of unemployment, and have committed to coordinating with training and workforce development efforts in local jurisdictions.

Broader Coverage of Comprehensive Residential Building Retrofit Program Using Discretionary Block Grant Funding

The EECBG Program required the Energy Commission to distribute a minimum of 60 percent of program funding to small cities and counties not eligible to apply directly through the program to DOE. The remaining 40 percent of the funding could be allocated to any cities and counties at the Energy Commission's discretion. The Energy Commission used a portion of its discretionary funding to ensure broader coverage of the state for comprehensive residential building retrofit programs, awarding $12.9 million through contracts with Los Angeles County, the City of Fresno, and the County of San Diego.

These three contracts address some of the primary barriers to residential retrofits by providing workforce training for auditors, installers, and inspectors, free energy audits to homeowners, marketing and outreach to motivate property owner participation, and installation of energy upgrades to more than 2,000 buildings each year.

Financing

Energy Upgrade California will include a comprehensive solicitation for financial institutions interested in offering residential and retrofit loan products. The program will provide low-rate financing with interest rate buy-downs and loan coverage in case of homeowner default. The financing program will be offered statewide

through an Energy Upgrade California website application. The intent is to provide a one-stop shop offering a wide range of financing options for residential and commercial building owners, with rapid prequalification of applicants meeting eligibility criteria.

The program is also creating a structure for PACE funding in case of a legal, legislative, or other solution to FHFA concerns so that these kinds of programs can be seamlessly integrated.

The Energy Efficiency and Conservation Block Grant Program

The Energy Commission received $49.6 million from DOE for the EECBG Program for small cities and counties.[41] As mentioned in the previous section, at least 60 percent of the block grant funding had to be allocated to small jurisdictions, with the remainder allocated at the Energy Commission's discretion to larger entities.

Funds for block grants are limited to energy efficiency measures as mandated by Assembly Bill 2176 (Caballero, Chapter 229, Statutes of 2008), which also requires priority be given to grants based on cost-effective energy efficiency and sets the 60 percent minimum threshold for funding to small cities and counties.

To determine the most effective allocation strategy, the Energy Commission conducted 19 workshops and application clinics throughout the state to get feedback from local governments. Based on their comments, the Energy Commission distributed the grants through a population-based formula rather than a competitive process to minimize the administrative burden on local governments. The Energy Commission also set a base amount of $25,000 for cities and $50,000 for counties to ensure sufficient funding for meaningful projects in the smaller jurisdictions. An unemployment adder was included in the allocation to target areas of the state with high unemployment rates.

The Energy Commission encouraged smaller cities and counties to form partnerships to make it more cost-effective for them to participate. For example, the San Joaquin Clean Energy partnership is serving 17 small jurisdictions. In addition, the Energy Commission provided a direct purchase option for small cities and counties that did not have the resources to undertake complex energy efficiency projects. To simplify the purchasing process, awardees were provided with a list of eligible products historically proven to be cost effective. To streamline the funding process, Energy Commission staff worked closely with local governments to provide assistance in identifying the most effective projects and filling out their grant applications.

The Energy Commission's EECBG solicitation drew considerable interest, receiving 210 applications representing 277 of the 309 eligible small cities and counties throughout the state.[42] The funding provided to these applicants represents 70 percent of the total EECBG funding.

41 "Small" is defined as cities with populations under 35,000 and counties with populations under 200,000.

42 Those that did not apply cited lack of resources (time, staff, and grant writing experience) to apply and manage the project and reporting requirements. Some could not identify potential projects.

The EECBG-funded projects include a range of end uses such as street lighting, interior lighting, building controls, and HVAC. These measures will create jobs for air conditioning installers, sheet metal workers, electricians, other building trades, lighting designers, and a range of less technically sophisticated support personnel.

EECBG Program Challenges

One challenge for awardees in the EECBG Program is compliance with federal prevailing wage requirements. Under ARRA, projects are subject to the federal Davis-Bacon Act, which requires payment of locally prevailing wages to be paid to "laborers and mechanics" on federal government contracts. To date, only five block grant recipients have completed Davis-Bacon requirements.

Another challenge, though not unique to block grant recipients, is the complexity of federal reporting requirements for ARRA-funded projects. Most jurisdictions prefer to use local contractors to help stimulate local economies, but many local contractors are small businesses that do not have the staff resources to comply with federal reporting requirements. This has reduced the number of contractors willing to work with local jurisdictions because the overhead is simply too high relative to the expected profit from the projects.

In addition, many smaller jurisdictions have limited staffing and other resources available to provide the required detailed reports on project results. In some cases, smaller cities and counties have minimal staff working in departments overseeing the operation of town buildings. With those staff responsible for maintaining equipment and conducting the day-to-day business of the department, they face challenges finding time to spend on the paperwork associated with the ARRA reporting requirements.

The Clean Energy Business Finance Program

California has lost a significant number of high volume and high quality clean technology manufacturing companies and related jobs over the last 10 years. To help reverse this trend, the Energy Commission used $30.6 million of its State Energy Program funds to establish the Clean Energy Business Financing Program, which provides low-interest loans to clean energy manufacturing businesses in California.

California has already taken important steps to incentivize in-state manufacturing. Senate Bill 71 (Padilla, Chapter 10, Statutes of 2010), implemented by the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA), exempts qualifying projects from paying sales and use taxes on clean energy manufacturing equipment. Projects must meet a "net benefit" test showing that that benefits like additional taxes, jobs, and GHG and other pollutant reductions outweigh the amount of the exemption. The statute contains a "soft cap" of $100 million annually, after which CAEATFA must notify the Legislature before approving any additional exemptions.

The Clean Energy Business Financing Program builds on these steps by providing an innovative public private partnership among the Energy Commission, the California Business, Transportation and Housing Agency, and financial development corporations located throughout the state.[43] The program is part

43 The participating Financial Development Corporations providing loan support include Pacific Coast Regional Small Business Development Corporation, San Fernando Valley Small Business Financial Development Corporation, State Assistance

of the Energy Commission's Clean Energy Manufacturing Program, which also offers funding opportunities to clean transportation and fuel projects through the Alternative and Renewable Fuel and Vehicle Technology Program funded by Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007).

The Energy Commission developed and funded the low-interest manufacturing loan program not only to stimulate the economy but also to secure the substantial economic and environmental benefits associated with bringing new clean energy manufacturing companies to California. By leveraging public and private financing and expertise, the Clean Energy Business Financing Program helps overcome a significant financing barrier faced by small businesses, early stage clean energy companies, and manufacturing expansion, which is the perception by most lenders and banking institutions that clean energy investments are high risk. The Clean Energy Business Financing Program's financial support combined with the state's proactive energy and environmental policies and investments, educated workforce, world-class universities and research centers, local economic development packages, and demand initiatives is the correct mix of incentives to attract and retain clean energy companies and their supply networks to California.

The Clean Energy Business Financing Program is designed to complement activities being funded under other federal and state ARRA energy and financing programs by supplying the clean energy components, systems, and technologies needed to make energy efficiency retrofits, build renewable energy infrastructure, and switch to cleaner transportation fuels and vehicles. The manufacturing plants will also hire the skilled workers coming out of clean energy workforce training programs. By attracting clean energy manufacturers to California, the state will reap the full scope of economic and equity benefits and will further its progress in meeting energy and climate change goals sustainably.

National Programs

California also received ARRA funding to support two national energy programs administered by individual states – the State Energy Efficient Appliance Rebate Program and the State Energy Assurance Program.

The State Energy Efficient Appliance Rebate Program

The overall goal of the State Energy Efficiency Appliance Rebate Program is to provide incentives to consumers to switch from older, less-efficient appliances to new, more efficient ones. This switch will help reduce consumers' electricity bills, reduce statewide energy consumption, and help meet statewide goals for increased energy efficiency in existing homes.

The Energy Commission received $35.2 million from DOE as a formula-based grant to support a residential appliance rebate program. While each state was given the discretion to determine the scope of its program, this funding can only be used for appliance rebates, meaning the Energy Commission cannot use these funds for other purposes.

Fund for Enterprise, Business, and Industrial Development Corporation, and Valley Small Business Development Corporation.

Local Initiatives to Attract Clean Energy Manufacturing

Cities like Los Angeles, San Diego, and San Francisco are actively working to bring manufacturing companies to their areas with a variety of incentives. Los Angeles County is using an ARRA-funded program called Transitional Subsidized Employment to place employees in businesses at no cost to the business for 6-12 months, providing employers with free workers and workers with training and an opportunity to demonstrate their skills. The program has placed more than 10,000 employees to date. Los Angeles also recently announced its success in bringing BYD Co., a Chinese electric car company, to establish its North American headquarters in downtown Los Angeles. The city is offering reduced tariffs for all zero-emission vehicles shipped into the Port of Los Angeles, is providing about $1 million in improvements around the firm's headquarters, and has agreed to showcase the company's electric vehicles in terminals at Los Angeles International Airport. BYD was aggressively courted by other states and cities, but decided on Los Angeles because of California's strong push for renewable energy and the state's abundant resources.

San Diego has been successful in attracting solar companies due to its clear commitment to solar and the opportunity for solar companies to be located near their markets. Clean Tech San Diego, a non-profit membership organization formed to accelerate San Diego as a world leader in the clean technology economy, is working to stimulate innovation and advance the adoption of clean technologies. The organization is actively tracking clean technology companies to understand what companies are growing in the region and reaching out to university and research institutes to establish strategic partnerships among the public and private sectors. San Diego currently has 200 solar companies and is using its ARRA funding creatively to bring new and different solar assets to the region. Another strategy is the use of Clean Renewable Energy Bonds issued through the Internal Revenue Service to help finance qualified projects that generate electricity from clean and/or renewable resources. Instead of receiving an interest check from the borrower, lenders receive a tax credit from the Federal Government. San Diego received $154 million of the $800 million originally available through this program, and $2.4 billion of additional funding will be available nationwide as a result of ARRA. San Diego also has a growing biofuels sector, and Clean Tech San Diego has established workforce training programs to meet the manufacturing and commercialization needs of new biofuel businesses.

San Francisco continues to work toward making the city a compelling location for clean technology companies through a wide variety of clean energy policies and incentives. In October 2007, Suntech Power Holdings Co., Ltd, one of the world's largest manufacturers of photovoltaic cells and modules, chose San Francisco as its United States headquarters. San Francisco is also working closely with the cities of Oakland and San Jose to prepare for rollout of electric vehicles like the Nissan Leaf.

Silicon Valley Leadership Group (SVLG), which represents more than 300 of Silicon Valley's most respected companies and whose members employ close to 500,000 Californians, sees the creation of demand for energy management systems, tools, and applications, along with strong market conditions, as a major driver for new manufacturing in the state since it will lead to scaled-up production, innovation, and lower costs. To increase demand, SVLG noted the need to move projects from the research phase into demonstration, and to make public the reliable, unbiased, and credible data demonstrating the effectiveness of energy efficiency tools and applications to give investors the confidence to invest in and use new technologies.

California's Cash for Appliances Program began on April 22, 2010, and originally included rebates for three appliances that the Energy Commission believed would provide the largest water, energy, and GHG emission reduction benefits to California consumers. In July 2010, the Energy Commission expanded the list of eligible appliances, in part to add categories like water heaters and heating, ventilation, and air conditioning systems that would create installation jobs for workers in the construction industry.

The Cash for Appliances Program is addressing a primary barrier to consumers' willingness to purchase and install energy efficient appliances, which is cost. These rebates will make consumers more likely to choose more efficient appliances to replace older appliances as they wear out.

The State Energy Assurance Initiative

The Energy Commission received $3.6 million from DOE for energy assurance planning activities. These funds will be used to update the state's Energy Assurance Plan and to encourage local governments to develop similar plans to improve emergency preparedness and ensure regional electricity grid resiliency.

Program Support and Contracts

The Energy Commission is using its program support and contract element to ensure transparency and accountability in awarding, distributing, tracking, and verifying the results of ARRA funding.

The Energy Commission has made it a priority to prevent waste, fraud, or abuse in the use of economic stimulus funds to protect taxpayers, ensure the long-term benefits from ARRA-funded programs, and set the stage for meeting future energy and environmental goals.

Partly in response to concerns raised by the Bureau of State Audits regarding delays in execution of ARRA contracts, grants, and agreements and the need for better internal controls to ensure funding was being used appropriately, the Energy Commission awarded $3.8 million to Perry-Smith, LLP to assess the Energy Commission's readiness to manage ARRA funds and to make recommendations to improve the system of internal controls. The contract also requires Perry-Smith to perform financial reviews of funding recipients, develop a clearly defined project monitoring process, and review funding recipients under the Clean Energy Business Financing Program to make sure they are credit worthy.

The Energy Commission has also contracted with KEMA, Inc., ($4.1 million) for a full measurement, verification, and evaluation (MV&E) of ARRA-funded programs. This MV&E effort will verify that projects are delivering the intended electricity, natural gas, and peak energy savings, GHG emission reductions, and job creation benefits from the ARRA funding. The Energy Commission is also working closely with the CPUC to coordinate MV&E efforts at both agencies to avoid double counting benefits between ARRA and utility energy efficiency programs.

Leveraging Competitive Funding

Recognizing the tremendous opportunity to bring even more ARRA dollars to California, the Energy Commission provided letters of support and cost-share funding to California companies applying for ARRA funding for energy-related

activities that advanced California's research, energy, and environmental goals. The Energy Commission's existing research programs – the Alternative and Renewable Fuel and Vehicle Technology (ARFVT) Program and the Public Interest Energy Research (PIER) Program – are providing this key leveraging support and funding.

The Energy Commission has a long-standing commitment to funding research and development activities to identify and develop new and innovative technologies and infrastructure that will support the state's energy efficiency, renewable energy, alternative transportation fuel and vehicle, and environmental goals.

In 1996, the California Legislature created an enduring legacy by funding a policy-driven, energy-related research program administered by the Energy Commission. The PIER program is the largest non-federal energy research program in the nation and works closely with a wide variety of national research organizations. PIER staff annually sifts through hundreds of energy research projects targeting geothermal, wind, advanced generation, transmission and distribution, energy efficiency, transportation, and a host of other concepts.

The Energy Commission has used its preeminence in the energy world to build a successful and productive program that supports projects that would not otherwise exist in independent utility, university, federal or private sector research and development. Over the last 12 years of operation, the PIER Program has provided more than $600 million for energy research, development, and demonstration projects that are in the public interest.

The Energy Commission also has a history of leading the move to reduce the use of petroleum-based fuels in the transportation sector and promoting the need for research and development for alternative fuels, vehicles, and infrastructure. This commitment and leadership led to the development of the ARFVT Program. AB 118 created the ARFVT Program to fund clean transportation energy projects that contribute to the state's goals to decrease petroleum use, increase in-state biofuel production, create a diverse alternative fuel mix for California, and reduce GHG emissions.

The ARFVT Program invests $100 million annually in deployment of alternative and renewable transportation fuels and technologies with the long-term goal of achieving 20 percent alternative fuel use by 2020. The program creates market demand by leveraging public and private investment in the research and production of clean technologies and services along with the workforce training to support the new jobs and businesses necessary for the future transportation system.

When the ARRA funds became available in 2009, the Energy Commission recognized the tremendous opportunity to use the PIER and ARVFT programs to leverage federal dollars and bring additional stimulus funding to California. Currently, California has been awarded more than $1 billion, about 8 percent of the ARRA funds available nationally for energy programs. These two programs provided more than $57 million in state matching funds that helped leverage $620 million in additional ARRA funding for California as well as more than $1 billion in private funding.

Public Interest Energy Research Program

After consulting with the PIER Program Advisory Board, the Energy Commission decided to help California entities prepare and submit proposals for ARRA funding and reserved up to $35 million in PIER funds to be used as match funding. Through its cost-share efforts, PIER was able to leverage $515 million in federal ARRA funds and $908 million in private investment. To be eligible for PIER cost-share funding, projects must be located in-state and provide clear, direct, and substantial benefits to California; provide on average 20 percent match funding; and obtain an award through one of the pre-identified federal ARRA Funding Opportunity Announcements (FOAs). FOAs included solicitations targeting geothermal and solar technologies, advanced energy-efficient building technologies, lighting improvements, smart grid development and demonstrations, and carbon capture and storage.

Since PIER's priority was to collaborate, not compete, in these solicitations, staff partnered with California agencies and departments, private industry, academic institutions, and other key stakeholders to pursue ARRA competitive funds. Staff also offered technical assistance and more than 90 letters of support to project applicants who submitted proposals to DOE and other federal agencies.

In PIER's two-stage application process, applicants first submitted a pre-application so that staff could determine if the proposed research projects were consistent with PIER research priorities and would provide technical and economic benefits to California. In letters of support for applicants passing this phase, the Energy Commission stated it would provide cost share funding once the applicant submitted a successful final application and received an award from the DOE. The Energy Commission encouraged applicants that met the pre-application requirements to submit a final application providing more technical details about the research.

PIER issued its first Program Opportunity Notice (PON) for ARRA funding in June 2009. DOE released 18 research-related solicitations between April and November of 2009, requiring PIER to amend the PON seven times to accommodate new solicitations and application dates before finally closing the PON in November 2009. In December 2009, PIER issued a second PON for applicants seeking DOE funding who either did not apply or were unsuccessful in the first PON. This solicitation consolidated all of the DOE FOAs at that time and included the same eligibility and solicitation requirements as the first PON. Of the 123 applications requesting more than $134 million in PIER funds under the two PONs, the Energy Commission endorsed 91 companies, resulting in 37 federal grant awards to California companies.

PIER cost-share funding did more than bring additional federal dollars to California. By partnering with project developers, the Energy Commission now has a voice in shaping these projects to ensure they stay on course, are consistent with the PIER energy research agenda, and deliver sustainable benefits to California.

Small Investments Yielding Big Rewards
Energy Innovations Small Grant Program

PIER's Energy Innovations Small Grant Program, established in 1998, has during the life of the program awarded more than 300 grants totaling approximately $28 million. These grants have led to more than $900 million in follow-on funding from other sources, representing a 30-to-1 return on PIER's initial investment.

A few of the many success stories from the small grant program include:

- **Nanosolar:** In 2002, PIER awarded Nanosolar, a California company, $75,000 to prove the feasibility of a thin film solar cell. Nanosolar was then able to secure $500 million in private sector funding and build production plants in San Jose, California, and Germany. The company's solar thin film print manufacturing process had made it a cost leader in the industry, and in 2008 the company received the United States Senate Conservation Champion award. That same year, Time Magazine recognized Nanosolar as one of the top 50 innovators of the year.
- **Adura Technologies:** In 2003, PIER awarded Adura Technologies a $75,000 research grant to prove the feasibility of a wireless lighting control network to control individual lighting fixtures in buildings, reducing energy use by up to 70 percent. The company received $20 million in venture capital funding and now has a commercially available product. Adura has been recognized as one of CNBC's top 15 "green tech" start-up companies, and is on Greentech Media's list of top 50 companies posed for success in the emerging green technologies sector.
- **UC Merced**: In 2004, PIER awarded UC Merced a $95,000 research grant to prove the feasibility of an innovative concentrating photovoltaic system using high efficiency solar cells. This led to an additional $172 million in venture capital funding to commercialize the product, which is being done by industry partner SolFocus.
- **Greenvolts:** In 2005, PIER awarded Greenvolts a $95,000 research grant to prove the feasibility of a low-cost, two-axis tracker for a concentrated solar power system. The company received follow-on funding of $45 million from a private equity firm and additional PIER funding to help commercialize its product. Greenvolts is currently building a 3 MW power plant near Tracy, California, that will be online in 2011, and is listed on the Global Cleantech list of 100 leading clean technology companies.
- **Primus Power:** In 2006, Primus Power received a $95,000 research grant to test the feasibility of a novel flow battery with better performance, longer storage time, and reduced maintenance costs. Using the technical proof-of-concept and the reliable pricing research demonstrating the value of their low-cost offering, Primus was able to secure substantial private equity financing. In November 2009, DOE selected Primus Power to receive $14 million as part of a larger project to commercialize, deploy, and monitor a large-scale (25 MW, 75 MWh) energy storage system as part of DOE's Smart Grid Demonstration Program.

Projects receiving cost-share support will also help create new jobs. Many of the jobs created by PIER's support for smart grid research will be in the application of computers and computer-controlled equipment and the increased use of communications system. With the increased integration of renewable resources into the grid, workers will be needed to support industries that sell and install small-scale renewable energy systems and to operate and maintain utility-scale generators. Other jobs will include energy engineers, who design the systems and write the specifications, as well as the technicians who install, program, and service the equipment.

PIER is also contributing to other workforce development efforts. California State University, Sacramento, has received an ARRA workforce development grant for $750,000 to develop a clean energy workforce curriculum for the electric power sector. PIER contributed $83,000 to this effort.

