California Energy Commission

PUBLIC INTEREST ENERGY RESEARCH

Responses to April 22, 2010 Questions
from Senator Alex Padilla, Chairman
Senate Energy, Utilities and Communications Committee

Program Purpose, Activity & Progress

A1. The stated legislative purpose of the PIER program is to develop, and help bring to market, energy technologies that provide increased environmental benefits, greater system reliability, and lower system costs, and that provide tangible benefits to electric and gas utility customers. For each stated purpose, please list ten contracts that have been awarded that have achieved that purpose, For each contract list the awardee and summarize its purpose and cost.

Part 1: ***For each stated purpose, please provide list ten contracts that have been awarded that have achieved…tangible benefits to electric and gas utility customers***

All contracts in the Energy Commission's research portfolio address the PIER program goal to "develop, and help bring to market, energy technologies that provide increased environmental benefits, greater system reliability and lower system costs, and that provide tangible benefits to electric utility customers" per Public Resources Code Section 25620.1. The following are 10 additional examples of research projects that demonstrate tangible benefits to electric and gas utility customers:

1) **Project Title:** Wireless Data Center Controls

Awardee: Lawrence Berkeley National Laboratory

Partners: California Franchise Tax Board, Department of General Services, Federspiel Controls

PIER Amount: $220,000

Purpose: In August 2008, Franchise Tax Board (FTB) partnered with California's Department of General Services and the California Energy Commission to install a Data Automation Software and Hardware (DASH) system from Federspiel Controls. The DASH system uses wireless sensors and web based software to control computer room air handling units. The project also installed variable frequency fan drives and fusible link curtains. The controls

software and hardware were installed sequentially and evaluated using a measurement and verification procedure between each measure.

The following are the project results:

- The datacenter saved 475,239 kWh per year and lowered energy use by 21 percent
- Annual cost savings of $42,772 per year
- Simple payback of 3.1 years

Based on the success of this project, the FTB plans to use this technology in other data centers to reduce its annual operating costs. Since the FTB is a tax support governmental agency, reductions in energy costs will benefit all electric rate payers in California.

The final report is posted at http://hightech.lbl.gov/demo-ftb-wireless.html.

2) **Project Title**: Western Cooling Efficiency Center
Awardee: UC Davis
PIER Amount: $424,000
Match Funding: $135,000
Purpose: Purpose: The Western Cooling Efficiency Center (WCEC) was founded by PIER to promote cooling techniques which work especially well in the dry climates found in the western United States. This climate offers particular opportunities for efficient cooling, because there is no need for the dehumidification required in moister areas. National air conditioning manufacturers, designing for the worst case, have largely ignored this potential. Efficient western options include both evaporative cooling technology and radiant cooling, which involves no dehumidification.

WalMart – Radiant Tubing Used for Store Cooling

With the WCEC assistance, a spectacular success was achieved with WalMart, by developing an inexpensive way to quickly install radiant tubing in a large floor slab. The tubing is manufactured in a large roll which is simply uncoiled just before the concrete is poured, eliminating a huge amount of installation labor. Cooled water is circulated through the tubing to keep the store comfortable. Cooling energy use in stores piloting the system is only 20 percent of that in a typical WalMart, going from 84 MWh to 17 MWh in pilot stores. Cooling power requirements are similarly reduced, and can be substantially shifted to off peak times by cooling the slab at night.

Six pilot stores have been constructed to date, including two in the Sacramento area, and the system is so successful that WalMart has indicated it will become their standard design in relatively dry areas. The radiant cooling system has a second beneficial characteristic: it costs less than the system it replaces. WalMart was able to eliminate 75 percent of the 39 rooftop air conditioners they place on a typical store, and this savings more than offset the cost of installing the radiant system. When the system is fully characterized it is likely to move into Title 24 as the prescriptive standard for setting the cooling energy budget for applicable California buildings.

A second remarkable success for the WCEC is the Western Cooling Challenge. This addressed the chicken-and-egg conundrum of efficient western air cooling: no manufacturer offered western-optimized equipment, and so no customer could specify it. Since no customer specified it, no manufacturer would offer it. The WCEC solved this by developing a tough but achievable specification for highly efficient dry-climate

cooling. The result was that twelve companies have set out to make equipment meeting the specification. The first qualifying product is manufactured by Coolerado, with an efficiency so exceptional that on a 105 degree peak day it will draw less than half the power of typical unit, saving over 3 kW for a 5-ton cooling capacity. The WCEC has proven that if customers are brought forward, manufacturers will respond.

3) **Project Title:** Windows and Facades Testbed
Awardee: Lawrence Berkeley National Laboratory
PIER Amount: $500,000
Match Funding: $1,530,000
Purpose: Glazing and façade systems can have large energy impacts on commercial building performance. These systems directly influence heating and cooling loads and indirectly influence lighting loads when daylighting is considered. Besides affecting annual energy use, they can have significant impacts on peak cooling system sizing, electric load shape and peak electric demand. These systems are also influenced by occupant preference, satisfaction and comfort. Accordingly, glazing and façade systems pose a complex design optimization challenge compared to other building systems. Opportunities for more energy efficient design and technology have been addressed in the building energy efficiency standards (Title 24), but high costs for such projects have impeded achievement of widespread, significant savings.

PIER funded research at the Windows and Facades Testbed to focus on addressing significant near-term opportunities to reduce energy use in California commercial building stock by a) targeting voluntary, design-based opportunities derived from the use of better design guidelines and tools, and b) developing and deploying more efficient glazings, shading systems, daylighting systems, façade systems and integrated controls.

The research project, supported by the PIER program and the US Department of Energy, initiated a collaborative effort between LBNL and major stakeholders in the facades industry to develop, evaluate, and accelerate market deployment of emerging, high-performance, integrated façade solutions. Project results include:

- Aided component suppliers to create and optimize cost effective, integrated systems that work and demonstrated and verified that these integrated systems reliably deliver required energy performance
- Initiated an industry consortium to mutually work out and agree on the goals, criteria, and pathways needed to attain the ambitious net zero energy building goals
- Formulated a testing, monitoring, and reporting protocol in collaboration with industry partners and transitioning industry to focus on the importance of expecting measured performance to consistently achieve design performance expectations
- Quantified energy use, peak demand, and occupant comfort impacts of synergistic facade-lighting-HVAC systems on an apples-to-apples comparative basis and its data can be used to verify results from simulations
- Investigated emerging interior and exterior shading technologies as potential near-term, low-cost solutions with potential broad applicability in both new and retrofit construction
- Determined that exterior shading systems yield net zero energy levels of performance in a sunny climate and significant reductions in summer peak demand
- Determined that interior shading systems yielded significant daylighting and comfort-related benefits

- Developed a PC-based commercial fenestration (COMFEN) software package, based on EnergyPlus, that enables architects and engineers to quickly assess and compare the performance of innovative façade technologies in the early sketch or schematic design phase. This tool is publicly available for free and will continue to improve in terms of features and accuracy.
- Developed simulation tools to model the performance of any arbitrary complex fenestration system such as common Venetian blinds, fabric roller shades as well as more exotic innovative façade systems such as optical louver systems.

One of the major benefits of the research is that energy savings from glazings and shading devices can now be quantified via simulation. This means utilities now have the ability to move forward and provide incentives for these technologies which will benefit both electric and gas utility customers.

Windows and Facades Testbed

4) **Project Title:** Commercializing Zero Energy New Home (ZENH) Communities
Awardee: Powerlight Corporation
PIER Amount: $2,730,261
Match Funding: $3,888,758
Purpose: The purpose of this project was to integrate building energy efficiency and photovoltaic (PV) systems in a cost effective manner. The goals of the project were to: a) provide practical approach to applying PV new solar homes and to make building integrated photovoltaic (BIPV) a mainstream product for California's new home construction; b) reduce the first-cost of solar homes, and reduce home owners' energy bill, and the summer peak electricity demand; c) remove market barriers by developing innovative business models and alternative financing mechanisms for solar homes; and d) demonstrate the results of the project by building two housing communities (a single-family housing and a multi-family housing), each with at least 75 ZENH solar homes.