Smart Grid – A Case Study for PIER's Leveraging Efforts

California is receiving $1.3 billion for smart grid projects, representing a tenfold increase in smart grid funding from PIER's past spending levels of $10-$14 million. These projects were awarded more than $13 million in PIER cost-share funding, nearly three quarters of the PIER awards, and will significantly advance the state of smart grid technologies in California.

Characteristics of the smart grid include:

- Use of digital information and control technologies to improve electric grid reliability, security, and efficiency.
- Optimizing grid operations and resources, with full cyber-security.
- Deployment and integration of distributed and other generating resources, including renewable resources.

National Center for the Clean Energy Workforce

PIER is sponsoring research with several California workforce development experts to determine what companies must do to ensure they have qualified workers for clean tech and clean energy jobs. PIER research indicates the need for 4-6 regional National Centers for the Clean Energy Workforce to adequately support the clean energy workforce of the future. California workforce development specialists have expressed a desire for California to take a leadership role and form the first Center.

A national center should include:

- Research focused on mapping, assessing, and evaluating skill standards and certification processes.
- Clearinghouse and communications to maintain information on best practices and communicate this to key audiences, including the workforce development and clean energy communities.
- Technical assistance focused on translating this information into practical changes in workforce development strategies.
- Public policy to provide independent analyses of policy initiatives with focus on workforce development implications of energy policy design.
- Funding workforce development projects to support effective training and education in clean energy sectors.

- Developing and incorporating demand response, demand-side, and energy efficiency resources.
- Using real-time, automated, interactive technologies that operate appliances and consumer devices more efficiently through metering, communications concerning grid operations and status, and distribution automation.
- Integrating "smart" appliances and consumer devices.
- Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles and thermal-storage air conditioning.
- Providing consumers with real-time information and control options.
- Developing standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
- Identifying and resolving unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

California was successful in the DOE smart grid solicitations for various reasons. The state's goals for energy efficiency, renewable energy, alternative transportation fuels and vehicles, and GHG emission reductions are the most progressive in the nation, if not the world. Coupled with these aggressive policies is the Energy Commission's experience. The PIER Program has been conducting smart grid research for many years, long before the rest of the nation embraced the concept. In fact, five years before passage of the Energy Independence and Security Act of 2007, which identified key elements of the smart grid, the PIER Program was already conducting research on each of these key elements.

Smart grid research funding will identify and bring to market innovative solutions to the many challenges facing California's transmission system as a result of new technologies and energy policies. For example, rapid technological advancements will be needed to integrate and manage the impacts on the grid from increased renewable resources and the use of electric vehicles. The Energy Commission's participation will help ensure that smart grid projects develop products that will not become obsolete after expected technology advances or changes in standards or communication protocols.

Other benefits of the relatively minimal contribution of PIER funding to smart grid research include:

- Sharing project information, problem solutions, and success stories with other stakeholders in California so they can replicate results.
- Identifying the need for standards and protocols; issues with technology implementation, privacy and security; and workforce development needs.
- Ensuring interoperability and consistent deployment of smart grid technologies among utilities.
- Documenting consumer reactions to new technologies.

PIER is tracking all smart grid efforts not just in California but also throughout the nation to integrate research so that both the state and national smart grids can adequately communicate with each other.

In the future, PIER intends to sponsor research efforts to assess the interoperability, communication, and performance challenges facing the smart grid and provide assistance, advice, and recommendations to the many diverse project teams all over California.

ARRA-funded smart grid projects are positively influencing the direction of future Energy Commission research in several ways. The amount of federal dollars leveraged has enabled the Energy Commission to conduct research on a much larger scale than previously possible. This will accelerate the rate of industry growth, which will create a vibrant private market of new startups and associated venture capital investment in California. Once new industries or research projects are proven, they will become self sufficient and help the state achieve its energy efficiency and GHG reduction goals. Using existing PIER funds to leverage much larger amounts of federal funding has enabled the program to make a quantum leap in achieving research goals set out in support of the state's energy and environmental policy initiatives.

Alternative and Renewable Fuel and Vehicle Technology Program

AB 118 created the ARFVT Program to fund research, development, demonstration, and deployment of clean transportation energy technologies that will help meet the state's objectives to decrease petroleum use, increase in-state production of biofuels, create a diverse alternative fuel mix for California, and reduce GHG emissions.

The Energy Commission prepares an annual investment plan for the ARFVT Program that identifies funding priorities for the $100 million that is collected for the program each year through 2014. The investment plan establishes funding priorities and opportunities based on the goals of achieving 2020 GHG emission targets and putting the state on the trajectory to achieve 2050 targets. The Energy Commission has issued two investment plans since the program's inception, one in April 2009[44] and one in August 2010.[45] Each plan identifies areas with the highest potential from ARFVT Program investments, with a focus on demonstration and deployment activities.

DOE made its initial announcement of federal funding opportunities for alternative and renewable fuels and advanced vehicles in March 2009, immediately before the Energy Commission adopted its first investment plan. The Energy Commission used flexibility built into the investment plan to reallocate a portion of its transportation dollars to provide match funding to help California entities applying for ARRA funding.

The Energy Commission released a Program Opportunity Notice (PON) for ARFVT Program cost-share funding in April 2009. The PON and subsequent addenda identified federal ARRA FOAs eligible for cost-share funding consistent with the investment plan priorities. These included transportation electrification,

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44 California Energy Commission, *Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*, April 2009, http://www.energy.ca.gov/2009publications/CEC-600-2009-008/CEC-600-2009-008-CMF.PDF.

45 California Energy Commission, *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*, August 2010, http://www.energy.ca.gov/2010publications/CEC-600-2010-001/CEC-600-2010-001-CMF.PDF.

electric drive battery and component manufacturing, the Clean Cities program, and biomass fuels. Eligible solicitations from other agencies, like the Advanced Research Projects Agency and the Federal Transit Administration, and new DOE FOAs were included through addenda to the original PON as they were announced.

The Energy Commission received 193 pre-proposals from 188 applicants requesting $1 billion of ARVTP funds and $2.85 billion of ARRA funds. The Energy Commission provided letters of intent to 146 applicants resulting in 112 final proposals requesting more than $624 million of ARVTP funds and $1.8 billion of ARRA funds. In the interest of time, the Energy Commission relied heavily on the federal scoring process, which included an intensive technical review, but staff also carefully reviewed proposals for consistency with the Energy Commission's investment plan goals and priorities and with California's overarching transportation policies. Ultimately, 100 of the proposals that received letters of intent were unsuccessful in securing federal ARRA funding.

ARFVT Program dollars were offered as match funding in six federal ARRA solicitations. However, only three – transportation electrification, Clean Cities, and Advanced Research Projects – resulted in awards to projects that applied to the Energy Commission's PON. The Energy Commission awarded $36.5 million to nine projects that support the investment plan goals for electric drive, ethanol, and natural gas vehicles and infrastructure. These projects were awarded approximately $105 million in ARRA funds and are leveraging about $106 million of private investment, which when combined totals nearly six times the Energy Commission's cost-share investment.

The *2010-2011 Investment Plan* takes into account the expected advances in certain investment plan categories that will result from ARRA funding and also includes flexibility to make investments in innovative technologies and advanced fuels not specifically identified in the plan. The Energy Commission has also allocated funding for cost-share opportunities in future federal funding solicitations. The federal government is increasingly providing funding opportunities for innovative low-carbon fuels and vehicle technology research, development, and deployment through the DOE, the Environmental Protection Agency, the Department of Transportation, and the Department of Agriculture. California's ability to capture these funds will rely heavily on the ability of the state to partner with organizations and institutions to develop cost-share proposals to the federal agencies. Similar to the ARRA cost-share efforts, proposals requesting match funding will be evaluated based on their financial leveraging and overall consistency with the ARFVT Program goals.

In its *2008-2009 Investment Plan*, the Energy Commission dedicated $15 million in ARFVT Program funds to support workforce training and development activities under the ARRA-funded Clean Energy Workforce Training Program. Funds are leveraging clean transportation workforce activities including targeted training programs, green job surveys, industry needs assessments, and high-level transportation studies.

These funds were allocated through interagency agreements with the

Employment Training Panel, the Employment Development Department, and the California Community Colleges Chancellor's Office. The Energy Commission partnered with these agencies to gain valuable access to existing training programs and expertise, which has allowed efficient distribution of funds to local projects, quick implementation of training activities, and an available pool of newly trained workers to fill clean transportation energy jobs.

Examples of jobs for which participants are being trained include:

- Biofuel Production and Processing
- Compressed Natural Gas Vehicle Technicians
- Vehicle Conversion Maintenance/Repair Technician
- Fueling Station Installer and Service Technician
- Liquefied Natural Gas Vehicle Maintenance/Service Technicians
- Plug in Hybrid Electric Vehicle Conversion and Maintenance
- Electric Vehicle Conversion and Maintenance technicians
- Hybrid Automotive Technician
- Electric Vehicle Manufacturing Assembly Technicians
- Fuel Cell Vehicle Manufacturing Assembly and Service Technicians

The ARFVT Program also allocated $59.5 million to the Energy Commission's Clean Energy Manufacturing Program, a new and innovative venture that provides financing for eligible clean energy manufacturers of energy efficiency, renewable energy, and alternative fuels and transportation projects. The program includes the Clean Energy Business Financing Program, which was allocated $30.6 million from the State Energy Program, combined with funding from the ARFVT Program for the transportation element of the program.

The transportation-related portion of the Clean Energy Manufacturing Program includes financing administered through the California Alternative Energy and Alternative Transportation Financing Authority and the California Pollution Control Financing Authority located in the State Treasurer's Office. Financing is provided in the form of loans, loan loss reserves, bond issuance, credit enhancements, and other financing tools. Current financing areas include:

- Design, construction and operation of new biomethane gas production facilities.
- Restarting idle California ethanol production facilities if the facilities reduce their GHG emissions and move toward using alternative feedstocks.
- Improving, modifying, or expanding vehicle and vehicle component manufacturing facilities or activities.
- Design, construction, and operation of new California refineries that will produce ultra-low carbon biofuels.

Electric Vehicle Infrastructure – A Case Study for ARFVT Program Leveraging Efforts

California currently has 413 electric vehicle charging stations with 1,300 public access electric charge points. To accommodate the significant expected rollout of plug-in electric vehicles (PEVs) in California, however, the state will need to install and

upgrade its electric charging infrastructure. The Energy Commission awarded $15 million from the first ARFVT Program investment plan to upgrade existing charging sites and install new charging stations in all major metropolitan areas where PEVs will be introduced by automakers, adding nearly 4,000 residential charging installations and public charge points.

The Energy Commission expects automakers to introduce as many as 30,000 PEVS into the California market by the end of 2012. PEV manufacturers are choosing California for a variety of reasons, including state policies supporting alternative vehicles and fuels, abundant intellectual property, multiple state funding opportunities, and high social acceptance of PEVs. In addition, manufacturers of electric trucks, buses, and non-road vehicles can achieve vehicle cost-effectiveness at much lower manufacturing levels (3,000 to 5,000 vehicles per year) than with passenger vehicles.

Successful ARRA projects will expand the scope and accelerate the progress of investment plan goals for electric vehicles. Projects receiving cost-share funding will in essence double the amount of existing EV infrastructure, putting the state on the trajectory needed to upgrade and add new charging infrastructure to match the expected rollout of EVs by 2012.

Cost-share funding is also leveraging far more than the Energy Commission's original investment plan expectations that projects would match the ARFVT Program funding at a 1:1 ratio. The investment of $18 million from the first investment plan's $46 million allocated to electric drive technologies is now leveraging approximately $128 million in ARRA and private funding, more than seven times the amount of cost-share funding. This additional investment in California's electric vehicle infrastructure will help move the state more quickly toward a goal of 1 million electric vehicles in the state by 2020.

California has been preparing for proposed PEV rollouts for several years. The Energy Commission funded the development of a research center at University of California at Davis focusing on plug-in hybrid EVs and battery EVs, and helped form the statewide PEV Collaborative, which is bringing stakeholders together to create a strategic plan for PEV success in California. The Council will conduct public meetings during the latter part of 2010 with the goal of a draft strategic plan by December 2010. Regional planning efforts have also been underway for the past several years in San Diego, Los Angeles, the San Francisco Bay Area, and Sacramento that include regional and local governments, vehicle manufacturers, utilities, and EV consortia.

The Energy Commission is also coordinating with the PEV Collaborative to develop a statewide guidance document for awardees installing charging infrastructure. The purpose of the document is to ensure the best use of state and federal funds for PEV infrastructure deployment including avoiding duplication of effort, mitigating on-peak charging, minimizing stranded investment by focusing investments on infrastructure with the highest likelihood of use, promoting customer satisfaction with PEVs, and developing a statewide database of PEVs and charging infrastructure. The document will be developed through a public process with input from stakeholders including equipment manufacturers,

infrastructure providers, utilities, local and state governments, and industry organizations.

Federal Tax Credits and Loan Guarantees

The final category of ARRA funding coming to California includes tax credits jointly administered by the United States Department of the Treasury and DOE and loan guarantees administered by DOE. ARRA extended many of the consumer tax incentives originally introduced in the Energy Policy Act of 2005, allowing consumers to receive tax credits for as much as 30 percent of the cost to install renewable energy sources or energy efficiency measures in residential buildings. Taxpayers can also get credits for certain types of PEVs.[46]

ARRA also includes a provision for taxpayers to get cash assistance from the United States Treasury in lieu of a 30 percent tax credit for renewable energy property. As of September 2010, there are 157 renewable projects in California that have been awarded $240 million through this program. Awards to date are primarily for solar installations, with a smattering of biomass, fuel cell, geothermal, landfill gas, and wind projects. To qualify for the tax credits, projects must be either placed in service in 2009 or 2010, start construction by the end of 2010, or spend five percent of the project cost by the end of 2010.

Lack of access to low-cost financing is a major barrier in the development of clean energy technologies. DOE is therefore providing loan guarantees financed by ARRA to support clean energy projects that use innovative technologies and to spur further investment in these advanced technologies. Projects must begin construction by September 30, 2011, to qualify for loan guarantees. DOE has awarded conditional loan guarantees to the following projects to date:

- Solyndra, Inc., received $535 million to expand its solar panel manufacturing facility in Fremont, California. Solyndra plans to expand its manufacturing capacity and create 1,000 jobs. This added capacity will help provide the equipment needed to meet California's goals for 3,000 MW of PV installed in the state by 2017.
- BrightSource Energy, Inc., has been offered conditional commitments for more than $1.37 billion in loans guarantees to support the construction and start-up of the 370-MW Ivanpah Solar Electric Generating System. This facility will be instrumental in helping California achieve its 33 percent by 2020 renewable energy target, while creating more than 90 permanent jobs.
- Tesla Motors has been offered a $465 million loan to finance a manufacturing facility for the Tesla Model S electric car and to support a facility to manufacture battery packs and electric drive trains. This project will help address the need for new alternative vehicles to meet California's petroleum reduction goals.

DOE currently has three open solicitations for loan guarantees with final application deadlines ranging from December 31, 2010, to January 31, 2011.

46 Recovery Act website, "Energy Tax Credits Extended," June 25, 2010, http://www.recovery.gov/News/featured/Pages/TaxCredits.aspx.

There are 49 renewable power plants totaling more than 11,000 MW being proposed in California that have either applied or indicated their intent to apply for ARRA tax credits or loan guarantees. Nine of these projects are large solar thermal power plants under the Energy Commission's power plant licensing jurisdiction which will provide more than 4,000 MW of new renewable generating capacity to California.[47] Chapter 3 discusses these projects and the challenges they face in meeting ARRA deadlines.

Conclusion

California is receiving ARRA funding through formula grants, competitive solicitations, and tax credits/loan guarantees. The Energy Commission is administering its formula grants through a suite of programs that include efforts to get funding into the economy quickly combined with new and innovative programs that will provide long-term and sustainable energy savings and economic benefits. Energy Commission programs focused on overcoming some of the major challenges to clean energy development in California, including cost, financing, consumer awareness, quality assurance, and workforce development.

ARRA-funded programs are providing immediate benefits through revolving loans and grants to local governments to defray the costs of investments in energy efficiency and renewable energy. New retrofit programs are transforming the market by providing financing assistance, workforce training, and a single source of information for consumers about the wide variety of resources available to support energy efficiency retrofit efforts. These programs will reduce energy costs and GHG emissions while creating new jobs and bringing new industries to local communities.

The Energy Commission's workforce training programs are leveraging ARRA, federal, and existing program funding to provide the skilled workforce that will be needed to fill these new jobs and to implement California's energy programs at the large scale needed to achieve the state's energy policy goals.

The Energy Commission is providing low-interest loans to encourage existing manufacturers to remain in California and expand their operations, and to encourage new companies to locate here. Existing programs, like the PIER and the ARFVT programs, are providing cost-share funding and bringing more than a billion dollars in additional investments in clean energy infrastructure and development to California.

ARRA funding has the potential to revolutionize California's energy sector and accelerate the achievement of the state's energy and environmental goals. Through its comprehensive MV&E effort, the Energy Commission will ensure that ARRA-funded projects deliver the expected jobs, energy savings, and GHG reductions and contribute to that market transformation.

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47 Renewable Energy Action Team Generation Tracking for ARRA Projects, http://www.energy.ca.gov/33by2020/documents/renewable_projects/Proposed_ARRA_Renewable_Projects.pdf .

Chapter 3: Renewable Power Plant Development in California

Introduction

This chapter focuses on the impact of American Recovery and Reinvestment Act of 2009 (ARRA) funding on the development of large-scale solar energy projects in California. Two programs authorized under ARRA – the 1603 Program Payments for Specific Energy Property in Lieu of Tax Credits administered by the United States Treasury and the United States Department of Energy (DOE) Loan Guarantee Program – offer substantial incentives for qualifying renewable energy projects.

ARRA extended an existing 30 percent investment tax credit for qualifying renewable energy projects and allowed developers to opt for a cash grant from the United States Treasury in lieu of the tax credit for as much as 30 percent of the qualifying cost. To qualify for the 1603 Program, projects must be either placed in service in 2009 or 2010, start construction by the end of 2010, or expend 5 percent of the project cost by the end of 2010. Projects seeking to qualify for the 1603 Program by starting construction or spending 5 percent of their project costs must also be operational by a specified year, which is 2016 for solar projects, 2013 for geothermal projects, and 2012 for wind projects.

Several proponents of solar thermal generating facilities eligible for ARRA incentives indicated to both state and federal agencies that to meet the 2010 deadline for start of construction, they needed their permits by fall of 2010. They explained this was necessary to allow enough time to secure financing, mobilize construction work, and comply with pre-construction conditions of certification.

Several of the projects have executed power purchase agreements with two sets of power prices – a lower one if they are awarded the cash grant and a higher one if not. Thus, ARRA may allow California to achieve its renewable energy goals at a lower cost to ratepayers. For some projects, the cash grants may be absolutely essential to obtaining financing given the general disruption in the tax equity markets associated with the collapse of the financial markets.

ARRA also expanded the DOE's Loan Guarantee Program to support clean energy projects that use innovative technologies, including large-scale renewable energy projects. The program's initial solicitation provided $2.5 billion in assistance for an expected $21 billion worth of new renewable energy projects through secure financing at competitive rates.

To qualify for a loan guarantee, projects need to meet fairly stringent risk assessment criteria and begin construction by September 30, 2011. Because of this later deadline, projects that are unable to meet the 1603 Program construction deadlines can still benefit from a loan guarantee. In a July 22, 2010, letter to DOE, Governor Schwarzenegger noted the importance of the Loan Guarantee Program in conjunction with the 1603 Program for financing solar projects and urged DOE to accelerate its review and approval of projects applying for loan guarantees.

For purposes of illustration, if only five of the nine projects within the Energy Commission's jurisdiction that are seeking tax credits and/or loan guarantees are able to proceed to construction and operation in time to meet ARRA deadlines, the benefits to California from the investment tax credit alone would be nearly $1.4 billion. In addition, these projects would provide upward of 6,000 temporary construction jobs and more than 1,000 full-time operation jobs.

California Context

Because of California's longstanding efforts to attract renewable energy projects to the state and the acceleration of those efforts in recent years, California is in a position to benefit tremendously from these ARRA programs.

In 2002, the California Legislature passed the Renewable Portfolio Standard (RPS) requiring investor-owned utilities (IOUs) to have 20 percent of their electricity supply mix derived from renewable sources by 2017. This requirement was accelerated by subsequent legislation in 2006 requiring the 20 percent target to be met by 2010.

Also in 2006, the Legislature enacted Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006), the Global Warming Solutions Act of 2006. AB 32 requires California to reduce its greenhouse gas (GHG) emissions to 1990 levels by 2020 and charged the California Air Resources Board (ARB) with developing a roadmap for achieving this goal. In its *Climate Change Scoping Plan* report, released in 2008, the ARB identified achievement of a 33 percent by 2020 RPS as a foundational policy for meeting the state's GHG emission reduction goals.