Project results include:
- Innovative and cost effective approaches to install photovoltaic systems, energy efficient products, home design, and strategies for the new housing construction market were developed.
- Market barriers to new solar and energy efficient homes were addressed along with mitigation plans.
- Innovative new business model and financing mechanism were developed for all facets of commercial homebuilding design, energy analysis and solar installation business.

Project benefits include:
- Built four ZENH demonstration communities in California with more than 150 single- and multi-family solar homes
- Reduced incremental first-cost of solar homes
- Developed new BIPV products for ZENH communities
- Built more than 3,000 energy efficient solar homes in California utilizing the results of this project
- Developed new innovative business model and financing mechanism for ZENH solar homes
- Exceeded the Title 24 requirements by more than 35 percent in ZENH building designs
- Produced homeowner energy savings averaging 60 to 70 percent
- Established streamlined processing standards for California's regulatory and local business practices
- Partnered with more than two dozen national and regional homebuilders to build solar homes
- Advanced energy production and usage monitoring equipment installed on all solar-equipped homes
- Documented the merits of ZENH solar homes through customer satisfaction surveys

Both homebuilders and homebuyers have benefited from the successes of the ZENH program. California builders choosing to build solar communities have realized faster

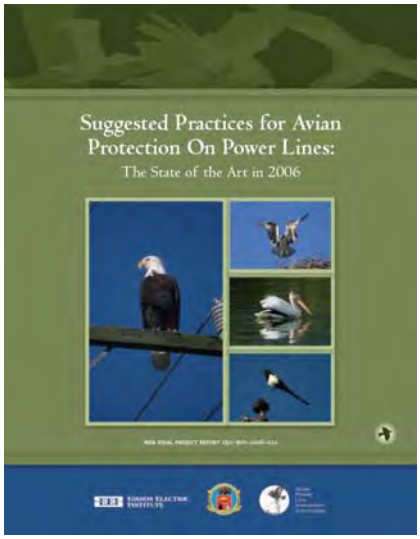
sales and increased profitability. Positive homeowner experience is leading to increased referrals and improved satisfaction with their solar homes. In surveys homeowners expressed a high level of satisfaction with their ZENH solar homes.

The benefits of this program have extended beyond the stated program objectives. In addition to benefiting builders and buyers, it has also benefited other key stakeholders in the industry, including new home sales consultants, realtors, appraisers, lenders, permitting agencies, regulators and other builder trade partners. The innovative business model for turnkey delivery of the solar homes developed under this project removed market barriers, which helped solar installations in production communities. Additionally, certification from the International Code Council (ICC) was received for SunPower's aesthetically pleasing building integrated SunTile solar roofing (BIPV) products. These products are designed to be integrated into predominant roof styles including flat tile, asphalt shingle, and s-tile.

SunPower developed training materials and tools for builders and external marketing professionals to sell, promote, and increase the demand for ZENH homes. New approaches to streamlined permitting, interconnection and incentive processing have been developed along with a concerted effort to provide enhanced customer support and warranty programs. These have helped overcome many of the challenges and barriers hindering mainstream adoption of ZENH solar homes. Additionally, this project resulted in the lasting impact of helping SunPower create an entire new business unit, generating new jobs and expanding operations throughout California and beyond.

The holistic approach of this project has fostered a deeper understanding of the challenges and risks related to commercialization of solar homes. It has laid the foundation for achieving accelerated adoption and market penetration of the ZENH solar homes.

5) **Project Title**: Suggested Practices for Avian Protection on Power Lines: 2006
Awardee: Avian Power Line Action Committee and Edison Electric Institute
PIER Amount: $38,800
Match Funding: $28,000



Purpose: This publication summarizes the history and success of more than three decades of work on the cause of and solutions to raptor electrocution. It springs from three previous editions of Suggested Practices for Raptor Protection on Power Lines and has been expanded and updated to assist those concerned with complying with federal laws, protecting and enhancing avian populations, and maintaining the reliability of electric power networks.

Produced as a cooperative effort of the Avian Power Line Interaction Committee, the Edison Electric Institute, and the California Energy Commission, this book provides a profile of the research and safeguards now available to remedy the issue of raptor electrocutions. This new edition is a significant update of the 1996 publication. Concerted joint efforts by industry, government, and conservation groups have led to an ever-increasing positive management of the issue. This fourth edition of the guide focuses on opportunities in the United States and throughout the world for avoidance or mitigation of electrocution

This project resulted in the following benefits:

- **Providing environmentally sound and safe electricity.** The standards, methods, and tools developed by this project will help reduce avian fatalities from interactions with utility structures. As a result, the impact on threatened and endangered bird populations will be reduced, and line and wind turbine owners will be able to comply better with the state and federal laws protecting most birds.
- **Providing reliable electricity.** Reducing the number of power outages caused by avian interactions with utility structures will improve the reliability of California's electricity delivery system. Identifying and addressing causes of wind turbine-related mortality may enable wind turbine facilities to increase capacity in the state.
- **Providing affordable energy services.** This work will improve the energy cost/value of California's electricity by enabling transmission systems to be retrofitted with bird-friendly designs that reduce the costs associated with avian-caused power outages and by reducing avian mortality associated with wind turbines problems.

1) Final Report at:
http://www.energy.ca.gov/publications/displayOneReport.php?pubNum=CEC-500-2006-022

Project Title: Integrated Forecasting and Reservoir Management (INFORM) Demonstration for Northern California
Awardee: Hydrologic Research Center
PIER Amount: $300,000
Match Funding: $800,000 from CalFed, $250,000 from Nat**ional** Weather Service
Purpose: The purpose of the project was to provide forecasts and decision support for the Northern California river and reservoir system, encompassing the Trinity River, the Sacramento River, the Feather River, the American River, the San Joaquin River, and the Sacramento-San Joaquin Delta. This system not only represents a major portion of the state's water supplies, but also over 1,600 MWs of hydropower generation.

The INFORM modeling system consists of forecasting system and a decision support system. The forecasting system integrates climate and weather forecasts for surface precipitation and temperature with reservoir inflows. Weather information from the National Weather Service is downscaled to represent local conditions and probabilistic forecasts of reservoir inflows are prepared ranging from six hours to nine months in advance. The decision support system uses forecast information to quantify system response to meeting different water management objectives such as water supply, flood control, hydroelectric generation and environmental management at user specified risk levels.

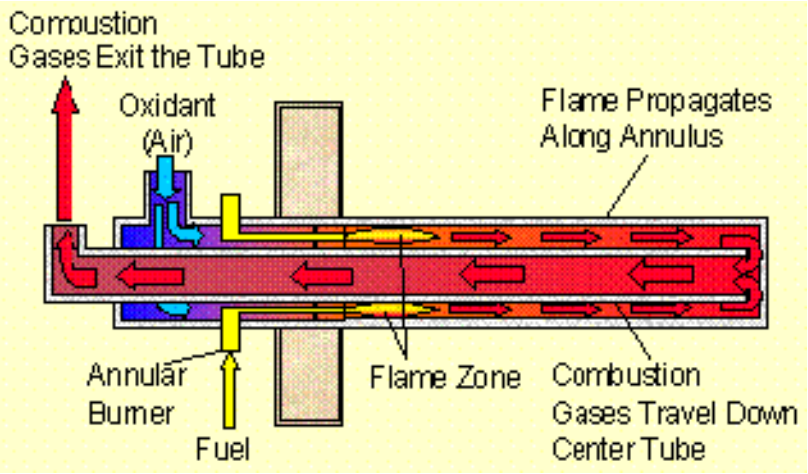
The benefit of the INFORM system is that it has provided near real time assessment to reservoir operators of the amount of electricity generated and the amount of water carried over to meet municipal and agricultural water needs. For example, the average level of electricity production that could be generated using release schedules indicated by INFORM exceeded actual production by 700 GWh over the three years in the analysis period.

This project met the PIER program objectives of promoting environmentally sound, reliable, and affordable electricity. The final report is posted at:
http://www.energy.ca.gov/pier/project_reports/CEC-500-2006-109.html

6) **Project Title:** Reverse-annulus, Single-ended Radiant Tube (RASERT)
Awardee: Gas Technology Institute
PIER Amount: $285,000
Match Funding: $171,400
Purpose: The project involved the development and extended field trial of an advanced and highly efficient burner known as the reverse-annulus, single-ended radiant tube (RASERT). A RASERT is a natural gas fired heating element (burner) which is used to melt metals in furnaces without introducing combustion gases into the furnace. Only radiant heat is directed into the furnace, while combustion gases are vented to the outside of the furnace chamber. A prototype was developed and tested under laboratory conditions, and 12 RASERTs based on the prototype design were deployed in a steel galvanizing line operated by California Steel in Fontana. Steel galvanization is a metallurgical process that is used to coat steel or iron with zinc. This is done to prevent galvanic corrosion such as rusting.

This project compared the existing burner design, the single-ended radiant tube (SERT), with the new RASERT design. The results indicate that the new RASERT burners produced a 25 percent improvement in thermal efficiency, resulting in an estimated annual natural gas savings of 2 billion BTU (20,000 therms) or an approximate annual cost savings of $20,000. Emissions of nitrogen oxides (NOx), carbon monoxide (CO), and carbon dioxide (CO2) were reduced by approximately 55 percent, 58 percent, and 25 percent respectively. The RASERT burner design can be cost-effectively retrofitted into existing furnaces or incorporated into new furnaces at minimal cost. This technology has the potential to increase furnace efficiency by 25 percent, thus reducing natural gas use and cost while reducing air emissions for the smelting industry in California. As a result of this PIER project, an estimated 2 billion BTU of natural gas per year will be conserved at the Fontana facility, and the retrofit will reduce NOx emissions by an estimated 492 pounds annually.

GTI RASERT Concept,



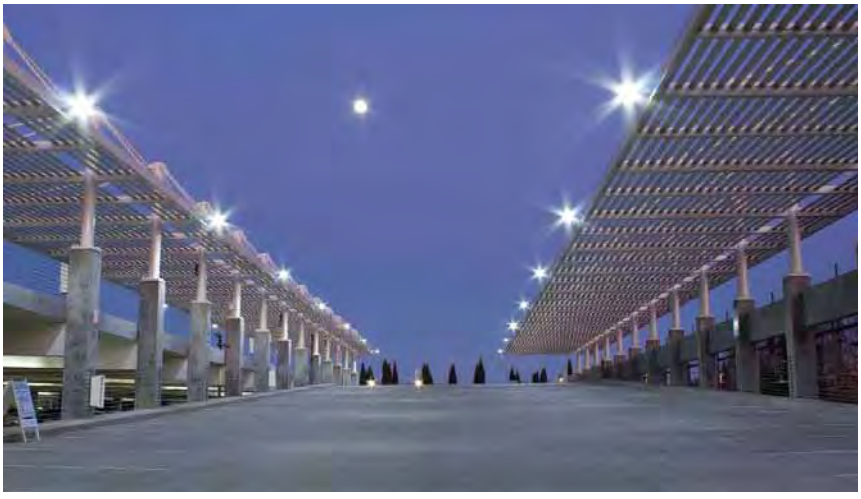
Source: Gas Technology Institute, 2008

7) **Project Title:** Realizing the Energy Efficiency Lighting in California
Awardee: UC Davis
PIER Amount: $1,913,388
Match Funding: $2,499,895
Purpose: The California Lighting Technology Center (CLTC) was developed at the University of California, Davis, through a collaborative effort between the Energy Commission, the U.S. Department of Energy, and the National Electrical Manufacturers Association to advance energy efficient lighting and daylighting technologies. The goal is to stimulate, facilitate, and accelerate the development and commercialization of energy efficient lighting and daylighting technologies. The Center's objective is to produce a group of products, technologies and knowledge that meets PIER goals of improving energy cost and value by developing energy efficient lighting technologies and bringing them to market through research, development, outreach and technology transfer. This will be accomplished through collaboration with the Energy Commission, utilities, industry, and academic and professional institutions. These actions will stimulate, facilitate, and accelerate the development and commercialization of energy efficient lighting and daylighting technologies.

As a result of PIER funding, the table on the right highlights some of the technologies developed and/or evaluated by the CLTC. The evaluation and monitoring ensures that project savings and benefits are realistic and achievable by California consumers.

- Integrated Classroom Lighting
- Integrated Office Lighting
- Advanced CFL Downllights
- Bi-level Smart LED Bollard
- Bi-level Smart Parking Garage/Lot Fixture
- Bi-level Smart Stairwell Luminaire
- Bathroom Vanity Luminaire
- LED Downlight
- Load Shed Ballast
- Low Glare Wall Pack
- Kitchen Lighting System
- Simplified Daylight Harvesting
- Dual Loop Daylight Photosensor
- Smart Outdoor Lighting

As lighting energy use ranges from 28 to 39 percent of a home or office's annual electricity use, reductions will be needed if the state's energy efficiency and net zero energy home goals are to be achieved. Many of the PIER lighting projects developed by the California Lighting Technology Center have been demonstrated at various facilities throughout California. These demonstrations are described in the State Partnership for Energy Efficient Demonstrations description in the next section.



Bi-level Smart Parking Garage Lighting at UC Davis

8) **Project Title:** State Partnership for Energy Efficient Demonstrations
Awardee: California Institute of Energy and Environment
PIER Amount: $7,550,000
Match Funding: $1 million to $3 million

Purpose: The main PIER activity for demonstrating newly developed building technologies is the State Partnership for Efficient Demonstrations (SPEED) Program. The program started in 2004 and approximately $7.55 million has been allocated to date for over 110 demonstrations. The California Institute for Energy and Environment administers the program for the California Energy Commission. The program provides actual field demonstrations of PIER funded and other technologies and provides real world data and product feedback. The intent is to be a market transformation program that gets the PIER supported technologies field tested and over the "valley of death" and once demonstrated, participants will order the technologies and make them the standard ones for their facility. The table on the right lists projects demonstrated through the SPEED Program:

Advanced lighting projects use an estimated 60 percent ($4.53 million) of the SPEED Program funds. The California Institute for Energy and Environment and UCD's California Lighting Technology Center provide technical assistance to identify appropriate and cost effective advanced lighting technologies. California utilities are direct partners who provide rebate funding to help offset the project cost. The program also provides education, case studies, and provides specifications on how to use PIER technologies.