Consistent with recommendations from the Energy Commission's *2004 Integrated Energy Policy Report Update*, in November of 2008, Governor Schwarzenegger issued Executive Order S-14-08 establishing a 33 percent by 2020 RPS target, and in September of 2009 he ordered the ARB to implement a 33 percent renewable energy standard for both investor- and publicly owned utilities in California.[48] Regulations for the ARB's Renewable Energy Standard were adopted by the ARB on September 23, 2010.[49]

The California Public Utilities Commission (CPUC), which oversees the procurement of renewable resources by IOUs under California's RPS statute, has established annual procurement targets and renewable resource solicitation requirements. Under the CPUC's rules, each IOU is required to plan for the acquisition of renewable resources on an annual basis. After CPUC approval of the plans, IOUs conduct solicitations for renewable generation.

RPS solicitations have been steadily gaining momentum for the past five years, with the 2008 and 2009 RPS solicitations especially robust. In the 2009 solicitation alone, IOUs received bids for approximately 100 terawatts of renewable energy, nearly a quarter of which was shortlisted to proceed to contract negotiations.[50] As a result,

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48 Executive Orders S-14-08 http://gov.ca.gov/executive-order/11072/ and S-21-09 http://gov.ca.gov/executive-order/13269.

49 California Air Resources Board, "California Commits to More Clean, Green Energy," September 23, 2010, press release, available at: http://www.arb.ca.gov/newsrel/newsrelease.php?id=155 .

50 See the *Renewables Portfolio Standard Quarterly Report for Q1 2010* published by the California Public Utilities Commission, available at

California had many renewable energy projects already in the queue for development when ARRA was passed.

The RPS law originally required publicly owned utilities to implement an RPS but gave them flexibility in developing specific targets and timelines. The ARB's Renewable Electricity Standard proposed regulations, however, will create a program that is consistent for all electrical entities. Publicly owned utilities have been moving toward procurement of 33 percent renewable in furtherance of policies established by their governing boards, as well as in anticipation of implementation of the policies set forth in the ARB's *Climate Change Scoping Plan*. Based on data submitted in the *2009 Integrated Energy Policy Report* proceeding, publicly owned utilities could increase their renewable percentage of retail sales from 10 percent in 2008 to as much as 30 percent by 2018.[51]

These policies culminated with the Energy Commission beginning to receive in early 2007, for the first time in nearly two decades, requests from renewable energy developers interested in filing Applications for Certification (AFCs) for new solar thermal power plants. In 2007, developers filed two AFCs for solar thermal projects and one for a natural gas/solar thermal hybrid project. AFCs for three more solar thermal plants and another natural gas/solar thermal hybrid were filed in 2008.

In the months after passage of ARRA in February 2009, developers filed six new solar thermal AFCs with the Energy Commission.

By fall 2009, the Energy Commission was reviewing applications for 12 solar-thermal projects seeking to avail themselves of the ARRA incentives. Nine of these projects, totaling approximately 5,000 megawatts (MW) of generating capacity, are on track to meet ARRA deadlines, seven of which are located on land managed by United States Bureau of Land Management.[52] The Renewable Energy Action Team project table indicates another 90 proposed wind and solar photovoltaic projects outside of the Energy Commission's jurisdiction accounting for an additional 8,300 MW, although how many of these may seek ARRA funding is unclear.

Cooperative Planning and Coordination Efforts for Renewable Resources

The surge in impending renewable energy development led to a number of cooperative planning efforts in California involving multiple agencies and stakeholders. In 2007, the Energy Commission, the CPUC, and the California Independent System Operator (California ISO) launched the Renewable Energy Transmission Initiative, or RETI. RETI is a stakeholder-driven process with broad-based participation by renewable energy project developers, environmental groups, investor- and publicly owned utilities and other stakeholders. Because RETI

ftp://ftp.cpuc.ca.gov/OGA/reports/2010/2010%20RPS%20Report%20to%20the%20Legislature%20%20Q1%20Feb%2010,%202010.pdf.

51 California Energy Commission, *An Assessment of Resource Adequacy and Resource Plans of Publicly Owned Utilities in California*, Staff Report, November 2009, http://www.energy.ca.gov/2009publications/CEC-200-2009-019/CEC-200-2009-019.PDF.

52 Two applications were withdrawn during the review process, and one project was deferred by its proponent to allow for additional studies.

participants expected a sizeable portion of the anticipated renewable development to occur on lands managed by the federal government, RETI includes over 30 stakeholders, including state agencies such as the Energy Commission and the Department of Fish and Game along with federal governmental agencies like the United States Bureau of Land Management (BLM) and United States Fish & Wildlife Service as stakeholders.

Using publicly available data on renewable energy potential and biological resources, RETI stakeholders identified Competitive Renewable Energy Zones – areas with high renewable energy potential and fewer environmental impacts – and a conceptual transmission infrastructure to connect this new generation to the electric grid.

In August of 2007, the Energy Commission and the BLM signed a Memorandum of Understanding (MOU) to coordinate review of solar thermal projects proposed on federal land. The MOU was followed in 2008 by formation of the Renewable Energy Action Team (REAT), composed of the Energy Commission, the Department of Fish and Game, BLM, and the United States Fish & Wildlife Service. Governor Schwarzenegger's Executive Order S-14-08 established the REAT and directed it to coordinate and streamline renewable energy project permitting.

In addition, the Executive Order directed the development of the Desert Renewable Energy Conservation Plan (DRECP). Building on the groundwork laid by RETI, the DRECP is developing a comprehensive planning effort for renewable energy development and species conservation in the Mojave and Colorado deserts where California's best solar resources are located.

In parallel, in spring of 2008 BLM and DOE jointly initiated the Solar Programmatic Environmental Impact Statement (PEIS) process, a federal impact analysis and land use planning document supporting BLM's decision to adopt a solar energy development program on BLM-managed lands in six Western states, including California. The solar development program will be implemented by amending BLM land use plans for the Colorado and Mojave deserts to allow solar development under specific terms and conditions. The Energy Commission is a cooperating agency in the federal Solar PEIS process, which coordinates the California Solar PEIS Interagency Working Group of five federal, seven state, and two local agencies.

In October 2009, Governor Schwarzenegger and Secretary of the Interior Salazar signed an MOU through which California and the United States Department of the Interior committed to work together to accelerate completion of environmental review and permitting of ARRA-eligible projects in time for them to meet the stringent ARRA deadlines. To further this goal, the MOU established a Renewable Energy Policy Group (REPG) consisting of senior staff representatives from the Governor's Office, the California Natural Resources Agency, the United States Department of the Interior and the REAT agencies.[53] California and the United States Department of Interior also

53 The Renewable Energy Policy Group also includes representatives from the California Public Utilities Commission, the California Independent System Operator, the Department of Defense, the National Park Service, Region IX of the United States Environmental Protection Agency, the United States Army Corp of Engineers, and the State Attorney General's Office.

agreed to cooperate in the development of the DRECP and the Solar PEIS.

Work on the DRECP subsequently formed the basis for the in-lieu mitigation program established by Senate Bill X8 34 (Padilla, Chapter 9, Statutes of 2010). SB X8 34 created an option for developers of ARRA-eligible projects located within the DRECP planning area to mitigate for certain biological impacts of their projects by paying money into a fund as specified by the California Department of Fish and Game. This fund will be used to pay for mitigation strategies to protect, restore, or enhance the habitat of listed species located in the DRECP planning area. The mitigation strategies are to be reviewed by the DRECP science advisory panel and ultimately incorporated into the final DRECP.

The interagency agreements and close departmental working relationships, as well as the prioritization of the work by the Governor's Office and United States Department of the Interior, have been critical for the timely consideration of the permitting applications for renewable projects to meet the ARRA deadlines. Processing such a large number of renewable energy project applications in such compressed time frames was possible only through the close coordination among the regulatory and resource agencies and the high priority placed on these projects by the REAT agencies. Agencies have been meeting on a weekly basis for nearly two years to address renewable project permitting and siting issues, ways to coordinate and expedite the project review process, and development of the DRECP. These regular meetings have dramatically improved communications and facilitated more timely decisions. The REAT agencies are undertaking a "lessons learned" exercise at the end of 2010 to examine and record the efforts that were successful and identify solutions for those areas that need improvement so that all agencies may benefit and build on the knowledge gained from the ARRA experience.

California Renewable Energy Projects Seeking ARRA incentives

As of October 2010, 249 renewable projects are seeking permits in California, which includes 49 ARRA projects that represent 2,988 MW of wind, 3,718 MW of solar photovoltaic, and 4,043 MW of solar-thermal energy projects.[54] Of these, nine of the largest projects, representing 38 percent of the total ARRA generation capacity, are solar thermal projects greater than 50 MW in size and therefore under the Energy Commission's power plant licensing jurisdiction. The REAT has worked with local government permitting agencies in California counties with desert lands to address the environmental impacts of issues associated with proposed non-thermal projects not under the Energy Commission's jurisdiction, primarily wind and large-scale solar photovoltaic projects.

To put into perspective the potential contribution of the nine projects under the Energy Commission's licensing jurisdiction to the state's renewable energy target, these 4,043 MW, operating at an annual capacity factor of 27 percent, would generate

54 California Energy Commission, Proposed Renewable Energy Projects for California, http://www.energy.ca.gov/33by2020/documents/index.html, accessed October 1, 2010; solar thermal project totals based on revisions to project sizes resulting from the Energy Commission's licensing decisions.

approximately 10,000 GWhs of renewable electricity, representing 15-17 percent of the new generation that will be needed to meet the 33 percent by 2020 RPS goal.[55]

Challenges in Renewable Power Plant License Review

State and federal agencies faced significant challenges in reviewing such a large number of projects with the same permitting deadline. To meet ARRA deadlines, the Energy Commission's equivalent California Environmental Quality Act (CEQA) review permitting process had to be completed in an expedited timeframe. To be able to start construction by the 1603 Program deadline after being approved by the Energy Commission, projects that filed late in 2009 after ARRA's passage in February 2009 would need their environmental review within 9 to 11 months of acceptance of their AFC, which is less than the 12 months specified in Public Resources Code Section 25540.6 for the permitting of natural gas and solar thermal powered facilities.[56] For projects proposed on federal lands, the National Environmental Policy Act review and permitting process needed to be both expedited by BLM and coordinated with the Energy Commission's review process.

Utility-scale solar thermal power plants involved complex environmental and engineering issues that required intensive review and analysis, especially given the accelerated timeframes required by ARRA. The size of the projects analyzed by the Energy Commission ranged from 1,765 acres to 9,400 acres (2.7 to 14.6 square miles), in contrast to a typical 500 MW conventional natural gas-fired generation facility, which might occupy only 30 acres.

In addition, these projects were all proposed in the Mojave and Colorado deserts, which have some of the best quality solar resources in the world but which are habitat for a number of rare and endangered animal and plant species such as desert tortoise, Mohave ground squirrel, several varieties of rare lizards and bighorn sheep, and numerous rare plants. Land in the Mojave and Colorado Deserts also has the potential to contain a wide array of historic and prehistoric cultural artifacts, including Native American resources of great antiquity. Also, given the large sites and vast arrays of solar collectors required to meet the electricity generation amounts specified in power purchase contracts, visual changes resulting from the ARRA solar projects are inevitable. The Energy Commission's environmental analyses have also noted that construction and installation of large industrial structures in fairly sweeping, open desert landscapes will affect current vistas.

Access to water for both construction and operational needs has also been a major challenge in the arid desert region. In addition to challenges associated with the proposed use of water by the projects themselves, a number of projects are proposed on terrain with many natural drainage channels and washes, which has complicated the engineering design process

55 Range based on updated Assembly Bill 32 Scoping Plan policies and estimates of existing renewable generation.

56 The Energy Commission and applicant may agree on more time. Thus, a typical facility approved by the Commission between 2003 and 2008 took approximately 18 months from initial filing to reach final decision.

for site grading, placement of solar collector structures, and storm water management. Desert flash floods are fairly infrequent, but projects still must be designed to be able to withstand them.

Each ARRA solar project has presented environmental issues unique to its site and also contributed to cumulative impacts affecting a broader desert region due to the large number of thermal and photovoltaic projects proposed, particularly on BLM lands.

Because of these complexities, the environmental and engineering review of a typical solar thermal project has required approximately 75 percent more staff resources than review of a conventional natural gas project. The permitting process for the nine ARRA-eligible solar thermal projects therefore consumed staff and other resources equivalent to more than 15 conventional facilities. The workload of the Energy Commission's power plant siting staff during review of the ARRA-eligible projects was approximately four times the historical norm.

To meet these demands, the Energy Commission prioritized the review of renewable energy projects versus natural gas projects in the permitting queue. Staff also undertook an internal review of the siting process and made a number of incremental adjustments to enhance its efficiency. For example, in November of 2009, staff was directed to work on State of California Furlough Fridays, with banked furlough days to be used after completion of the ARRA solar project siting effort. The Energy Commission's permanent siting staff has also been supplemented with numerous contract consultants for various environmental and engineering disciplines, such as soils and water, biological, and cultural resources.

Both the Legislature and the Governor recognized the strain on the staff of California agencies responsible for environmental review of the ARRA siting projects. Both worked together and with agency management to craft programs designed to ensure there were sufficient resources to complete environmental review of the ARRA projects. In February of 2010, SB X8 34 provided additional resources requested by the Energy Commission to review all of the ARRA projects in accordance with ARRA timelines through recruitment and retention pay to select Energy Commission siting staff. At the same time, the Governor's Office and the State Personnel Board developed an "arduous pay program" to recognize and compensate high-level siting staff who were otherwise ineligible for overtime wages to compensate them for the extraordinary amount of overtime necessary to complete the Energy Commission's review of power plants in the siting queue.

From January 2010 through August 2010, Energy Commission siting staff worked thousands of additional hours eligible for overtime and arduous pay to complete environmental review of all ARRA projects by the deadlines, and thereby potentially secure billions of dollars in federal assistance to help California achieve its renewable energy goals. During this same period, the Energy Commission paid a recruitment and retention bonus of $600 per month to about 50 employees at a total cost of approximately $240,000. While these figures are substantial in absolute terms, they are considerably less than the billions of dollars in potential ARRA assistance

California stands to gain from construction of the projects pending before the Energy Commission.[57]

Renewable Power Plant Status and Outcomes

To date, the Energy Commission has certified six solar thermal power plants seeking ARRA funding, and is scheduled to reach decisions on three more by the end of the year. The environmental review process for ARRA projects has resulted in substantial reconfigurations in some projects, including reduced site footprints, to avoid and minimize impacts to sensitive wildlife habitat and plant species, reduce changes to desert washes, and minimize drainage impacts. Other changes included compensating land acquisitions made to mitigate for loss of biological habitat, in particular for the desert tortoise and the Mojave fringe-toed lizard, as well as the flat-tailed horned lizard found in the southern region of the Colorado Desert. In addition, the environmental review process resulted in improved site specific mitigation such as mitigation for loss of foraging habitat for desert bighorn sheep. Multi-project mitigation funds for regional cultural resources studies and possible historic register nominations were established. Requirements for enhancing local fire protection and emergency service response resources were also a significant outcome of the review process.

Where possible, the Energy Commission has adopted Conditions of Certification designed to mitigate for cumulative impacts of the solar thermal projects, particularly in the biological, cultural, and soil and water resources areas. Cumulative visual, land use, and cultural resource impacts remain in several regions; however, the Energy Commission concluded that the projects' overall benefits outweighed the impacts.

Challenges remain for projects that have received their federal and state approvals. In addition to having government approvals, projects must be able to obtain financing, obtain a contract to sell their power, and secure access to the transmission infrastructure needed to get that power to the grid. To accommodate these needs, the California ISO and Southern California Edison expedited by six months their assessments of transmission interconnection arrangements for these projects, many of which had to be examined as "clusters" of projects. The California ISO has had to develop innovative regulatory mechanisms to address both the allocation of the costs for these interconnections and the phasing of the project development and necessary transmission upgrades.

The California ISO and utilities have also observed that the ARRA solar projects' "scale-up" and phasing plans for incremental development complicates the process of building and accommodating renewable transmission, particularly from a financing perspective. The Federal Energy Regulatory Commission will need to

57 Despite this extremely heavy ARRA Project workload, the Energy Commission managed to act on several natural gas-fired power plant applications. Specifically, during 2010 the Energy Commission certified the Canyon Power Plant in March, Lodi Energy Center in April, the Marsh Landing Generating Station Project in August, and is on schedule to consider certification of the Almond 2 Peaking Power Plant Project in December 2010. In addition, the Energy Commission authorized 12 modifications to previously certified natural gas-fired power plants in 2010, and may authorize several more modifications to existing natural gas facilities before the end of the year.

approve the interconnection agreements and the California ISO's innovative regulatory approaches in a timely fashion. Similarly, the CPUC has been expediting its review of amendments to the power purchase agreements and any required enhancements to the transmission network. As discussed earlier, it will also be critical for the Department of Energy to issue timely decisions on loan guarantee applications for many of these projects.

In addition, while some projects presented fewer environmental complexities and therefore aroused little or no opposition, others remain controversial and may face litigation before they can move forward. While it is unclear whether all the projects that made it through the permitting stage will ultimately be built, some almost certainly will be. California's electricity system will be cleaner and its economy will be stronger to the extent that these projects are built and able to take advantage of ARRA incentives.

Conclusion

As this period of unprecedented renewable energy permitting activity winds down, the Energy Commission and other REAT agencies will undertake a lessons-learned exercise to examine and record the efforts that were successful and identify solutions for areas that need improvement. Agencies, applicants, environmental groups and other stakeholders have all learned from the environmental review of the ARRA projects. There were significant variations between the projects, and it is clear that factors such as site selection, project design, and water source and usage make a tremendous difference in the nature and extent of environmental impacts. Different technologies also have advantages and disadvantages from an environmental perspective. This knowledge and experience should inform all parties and hopefully ensure that the next round of projects proposed in California is better planned and presents fewer issues from the outset.

The Energy Commission is currently accepting comments on the Desert Renewable Energy Best Management Practices Manual developed by the REAT, which may be informed by this experience. The Energy Commission will consider policies to address issues common to many of the projects, such as an update to the existing water policy addressing desert projects' use of groundwater and the advantages of choosing sites on disturbed lands with few sensitive resources. The Energy Commission will also consider changes to its siting regulations as well as potential recommendations for legislative action.

The intensive and fast-paced environmental review process for the ARRA projects was difficult for all parties, but was perhaps hardest on thinly staffed interveners and members of the public trying to engage actively with the Energy Commission for one or more projects, often for the first time. The Energy Commission is particularly interested in learning about the experience of people new to its process and finding ways to make it easier for the public to understand and engage in that process.

Finally, the DRECP will continue to drive ongoing scientific research and stakeholder engagement, including critical engagement with local governments. It is essential in the Energy Commission's planning and permitting role to engage with local governments as partners as was done with

the other REAT agencies. The DRECP provides this opportunity to develop a roadmap for how to achieve both renewable energy development and species conservation in the California desert, across federally managed and privately owned land, and spanning the seven counties within the DRECP planning area.

Chapter 4:

Overview of Energy Commission Formula-Based Awards and Leveraging Efforts

Introduction

As described in earlier chapters, California has been awarded approximately $4.7 billion to date through the American Recovery and Reinvestment Act of 2009 (ARRA) for energy-related efforts. This funding was awarded through formula grants based on population, competitive solicitations, and tax credits/loan guarantees. This chapter describes the Energy Commission's programs to administer $314.5 million in ARRA formula awards and to provide cost-share support to applicants for federal ARRA solicitations. The chapter also briefly describes tax credits and loan guarantees being provided by the United States Department of the Treasury, the Internal Revenue Service, and the United States Department of Energy.

Formula Grants

As the state's primary energy agency, the Energy Commission was awarded $314.5 million in ARRA funding to administer through four nationally based programs:

The State Energy Program (SEP): The SEP has historically provided financial and technical assistance to states for developing strategies and goals to meet energy priorities. ARRA allocated $3.1 billion in stimulus funding to the SEP, which was then awarded to energy offices in individual states through formula and competitive grants. The DOE awarded the Energy Commission $226 million in SEP funds on June 25, 2009.

The Energy Efficiency and Conservation Block Grant (EECBG) Program: The Energy Independence and Security Act of 2007 authorized the EECBG Program, which is being funded for the first time with $3.2 billion through ARRA. The intent of this national program is to help United States cities, counties, states, territories, and Native American tribes develop, promote, implement, and manage energy efficiency and conservation projects and programs. California's EECBG Program was allocated $49.6 million, most of which has been awarded to small cities and counties for energy efficiency activities and projects.