Participating organizations include UC, CSU, California Community Colleges, State facilities and the US Department of Defense. As nearly all of the organizations are public entities, energy savings from these projects directly benefit electric and rate payers throughout California. Website for project locations: http://www.terradex.com/PublicPages/CIEE/PIER_01.aspx

- Bi-Level Stairwell Lighting
- Integrated Classroom and Office Lighting
- Bathroom Smart Fixture and Switch
- Energy efficient downlight
- Low glare outdoor luminaire
- Hybrid Outdoor Lighting
- Load Shed Ballast
- NEMA/DALI
- Air Flow Measurement and Control
- VAV Static Pressure Reset
- Discharge air register technique
- Large Duct System
- Package Rooftop HVAC Unit Diagnostics
- Kitchen Ventilation
- Monitoring Based Commission
- Benchmarking
- Smart Bi level Garage Fixture
- Smart LED Bollards
- Smart Bi Level wall pack
- Smart bi level parking lot
- Berkeley Lamp
- Simplified daylighting controls
- Wireless lighting control
- Indirect evaporative cooling
- Western Cooling Challenge Package Units
- Occupancy based control
- Chiller optimization
- Datacenter efficiency
- Temperature sensors for HVAC controls
- Water cooled servers
- Centralized Demand Control Ventilation
- Laboratory Fume Hood Sash Controlteg

The SPEED Program has resulted in the following benefits:

- Over 110 demonstrations completed
- Estimated annual savings of over 6 million kWh, 95,000 therms
- Estimated annual cost savings between $800,000 and $1.2 million
- Estimated 6.3 million pounds of greenhouse gas reduced

The following example shows actual savings associated with an integrated office lighting project funded by PIER at the Bateson Building. The project saved 2,700 kWh/year, or reduced lighting energy use by 44 percent compared to a standard T8 fluorescent lighting system.

Pre Retrofit

Post Retrofit

9) **Project Title:** Electrodialysis Systems for Tartrate Stabilization of Wine
Awardee: Winesecrets, Inc., (located in Sebastopol and Paso Robles)
PIER Amount: $309,757.00
Match Funding: $926,229.00
Purpose: STARS (electrodialysis) is an electrically driven membrane process that separates ionized solutions from aqueous solutions. It is widely used for desalination of seawater, demineralization of whey and many other applications. Recent advances in membrane development have enabled application of this technology to tartrate removal and the stabilization of wines. The California Energy Commission provided a $309,757 grant to Winesecrets to explore the use of this technology in the wine industry.

The following are the project results and benefits:

- Electrodialysis requires less than 20 percent of the electrical energy used in the conventional cold stabilization process
- Electrodialysis uses about 12 kWh per thousand gallons of wine compared to 70 kWh per thousand gallons of wine for standard cold stabilization method.
- Electrodialysis is less energy intensive than the cold stabilization process.
- Electrodialysis cost about $0.05 per gallon compared to $0.12 to $0.16 per gallon for the standard cold stabilization process. This results in a $0.01 per bottle difference in cost.

Part 2: ***For each stated purpose, please provide list ten contracts that have been awarded that have achieved…greater system reliability, and lower system costs***

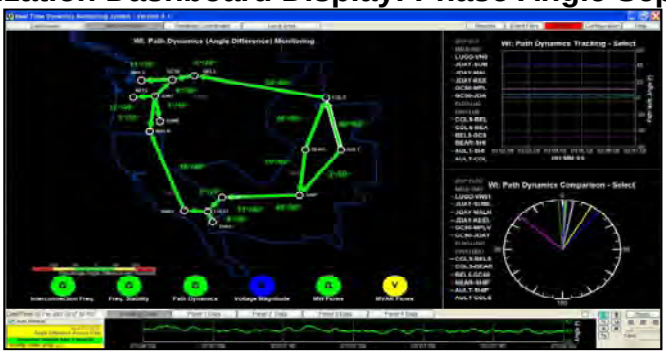
1) **Project Title:** Real-Time Dynamics Monitoring System (RTDMS)
Awardees: Electric Power Group
PIER Amount: $1,699,149
Purpose: Synchophasors are time stamped, high-precision measurements which provide both magnitude and phase of an electrical parameter on the power grid. Although such measurements have been available for over 20 years, until fairly recently their use has been limited to post event analysis.

A series of 6 PIER research projects have aimed at developing a platform and specific applications that would allow synchrophasors to be used to provide situational awareness and alarming to grid operators in real time. The projects were performed with the cooperation and support of the California Independent System Operator (CAISO). Estimated benefits from reduced outages over a 10-year period range up to $170 million for California, and up to $470 million for the entire Western Electric Coordinating Council region.
A prototype Real Time Dynamic Measurement System (RTDMS) was installed at the CAISO in Folsom, California and monitored by its engineering group with active feedback to Electric Power Group under a continuous improvement program. In 2009, CAISO, acknowledging the value of the system, made the decision to bring the system into their mainstream operation and to place it under Information Technology support, essentially establishing it as a production tool. The RTDMS, like other synchrophasor-based tools, enables enhanced situational awareness of impending contingencies, increased transfer capacity, and improved reliability of the grid.

This project supports California's goal to upgrade and expand the electricity transmission and distribution infrastructure per the Energy Action Plan 2003 in following ways:

- Increases reliability by giving system operators situational awareness of the grid to avoid dynamic problems and the need to reduce grid transfer capacity.
- Lowers system costs by increasing the capacity of the transmission system and enabling more efficient use of existing grid resources.

Visualization Dashboard Display: Phase Angle Separation



2) **Project Title:** Flywheel Energy Storage System (FESS) for Grid Frequency Regulation

Awardee: Beacon Matrix Services
PIER Amount: $1,232,854
Match Funding: $347,087
Purpose: To maintain a constant frequency on the California electric grid (60 hertz), the California Independent System Operator must constantly balance the supply of power generated with the varying demand (load). This balance is maintained today by frequent small adjustments to the output of some of the generators operating on the grid. This process is inefficient, increases maintenance costs and results in keeping older power plants operating to meet California's electricity needs. The use of energy storage technology offers the opportunity to provide this frequency regulation service with a more efficient and more flexible power source that is cleaner, and non-fossil fueled.

This project demonstrated the ability of an electricity energy storage medium (flywheel technology) to cost-effectively meet the California Independent System Operator requirement of securing frequency regulation service. This service requires the ability to react in real-time to frequent imbalances in the demand and supply of electric generation. When a storage technology is used for this application, it can store energy instantaneously when generation exceeds loads and discharge energy instantaneously when load exceeds generation. The project results are as follows:

- Demonstrated the environmental benefits of using electric energy storage technology to replace fossil fuel power plant generator responses for grid system frequency services.
- Improved the reliability of California’s electricity by demonstrating an alternative method of regulating frequency compared to the existing practice of cycling generators.

This project is part of the Energy Commission’s research portfolio to “develop, and help bring to market, energy technologies that provide increased environmental benefits, greater system reliability and lower system costs, and that provide tangible benefits to electric utility customers” per Public Resources Code Section 25620.1.

As a result of the successful PIER project, Beacon competed in the 2009 Federal Government’s American Recovery and Reinvestment Act’s competitive solicitation and was awarded a $20 million grant to further advance the flywheel technology.

The Department of Energy, in collaboration with the California Energy Commission and Beacon Matrix Services, is hosting a public web site where the results from the field demonstrations of the Beacon flywheel system can be reviewed.

3) **Project Title:** Advanced Distributed Sensor Networks for Electric Utilities
Awardee: Science Applications International Corporation (SAIC)
PIER Amount: $691,841.00
Purpose: The electric utility system is vulnerable to outages caused by a range of activities, including natural disasters, accidental damage, vandalism, and terrorism. The main consequence of these activities would be widespread power outages lasting for an extended period of time.

Two primary vulnerabilities are high-voltage transformers and transmission towers. Recovery from a transformer failure could take months. Recovery from damage to an individual transmission tower would be more rapid, but a simultaneous widespread attack could lead to significant outages.

This project designed and fabricated two types of small, battery-powered wireless sensor nodes, one with geophones and magnetometers, and another with passive infrared (PIR) detectors, accelerometers and thermistors. They detect the motion of intruders and vibrations on perimeter fences, transmission towers, and transformers resulting from intrusion or tampering, and they sense temperatures and differential temperatures for detection of extreme environmental conditions, including wildfire and transformer state of health. This project deployed a network of 89 wireless sensors on and around two switchyards, three adjacent transmission towers, and a nearby storage yard at an SDG&E transmission substation. The system successfully detected and localized simulated threats in six scenarios, including intrusion, tampering, and wildfires. The electric transmission system of California is vulnerable to damage from deliberate attacks and from environmental hazards, such as wildfires, yet the transmission system is not generally monitored for intrusion, tampering, or environmental hazards. The results of this project could be applied to increase the reliability of the delivery of electricity to Californians.