State Energy Efficient Appliance Rebate Program: The DOE established this program and is providing up to $300 million in ARRA funding support. State energy offices are administering the program and will provide rebates to consumers for replacing used appliances with new ENERGY STAR®-qualified appliances. California's Cash for Appliances Program ($35.2 million) originally provided rebates for clothes washers, refrigerators, and room/window air conditioners, and was recently expanded to include dishwashers, freezers, water heaters, and heating, ventilation, and air conditioning (HVAC) systems.

The State Energy Assurance Initiative: Funded with $39.5 million through ARRA, this initiative provides money to state governments to improve their emergency plans and ensure regional grid resiliency, including staff training on smart grid technologies integration, interdependencies, and cyber-security. California will use its share of the funding ($3.6 million) to update

the state's Energy Assurance Plan and to support local governments in making updates to their plans.

The following section provides more detail for each of the Energy Commission-administered ARRA programs, including the status of funding awards as of publication of this report, a general description of funded activities, and expected results. Because many of the ARRA-funded efforts are still in the early stages of development, there are few actual results to report at this time. Although the expected results of these programs are striking, not all the program areas required applicants to report on every category of expected benefits; therefore, the information provided here on expected results represents only a portion of the total benefits that these programs could ultimately deliver.

State Energy Program

California's SEP funding is divided among six areas:

- Energy Upgrade California ($113 million).
- The Clean Energy Workforce Training Program ($20 million) .
- The Clean Energy Business Finance Program ($30.6 million).
- Energy Conservation Assistance Act Low-Interest Loans ($25 million).
- The Department of General Services Energy Efficiency State Property Revolving Loan Program ($25 million).
- Program support and contracts for auditing, measurement, verification, and evaluation of ARRA-funded projects and their results ($12.4 million).

State Energy Program Totals

Funding: **$226 million**

Public/private funds leveraged: **$637 million**

Jobs created/retained: **5,621**

Energy cost savings: **$13.9 million**

Electricity saved per year: **141 million kWhs**

Natural gas savings per year: **2.5 million therms**

GHG reduction per year: **337,000 tons**

The Energy Commission adopted its *State Energy Program Guidelines* in February 2010 to help implement and administer the various SEP program areas.[58] Consistent with federal requirements, all programs and activities awarded SEP funds must be completed and the funds spent by March 31, 2012.

A complete list of projects and programs awarded ARRA funds by the Energy Commission is available in Appendix A.

Energy Upgrade California

Energy Upgrade California is an umbrella program that includes the Municipal and Commercial Building Targeted Measure Retrofit Program, the California Comprehensive Residential Building Retrofit Program, discretionary block grants focused on residential energy efficiency retrofits, and the California Clean Energy Workforce Training Program. The following sections discuss the two retrofit programs and the Clean Energy Workforce Training

58 California Energy Commission, *State Energy Program Guidelines, Third Edition,* August 6, 2010, http://www.energy.ca.gov/2009publications/CEC-150-2009-004/CEC-150-2009-004-CMF-REV2.PDF

Program, while the section on the Energy Efficiency and Conservation Block Grant Program describes the discretionary block grants.

Municipal and Commercial Building Targeted Measure Retrofit Program

This program focuses on energy efficiency retrofit programs in municipal and commercial buildings in California. The funded programs will reduce greenhouse gas (GHG) emissions by reducing energy use and stimulate the economy by training workers to perform on-site assessments of potential energy savings and install equipment.

Municipal and Commercial Building Targeted Measure Retrofit Program

Funding: **$29.6 million**

Public/private funds leveraged: **$16.7 million**

Jobs created/retained: **605**

Electricity saved per year: **73 million kWhs**

Natural gas savings per year: **395,200 therms**

The program builds on the success of demonstration projects funded by Public Interest Energy Research (PIER) for exterior lighting, commercial kitchen ventilation, and heating, ventilation, and air conditioning (HVAC) technologies that use 50-70 percent less energy than the models they replace.

The three subprograms awarded funds from this program are described below. All information is from the applicant's original proposals.[59]

- **The *EnergySmart Jobs Program*** *($18.8 million)* focuses on delivering energy and costs savings through retrofits of existing refrigeration systems in the commercial retail sector using refrigeration controls, Visi Cooler controllers, light-emitting diode (LED) case lighting, and some compact fluorescents. Portland Energy Conservation, Inc., is partnering with jobs programs, community colleges, private sector technology firms, utilities, manufacturers, and technical trainers to execute workforce training, pre- and post audits, installation, incentive management, and verification of energy savings. The program is targeting approximately 40,000 facilities in California – including 17,000 large and small grocery stores – and will prioritize the facilities based on energy savings potential and facility type.

  This program expects to create 117 direct jobs and help retain more than 200 contractor and auditor positions throughout California. One of the key partners in the program is the California Conservation Corps, which will supply screened trainees to meet the program's auditing needs and help guarantee new jobs.

  By retrofitting existing refrigeration systems, the program expects to save about 88 million kilowatt hours (kWhs) over two years. In addition, because the

59 Proposals available on the California Energy Commission website at: http://www.energy.ca.gov/recovery/sep.html#efficiency.

savings in the commercial refrigeration sector are relatively untapped, this program will help to transform the market by demonstrating that commercial refrigeration systems can be upgraded cost-effectively. This will contribute to widespread acceptance of advanced energy-efficient refrigeration technologies, thereby continuing the benefits of the program far beyond its two-year life. The program will more than meet the ARRA cost-effectiveness requirements by saving 45.8 million British thermal units (BTUs) per $1,000 spent versus ARRA's requirement of 10 million BTUs per $1,000 spent.

The program is leveraging nearly $900,000 through its program partners, which include jobs programs, community colleges, private sector technology firms, utilities, manufacturers, and technical trainers.

- ***The Energy Technology Assistance Program*** *($5.9 million)* plans to install cutting-edge energy efficiency measures in local government and special district facilities in Northern and Southern California. Energy Solutions, Inc., is partnering with 21 municipal agencies throughout the state to implement 79 specific projects that will use an estimated 10,770 efficiency measures, including parking lot and garage lighting fixtures with occupancy sensors and wireless lighting and HVAC controls. The program will also provide workforce development and training for electrical and HVAC installation contractors, and green internships and job opportunities for Workforce Institute and community college green certification program participants.

California Lighting Technology Center

The California Lighting Technology Center (CLTC), one of the workforce training partners for the Energy Technology Assistance Program's wireless lighting controls installer training, is a collaborative effort of the Energy Commission's PIER Program and UC Davis. The PIER Buildings Program provided start-up funding for the CLTC, a research and education facility that focuses on the application of energy efficient lighting and daylighting technologies through research, development, demonstration, outreach, and education in partnership with utilities, manufacturers, end users, builders, designers, and governmental agencies.

The program expects to create 211 direct jobs by increasing the demand for installation of targeted lighting and HVAC measures and will provide training on best practices installation, operations, and maintenance of the targeted measures to municipal facilities, entry-level and unemployed workers in the Green Jobs Training Programs, and community college faculty. As part of its job creation efforts, it will provide training to 40 contractors needed to support the program as well as 20 HVAC controls contractors.

The program expects to achieve annual energy savings of nearly 21 million kWhs, 243,200 therms of natural gas, and 1.7 MW of peak demand reduction through installation of parking lot and garage lighting fixtures with occupancy sensors and wireless lighting and HVAC controls.

The ETAP is leveraging $13.5 million, more than twice its ARRA award, using utility incentive funds, block grants, low-interest loans, local government and private funding, and in-kind services.

The Energy Technology Assistance Program intends to deliver lasting changes and transform the market through increased market penetration of ETAP measures, providing publicity regarding the energy and non-energy benefits of those measures, and workforce training for HVAC and advanced lighting controls installers.

- **The *Downtown Oakland Targeted Measure Saturation Program*** *($4.8 million)* will install advanced lighting and HVAC including wireless technologies in commercial buildings in the downtown Oakland business corridor. The pilot program, administered by Quantum Energy Services & Technologies, Inc., will retrofit classrooms, offices, and parking lots/garages with advanced lighting and HVAC technologies. This shovel-ready program has already identified a dozen commercial building owners and managers willing to participate in the program that represent 4 million square feet of commercial space. The program also plans to leverage existing workforce development investment such as the nationally recognized Oakland Green Jobs Corp by providing jobs for installation contractors, auditors, and engineering trainees.

  This program expects to create 77 jobs in Oakland, a disadvantaged community, by installing advanced lighting and HVAC technologies in a wide variety of commercial buildings in the downtown corridor. The program will also create other benefits such as work for small business energy efficiency companies and career path jobs for Oakland's Green Jobs Corp participants.

  The program expects to deliver 8 million kWhs and 152,000 therms of electricity and natural gas savings, amounting to $1.2 million in annual energy savings, through a variety of lighting measures – including occupancy sensors, office and classroom lighting, refrigeration LED lighting, and lighting controls – and HVAC wireless controls. Total leveraged funding from the program is expected to be $2.3 million. This program also significantly exceeds the ARRA cost effectiveness requirements, delivering 10 million BTUs for every $488 spent.

  The program will provide additional benefits by leveraging other programs to increase the overall level of energy efficiency within the downtown corridor and by laying the foundation for continued installation of these technologies through contractor training to ensure the technologies remain available. The program will also carefully monitor the projects and showcase those that prove the performance claims. The goal is to ingrain energy efficiency improvements in the downtown corridor and engage downtown business and building owners to encourage future improvements.

California Comprehensive Residential Building Retrofit Program

Consistent with the state's goal of achieving all cost-effective energy efficiency, this program is funding energy efficiency improvements to existing residential buildings in California. Projects funded through this program will not only save energy and reduce GHG emissions, they will also stimulate the economy by creating jobs for the retrained construction workers, contractors, and youth who will be performing energy efficiency improvements. These activities are also building important partnerships among regional groups of local governments, utilities, community colleges, national and state energy programs, affordable housing programs, and private and public energy and building contracting experts.

California Comprehensive Residential Building Retrofit Program

Funding: **$50.2 million**

Public/private funds leveraged: **$250 million**

Jobs created/retained: **3,428**

Electricity saved per year: **35 million kWhs**

Natural gas savings per year: **1.1 million therms**

GHG reduction per year: **19,553 tons**

The program is using a three-tiered approach. First, a minimally trained person can identify low-cost items through visual inspection. At the second tier, a specialty contractor with some training installs quality efficiency measures (for example, HVAC or insulation). Under the third tier, raters and building performance contractors with more comprehensive training in efficiency retrofits deliver the highest energy and cost savings per home. The Energy Commission prefers the third tier but, because that tier requires extensive training and market development, is including the first two tiers to provide transition to the higher-tier, deeper savings approach.

The Energy Commission selected the following four programs for funding from this program. All information is from the applicant's original proposals.[60]

- **The *Sacramento Regional Energy Alliance*** *($19.9 million)* is a partnership among the Sacramento Municipal Utility District (SMUD) and local governments, educational institutions, not-for-profits, and private businesses. SMUD will perform audits and/or home performance retrofits to existing homes. In addition, the Alliance will train contractors in auditing and building performance science and will implement a regional marketing and educational campaign on energy efficiency and home performance. This program covers Sacramento County and the cities of Sacramento, Rancho Cordova, Citrus Heights, Elk Grove, Folsom, and Galt.

  The Alliance expects to preserve or create 1,148 jobs in a county with an unemployment rate higher than the state average. SMUD is the lead agency for the Sacramento Regional Energy Alliance and will use the funding to expand its Home Performance program,

60 Proposals available on the California Energy Commission website at: http://www.energy.ca.gov/recovery/sep.html#efficiency.

which will provide audits and home performance retrofits. SMUD originally planned to target 1,024 homes under its program but this funding will enable the utility to expand to more than 15,000 homes, including 850 low-income and 300 moderate-low income homes.

The program will create energy efficiency auditing, rating, contracting, retrofitting, and measurement and verification jobs, and includes development of a SMUD Green Academy in collaboration with the Sacramento Employment and Training Agency and the Los Rios Community College District that will train contractors in auditing and building performance science to meet the expected increased demand for building science professionals generated by the program.

The program is expected to save nearly 22 million kWhs of electricity per year and reduce annual carbon emissions by more than 6,000 tons. By creating demand for the energy-efficient equipment and measures to be installed in these homes, the program will provide the catalyst for technological advances as well as manufacturing facilities that can produce the needed equipment and technologies.

SMUD is leveraging more than $27 million with partners that include local cities, the Sacramento County, the Sacramento Employment and Training Agency, the Los Rios Community College District, Build It Green, the Sacramento Housing Redevelopment Agency, and the Community Resource Project.

This program has several components that will contribute to the long-term sustainability of the program and help to transform the market. First, the program will implement a regional education and marketing campaign to raise awareness of building-science approaches to energy efficiency from zero to 15 percent in two years. Next, the program will leverage financing programs and permanent performance-based incentives to overcome financial barriers to making home performance investments. Finally, the program will implement a comprehensive program to promptly recruit and train contractors in home performance business development.

- **The *Moderate Income Sustainable Technology*** *($16.5 million)* program will create a self-replenishing source of loans and grants for comprehensive energy efficiency retrofits available to rural California homeowners in low-to-moderate income segments. The program includes a revolving fund for low-interest loans; a marketing component to contractors, banks, real estate agents, and mortgage professionals; HERS II audits; grants to buy down a portion of the cost of energy efficiency measures; and training and education. An estimated 2,463 house comprehensive retrofits will be funded during the program.

  The program is expected to provide approximately 493 newly created construction, energy efficiency installation, and verification jobs in 30 rural counties in California, most of which have relatively high rates of unemployment. The program will

provide loans to finance comprehensive energy efficiency retrofits in moderate income homes, and also provide direct grants to reduce the costs of the measures installed. The program is targeting about 2,400 homes during the two-year ARRA program timetable, with expectations of an additional 75-100 retrofits per year thereafter as the loan principal is recycled from paybacks.

Moderate income homeowners are underserved in energy efficiency financing because they often cannot afford comprehensive retrofits on their own but exceed the income limits for the federal Weatherization Assistance Program. By making 3 percent fixed-rate loans available, this program will allow these homeowners to reduce their energy bills while also providing the energy savings from existing homes that will help California meet its energy efficiency and GHG emission targets for 2020 and beyond. Estimated energy savings from the program are 11 million kWhs of electricity and more than a million therms of natural gas per year, resulting in total expected annual GHG reductions of 13,553 tons of carbon.

The Moderate Income Sustainable Technology program will be self-sustaining, with repaid principal balances loaned out again. However, the sustainability of the program is not measured simply by continuing loans. Lasting success will come from increasing the number of certified contractors and HERS Raters and increasing the awareness of the value of energy efficiency among real estate professionals and contractors. In addition, the program will disseminate information regarding the United States Department of Housing and Urban Development's 203(k) Rehabilitation Program, which provides loans for the rehabilitation and repair of single-family properties as a tool for community and neighborhood revitalization. Because the funding for the 203(k) program will continue to be available after ARRA funds are spent, increasing consumer awareness about this program and how it can be used to finance energy efficiency measures will continue to stimulate the energy efficiency market and achieve further energy savings going forward.

- ***Retrofit Bay Area*** *($10.7 million)* is a community-scale building retrofit program aimed at upgrading up to 15,000 single-family and 2,000 multi-family residences with energy efficiency measures. The Association of Bay Area Governments will partner with eight counties and a team of public and private partners to administer the region-wide program. Retrofit Bay Area will offer an innovative marketing and outreach strategy to Bay Area residents, including a website and regional call-center where consumers can access information about the benefits of retrofit improvements, homeowner incentives, and qualified contractors. The program will be offered in Alameda, Contra Costa, Marin, San Francisco, Santa Clara, San Mateo, Solano counties.

  This program expects to create more than 1,700 jobs, retrofit 15,000 single-family and 2,000 multi-family homes, and reduce annual energy costs by $6.7 million. It will also provide financing

mechanisms to address the high upfront costs of retrofits and conduct marketing and outreach to motivate property owner participation.

- ***The Affordable Multi-Family Retrofit Initiative*** *($2.9 million)* will make green retrofit loans available to existing multi-family building owners to help pay for energy and water efficiency improvements. The San Francisco Mayor's Office of Housing, Enterprise Community Partners, Inc., and the Low Income Investment Fund are partnering to implement this communitywide program. The cash flow generated from reduced utility expenses will pay the principal and interest on the green retrofit loans. As payments are made, they will return to the community as new loans for additional affordable housing retrofits. The program will be available in the city and county of San Francisco, in Berkeley, and in Oakland.

  This initiative expects to create 87 jobs beyond those associated with administration of the program. The number of jobs could be more than double this figure based on studies showing each on-site construction job results in another 1.5 jobs for architects, engineers, local jurisdiction planning staff, energy auditors, field verification, project and construction management staff and consultants, and energy services consultants.

  The initiative will provide technical support and make green retrofit loans to existing multifamily building owners in the San Francisco Bay Area to help pay for energy and water efficiency improvements in 26 buildings, totaling approximately 1,300 rental homes. The cash flow from reduced utility bills will pay the principal and interest on the loans, which will then be used for additional loans.

  Much of this region's affordable housing consists of older structures that have leaky single-glazed windows, old boilers, inefficient heat and hot water systems, and poor lighting controls. An analysis by the initiative indicates that a fourth of San Francisco's affordable housing portfolio has utility costs that are far above average, illustrating the significant cost and energy savings potential from improving the efficiency of these structures.

  The initiative will provide technical support to affordable housing owners to assess the need for efficiency upgrades and then assemble financing that can address those needs, increase energy efficiency, improve resident comfort, and lower utility costs. A key component of the initiative is to prove the viability of underwriting loans based on projected energy savings, which will bring private capital to serve the affordable housing market. In addition, the initiative will closely coordinate with local jurisdictions' job training and workforce development programs

  This initiative expects to achieve 25 percent energy savings program-wide, a figure based on consultations with industry experts, analysis of the existing housing portfolio in San Francisco, and an in-depth analysis of three properties already selected to participate in the initiative. With estimated savings of 625 kWhs and 62.5 natural gas therms per unit and a target of 1,300 units, this

equates to savings of approximately 1,562,500 kWhs and 81,250 therms annually.

California Clean Energy Workforce Training Program

The California Clean Energy Workforce Training Program (CEWTP) is a collaborative effort that combines funds from the State Energy Program ($20 million), the federal Workforce Investment Act ($10 million), the Alternative and Renewable Fuel and Vehicle Technology Program ($3.8 million), plus public-private partnership matching funds to provide hands-on training for green collar jobs. Selected local workforce investment boards and community colleges are leading regional workforce training partnerships around the state that will train workers for jobs in clean energy.

California Clean Energy Workforce Training Program

Funding: **$20 million**

Public/private funds leveraged: **$39 million**

Federal funds leveraged: **$10 million**

AB 118 funding: **$2.2 million**

Workers trained: **9,052**

There are 48 grant awards under CEWTP. The Employment Development Department is administering 34 of the grants (totaling nearly $27 million), including 28 for green building and clean energy partnerships and 6 for clean transportation programs,[61] with the remaining 14 grants administered by the Employment Training Panel. These grants encompass 17 community college districts, 19 counties, 5 cities, and several workforce development and training organizations that will serve more than 9,000 participants.

Green Building and Clean Energy Retraining Partnerships: Ten grants are focusing on workers with construction experience who are unemployed or underemployed and will provide retraining in a wide variety of green building skills including solar installation, HVAC installation and maintenance, green plumbing, home energy rating, and energy auditing.

Green Building and Clean Energy Pre-Apprenticeship Partnerships: These 18 grants provide training to unemployed, underemployed, and new workers to provide the skills needed to secure employment in the green building or renewable energy industries. Subjects covered include energy fundamentals, energy auditing, efficiency retrofitting, and distributed solar installation to renewable energy principles and fundamentals and utility-scale renewable plant construction.

Alternative and Renewable Fuel and Vehicle Technologies Workforce Development and Training Program: This program has awarded $2.2 million dollars in non-ARRA funds to six grants that will also target unemployed and underemployed workers along with incumbent workers. Training will provide the skills needed for the biofuels production industry and for retrofits, service, and maintenance of electric, hybrid, and natural gas vehicles. The Energy Commission will release another solicitation in the October – December 2010 timeframe to expend the

61 A complete listing along with descriptions of individual grants is available at: http://www.edd.ca.gov/Jobs_and_Training/pubs/wiasfp09-2Awards.pdf.

remaining $1.6 million. Programs receiving awards from this program are described later in the chapter under "Clean Transportation Workforce Training."

Employment Training Panel: The remaining 14 grants totaling $4.5 million for green building and clean energy training programs will serve nearly 3,500 participants. Training will target placement of unemployed workers, or upgrading the skills of existing workers, in jobs that reduce energy or water use in the building trades, such as retrofitting, green plumbing, and efficient lighting manufacturing, or in jobs that produce or transmit renewable energy, like solar panel manufacturing or smart grid installation.