Thermistors can detect the motion of intruders and vibrations on perimeter fences

3) **Project Title:** Automated Demand Response
Awardee: Lawrence Berkeley National Laboratory-Demand Response Research Center (DRRC)
PIER Amount: $12,999,970 **Match:** $3,411,766
Purpose: The DRRC has developed technology to automate demand response as well as methods to automated end-use control systems in existing buildings. The automation is known as Open Automated DR Communications. OpenADR is an open data model that links price, reliability and event signaling to customer energy control systems and devices. OpenADR provides capability, costs, and values that bridge multiple CPUC proceedings in demand response, dynamic pricing, demand response-energy efficiency integration, and Smart Grid.

OpenADR also provides a secure, reliable notification capability to support dynamic pricing that can't be provided by conventional phone and email (PG&E Rate Window Testimony, August 21, 2009, Chapter 6). Linkage of price and event signals with facility energy management systems provides the automation necessary to create the smart grid. OpenADR is an open, non-proprietary standards-based platform to support the delivery of price, reliability, and demand response event signals. OpenADR is neutral to and can support almost all communication methods. OpenADR is also neutral to customer energy management systems and control hardware. DRRC testing and implementation has clearly demonstrated that low cost options are available that provide OpenADR with capability to address multiple vendors and existing legacy as well as new state-of-the art options for all customer segments. Each of the California investor-owned utilities have already acquired and operate their own OpenADR demand response automation servers (DRAS).

The public interest is best served by investments that provide a standards-based platform with a track record demonstrating low costs, flexibility, industry support, and the capability to support and quickly adapt to a changing technology environment. OpenADR provides this capability.

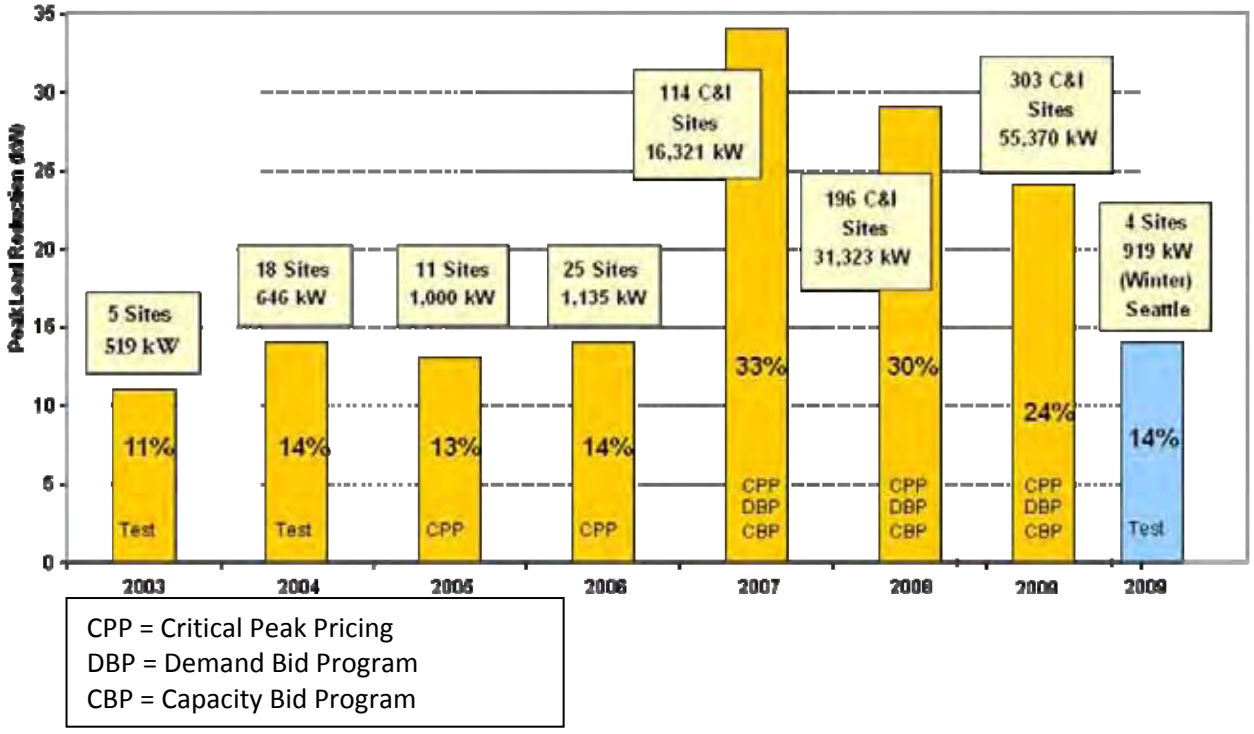
A recent national study for the United States showed that even a 5 percent drop in peak demand would yield substantial savings in generation, transmission, and distribution costs – enough to eliminate the need for installing and running some 625 infrequently used peaking power plants and associated power delivery infrastructure. This would yield an annual savings of $3 billion or over $300 million/year for California. Reducing peak demand reduces the cost of expensive power, thereby reducing the total costs that translate into lower wholesale and retail prices. California is moving toward dynamic real time and critical peak pricing as the default price structure thereby providing a price signal for hot summer days. The energy efficiency agenda associated with the Smart Grid is critical to obtain the best use of new schemes.

PG&E's Participating Load Pilot with the CAISO in 2009 provides a perfect illustration of how OpenADR facilitates Smart Grid development. As the DRRC presentation described, three PG&E commercial customers (>200kW) on Critical Peak Pricing rate (CPP) with OpenADR, switched over to the CAISO Participating Load Pilot without the

need for any additional investment in equipment and only minor adjustments to their demand response strategies. OpenADR provided the platform that enabled the customer, PG&E, and CAISO to quickly develop and implement an entirely new Smart Grid option, at no additional cost to the customer.

There are currently about 60 MW of OpenADR installations in California, with another 80 MW planned for the next 2 years. This is becoming a national standard with over 50 vendors using the client.

Peak Load Reduction



CPP = Critical Peak Pricing
DBP = Demand Bid Program
CBP = Capacity Bid Program

4) Title: Demand Response Spinning Reserve Demonstration
Awardees: Lawrence Berkeley National Laboratory
Amount: $1,899,925 (total) $613,000 (most recent amendment)

Purpose: Spinning reserve is an electricity grid operator's first strategy for maintaining system reliability following a major contingency, such as the unplanned loss of a large generation facility or critical transmission line. Spinning reserve is traditionally provided by generation resources that are standing by – "spinning" – ready to connect to the grid in case of an emergency.

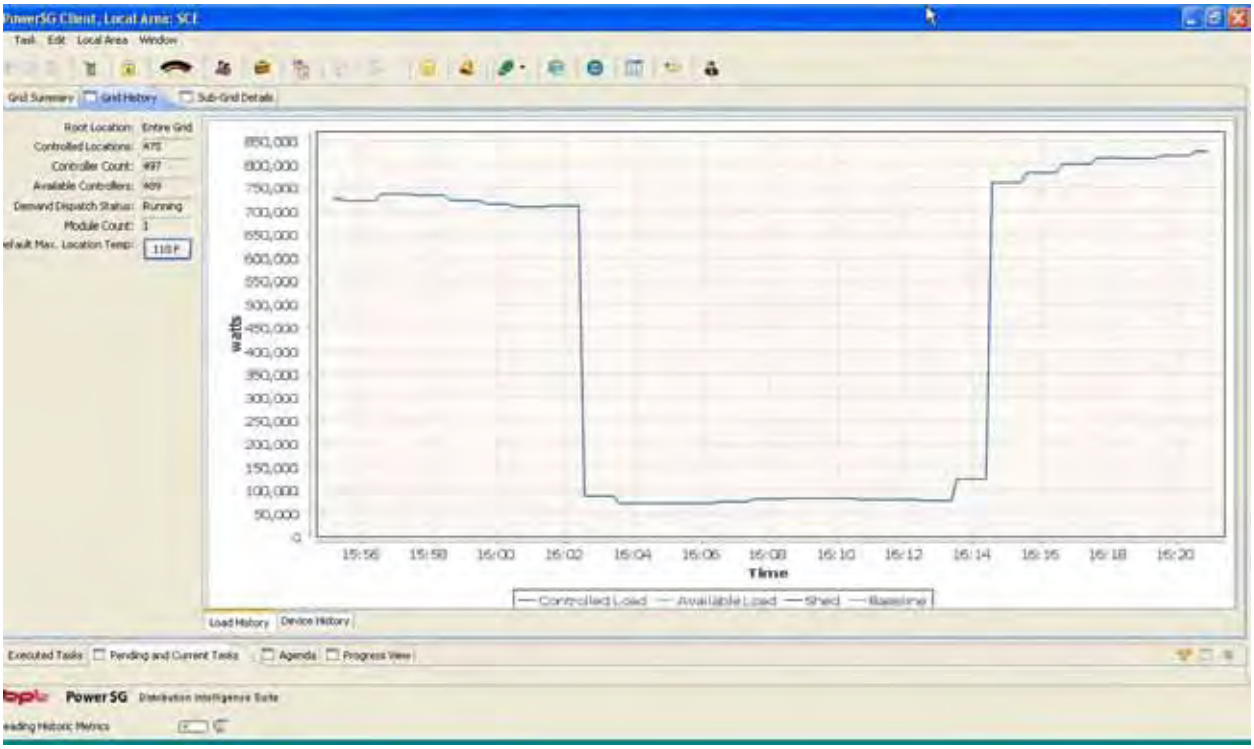
Five years of PIER-sponsored research has demonstrated that it is technologically feasible to provide spinning reserve using demand response, and that relying on demand response may be preferable because it can be targeted geographically and its performance is superior to generation resources. As a result, the research has now successfully transitioned from a demonstration project to pre-commercialization activity that is largely funded by California's investor owned utilities (IOUs). In addition, the research has provided a technical basis for the development of new market products by the California Independent System Operator (ISO) to take advantage of the unique characteristics of demand response in providing this critical reliability function.

The project used the 25+ year-old air-conditioning (AC) load-cycling program at Southern California Edison (SCE). However, unlike SCE's program, the demonstration required only very short interruptions (less than 10 or 20 minutes) to replicate the California ISO's deployment of spinning reserve when provided by generators. Over the course of the summer, customers were interrupted 30 to 40 times in this manner, yet not a single complaint was received by the utility.

This project is part of the Energy Commission's research portfolio to "develop, and help bring to market, energy technologies that provide increased environmental benefits, greater system reliability and lower system costs, and that provide tangible benefits to electric utility customers" per Public Resources Code Section 25620.1. This project supports California's goal to upgrade and expand the electricity transmission and distribution infrastructure per the Energy Action Plan 2003 and provides the following benefits:

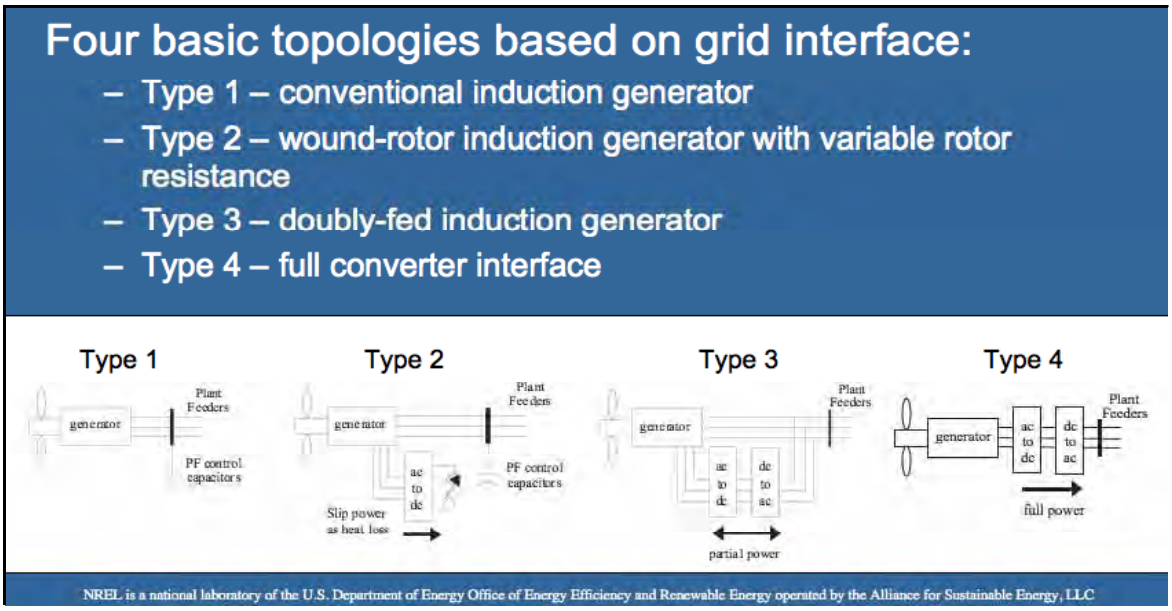
- Increases the reliability by providing system operators with another source of supply for this critical ancillary service.
- Lowers system costs by increasing competition the California ISO's markets for ancillary services.

Real-Time Visualization Display: Demand Response Spinning Reserve Event



5) **Project Title:** Wind Generator Modeling
Awardees: NREL
PIER Amount: $573,764
Purpose: The successful integration of new wind power plants requires accurate dynamic modeling in system planning and operations studies, so that the required transmission capacity can be built and operating practices designed based on the dynamic characteristics of the wind machines.

Wind generators can be classified into four basic types: induction generator, wound-rotor induction generator, doubly-fed induction generator, and inverter-interfaced. Each has specific dynamic characteristics that must be modeled correctly in order to predict its performance. System planning tools require accurate models.



This project was led by the Western Electricity Coordinating Council (WECC) Modeling Validation Working Group and included active participation of the major western utilities. This objective was to develop dynamic models for the currently available fleet of wind generators, validate these models, and include them in the analytic tools used for planning the electric grid. System planners in the WECC utilities are now using these models to ensure that grid capacity is optimized and reliability is maintained with the anticipated wind resources.

This project is part of the Energy Commission's research portfolio to "develop, and help bring to market, energy technologies that provide increased environmental benefits, greater system reliability and lower system costs, and that provide tangible benefits to electric utility customers" per Public Resources Code Section 25620.1. This project supports California's goal to upgrade and expand the electricity transmission and distribution infrastructure per the Energy Action Plan 2003 by:

- Providing the environmental benefit of facilitating the integration of clean wind generation into the electric system.
- Increasing electric system reliability by alleviating the dynamic operating issues associated with large amounts of wind generation.