The CEWTP is one of three segments of California's Green Workforce Initiative, which also includes the Regional Industry Clusters of Opportunity Grants (RICOG) and the State Energy Sector Partnership (SESP) and Training Grants. The RICOG is a partnership among the California Workforce Investment Board, the Energy Commission, the Economic Strategy Panel, and the California Labor and Workforce Development Agency, which is providing $2.5 million to support 10 local workforce areas. The funding will support the analysis needed to develop regional initiatives to identify the specific workforce needs of industries in the local workforce areas and build regional partnerships of employers, training providers, and community organizations to provide the training and jobs that will bolster regional economic competitiveness by addressing those workforce needs as well as the training, employment, and career advancement needs of workers.

The California Workforce Investment Board, which was awarded $6 million from the Department of Labor's Employment and Training Administration, administers the SESP and Training Grants. The funding will support six regional teams in developing training programs in emerging energy efficiency and renewable energy industries. This program will complement existing work of the Green Collar Jobs Council and will support action clinics, information exchange, worker training, curriculum publication, and further refinement of regional sector initiatives.

Also under the CEWTP is the California Solar Training Partnership, which received $3.5 million in ARRA funding to develop a training center to provide high-quality, standardized solar training for workers in the state. The Energy Commission is investing $500,000 in this effort to build the trained workforce needed to support California's renewable energy goals.

Several examples of training programs and results from ARRA workforce grants are outlined below. Appendix A provides a complete list of CEWTP awardees.

- ***Los Angeles Trade Technical College:*** One of nine community colleges in the Los Angeles Community College District, Los Angeles Trade Technical College (LA Trade Tech) is providing a variety of clean energy training classes for 150 participants. As of August 2010, LA Trade Tech has completed three weatherization classes, one solar photovoltaic installer class, and one sustainable lighting class. In addition, the college recently graduated its first all-female utility lineworker class of 22. In the past, the utility lineworker program, which provides graduates to

Southern California Edison, Los Angeles Department of Water and Power, and San Diego Gas & Electric Company, was predominantly male, with female lineworkers holding only about 2 percent of utility transmission and distribution positions. The female lineworker training class is supported by local utilities that want to diversify their workforce.

This was an opportunity for me to change my life, to get a good paying job, and to help others, because when the lights go out, people suffer.

Kimberly Allen
Graduate of Utility Lineworker Certification Class

LA Trade Tech is experiencing some challenges in implementing its clean energy training programs. One challenge is that the college serves a demographic where 55 percent of the population does not have a high school diploma or GED, and 35 percent have less than a ninth-grade education. Also, ARRA-funded training is limited to clean energy workforce skills, so finding ways to teach basic skills like tool use or worker safety can be an issue. Another challenge that many of the CEWTP grantees are facing is the difficulty in placing graduates once they are trained, given the slowdown in the job market.

- ***The Monterey Bay Green Building/Pre-Apprenticeship Training Program:*** This program serves Monterey and Santa Cruz counties and currently has 146 participants enrolled. At Hartnell College in Monterey, 58 students have completed 330 hours of classroom training and have been organized into eight intern teams to do building power, water, and waste audits on 10 buildings in six Salinas Valley cities. The teams will be taking their United States Green Building Council Associate Certification testing in August, followed by presentations to a panel of experts, city managers and officials, school officials and faculty, and Hartnell Industry Advisory Councils including 40 potential employers as part of the placement process for program graduates.

  At Cabrillo College, 14 students have completed spring classes in Green Fundamentals and the Green Proficiency Program and are now in paid internships with Central Coast Energy Services as part of the Fast Track To Work Program. Fall classes for an additional 33 students include Solar Photovoltaic Design and Installation and Solar Thermal and Building Science.

  In Santa Cruz County, 31 students graduated from the Santa Cruz County Graywater Training Program, bringing the total of individuals certified through this program to 46. The other 15 students are from Monterey County. In June, the Santa Cruz class helped install five laundry-to-irrigation systems in four water districts and in July installed the first two permitted graywater systems in the county.

- ***The Northern Rural Training and Employment Consortium:*** This consortium consists of 11 rural counties in Northern California, including Butte, Del Norte, Lassen, Modoc, Nevada, Plumas, Shasta, Sierra, Siskiyou, Tehama, and Trinity. To date, 76 participants have been enrolled into the

Certified Green Building Professional Program through the Shasta Builder's Exchange's Training Place. Several have completed or are near completing their training. Another 72 participants are completing the National Center for Construction Education and Research Core Foundation and Certified Green Professional courses, with several also receiving training for photovoltaic installation through Shasta College.

- ***Sacramento Employment and Training Agency:*** The Sacramento Employment and Training Agency (SETA) was awarded grants in all three CEWTP areas. SETA is focusing helping new entrants to the workforce, low-skilled workers, and laid-off construction workers to secure green collar jobs. To quickly provide information to job seekers and employers, SETA worked with Los Rios Community College District to develop a curriculum for both four-hour and eight-hour workshops called Green Career Exploration to provide an introduction on history and terminology for the green jobs movement, information on green career pathways, skills that are needed, types of employers that are hiring, and an interactive assessment to determine whether job seekers are good matches for emerging green jobs. These orientations have served 300 participants as of July 2010, and SETA is now scheduling orientations on a weekly basis in its career centers.

  For pre-apprenticeship training, SETA has three training providers: American River College, which focuses on green infrastructure building skills and preparing job seekers for apprenticeships in sheet metal, plumbing, electrical, and carpentry; Cosumnes River College, which focuses on energy efficiency, weatherization, and home energy auditing; and the Sacramento Area Electrical Training Center, which is focusing on recruiting and training apprentices with the Electricians Union, or the IBEW. This program had 94 enrollments as of July 2010, with a goal of 230 by June 2011.

  For workers with prior experience in construction, the Green Building Retraining Program provides opportunities in green construction career pathways to skilled construction workers and provides journey-level training by the Joint Apprenticeship Training Councils in carpentry, electrical, and sheet metal work. Another component provides scholarships for training and testing to assist job seekers become certified as green building professional Home Energy Raters, building analysts, professional green plumbers, photovoltaic solar installers, and advanced high-energy lighting control technicians. This program had 72 individuals enrolled as of July 2010 and expects to have 200 by the end of 2011.

  SETA's Alternative and Renewable Fuel and Vehicle Program focuses on entry level training for unemployed or underemployed individuals, with active recruitment of women. Classes are being offered on biodiesel, advanced electrical, hybrid technology, and alternative fuels. Upon completion, technicians will be prepared for careers in the service and maintenance sector for hybrid and electric vehicles, alternative fuels, and

alternative fueled vehicles and systems. Training partners Pacific Gas & Electric Company, SMUD, and Sacramento Regional Transit reportedly are seeking to hire a combined total of 84 technicians from the program. The ARFVT Program is providing $400,000 in cost share funds for the transportation component of the SETA program.

- ***Richmond City's ATLAS Advanced Transportation Initiative:*** This regional consortium of workforce investment boards, community colleges, community workforce providers, labor, and regional industry employers will conduct training in electric vehicles, hybrid-electric vehicles, and alternative fuels technologies in the greater East San Francisco Bay Area. Eleven students completed the first phase of training for Hybrid Automotive Service Technician in June 2010. The second phase of classes began in August. Courses being offered in the second phase of training include: Introduction to Hybrid Electrical Vehicles, Hybrid and Electric Vehicle Electrical Systems, and Regenerative Braking Systems. The ARFVT Program is providing $400,000 in cost share funds for this initiative.

Clean Energy Business Finance Program

The Clean Energy Business Finance Program provides $30 million in low-interest loans to private sector companies that improve or expand clean energy manufacturing facilities in California. These funds were offered competitively to manufacturers of energy efficiency and renewable energy components and products, as well as for specified biomethane gas projects that are eligible for California's Renewable Portfolio Standard.

Clean Energy Business Finance Program

Funding: **$30.6 million**

Public/private funds leveraged: **$85 million**

Jobs created/retained: **1,588**

Increased PV panel production per year: **446 MW**

Renewable generation added per year: **905 million kWhs**

GHG reduction per year: **282,180 tons**

As of October 2010, the Energy Commission has approved loans to the following eight companies:

- ***CaliSolar, Inc.,*** *($5 million)* will purchase equipment to expand the manufacture of solar cells at its Sunnyvale, California, manufacturing facility. The project will expand capacity production from 60 MW annually to 155 MW annually by December 2011. The project is expected to create and/or retain an estimated 181 full-time equivalent jobs. Increased annual production of solar cells at the facility is expected to reduce carbon emissions by 81,131 tons per year.
- ***Stion Corporation*** *($5 million)* will purchase equipment needed to expand the manufacturing of thin film solar modules at its San Jose, California, manufacturing facility. The project will expand capacity by 140 MW per year and is expected to be completed by December 2011. The project is expected to create and/or retain an estimated 73 full-time equivalent jobs, and reduce

carbon emissions by 63,493 tons per year.

- ***Solar Power, Inc.,*** *($5 million)* will purchase equipment to manufacture photovoltaic solar panels at its future McClellan, California, manufacturing facility. The project will expand production capacity from 50 to 155 MW annually by December 2011. The project will create and/or retain an estimated 698 full-time equivalent jobs, and offset 25,076 tons of carbon per year.
- ***Energy Innovations, Inc.,*** *($3.5 million)* will purchase equipment to establish a concentrated solar energy system manufactured in Poway, California. The facility will have an annual capacity of 60 MW and is expected to be completed in September 2011. The project will create and/or retain an estimated 240 full-time equivalent jobs. The facility is expected to reduce carbon emissions by 35,397 tons per year.
- ***Quantum Energy Systems Technologies Worldwide, Inc.,*** *($4.4 million)* will purchase equipment to expand the manufacture of photovoltaic solar modules at its Irvine, California, manufacturing facility. The project will expand capacity to 45 MW annually and is expected to be completed in January 2011. The project will create and/or retain an estimated 94 full-time equivalent jobs. Increased annual production is expected to result in 29,834 tons of reduced carbon emissions annually.
- ***Soliant Energy, Inc.,*** *($2.1 million)* will purchase equipment to establish a concentrated photovoltaic solar panel manufacturing facility in San Bernardino, California. The facility will have an annual capacity of 40 MW and is expected to be completed by October 2011. The project will create and/or retain an estimated 118 full-time equivalent jobs. The estimated annual production of solar panels from the facility will offset 23,367 tons of carbon dioxide per year.
- ***Morgan Solar, Inc.,*** *($3.3 million)* will purchase equipment to establish a concentrated photovoltaic solar panel manufacturing facility in Chula Vista, California. The facility will have an annual capacity of 10 MW and is expected to be completed by November 2011. The project will create and/or retain an estimated 105 full-time equivalent jobs. The estimated annual production of solar panels from the facility will offset 19,968 tons of carbon dioxide emissions annually
- ***Solaria Corporation*** *($753,992)* will purchase equipment to expand the manufacture of photovoltaic solar panels at Solaria's Fremont, California, manufacturing facility. The project will expand capacity to 6 MW annually and is expected to be completed by October 2010. The project will create and/or retain an estimated 79 full-time equivalent jobs. The estimated annual production of solar panels from the facility will offset 3,914 tons of carbon dioxide emissions annually.

Energy Conservation Assistance Act Low-Interest Loan Program

The Energy Conservation Assistance Act (ECAA) loan program offered $25 million in low interest rate loans to cities, counties, special districts, public schools, colleges and universities, public care institutions, and

public hospitals for energy efficiency and energy generation projects.

Energy Conservation Assistance Act Low Interest Loan Program

Funding: **$25 million**

Public/private funds leveraged: **$9.5 million**

Energy cost savings: **$2 million**

Electricity saved per year: **4 million kWhs**

Average payback: **13 years**

Eligible energy efficiency projects include lighting replacement and commercial building retrofits, and loan recipients must fully repay the loans from their energy savings within 15 years.

- 7 lighting projects**:** These projects are converting existing inefficient exterior lighting (such as high-pressure sodium vapor, low pressure sodium vapor, mercury vapor and/or metal halide) to new, efficient induction or LED lamps. One project also upgraded lighting for a bike path and tunnel.
- 5 electrical/mechanical projects: Of these projects, two installed or upgraded pumps at a water station, one replaced a 30-year old HVAC system, and the other installed a new 150-ton oil-free, variable-speed drive chiller and upgraded controls.
- 1 photovoltaic project: This project installed a 250-kilowatt photovoltaic system on a public building.
- 8 combined projects: These projects involved a combination of lighting conversions; electrical/mechanical installations, replacements, or upgrades; and/or photovoltaic system installations.

Loan amounts range from $30,868 to replace a 30-year-old HVAC system at the city of Hollister's recreation center, saving the city about $3,000 per year in energy costs, to $3 million to convert incandescent residential streetlights to more efficient induction lamps in the city of Los Angeles, expected to provide annual energy cost savings of more than $300,000.

Payback periods for the projects (based on total project cost) range from 4.7 years for the city of Carlsbad's project to replace 7,040 street lights with more efficient fixtures to 22 years for a 250 kilowatt photovoltaic system on the Castro Valley library in the Alameda County.

The energy efficiency improvements and renewable generation technologies installed through this program will continue to provide benefits over the lifetimes of the projects, including reduced energy demand, increased renewable energy, reduced electricity costs for local jurisdictions whose budgets have been severely impacted by the recession, and reduced GHG emissions. As local governments see the concrete and ongoing benefits of these projects, they will be more likely to install additional efficiency measures and achieve even more energy savings in the future.

Due to the high demand for these loans, the Energy Commission has allocated additional non-ARRA funding to provide loans to projects still on the waiting list after the ARRA funding was fully awarded.

Department of General Services Energy Efficient Revolving Loan Fund

In October 2009, the Energy Commission directed $25 million of State Energy Program funding to DGS through an

interagency agreement.[62] DGS established the Energy Efficient State Property Revolving Loan Fund to provide revolving loans using ARRA funds to state departments and agencies for energy efficiency improvements to state-owned buildings. The Public Resources Code directs DGS to prioritize those projects that are cost-effective and will yield immediate and sustainable energy efficiency, energy conservation, energy use cost savings, and cost avoidance.[63]

Department of General Services Energy Efficient Revolving Loan Fund

Funding: **$25 million**

Public/private funds leveraged: **$6.8 million**

Energy cost savings: **$4 million**

Electricity saved per year: **29 million kWhs**

Natural gas savings per year: **1 million therms**

GHG reductions: **14,000 tons**

In the first cycle of funding, DGS allocated funds to the following agencies:

- Department of Motor Vehicles, 18 sites, $1.3 million.
- Department of Water Resources, 4 sites, $1 million.
- California Highway Patrol, 18 sites, $1.8 million.
- Department of Developmental Services, 3 sites, $4.9 million.
- Department of Mental Health, 2 sites, $1 million.
- Department of Corrections and Rehabilitation, 6 sites, $5.5 million.
- Office of the Chief Information Officer, 1 site, $2.3 million.
- Department of General Services Large Buildings, 11 sites, $6.7 million.

The projects include lighting and HVAC retrofits and replacements of control systems, boilers, chillers, water heaters, condenser coils, and motors. The first round of funding is expected to be fully paid back within approximately seven years.

The PIER State Partnership for Energy Efficient Demonstrations (SPEED)[64] has paved the way for some of the advanced lighting technologies that will be used under this program. Since 2004, SPEED has provided funding support and helped move promising new technologies into field tests, so that once they are proven effective, participants can order the technologies and make them standard for their facility. SPEED is providing nearly $300,000 in funding for seven lighting projects in state buildings and garages that will result in a simple payback period of just 3.1 years.

DGS and the Energy Commission entered into an interagency agreement in September 2009 to establish the roles of each agency in developing a revolving loan program and to establish reporting requirements for the ARRA funds. DGS took advantage of retro-

62 Pursuant to Public Resources Code 25470 through 25474, established by AB4X 11 (Chapter 11, Statutes of 2009-10 Fourth Extraordinary Session)

63 Public Resources Code 25472(d).

64 The Energy Commission partnered with California Institute for Energy and Environment, who administers the program for the California Energy Commission, and the U.C. Davis California Lighting Technology Center, who helps identify appropriate and cost effective advanced lighting technologies.

commissioning contracts already in place and was able to get projects started quickly, since building audits had been done that identified potential efficiency measures. Early indications are that the potential for additional energy and cost savings from state buildings is high. As the current loans are repaid, those monies can be channeled into new projects that will continue to improve the energy efficiency of state buildings, provide jobs and economic benefits, and reduce the energy costs for operating state buildings.

As of September 2010, the revolving loan program has awarded all $25 million. These projects are expected to result in energy cost savings of $4 million per year, energy reductions of more than 29 million kWhs of electricity and nearly 1 million therms of natural gas per year, and GHG emission reductions of more than 14,000 tons per year.[65]

Program Support and Contracts

As the administrator of State Energy Program funding, the Energy Commission is subject to scrutiny and review by federal and state regulators. In 2009, the Bureau of State Audits (BSA) reviewed the Energy Commission to determine its preparedness for receiving and spending the SEP funds.[66] The BSA issued a report on December 1, 2009, stating that the Energy Commission was slow to execute contracts, grants, and agreements, and lacked a system of internal controls to make awards and ensure funds are used appropriately.

The Energy Commission has executed a contract for $3.8 million with Perry-Smith, LLP, to conduct an organizational assessment of the Energy Commission's readiness to manage ARRA funds and to review and make recommendations to improve the agency's internal controls. Perry-Smith released a report in August 2010, documenting its findings and recommending how and where the Energy Commission can make improvements.[67] Under the contract, Perry-Smith will also perform financial reviews of funding recipients, provide technical support for all ARRA program areas, develop a clearly defined project monitoring process, train staff, and review funding recipients under the Clean Energy Business Financing Program to ensure they are financially creditworthy.

Although not required, DOE strongly encourages states to evaluate their ARRA programs. DOE published *State Guidelines for ARRA Evaluation* in March 2010, which identified four metrics on which states should focus: job creation, including number, type, and duration, energy and demand savings, renewable energy capacity and generation, and carbon emission reductions. However, given that each state's portfolio of ARRA projects is very different, DOE did not recommend any specific measurement, verification, and evaluation (MV&E) methods or approaches. Instead, DOE outlined standards designed to

65 Assuming 0.524 lbs CO2 per kWh and 13.446 lbs CO2 per therm.

66 The Bureau of State Audits did not review the Energy Efficiency and Conservation Block Grant Program, Appliance Rebate Program, or Energy Assurance Planning Initiative.

67 Perry-Smith, LLP, *Preliminary Macro-Level Readiness Assessment of the California Energy Commission*, Consultant Report, July 23, 2010, http://www.energy.ca.gov/recovery/auditing.html

provide useful, reliable, and repeatable results. They also reinforced the importance of accurately attributing savings from ARRA-funded programs, for example to determine whether energy savings are the result of a specific program or the result of a cooler-than-usual summer.

Consistent with its strong belief in preventing waste, fraud, and abuse in the administration and distribution of ARRA funding, the Energy Commission has chosen to do a comprehensive MV&E effort that goes beyond the four metrics recommended by DOE. In March 2010, the Energy Commission signed a contract for $4.1 million with KEMA, Inc., to perform the MV&E assessment and report on its results.

The primary focus of the MV&E process is to verify the electricity, natural gas, peak, GHG emissions, and jobs impacts resulting from ARRA programs. However, an equally important goal is to understand why some program efforts are more successful than others and apply that knowledge to the design of future programs and standards. Because ARRA programs targeted at energy efficiency are intended to transform the energy efficiency market and make these practices self-sustaining, the MV&E effort will focus on assessing program progress toward achieving this goal.

The MV&E effort is complicated by projects using incentives from multiple sources to encourage the same actions and the difficulty in assessing the contribution of each source to the ultimate outcome. This issue is particularly important to the CPUC, since it oversees the payment of incentives to investor-owned utilities (IOUs) for delivering successful energy efficiency programs. If energy savings from a program are solely due to IOU efforts, IOUs qualify for full incentives. If, however, some portion of the savings is the result of other programs such as those funded through ARRA, IOUs could potentially receive a smaller incentive.

The Energy Commission also has an interest in attribution to avoid double counting savings from energy efficiency programs in its biennial electricity demand forecast. Correct attribution of savings helps avoid overestimating program impacts and thus underestimating the future need for electricity. Correct attribution of incentives such as IOU rebates, ARRA incentives, marketing, and training to program outcomes also helps to identify which program activities are most effective in encouraging the adoption of energy efficiency practices. The Energy Commission and the CPUC have established an evaluation working group to coordinate and share information to help address the attribution issue, and the CPUC is sharing its lessons learned from its 2008-2010 IOU MV&E cycle to help inform the MV&E for ARRA-funded projects.

Energy Efficiency and Conservation Block Grant Program

The DOE awarded California $49.6 million for the EECBG Program. As noted in Chapter 2, Assembly Bill 2176 (Caballero, Chapter 229, Statutes of 2008) requires these funds to be used for energy efficiency measures and for at least 60 percent of the funds to be provided to small cities and counties.[68] The remaining funding can be awarded at the Energy Commission's discretion to larger jurisdictions.

68 "Small" is defined as cities with populations under 35,000 and counties with populations under 200,000.

Energy Efficiency and Conservation Block Grant Program

Funding: **$49.6 million**

Public/private funds leveraged: **$24.4 million**

Jobs created/retained: **362**

Electricity saved per year: **34 million kWhs**

Natural gas savings per year: **652,808 therms**

GHG reductions per year: **15,640 tons**

In October 2009, the Energy Commission adopted the *Block Grant Guidelines*.[69] Through the EECBG Program, the Energy Commission is working with and educating small jurisdictions about the benefits of energy efficiency. This program also provides the opportunity to stimulate economy activity in underserved and economically distressed areas. Projects resulting from these awards will provide energy and cost savings for many years to come, which will in turn encourage local jurisdictions to pursue additional energy efficiency projects and be more aware of their energy consumption.

The Energy Commission is not just providing much-needed financial assistance, but is also lending its staff expertise to the cities and counties to help ensure project success. Energy Commission staff is providing phone assistance, making site visits to project locations to advise and evaluate potential projects, and providing energy assessments up to $20,000 in consulting cost per application. All projects funded under the EECBG Program must be completed and paid by September 13, 2012.

The EECBG Program adheres to several federal requirements (such as "Buy American" and Davis-Bacon prevailing wage) and state requirements under AB 2176 that grants must be cost-effective.[70]

The Energy Commission estimates that energy efficiency investments from this program will save consumers 34 million kWhs of electricity and 652,808 therms of natural gas every year, and reduce CO2 emissions annually by nearly 16,000 tons.[71] In addition, these projects are expected to create or retain an estimated 362 jobs.

Formula Grants

EECBG Program applicants could propose a project in any of three different categories: 1) direct equipment purchase and installation; 2) complex energy efficiency upgrades or retrofits at a project site; or 3) municipal financing offered to property owners to perform efficiency retrofits.[72] In April and May 2010, the Energy

69 California Energy Commission, *Block Grant Guidelines*, October 2009, http://www.energy.ca.gov/2009publications/CEC-150-2009-002/CEC-150-2009-002-CMF-REV1.PDF.

70 Consistent with Department of Energy direction, the Energy Commission defines cost-effectiveness as achievement of minimum annual energy savings per dollar spent (10 million source British thermal units saved per year for each $1,000 of EECBG funds spent), see *Block Grant Guidelines*, pg. 5, at: http://www.energy.ca.gov/2009publications/CEC-150-2009-002/CEC-150-2009-002-CMF-REV1.PDF

71 Presentation by Deborah Godfrey, California Energy Commission, July 8, 2010, Joint Committee Workshop on State and Local Government Building Retrofit Projects Funded Through ARRA, available at: http://www.energy.ca.gov/2010_energypolicy/documents/index.html.

72 Applicants could combine a municipal financing project with a direct equipment purchase or energy efficiency retrofit.

Commission approved 208 grant agreements totaling $33.3 million representing 70 percent of the total EECBG funds. Four projects subsequently canceled, leaving a total of 204 funded projects. Appendix A provides a complete list of awardees. The breakdown of funding by category is as follows:

1. ***Direct Equipment Purchase*** *($15.6 million)*: The Energy Commission provided grants to 121 small cities and counties for the purchase and installation of energy efficiency equipment.[73] The Energy Commission provided awardees with a list of eligible, cost-effective lighting or electrical/mechanical products, some of which were developed and brought to market because of support from the Energy Commission's PIER Program. The 121 projects that received awards are broken down into the following project types:
    - 75 lighting projects: These awardees purchased cost-effective, efficient lighting technologies to replace older, inefficient versions for interior and exterior applications. Two of these technologies, LED outdoor lighting and occupancy sensors, were developed using PIER funding. Eligible lighting equipment from the Energy Commission's pre-approved list included:
        - Energy efficient fluorescent lamps.
        - Instant start electronic ballasts.
        - LED traffic and pedestrian signals.
        - LED outdoor lighting.
        - LED exit signs (to replace either fluorescent or incandescent exit signs).
        - Occupancy sensors.
    - 10 electrical/mechanical projects: These awardees purchased new indoor environmental comfort systems to replace older, inefficient systems. As with the lighting technologies, qualifying technologies (several of the HVAC systems and one programmable thermostat) were developed using PIER support. Eligible electrical or mechanical equipment from the Energy Commission's pre-approved list include:
        - National Electrical Manufacturers Association-approved premium efficiency motors.
        - Variable-frequency drives for all motors, fans and pumps.
        - High-efficiency HVAC system replacement.
        - Condensing boiler or furnace.
        - Vending machines controller.
        - Programmable thermostats.
    - 36 combined projects: These awardees purchased and installed a combination of new lighting and electrical/mechanical equipment.
2. ***Energy Efficiency Retrofits*** *($16.2 million)*: The Energy Commission provided grants to 81 small cities and counties to perform cost-effective

73 The Energy Commission provided a pre-approved list of equipment for applicants to choose from.

energy efficiency retrofits. Applicants were required to conduct and submit a feasibility study providing estimates of costs and energy savings for the proposed projects. Nearly half of these projects involve either lighting retrofits only or lighting combined with HVAC upgrades or replacement. Six projects combined lighting with installation of energy efficient control systems, such as vending machine controllers, and some combined all three project types. Four projects also included the installation of cool roof materials[74] and insulation.

3. ***Municipal Financing Program*** *($1.26 million):* The Energy Commission provided two grants, one to Santa Barbara County and the other to Alameda County, to implement municipal financing programs. Santa Barbara County will use $772,635 for its Central Coast Energy Independence Program, which will assist property owners with energy efficiency improvements. Alameda County is using its EECBG funds to participate in Energy Upgrade California, discussed in more detail in Chapter 2. Alameda County will participate in Energy Upgrade California local government advisory committee meetings and provide input on program policy, communication, rollout, and outreach.

As of October 2010, there is little available information about actual project results from the EECBG Program. However, at the Energy Commission's IEPR workshop on July 8, 2010, which focused on ARRA-funded government retrofit programs, representatives from small cities and counties shared early feedback on the type of energy efficiency projects that will be funded using EECBG funding and the potential economic and environmental benefits, and challenges associated with the ARRA application process.[75]

- ***San Joaquin County*** has a history of commitment to clean energy, including its Green Purchasing Policy adopted in February 2008 and construction in 2009 of its LEED Gold-certified County Administration Building, the first such building in Stockton, California.

  The facilities management department had to lay off 13 of its 63 staff because of the economic downturn, but the county representative stated that without the EECBG grant, they would have had to lay off an additional 4-5 workers.

Grants spent on equipment purchases sustain manufacturing jobs, create business for distributors in California, and support local businesses for contracted portions of the projects.

Gabriel Karam
San Joaquin County

  San Joaquin County chose the direct equipment purchase option and will be using its EECBG grant of $836,781 to replace old and inefficient variable-frequency drives for pumps and air-

[74] These materials efficiently reflect the sun's heat and emit absorbed solar radiation back into the atmosphere which reduces heat transfer from the roof to the rest of the building.

75 California Energy Commission, Transcript of the Joint Committee Workshop on State and Local Government Building Retrofit Projects Funded Through ARRA, July 8, 2010, available at: http://www.energy.ca.gov/2010_energypolicy/documents/index.html.

handling units with 13 new units and to install 70 new HVAC units at various county buildings.

Benefits of this project include 500,000 kWhs of electricity savings and 340 tons of avoided CO_2 emissions by replacing older equipment with new equipment that is between 30 and 40 percent more efficient. The county expects to reduce its energy costs by about 20 percent and put those savings toward retaining staff, but also noted that there will be additional savings of $25,000 per year from reduced maintenance costs. By contracting out the installation of the variable-frequency drives to local businesses, the county expects to support jobs and economic development in the private sector.

- ***The City of South Lake Tahoe*** has a strong commitment to environmental improvement and established its Sustainability Commission in May 2009. The city is proposing to demonstrate energy efficiency to the public community through its "Change Your Lights, Change the World" concept. Consistent with this mission, the city applied for and was awarded $130,311 for lighting projects including LED retrofits for the city motor pool building, city offices and a pedestrian walkway on the city's main thoroughfare used by approximately 600,000 cars each winter. The Energy Commission staff and the city identified these projects before the availability of ARRA funding, but because the cost of the LEDs was prohibitive, the city was unable to undertake the retrofits until the grant funding became available. Estimated benefits of these projects include $6,000 direct energy cost savings per year, with additional potential savings of $5,000 in reduced maintenance costs, and GHG reductions of 35 tons per year. The EECBG grant will also help retain jobs since the installation of the lighting measures will be done with existing staff. The city also intends to purchase the equipment being installed from small businesses, helping to support the local economy.
- ***The Town of Moraga*** is a small community of 16,000 residents and about 50 square miles. Because of its size and typical annual operations budget of only $6.5 million, Moraga saw the EECBG Program funding as an important opportunity to address its energy efficiency needs. Moraga will use its $93,465 block grant, coupled with funding awarded through the ECAA Loan Program and utility rebates, to upgrade HVAC systems, lighting, and insulation, and to install photovoltaic panels on its town hall and police department. Expected energy savings from these projects total $21,000 per year, a little less than a third of the town's typical annual energy costs of $70,000. This translates into a 17 percent reduction in electricity usage and a 30 percent reduction in natural gas, along with GHG emissions reductions of about 88 tons. The town intends to support local jobs and the economy by using local contractors for the work.
- ***The County of Nevada*** adopted its Energy Plan in 2009 with the goals of improving energy efficiency, reducing GHGs, addressing renewable energy, improving transportation efficiencies,

and conserving water. The county received a grant award for $373,291 to replace HVAC equipment, lighting, and boilers in its administration building and correctional facility. Like the Town of Moraga, Nevada County is using a combination of ECAA loan funding and EECBG funding for this project.

We had a need, we had an assessment done, we had an Energy Plan, we had identified an Energy Service Company, but we did not have the money to move forward…with the introduction of the stimulus funds, it gave us a bump to get the ball rolling.

Tom Coburn
County of Nevada

Annual energy savings are expected to be $181,743 with GHG reductions of 704 tons per year. The county estimates that over the next 25 years, these retrofits will save $3.7 million in energy costs.

These four projects are a small subset of the 204 grant agreements under the EECBG Program but do give a sense of the significant benefits they will provide to local governments in both the short and long term. The success of these retrofit projects will show that energy efficiency projects work and that local governments can save money by investing in energy-saving opportunities today.

Discretionary Grants

After the Energy Commission distributed the population-based grants, $12.9 million remained in discretionary EECBG Program funds. In June 2010, the Energy Commission awarded these funds to three large jurisdictions to ensure broader state coverage of the program:

- ***The County of Los Angeles*** *($8 million)* will create the Retrofit LA program to install energy efficiency retrofits in 8,300 single-family and 1,000 multi-family homes throughout Los Angeles County. The program will use an innovative marketing and outreach strategy to motivate property owners to participate. The county is partnering with various workforce training groups and institutions to increase the pool of qualified contractors who will perform energy efficiency assessments, installations, and inspections.
- ***The City of Fresno*** *($1.9 million)* will conduct a pilot project called the Fresno Regional Comprehensive Residential Retrofit Program to expand energy efficiency retrofits in Fresno and Kern counties. The program will use HERS rater contractors in the two-county region to perform more than 1,800 free energy audits for homeowners. The program will also support the development of a highly skilled workforce to conduct the audits by providing training and certification opportunities through the Building Performance Institute.
- ***The County of San Diego*** *($3 million)* will design and implement a comprehensive residential building retrofit program for the San Diego region. The program will provide energy upgrades to 1,000 single-family homes and 1,000 multi-family buildings annually and will educate homeowners about the program and available incentives. The county is partnering with various community colleges, local economic development programs, and

building industry organizations to train a residential retrofit workforce.

State Energy Efficient Appliance Rebate Program

The State Energy Efficient Appliance Rebate Program was created by the Energy Policy Act of 2005, is funded by ARRA, and is administered federally by the DOE. Individual states are required to implement their own program tailored to their needs based on specific requirements. Through this program, states can apply for formula-based grants to support residential appliance rebate programs. Each state can determine the scope of its program, including which appliance categories to include and the rebate amounts that will be provided for each project type.[76]

Of the $300 million in ARRA funds available nationally for this program, the DOE allocated $35.2 million to California to be administered by the Energy Commission. The Energy Commission adopted its *State Energy Efficiency Appliance Rebate Program Guidelines* on December 16, 2009.[77]

California's Cash for Appliances Program began on April 22, 2010. To qualify for rebates, appliances must be ENERGY STAR®-listed and meet all state and federal appliance efficiency standards.[78] Initially, three residential appliance categories were eligible for rebates: clothes washers ($100), refrigerators ($200), and room/window air conditioners ($50). The program experienced some early supply availability challenges associated with a limited number of models available to consumers. To address this challenge, the Energy Commission worked with suppliers to expand the list of eligible appliance models and extended the deadline for the program. In July 2010, the Energy Commission further expanded the program to include rebates for energy efficient dishwashers ($100), freezers ($50), water heaters ($100-$750), and HVAC systems ($200-$1,000).

As of October 2010, the Cash for Appliances Program has received more than 173,000 applications for an estimated $19 million in rebates, and approved 68,269 rebates totaling more than $9 million. Not only do these rebates represent significant economic activity at retail locations, they also represent manufacturing, recycling and installation-related jobs.[79]

Rebates can be combined with other rebate or promotional offerings to provide an even greater incentive to consumers to take advantage of the efficiency benefits of these appliances. By coordinating the promotion of these rebates with utility and state programs, such as the California Solar Initiative's solar water heating program, the Energy Commission hopes to ensure a lasting effect in the market and consumer

76 Department of Energy State Energy Efficient Appliance Rebate Program Funding Opportunity Announcement (DE-FOA-0000119).

77 California Energy Commission, *State Energy Efficient Appliance Rebate Program Guidelines, Fourth Edition*, December 16, 2009, (amended July 28, 2010), http://www.energy.ca.gov/2009publications/CEC-400-2009-025/CEC-400-2009-025-CMF-REV4.PDF

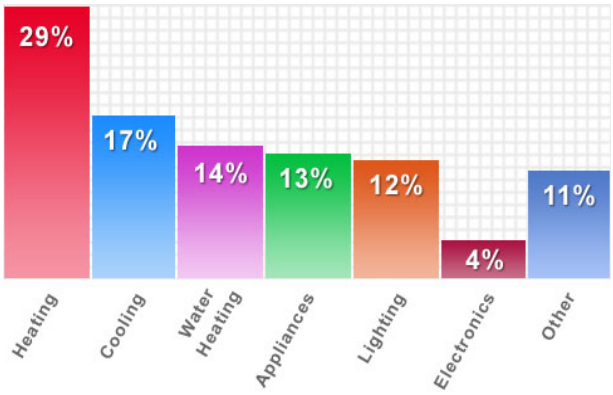
78 California Energy Commission, http://www.cash4appliances.org and http://energy.ca.gov/recovery/energystar.html

79 Ibid.

awareness of the benefits of energy-efficient appliances.

According to the DOE, the annual energy bill for a typical single home is approximately $2,200, about 13 percent of which is for appliances (Figure 4). Making the transition to more energy-efficient appliances therefore provides a huge opportunity for consumers to save both energy and money. ENERGY STAR® appliances use 10 to 50 percent less energy than the federal standards for regulated appliances, resulting in lower utility bills.

Figure 4. Annual Energy Bill for a Typical Single Home



Source: http://www.energystar.gov/index.cfm?c=products.pr_where_money.

The Consortium of Energy Efficiency works to advance efficiency even more through its Super-Efficient Home Appliance Initiatives.[80] Energy efficient appliances incorporate advanced technologies and components that improve quality and durability, which results in fewer mechanical problems and longer equipment life, and many energy efficient appliances also include improved performance features like decreased operating noise or reduced water use. The California Cash for Appliance Program embodied these initiatives and California's energy goals to increase the penetration of higher-efficiency appliances into the marketplace.

In August 2010, the Association of Home Appliance Manufacturers reached a historic agreement with a nationwide coalition of energy and water efficiency supporters including efficiency, environmental, and consumer groups to dramatically increase the energy and water efficiency of most major home appliances while providing incentives for development and manufacture of "smart" appliances.[81] The agreement calls for new national minimum efficiency standards and production tax credits for super-efficient appliances. Highlights of the agreement include reducing CO_2 emissions by 550 million metric tons, saving nearly 5 trillion gallons of water over 30 years, and retaining 46,000 United States manufacturing jobs in the appliance industry.[82] The Appliance Rebate Program will contribute to achieving these benefits by making highly efficient appliances more affordable to the average consumer.

State Energy Assurance Initiative

Of the $39.5 million available nationally, the DOE awarded $3.6 million of federal ARRA

80 Consortium for Energy Efficiency website, see: http://www.cee1.org/resid/resid-main.php3.

81 American Association of Home Appliance Manufacturers, http://www.aham.org/industry/ht/d/sp/i/49934/pid/49934, accessed August 22, 2010.

82 Planet Green, "Good News in Energy Efficiency: Appliance Manufacturers Agree to It," August 5, 2010, http://planetgreen.discovery.com/tech-transport/good-news-energy-efficiency-appliance-manufacturers.html.

funds to California for energy assurance planning efforts. The Energy Commission will use this funding to support the following local and state energy assurance activities:

- The Energy Commission has authorized $250,000 for a contract to:
  - Update the state's Energy Assurance Plan to include recent advancements in technology (such as smart grid), critical infrastructure interdependencies, cyber security, energy supply systems, energy data analysis, and communications.
  - Prepare a Workforce Development Plan to include developing in-house expertise at the state level on energy assurance planning.
  - Update the Energy Commission's Energy Supply Disruption Tracking Process Preliminary Report to include a process for tracking the duration, response, restoration, and recovery time of energy supply disruption events.
  - Conduct/participate in intra- and interstate energy emergency exercises designed to test the Energy Assurance Plan.
- The Energy Commission has also authorized up to $3 million to hire a contractor to develop local energy assurance planning tools and templates and encourage and support the use of these tools by local jurisdictions, including individual assistance and centralized training for local governments to develop standardized energy assurance and resiliency plans as well as energy emergency planning.

Energy Commission-Leveraged Funding Programs

The Energy Commission recognized the tremendous opportunity to bring additional ARRA funding to California using match funding from two of its existing funding programs – the Public Interest Energy Research Program and the Alternative and Renewable Fuel and Vehicle Technology Program – to increase the likelihood of California companies being successful in competitive federal solicitations. The Energy Commission identified DOE solicitations that were consistent with California's overall energy and environmental policy goals as well as the goals of the two existing funding programs.

Public Interest Energy Research Program

The Energy Commission's PIER Program is providing cost-share funding to help leverage more than $515 million in ARRA funding from the DOE and approximately $908 million in private investments to support smart grid, energy efficiency, and renewable research efforts in California.

For more than 10 years, the PIER Program has funded energy research, development, and demonstration projects that are in the public interest but are not adequately funded by competitive or regulated markets. PIER investments are based on specific statutory direction provided by the California Legislature but also closely follow the state's loading order policy of efficiency first followed by renewable resources, distributed generation, advanced electricity generation, and transmission and distribution infrastructure improvements. PIER research helps to develop the energy efficiency products and measures that are

ultimately included in the state's Title 24 Building Energy Efficiency Standards. PIER also funds the smart grid research and demonstration projects that will allow California's electricity grid to support the high level of renewable resources needed to meet the 33 percent RPS target.

When ARRA funds became available in 2009, the Energy Commission recognized the value of using PIER funding to help California companies secure federal stimulus funding. Using PIER money to leverage federal dollars was also seen as an opportunity to accelerate California's research agenda, particularly in the area of smart grid technologies.

Public Interest Energy Research Program

Funding: **$35 million**

Private funds leveraged: **$908 million**

Federal funds leveraged: **$515 million**

PIER's cost-share strategy was designed to take advantage of federal solicitations that support California's energy policy goals. PIER set aside approximately $35 million for ARRA solicitations covering geothermal and solar technologies, advanced energy efficient building technologies, lighting improvements, smart grid development and demonstrations, and carbon capture and storage. To be eligible for match funding, projects had to be based in California and hold an award through one of a number of pre-identified federal ARRA Funding Opportunity Announcements. Once projects were awarded federal ARRA funding, their proposals were carefully reviewed for consistency with California's energy policies and PIER's program direction before being awarded PIER funding.