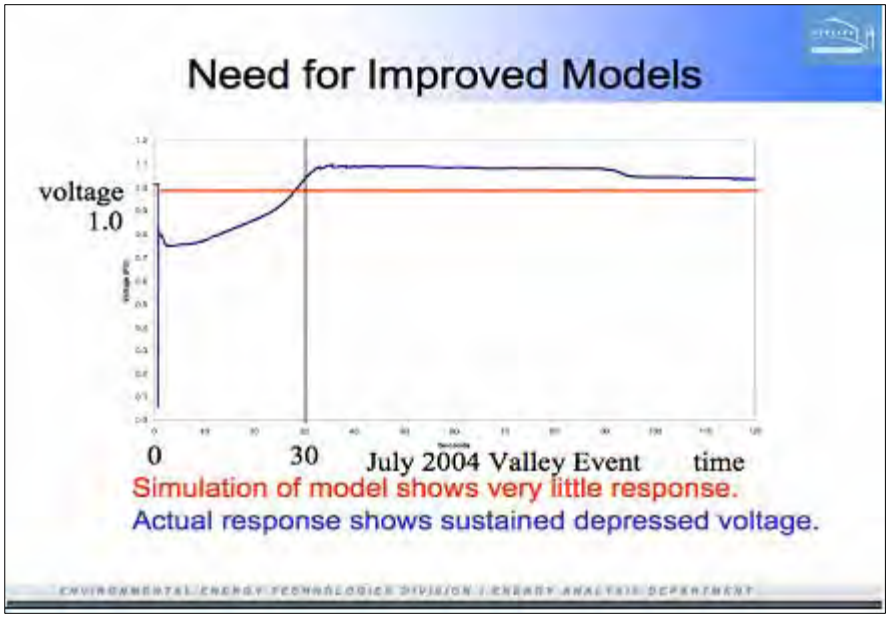
6) **Project Title:** Western Electric Coordinating Council (WECC) Load Modeling
Awardees: Lawrence Berkeley National Laboratory
PIER Amount: $1,318,430
Purpose: In recent years utilities, especially in Southern California, have noticed delayed voltage recovery after a transmission system disturbance, which was not predicted by system planning and analysis studies. It was suspected that stalling of high-efficiency air conditioners (AC), which have increased significantly in number in recent years, may be a factor in hindering voltage recovery, but simulation studies were not showing the problem as shown in the figure below. Clearly, dynamic load models for newer AC units needed updating

This project performed testing of AC units to benchmark their dynamic performance, and guide the development of new load models that were integrated into the existing suite of analysis tools used by WECC and its member utilities to evaluate system performance and improve the reliability of the western grid.

This project also included design requirements and specifications for retrofit devices, such as low-voltage relays, and re-design of high-efficiency AC units to address the AC stalling issue at its source.

This project is part of the Energy Commission's research portfolio to "develop, and help bring to market, energy technologies that provide increased environmental benefits, greater system reliability and lower system costs, and that provide tangible benefits to electric utility customers" per Public Resources Code Section 25620.1. This project supports California's goal to upgrade and expand the electricity transmission and distribution infrastructure per the Energy Action Plan 2003 by increasing grid reliability by avoiding low-voltage delayed recovery and possible system collapse after a fault.

Voltage Recovery After a Fault (Simulated vs. Actual)



7) **Title:** Tracking the Sun for High Value Grid Electricity
Awardee: Powerlight Corporation (now SunPower)
PIER Amount: $1,214,389
Match Funding: $1,700,573
Purpose: The project resulted in a less costly photovoltaic (PV) tracker system. The research addressed design improvements for an existing single axis solar tracker, that included standardizing parts and reducing the number of required parts. The modified tracker design resulted in increased reliability, lower capital costs, and less required installation and maintenance time compared to previous designs of tracker systems. Depending on site conditions, the tracker can result in 15 to 35 percent more energy production, compared with a stationary array using an equivalent number of solar panels. The new design is sold commercially in California and contributes to the state's Renewable Portfolio Standard (RPS). A final report should be released in late 2010.

New Design for tracking sign

8) **Project Title**: The Development of an Extended Induction Logging Tool for Geothermal Exploration and Field Development

Awardee: Electromagnetic Instruments, Inc.

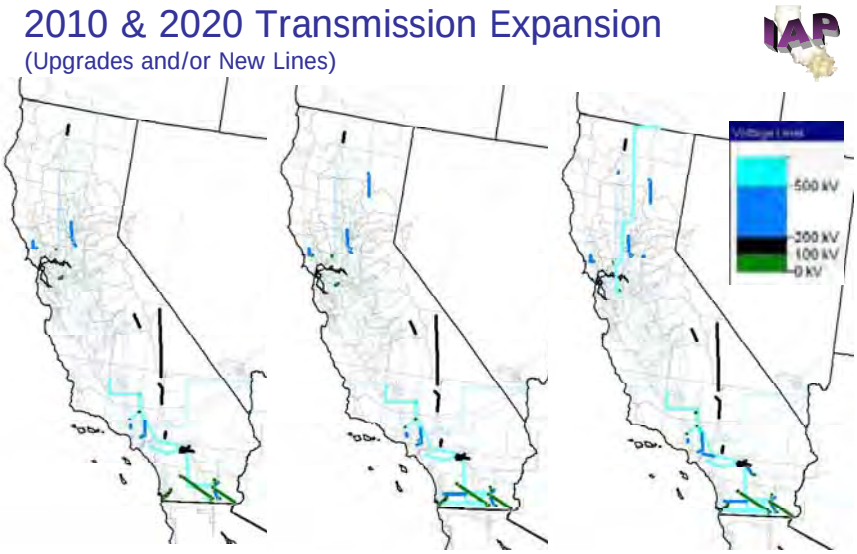
PIER Amount: $1,380,709

Match Funding: $1,407,953

Purpose: The Extended Induction Logging Tool for Geothermal Exploration and Field Development project is an innovative geophysical device that is used in an existing geothermal well. This new tool, "GeoBILT", can construct 3D imagery of the subsurface near the well and identify fracture zones that can conduct geothermal fluids. This capability will aid in the identification of new geothermal resources, reduce the financial risks, costs, and impacts typically associated with geothermal exploration projects. The tool will make it easier to identify promising areas for drilling and reduce the risk of expensive unproductive wells. Fewer wells drilled means reduced environmental impacts of geothermal exploration and benefits the ratepayers with reduced cost of geothermal energy. Ultimately, this project will aid in increased low-carbon geothermal electricity production and in greater reliability of California's electricity grid, due to geothermal's ability to generate energy round the clock every day ("baseload" supply). Both of these contribute to the state's compliance with the Renewal Portfolio Standard (RPS).

9) **Project Title:** Intermittency Analysis Project
Awardee: California Wind Energy Collaborative (CWEC), Kevin Porter Exeter Associates, and Intermittency Analysis Project Team
PIER Amount: $2,294,777
Purpose: The Intermittency Analysis Project assembled an industry team to examine the challenges of integrating "intermittent" renewable energy sources (sources that are not available on a constant basis 24 hours a day, year-round) into a future 2020 electricity transmission system. The team conducted a series of scenario-based studies to examine the statewide system impacts of higher levels of intermittent renewables on California's electricity and transmission infrastructure. The analysis led to recommendation of several technical and operational strategies and mitigation measures for consideration by California's utilities and system integrator. The analysis also provided a framework for system operators, utilities, and infrastructure planners to gauge the needs of the future 2020 system.

Working with various agencies and California utilities to ensure coordination and to review results and findings, the project team also incorporated recent findings and input from a number of regional study groups in California, as well as lessons learned from the international perspective. Results include providing a detailed technical analysis of existing and future infrastructure needs, addressing potential operational strategies, developing a set of utility "best practices," and tools for integrating intermittent renewables and for assessing potential mitigation options as problems are encountered to ensure sustainable operation.