Thirty one projects were selected to receive a total of $18.7 million in PIER cost-share funding. Projects include 17 smart grid projects and 14 energy efficiency and renewable energy projects. Based on comments from both applicants and the DOE, the cost-share support offered by PIER made project applications more credible and more likely to be selected for ARRA funding.

Smart Grid Research Projects

Seventeen smart grid research projects were awarded approximately $13 million in PIER funding and are being conducted by a broad cross-section of California's investor- and publicly owned utilities as well as private companies. General examples of the grid upgrade and enhancement activities undertaken by these 17 projects include:

- Installing more than 2 million "smart meters" to help reduce peak electricity loads, enable dynamic pricing, and enhance grid stability.
- Analysis of how best to integrate large numbers of plug-in hybrid electric vehicles onto the grid, as well as development of electric vehicle charging stations.
- Developing energy storage technologies such as batteries, flywheels, and compressed air energy storage that will help integrate variable renewable technologies like wind and solar into the grid as well as improve grid reliability.
- Design, testing, and demonstration of a technology that temporarily absorbs power to avoid blackouts caused by

power surges from short circuits or lightning strikes.

- Testing of next-generation cyber-security technologies.

Notable examples of specific smart grid projects are provided below. A complete list of smart grid projects awarded cost-share funding is available in Appendix A.

- **The *SMUD SmartSacramento Project* (*$1 million)*** will install a comprehensive regional smart grid system, including 600,000 smart meters, 100 electric vehicle charging stations, and 50,000 residential energy control systems consisting of programmable smart thermostats and home energy management networks. SMUD is partnering with three public agencies – DGS, California State University, Sacramento, and Los Rios Community College District – to install energy management systems, smart meters, and electric vehicle charging stations at state and college facilities.

- **The *SDG&E Smart Grid Project ($1 million)*** will help install a new $60 million wireless communications system linking SDG&E's workers, substations, and meters. The communications system will provide reliable, secure wireless service to utility operations stakeholders by consolidating previously dedicated radio frequency systems into a general purpose wide area wireless system. The wireless network will provide connection for 1.4 million smart meters, enable dynamic pricing, and examples of smart equipment that will allow increased monitoring, communication, and control over the electrical system.

- **The *Primus Power Smart Grid Storage Demonstration Project* (*$1 million)*** will develop, integrate, and deploy a zinc cell battery storage system to provide storage to help firm up wind generation in the Modesto area. Primus Power will develop the cell (EnergyCell™) in 2010-11, perform a field demonstration at a PG&E test facility in 2012, and install a 25-75 MW storage system in the Modesto Irrigation District in late 2013 that will replace a planned $78 million, 50-MW fossil fuel plant.

- **The *Los Angeles Department of Water and Power Smart Grid Regional Demonstration Program* (*$1 million)*** will develop and test advanced smart grid technologies in partnership with top Southern California research institutes, including University of Southern California, University of California at Los Angeles, and CalTech/Jet Propulsion Laboratory. The program will use university campuses as testing grounds to gather data on how consumers use energy in a variety of systems, testing the next generation of cyber-security technologies, and cutting-edge methods of integrating large numbers of plug-in hybrid electric vehicles into the grid. The program will cost $1 billion and take 10 years and serve as a model for other cities.

- ***Southern California Edison (SCE)*** is funding two smart grid demonstration projects and is contributing to a third project:

  - SCE's *Smart Grid Demonstration Project ($1 million)* in Irvine, California, will serve as a scale model for providing real-time data on electricity load shifts and a secure

communications infrastructure to link utilities and transmission operators across the United States. The project will focus on the interoperability and interactions between technologies and systems working at the same time – such as communications networks, cyber-security requirements, and interoperability standards.

- SCE's *Tehachapi Wind Energy Storage Project ($1 million)* will deploy and evaluate a 32 MWh utility-scale lithium-ion battery to improve grid performance and aid in the integration of wind generation into the electricity supply. The project will evaluate a wider range of applications for lithium-ion batteries that will spur broader demand for the technology, bringing production to a scale that will make this form of large energy storage more affordable.
- SCE ($756,000) will help Waukesha Electric Systems to demonstrate a prototype superconducting transformer with fault current limiting capabilities, which is expected to reduce the cost and size of substation equipment.

In total, smart grid investment in California as a result of ARRA will be more than $1.2 billion, a ten-fold increase over PIER's past spending levels of $10-$14 million. This rapid increase in funding will help accelerate development and deployment of smart grid technologies and the benefits of those technologies. One of the primary results of the PIER cost-share funding will be the clean technology jobs created both from manufacturing the smart grid products being installed and from the workforce needed to install those products. Another benefit will be the development of a statewide smart grid where all equipment and technologies work together, rather than having separate grids for individual utility service areas. Also, many of the state's publicly owned utilities, which provide 25-30 percent of the state's electricity, may not have the financial wherewithal to do their own smart grid research but need to be on the same page as the investor-owned utilities for the grid to operate most effectively.

Yet another outcome of smart grid research and development will be its contribution to California's achievement of its RPS goals. Without a smart grid and its ability to integrate variable renewable resources like wind and solar, it is unlikely California will be able to meet the 33 percent RPS target by 2020. Smart grid will also help the state meet photovoltaic installation goals under the Governor's Million Solar Roof Initiative, since customer-sited photovoltaic requires a distribution system that can move electricity to and from the customer's home, in contrast to the one-directional systems currently in place.

Smart grid technologies will also help facilitate the expected increasing numbers of plug-in electric vehicles. Each automobile that plugs into the grid is equivalent to the electric load of an entire home. The current system uses transformers designed to serve a certain number of homes, but if each of those homes suddenly needs to charge one or more electric vehicles every day, those transformers will rapidly become overloaded. Smart grid technologies will allow the utility to stagger or cycle the charging of those vehicles to maintain the

stability of the grid and prevent outages caused by overloaded circuits.

This increase in grid reliability will reduce the need for transmission and distribution infrastructure, which will in turn reduce costs for customers. PIER is helping to reduce the likelihood of stranded assets and their associated costs to ratepayers by making sure proposed smart grid projects are needed and have the most likelihood of success.

Finally, there is the potential for a huge technology boom from the development of the smart grid. By helping to fund foundational smart grid research, development, and demonstration, PIER is helping to secure the benefits of future technology development for California.

Energy Efficiency and Renewable Energy Research

PIER is also providing approximately $5 million to 14 energy efficiency and renewable energy research projects designed to reduce energy use and increase the amount of renewable electricity in California's energy portfolio. Examples of projects include:

- Field testing redesigned computer server systems that can reduce the use of computing energy by as much as 75 percent compared to conventional servers.
- Demonstrating cooling control technologies that are integrated with wireless network sensors to reduce the cooling infrastructure that typically represents 25 percent of the energy use in computer data centers.
- Developing a new wind turbine prototype that is simpler to operate and cheaper to build than current technologies.
- Reopening abandoned geothermal wells using wastewater injection, identifying new geothermal wells using state-of-the-art geophysical techniques, capturing high-value minerals from geothermal brine fluid, and developing new geothermal well drilling technology.
- Developing a waste-to-renewable-energy biodigester system within a large-scale mixed-use community to serve as a model for implementing community scale renewable energy development.
- Developing computer models to identify potential impacts to the electricity grid from integrating large numbers of photovoltaic systems, such as those that will be seen under the state's Million Solar Roofs Initiative.

In the areas of energy efficiency and renewable energy, PIER cost-share funding is helping to develop projects that will reduce energy use and increase the amount of renewable energy in the state's electricity portfolio, consistent with statewide policy goals for achieving all cost-effective energy efficiency and achieving a 33 percent RPS target by 2020.

Two of the projects for which PIER is providing cost-share funding address energy use in computer data centers. In 2007, the average data center consumed as much energy as 25,000 households.[83] With

83 McKinsey & Company, *Revolutionizing Data Center Energy Efficiency*, July 2008, http://www.mckinsey.com/clientservice/bto/pointofview/pdf/Revolutionizing_Data_Center_Efficiency.pdf.

this huge appetite for energy, data centers have a large and growing carbon footprint, making them an ideal target for energy efficiency improvements. SeaMicro, Inc.,, in Santa Clara, California, received a $9.3 million federal ARRA award ($250,000 from PIER) to field test and demonstrate a patented technology that is expected to save 75 percent of the computing energy over conventional servers. The second project, Federspiel Controls, Inc., in El Cerrito, California, was awarded $584,000 in federal funding ($250,000 from PIER) to integrate variable-speed fans, adjustable server fan inlets, and wireless temperature sensors to significantly reduce cooling infrastructure, which typically consumes 25 percent of the electric energy in a data center.

PIER is also providing cost-share funding for projects to increase the amount of renewable energy generated in California. Four awards were made to support geothermal energy, which provided almost half of the state's renewable energy in 2008 and continues to be an important renewable resource in California.[84] Expected results from these projects include: development of less expensive geothermal drilling technologies that will lower the costs of developing geothermal projects; reopening abandoned wells that are expected to be able to produce 7.5 MW of renewable electricity; drilling exploratory wells with the intent of developing a 49 MW power plant in the Imperial Valley; and demonstrating a technology to recover strategically important minerals from geothermal brine that are currently almost entirely imported, thereby reducing costs to California renewable energy companies, electric vehicle manufacturers, and makers and users of lithium batteries.

Other renewable energy projects are targeting community-scale renewable energy deployment. A SMUD project will demonstrate renewable energy technologies totaling 7.1 MW, including 1.5 MW of solar photovoltaic along Sacramento's highways; 1-3 MW of energy from co-digestion of fats, oil, and grease with liquid food waste; 850 kilowatts of energy from digestion systems at two dairies; and 1.5 MW from anaerobic digestion of food waste. Similarly, the UC Davis West Village Energy Initiative will install a biodigester to produce biogas to run a fuel cell that will produce energy for the West Village, an environmentally conscious community on campus for almost 2000 students, 340 faculty and staff homes, a 10-acre recreation field complex, and a village square for retail. The community will serve as a model for a secure community electricity grid with increased power, reliability, and quality, competitive electricity costs, reduced energy demand, and lower GHG emissions.

Each of these renewable energy projects will contribute toward California's RPS goals as well as toward the state's GHG emission reduction targets. The community-scale projects will also contribute toward Governor Schwarzenegger's Executive Order S-06-06 target of increasing the amount of California's biopower produced in state.

Other PIER Cost-Share Efforts

PIER's cost-sharing activities are not limited solely to leveraging ARRA funds. PIER is also planning to provide cost-share funding for the DOE's solicitation to establish a

84 California Energy Commission, *2009 Integrated Energy Policy Report*, December 2009.

technology "hub" focused on developing new technologies to improve the design of energy efficient building systems. If the California applicant in that solicitation is ultimately selected, PIER has committed to providing $10 million in cost-share funding. Although this technology hub will not be funded with ARRA monies, it will provide jobs and other economic benefits to the state, and its research and results will feed into and likely benefit from the results of ARRA-funded energy efficiency projects in California.

Alternative and Renewable Fuel and Vehicle Technology Program

The ARVFT Program provides $100 million per year for investments in alternative fuels and vehicles technologies needed to transform California's transportation sector and achieve the state's goal of 20 percent alternative fuel use by 2020 as well as GHG emission reduction goals for 2020 and 2050.

In 2008, California's transportation sector consumed approximately 15 billion gallons of gasoline and more than 3 billion gallons of diesel fuel. Although the 2008-2009 economic downturn has reduced near-term fuel consumption, projections indicate that over the next 10 years the combined volume of gasoline and diesel consumption could grow by nearly 2 percent per year. The transportation sector also accounts for roughly 40 percent of all GHG emissions in the state.

In July 2010, the Energy Commission published its second investment plan to establish funding priorities for the ARFVT Program, the *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program.* The plan allocates funding among battery electric drive, hydrogen electric drive, gasoline and diesel substitutes, natural gas, propane, innovative technologies and advanced fuels, and market and program development.[85]

Alternative and Renewable Fuel and Vehicle Technology Program

Funding: **$36.5 million**

Private funds leveraged: **$106 million**

Federal funds leveraged: **$105 million**

Jobs created/retained: **1,364**

Alternative vehicles demonstrated: **1,603**

Alternative fueling stations added:
LNG, 2; Ethanol, 75; EV charging, 3,890

Petroleum fuel displaced per year:
36 million gallons

GHG reductions per year:
181,919 tons

Consistent with the Energy Commission's commitment to leverage federal ARRA dollars to the maximum extent possible, a portion of the ARFVT Program funding was set aside to provide match funding for California companies applying for competitive DOE ARRA funding. ARFVT Program funds are also being used to support workforce development activities through the Clean Energy Workforce Training Program.

The Energy Commission's ARFVT Program cost-share funding is helping to fund the

85 California Energy Commission, *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*, July 2010, http://www.energy.ca.gov/2010publications/CEC-600-2010-001/CEC-600-2010-001-CTF.PDF

installation of 3,650 new electric vehicle charging sites, demonstration of more than 800 medium- and heavy-duty natural gas and hybrid-electric trucks to show how alternative vehicles perform under real driving, traffic, and weather conditions, and development of high energy density lithium-ion batteries that could allow electric cars to drive 300 miles on a single charge, powered by $10 of clean electricity instead of $50 of oil.[86] Several of the projects that the Energy Commission is helping to fund are multi-state efforts that will have indirect benefits to California by providing more robust vehicle and infrastructure manufacturing industries in other states that provide vehicles for California use.

Plug-in hybrid-electric vehicles and battery electric vehicles are being aggressively developed by automakers and will be entering the market in increasing numbers over the next decade. Currently, 10 automakers are producing light-duty hybrid electric vehicles, and as many as 110,000 of these vehicles are being added to the market in California each year. With the potential for more than a million electric vehicles in California by 2020, it is essential that California develop the charging stations needed to support these vehicles. The ARRA awards to California, while initially a small part of what will eventually be needed, are laying the foundation for the infrastructure that will be required for successful deployment of electric vehicles in the state.

86 Ibid.

Transportation Projects

To date, the Energy Commission has committed $36.5 million in cost-share funding to the following California projects that have been awarded approximately $105 million in ARRA funds and secured $106 million in private funds.

- ***Ultra-Low-Emission LNG Local Goods Movement Using LNG Trucks and LNG/CNG Fueling Infrastructure, San Bernardino Associated Governments ($9.3 million):*** San Bernardino Associated Governments is partnering with Ryder Trucks to buy 262 natural gas heavy-duty trucks that will replace more than 2.64 million gallons of diesel fuel per year with cleaner and locally produced liquefied natural gas (LNG), shifting fuel investments from overseas markets to California-produced fuels. Since one of the biggest challenges facing heavy-duty fleets that are considering natural gas as an alternative fuel is access to alternative fueling infrastructure, the project also includes construction of two LNG fueling stations in the San Bernardino and Orange County market areas.

  The project is expected to create 428 jobs and retain 30 jobs and will serve as a model for other commercial heavy-duty trucking companies on how to successfully implement alternative fuel programs in large commercial fleets. Air quality benefits from the project include reducing GHG emissions by nearly 4,000 tons per year and eliminating more than two tons of diesel particulate emissions from a truck fleet that operates in low-income and minority communities that suffer from

disproportionate impacts from diesel emissions.

- ***Heavy-Duty Natural Gas Drayage Truck Replacement, South Coast Air Quality Management District ($5.1 million):*** This project will replace 180 existing diesel trucks used in the Ports of Los Angeles and Long Beach with natural gas-powered trucks, displacing about 1.5 million gallons of diesel fuel annually. Because the use of natural gas as a vehicle fuel requires special training, this project will create or expand specialized jobs in alternative fuel education, maintenance, repair, and safety expansion and is expected to create 152 jobs during its first two years. The project will support California's efforts to increase the use of alternative transportation fuels and reduce petroleum dependence and provide economic benefits by expanding the alternative fuel industry. In addition, with increased sales of alternative fueled vehicles, there will be increased revenues for California through local and state sales taxes. Air quality benefits include reduced GHG emissions of 152 tons per year as well as significant reductions in carbon monoxide, volatile organic compounds, nitrogen oxides, and particulate matter.

- ***California Low Carbon Fuels Infrastructure Investment Initiative (Propel Fuels, Inc.)*** This project will build 75 ethanol fueling stations throughout California to supply low-carbon, domestically produced fuel to support flexible fuel vehicles (FFVs) in both the private and public sectors. Stations will be located in areas of the state with high concentrations of FFVs. The project is expected to displace more than 24 million gallons of petroleum-based fuel per year and create direct and indirect jobs through the design, construction, and operation of a statewide network of fueling stations. The project expects to create or retain more than 450 jobs in construction, operation, manufacturing, and fuel production. Partnering with Local Conservation Corps will provide a unique opportunity for job creation for site operations and maintenance, technical support of installed equipment, and certified site inspectors. The project anticipates reducing GHG emissions by 170,000 metric tons per year.

  Ethanol currently represents the largest volume of alternative or renewable fuel in use today, with about 1 billion gallons per year blended in gasoline in California. FFVs that can use gasoline, E-85 (85 percent ethanol), or any blend level in between are being produced today, with approximately 400,000 FFVs in California's existing fleet. However, there are only 43 existing retail and fleet fueling facilities in operation today. To meet existing federal requirements for increased use of alternative and renewable fuels like ethanol and biodiesel, California will need to dramatically increase its ethanol fueling infrastructure. The Propel Fuels project will develop this infrastructure and increase the availability of E-85 fuel to consumers in California.

- ***Charge California, Alternative and Renewable Fuel Infrastructure (Coulomb Technologies, Inc.)*** Charge California is a partnership among

Coulomb Technologies, Clean Fuel Connection, and the California Car Initiative to establish 1,290 public and private electric vehicle charging stations in the San Francisco, Sacramento, and Los Angeles areas. Successful completion of the project will annually displace approximately 500,000 gallons of gasoline and reduce GHG emissions by 2,500 tons. The project will also address the goals of the Energy Commission's transportation investment plan to "upgrade public and private infrastructure investments and expand the network of public access fueling stations." Providing this infrastructure will help accelerate the adoption and use of electric vehicles which will in turn help California achieve its Low Carbon Fuel Standard and GHG emission reduction goals, reduce petroleum dependence, and increase energy security through fuel diversity. With the significant number of planned charging stations, this initiative will provide jobs for installation and operation of the stations as well as manufacture of the equipment that is installed.

- ***Nissan Electric Vehicle Demonstration and Vehicle Infrastructure Evaluation*** The Electric Transportation Engineering Corporation (ETEC) and Nissan North America will demonstrate and evaluate 1,000 battery electric vehicles in the San Diego area and provide infrastructure support including more than 2,300 public and private chargers. As all-electric vehicles, the 1,000 Nissan Leaf vehicles are expected to save more than 1.7 million gallons of gasoline and reduce GHG emissions by nearly 5,000 tons per year. Economic benefits of the project include an estimated 153 jobs produced in California for installation and servicing of electric charging stations. The project will also address barriers to market penetration of alternative vehicles like inadequate fueling and maintenance infrastructure, limited vehicle availability, and lack of trained service personnel, which will help to spur the deployment of 242,000 Nissan electric vehicles by 2015. Companies like ETEC are helping to move the United States from less than 500 electric vehicle charging locations to more than 20,000 by 2012.[87]

- ***Plug-In Hybrid Electric Medium-Duty Commercial Fleet Demonstration and Evaluation (South Coast Air Quality Management District)*** This project will develop a demonstration fleet of 107 plug-in hybrid electric trucks and shuttles in California along with the charging infrastructure to support those vehicles. Economic benefits to California include reduced consumption of diesel and gasoline in favor of lower-cost, locally generated electricity. By reducing the operating costs in vehicle fleets, this project can increase economic performance for companies and agencies. Projections of fuel savings by 2015 are from 3.9 million to 7.8 million gallons per year. This project is expected to create 31-41 direct jobs and retain 30-100 jobs.

87 The White House, "The Recovery Act: Transforming the American Economy Through Innovation," August 2010, http://www.whitehouse.gov/recovery/innovations/intro, accessed August 28, 2010.

- ***Charging Infrastructure for Plug-In Hybrids and Electric Vehicle Demonstration With General Motors (Sacramento Municipal Utility District)*** This project will demonstrate 34 General Motors Volt vehicles and install 300 charging stations in SMUD's service territory. The overall goal of the project is to advance the use of electric drive technology for plug-in hybrid vehicles, which then allows the use of electricity as a low-carbon transportation fuel to reduce GHG emissions. CO_2 emissions are expected to be reduced by 267 metric tons during the three-year project. The project will also provide economic benefits by offsetting the use of gasoline and reducing California's dependence on fuel imports. SMUD estimates that at $2.50 per gallon, the retail value of out-of-state petroleum is about $22.7 billion each year. Displacing only 10 percent of that out-of-state petroleum with electricity would save California's economy $2.27 billion in exported capital.
- ***Charging Infrastructure for Plug-In Hybrids and Electric Vehicle Demonstration With Chrysler (SMUD)*** This project will demonstrate 9 Chrysler PHEV vans and 11 Dodge Ram pickups. Annual gasoline displacement is estimated at 4,550 gallons per year for the 20 vehicles during this project. Similar to the SMUD/GM project, this project will help with the commercialization of these new product offerings and also provide benefits from the charging infrastructure to support these and other electric vehicles. The vehicles demonstrated through this project will support California's AB 32 and Low Carbon Fuel Standard GHG reduction policies as well as the state's alternative fuel and petroleum reduction policies. Economic benefits of this project will result not only from petroleum displacement and reduction of California's dependence on imported gasoline from out of state, but also from the increased manufacture of equipment that will be used in the charging stations supporting the vehicles.
- ***Development of High Energy Density Lithium Batteries for Electric Vehicles and Plug-In Hybrid Electric Vehicles (Envia, Inc.)*** This project will create new high-performance batteries with double the energy density of current batteries. Doubling the performance of the battery can cut battery costs by more than half. With battery costs in the current Chevy Volt about a third of the price of the vehicle, Envia's technology can reduce vehicle costs by 17 percent, addressing one of the main barriers to widespread adoption of battery vehicles. The project will initially result in 10 new jobs, but Envia anticipates eventually hiring more than 100 people to manufacture the battery material in high volume. ARRA-funded start-ups like Envia are helping to create lighter, cheaper, and more powerful batteries that will put California and the United States in the position to build the best electric cars in the world.

Clean Transportation Workforce Training

The Energy Commission allocated funding from the ARFVT Program to support workforce training under the ARRA-funded Clean Energy Workforce Training Program. Funds were allocated through interagency agreements with the Employment Training Panel ($6 million), the Employment

Development Department ($4.5 million), and the California Community Colleges Chancellor's Office ($4.5 million). A complete list of projects awarded funding is available in Appendix A.

Highlights of activities taking place under each agreement include:

- *Employment Training Panel (ETP) Interagency Agreement ($6 million):* The Energy Commission has awarded $1.8 million in workforce training contracts to five projects with companies that will train more than 600 workers in hybrid electric technologies, electric vehicle manufacturing, alternative fueling station construction, hydrogen fuel cell design, biodiesel, and other alternative fuels production. These contracts are business-driven, meaning that the companies are crafting the training programs to meet specific business needs. For example, Electric Vehicles International, an electric vehicle manufacturer, will use its funds to train 100 new workers in commercial skills related to electric vehicle manufacturing and conversion. The ETP is currently developing seven additional contracts totaling $1.1 million to train more than 5,400 workers and anticipates having the full $6 million allocated by the end of 2010.
- *Employment Development Department Interagency Agreement ($4.5 million):* The Energy Commission has awarded $2.2 million to six workforce training programs that will turn out more than 700 graduates equipped with the skills to fill positions within the clean transportation industry and support the state's transition to alternative fuels and advanced vehicle technologies. The Energy Commission distributed the awards to geographically diverse locations with three of the training programs in Southern California, two in the Bay Area, and one in Sacramento. The training programs seek to train or retrain workers who have experienced hardships such as lost jobs or reduced pay or who cannot find work as a result of the economic recession. One of the projects will provide instruction to an estimated 210 trainees in green heavy-duty trucks and transit vehicles at colleges in the Long Beach region, an area with a large high school dropout population. In the October – December 2010 timeframe, the Energy Commission will release a targeted solicitation using the $1.6 million not yet obligated under the Clean Energy Workforce Training Program. This solicitation will target geographic regions like the San Joaquin Valley that did not solicit funding in the first round.
- The Regional Industry Clusters of Development is a partnership among the Energy Commission, the California Workforce Investment Board, the Economic Strategy Panel, and the California Labor and Workforce Development Agency. The ARFVT Program dedicated funds to this effort to support four regions that have identified clean transportation industries and/or transportation industry clusters: San Bernardino County, Long Beach, Santa Barbara, and 11 northern California counties. In addition, the agreement is funding the Employment Development Department's green jobs survey and response analysis with 5,000

respondents to obtain vital feedback on the labor market.

- *California Community Colleges Chancellor's Office (CCCCO):* The CCCCO will fund activities that include regional assessments and environmental scans[88] conducted by the Centers of Excellence[89], as well as curriculum development and a "train the trainer" program enacted through the Advanced Transportation Technology and Energy centers located at various community colleges throughout California. The results of the studies from the Centers of Excellence will enhance California's understanding of how the transportation industry is evolving and what new skills are needed to meet workforce training demand.

Other ARRA-Funded Energy Projects in California

Table 1 shows ARRA awards to California as of June 2010.[90] Not included in the table are $2.4 billion in loan guarantees, additional tax credits that have been awarded since June,[91]and $2.3 billion for high-speed rail.

Energy Efficiency

In addition to the $49.6 million that the Energy Commission was awarded through the Energy Efficiency and Conservation Block Grant program for small cities and counties, California is was awarded nearly $306 million in direct formula grants from the DOE for large cities and counties as well as Native American tribal organizations.[92] The DOE's minimum requirements for direct formula grants were based on population, 35,000 for cities and 200,000 for counties, or on being one of the 10 largest populated cities or counties in the state. The direct formula grants are supporting a wide variety of energy efficiency planning, audits, and projects across the state.

A few examples of the 332 formula grants to large cities and counties include:

- ***Los Angeles County ($37 million):*** Los Angeles County plans to launch a community-scale building retrofit program, retrofit municipal buildings to improve their energy efficiency, and implement a Green Building Ordinance for new construction of residential and commercial buildings to meet California's energy and GHG emission reduction goals.

[88] Environmental scans consider the factors that will influence the direction and goals of a business or organization.

[89] The Centers of Excellence partner with business and industry to deliver regional workforce research that is customized for community college and workforce system decision-making and resource development.

[90] Brief descriptions of all California awards as of June 2010 are available on the United States Department of Energy website at: http://www.energy.gov/recovery/documents/Recovery_Act_Memo_California.pdf.

[91] For a partial list of California entities receiving tax credits, please see United States Department of the Treasury website at : http://www.treasury.gov/recovery/1603.shtml.

[92] Data from: http://www.recovery.gov/FAQ/Pages/DownLoadCenter.aspx.

Table 1. ARRA Funding for California Energy Projects

Program	# Awards[a]	Amount (millions)[a]
Weatherization Assistance Program	1	$185.8
State Energy Program	1	$226.1
Energy Efficiency and Conservation Block Grant Program	307	$355.1
Energy Efficient Appliance Rebate Program	1	$35.3
Building and Industrial Energy Efficiency	23	$51.1
TOTAL ENERGY EFFICIENCY	**333**	**$853.4**
Solar, Wind, Geothermal	35	$77.5
Community Renewable Energy Deployment	2	$7.5
TOTAL RENEWABLE ENERGY	**37**	**$85.0**
Smart Grid Investment and Demonstrations Project	14	$385.7
State and Local Energy Assurance and Regulatory Assistance	5	$6.0
Smart Grid Workforce Training	2	$1.5
TOTAL ELECTRIC GRID	**21**	**$393.2**
Transportation Electrification	3	$60.9
Clean Cities Alternative Fuel and Vehicles Program	3	$25.0
Advanced Fuels	2	$44.8
Additional Programs	3	$11.1
TOTAL TRANSPORTATION	**11**	**$141.8**
Carbon Capture and Storage Projects	4	$313.2
Geological Characterization Projects	1	$4.8
Research and Training	3	$0.9
TOTAL CARBON CAPTURE AND STORAGE	**8**	**$318.9**
Environmental Management Contracts	2	$23.8
TOTAL ENVIRONMENTAL CLEANUP	**2**	**$23.8**
Advanced Research Projects Agency - Energy	7	$20.8
Energy Frontier Research Centers	3	$28.4
Small Business Research	19	$2.7
National Laboratory Facilities	40	$351.9
Additional Programs	19	$55.2
TOTAL SCIENCE AND INNOVATION	**88**	**$459.0**
Payments/Renewable Generation in Lieu of Tax Credits	248	$79.1
Clean Energy Manufacturing Tax Credits	9	$235.5
TOTAL TAX INCENTIVES[b]	**257**	**$314.6**
GRAND TOTAL	**757**	**$2,589.7**

[a] Represents DOE selections for potential funding recipients but does not necessarily indicate that a final agreement has been reached.
[b] Jointly administered by DOE and the United States Department of Treasury.

Source: United States Department of Energy, www.energy.gov/recovery.

- ***San Diego County ($12.5 million):*** San Diego County's plans include an initiative to expedite the permitting of green buildings and renewable energy projects to improve energy efficiency and expand the use of renewable energy in the county.
- ***San Jose ($8.8 million):*** San Jose will install HVAC upgrades, cool roofs, water heater replacements, and lighting improvements in city facilities with high energy costs; expand solar energy deployment; and replace approximately 1,500 streetlights with energy efficient LED lights.
- ***Sacramento County ($5.4 million):*** Sacramento County will establish an incentive program to upgrade county facilities, establish a revolving fund to pay for energy audits and energy efficiency retrofits on county-owned and leased buildings, and fund the Sacramento Regional Energy Alliance to focus on upgrading the energy efficiency in existing homes.
- ***Fresno ($4.6 million):*** Fresno will establish the Sustainable Fresno Revolving Loan Bank to create a revolving fund for loans to families and businesses to install renewable energy and energy efficiency and water conservation measures.

In addition to formula grant funding, Los Angeles County was also awarded $30 million through the Retrofit Ramp Up Program which is the competitive portion of the EECBG program. Retrofit Ramp Up is providing $452 million to target community-scale retrofit projects that make significant long-term impacts on energy use and can serve as national models. Los Angeles County is partnering with utilities, cities, and counties across California, including Sacramento and the Association of Bay Area Governments. The Retrofit California Project focuses on rapidly accelerating whole neighborhood building energy retrofits across California and demonstrating innovative retrofit models that are widely replicable, both statewide and nationally.[93]

While detailed data about expected results of these grants is not readily available, these projects will help transform California's energy efficiency retrofit sector, add renewable energy to the state's electricity mix, and provide large-scale energy, environmental, and economic benefits including energy and water savings, reduced GHG emissions, and jobs.

Renewable Resources

Manufacturing

The first United States company to be awarded a DOE loan guarantee was Solyndra, Inc., a manufacturer of innovative cylindrical photovoltaic systems. Solyndra, located in Fremont, California, plans to use its $535 million loan to expand its solar panel manufacturing capacity in California. The project is estimated to create more than 1,000 jobs. Over the life of the project, Solyndra expects to produce solar panels sufficient to generate up to 15 GW of renewable electricity, enough to avoid 300 million tons of CO2 emissions.

Power Plants

There are 46 renewable projects currently being proposed in California that applying

93 California Energy Commission, Retrofit Ramp-Up Selected Projects, http://www.energy.gov/news/documents/Retrofit_Ramp-Up_Project_List.pdf.

for ARRA assistance. Nine of those projects are solar thermal plants that fall under the Energy Commission's power plant licensing jurisdiction. Because of federal deadlines associated with ARRA tax credits and loan guarantees, the Energy Commission has worked diligently with state and federal agencies and with the California Legislature to streamline the permitting process while still ensuring balanced, thorough, and independent evaluations of their safety and environmental impacts on California and its citizens.[94] These efforts along with the unique challenges faced by these power plants were described in Chapter 3.

Transportation Projects

California produces only about 37 percent of the petroleum is uses, with petroleum fuel accounting for 96 percent of the state's transportation needs.[95] This overwhelming dependence on a single source of fuel threatens the state's energy and economic security and raises environmental concerns. ARRA funding is helping to transform California's automotive sector by investing in transportation-related projects like high-speed rail, advanced biofuels, and electric vehicle manufacturing.

The DOE is providing direct ARRA funding to several clean energy transportation projects that will help the state meet its environmental and economic goals. These are projects that are not under the Energy Commission's oversight, but will have a direct effect on the state's progress in achieving policy goals under AB 32, the Energy Commission's *Integrated Energy Policy Report*, the ARB's *Climate Change Scoping Plan*, the Low Carbon Fuel Standard, and the *Bioenergy Action Plan for California*.

Below are brief descriptions of clean energy transportation projects with ARRA funding awards directly from the DOE:

- ***California High-Speed Rail Project*:** In January 2010, the DOE awarded $2.3 billion to the California High-Speed Rail Authority for the development of high-speed intercity rail that will eventually span from Sacramento to San Diego. California's award represents the largest share of federal funding for such a project in the nation. The high-speed train will help meet state climate change goals, as it will run on 100 percent renewable and will remove millions of passenger trips from the highways yearly. This project promises to significantly alter the transportation landscape in California by connecting the state's largest cities with up to 220 mile per hour service. With less than 500 miles of high-speed rail, the United States is significantly behind other nations like China, which has completed nearly two-thirds of a planned 8,000-mile high speed rail network, as well as smaller countries like Japan, France, and Germany, which all have more than 1,000-mile networks. Adding high-speed rail infrastructure in California is an important piece of national investments that are laying the groundwork for future high-speed rail services throughout the United States. Once complete, the project expects

94 "Safe harbor" provisions may permit expenditure of 5 percent of project cost by year end as an alternative to physically starting construction.

95 California Energy Commission, California Petroleum Statistics and Data, http://energyalmanac.ca.gov/petroleum/index.html, accessed August 28, 2010.

business, leisure, and commuter ridership of up to 100 million passengers a year by 2035, making it one of the busiest passenger rail lines in the world. Projected benefits of the project include reduced dependency on foreign oil by up to 12.7 million gallons per year[96] and decreased GHG emissions of more than 5 million metric tons of CO_2 annually. This project will also add as many as 600,000 new construction-related jobs throughout California to build the rail system.[97] For example, on August 11, 2010, the Transbay Transit Center in San Francisco, the northern terminus for the high-speed rail system, broke ground and is expected to create 48,000 jobs in the first phase of construction, which will last seven years.[98]

- ***Biorefinery Pilot Projects*:** California was awarded DOE funding for two advanced biofuel projects, *Amyris Biotechnologies, Inc.*, ($24.3 million) pilot project to produce renewable diesel fuel from sweet sorghum and *Logos Technologies* ($20.5 million) project to convert switchgrass and woody biomass into low-cost ethanol. The Amyris pilot facility in Emeryville, California, will have a capacity of 1,370 gallons per year of biodiesel fuel that will provide GHG reductions of 80 percent compared to petroleum diesel. The project is expected to result in 50 new full-time jobs during the funding period.[99] The Logos Technologies pilot project in Visalia, California, will have a capacity of 50,000 gallons per year of ethanol, provide 80 percent reduction in GHG emissions versus petroleum-based fuels, and create 11 new positions.[100]

Advanced biofuels are critical to building a cleaner, more sustainable transportation system in the U.S.

Dr. Steven Chu
Department of Energy Secretary

- ***Advanced Technology Vehicles Manufacturing***: Tesla Motors was awarded a $465 million loan under DOE's Advanced Technology Vehicles Manufacturing program to produce electric drive trains, electric vehicles, and battery packs. Tesla purchased the former New United Motor Manufacturing Inc., plant in Fremont, California, that closed in early 2010, with the goal of producing increasingly affordable electric cars to mainstream buyers. The first model to be produced, the Model S, is expected to be the first pure electric premium sedan and will have an optional extended-range battery pack, allowing it to travel more than 300 miles per charge. The company

96 California High-Speed Rail Authority, see: http://www.cahighspeedrail.ca.gov/news/Factsheetenviro.pdf.

97 http://gov.ca.gov/press-release/14304/.

98 Transbay Transit Center, "Historic Groundbreaking of First New High-Speed Rail Station in United States," August 11, 2010, http://transbaycenter.org/uploads/2010/08/groundbreaking_press_release_2010-0811.pdf, accessed August 28, 2010.

99 United States Department of Energy Biomass Program fact sheet, http://www1.eere.energy.gov/biomass/pdfs/ibr_arra_amyris.pdf, accessed August 28, 2010.

100 United States Department of Energy Biomass Program fact sheet, http://www1.eere.energy.gov/biomass/pdfs/ibr_arra_logos.pdf, accessed August 28, 2010.

estimates the project will create 1,000 jobs.

The United States Department of Transportation is also administering hundreds of other transportation projects throughout the state using ARRA funds. This report will not describe these projects, as they are too numerous and most do not pertain to energy. However, these federal ARRA funds are going toward several statewide road and infrastructure improvements, bus and rail line upgrades and expansions, bridge work, and various other projects that will stimulate the economy, improve public safety, and expand clean transportation options for all Californians.

Conclusion

ARRA funding awards to California will clearly have a transformative effect on the state's economy and on its energy sectors. The formula grants administered by the Energy Commission are expected to create or retain nearly 6,000 jobs, reduce annual energy costs by almost $14 million, save 174 million kWhs of electricity and 3 million therms of natural gas, reduce GHG emissions by 370,000 tons per year, leverage $660 million of funding from other sources, and train more than 9,000 potential workers to provide the workforce needed to support these programs.

The Energy Commission's cost-share funding for projects with competitive ARRA awards is helping to leverage more than $620 million in additional federal funding and more than $1 billion in private funding for projects that are expected to provide more than 1,300 in-state jobs, demonstrate 1,600 alternative fuel vehicles, add nearly 4,000 alternative vehicle fueling and charging stations, displace more than 35 million gallons of petroleum fuel, and reduce GHG emissions by 181,000 tons per year.

Renewable power plants seeking ARRA-funded federal tax credits and loan guarantees will add 4,000 MW of new renewable generating capacity to the state, provide 10,000 construction jobs and close to 1,400 permanent jobs, and add billions to the state's economy in the form of investment, tax benefits, and purchases of equipment and material from local vendors.

These expected results are impressive, but more important is the foundation that ARRA funding is providing for the future of California's clean energy economy. The investment of ARRA funds will provide energy and cost savings, job creation, and essential energy infrastructure that will benefit California for years to come.

Acronyms Used in Report

AFC	–	Application for Certification
ARB	–	California Air Resources Board
ARFVT	–	Alternative and Renewable Fuel and Vehicle Technology Program
ARRA	–	American Recovery and Reinvestment Act of 2009
BLM	–	United States Bureau of Land Management
BSA	–	Bureau of State Audits
BTU	–	British thermal unit
CAEATFA	–	California Alternative Energy and Advanced Transportation Financing Authority
California ISO	–	California Independent System Operator
CCCCO	–	California Community Colleges Chancellor's Office
CEQA	–	California Environmental Quality Act
CEWTP	–	Clean Energy Workforce Training Program
CLTC	–	California Lighting Technology Center
CPUC	–	California Public Utilities Commission
DGS	–	Department of General Services
DOE	–	United States Department of Energy
DRECP	–	Desert Renewable Energy Conservation Plan
ECAA	–	Energy Conservation Assistance Act
EDD	–	Employment Development Department
EECBG	–	Energy Efficiency and Conservation Block Grant
ETEC	–	Electric Transportation Engineering Corporation
ETP	–	Employment Training Panel
FFV	–	Flexible fuel vehicle
FHFA	–	Federal Housing Financing Agency
FOA	–	Funding Opportunity Announcement
GHG	–	Greenhouse gas
GWh	–	Gigawatt-hour
HERS	–	Home Energy Rating System
HVAC	–	Heating, ventilation, and air conditioning

IEPR	–	Integrated Energy Policy Report
IOU	–	Investor-owned utility
kWh	–	Kilowatt-hour
LED	–	Light-emitting diode
LNG	–	Liquefied natural gas
MOU	–	Memorandum of Understanding
MV&E	–	Measurement, verification, and evaluation
MW	–	Megawatt
OTC	–	Once-through cooling
PACE	–	Property Assessed Clean Energy
PEIS	–	Programmatic Environmental Impact Statement
PEV	–	Plug-in electric vehicle
PIER	–	Public Interest Energy Research Program
PON	–	Program Opportunity Notice
PV	–	Photovoltaic
RD&D	–	Research, development, and demonstration
REAT	–	Renewable Energy Action Team
REPG	–	Renewable Energy Policy Group
RETI	–	Renewable Energy Transmission Initiative
RICOG	–	Regional Industry Clusters of Opportunity Grants
RPS	–	Renewable Portfolio Standard
SCE	–	Southern California Edison
SDG&E	–	San Diego Gas & Electric Company
SEP	–	State Energy Program
SESP	–	State Energy Sector Partnership
SETA	–	Sacramento Employment and Training Agency
SMUD	–	Sacramento Municipal Utility District
SPEED	–	State Partnership for Energy Efficiency Demonstrations
SWRCB	–	State Water Resources Control Board