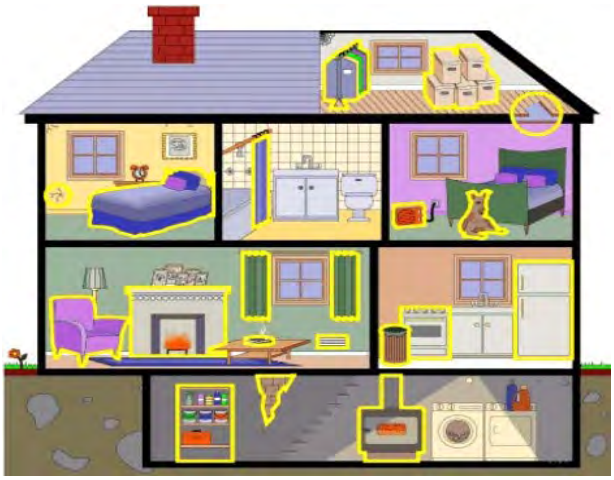


This project provides benefits to efficiency, reliability, and costs of transmission and also aids in the integration of additional renewable energy sources into California's electricity mix.

Part 3: ***For each stated purpose, please list ten contracts that have been awarded that have achieved…environmental benefits***

1) **Project Title:** Energy Related Indoor Environmental Quality Research: New Homes Field Study and Survey

Awardee: California Air Resources Board/Indoor Environmental Engineering
PIER Amount: $1,139,796
Match Funding: $305,448
Purpose: Concerns have been raised regarding whether homeowners protect their health by using windows, exhaust fans, and other mechanical ventilation devices enough to remove indoor air contaminants and excess moisture. In a multi-season study of ventilation and indoor air quality of 108 new single-family detached homes in northern and southern California, window use, ventilation rates, and air contaminant concentrations were measured. Six to seven percent of the homes were below the California building code requirement for air changes per hour; and 32 percent of the homes did not use their windows. Home-to-garage pressure testing guidelines were exceeded in 65 percent of the homes. Nearly all homes had formaldehyde concentrations that exceeded guidelines for cancer and chronic irritation, while 59 percent exceeded guidelines for acute irritation. This research found that new single-family detached homes in California are built relatively airtight, can have very low outdoor air exchange rates, and can often exceed exposure guidelines for air contaminants with indoor sources, such as formaldehyde and some other volatile organic compounds. Mechanical ventilation systems are needed to provide a dependable, continuous supply of outdoor air to new homes, and reductions of various indoor formaldehyde sources are also needed.



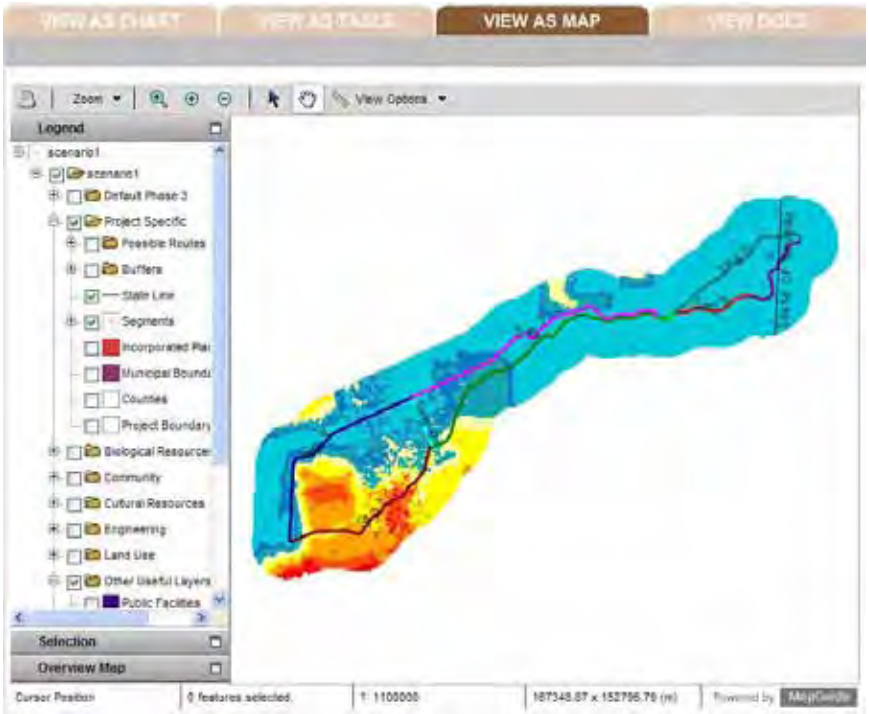
This was the first large field study of window use, outdoor air ventilation rates, and indoor air contaminants in new California homes. The data from this study were immediately useful for the California Energy Commission in guiding the development of building design standards to require mechanical ventilation that protects indoor heath and comfort by ensuring proper indoor air quality in California homes and for the California Air Resources Board to improve exposure assessments of indoor and outdoor air contaminants. In particular, the Energy Commission used the study results as a scientific basis to revise the State's building energy efficiency standards (Title 24) to provide more healthful, energy-efficient homes in California. The study results will also improve California Air Resources Board's ability to identify current sources of indoor air contaminants, to assess Californians' current exposure to measured toxic air contaminants, and to recommend effective and cost-efferctive strategies for reducing indoor air pollution.

Final Report is posted at: http://www.energy.ca.gov/2009publications/CEC-500-2009-085/CEC-500-2009-085.PDF

2) **Project Title:** Planning Alternative Corridors for Transmission (PACT)
Awardee: Southern California Edison
PIER Amount: $1,519,916
Match Funding: $472,884
Purpose: The purpose of the Planning Alternative Corridors for Transmission project was to create a decision-support model for siting transmission facilities. The project incorporates environmental and engineering analysis and multiple stakeholders' values, allowing users to create unique scenarios that capture their values. The Planning Alternative Corridors for Transmission project turned a complex environmental analysis of alternative locations for proposed energy developments into a clearer and more decision-friendly medium. This unique model provides planners, regulators, interested stakeholders, and decision makers a common, transparent and informational format to facilitate an open and participatory process for siting new electrical facilities. This project responds to the 2004 Integrated Energy Policy Report Update which identified the need to develop a process to engage the active, early participation of stakeholders in transmission line planning as a means to improve the state's long-term transmission planning process. California Department of Fish and Game is currently field testing PACT on the Desert Renewable Energy Conservation Planning process.

Final report at:
http://www.energy.ca.gov/2009publications/CEC-500-2009-079/CEC-500-2009-079.PDF

Support Model Screenshot



3) **Project Title:** Spray Enhancement for Air-cooled Condensers
Awardee: Electric Power Research Institute
PIER Amount: $749,440
Purpose: To reduce freshwater consumption, many new power plants are using air-cooled condensers for steam condensation (cooling). This is commonly referred to as dry cooling and can save several million gallons of water per day. Unfortunately, on exceptionally hot days, performance of such condensers will decline, reducing the amount of energy a power plant can generate. On a hot day, the amount of energy lost from a 500 MW combined-cycle power plant can be as much as 20 MWs or more. One way to reduce this loss of generation is to spray a small amount of water into the air passing through the condenser.

This project conducted a pilot-scale field evaluation of the performance, costs, and potential problems associated with spray enhancement for dry cooling at an operating power plant using this cooling technology. Field testing was conducted on a single cell of a full-size air-cooled condenser at the Crockett Cogeneration Facility, a 240-MW gas-fired, combined-cycle plant in Crockett, California. Researchers documented that by using spray enhancement, 75 percent or more of the energy lost due to high temperatures can be regained and that for a full scale power plants, the payback period could be from less than a year to two and a half years depending on the price of power.

This project meets two PIER program objectives:

- Providing reliable energy**:** Spray enhancement would enable dry-cooled power plants to produce more power on hot days—thereby increasing electrical system reliability during peak demand periods.
- Providing environmentally sound energy: Dry cooling significantly reduces fresh water use, leaving more fresh water in the natural environment or available for delivery to customers.

The final report is posted at http://www.energy.ca.gov/pier/project_reports/500-03-109.html.

Spray Enhanced Air Cooled Condenser

4) **Project Title:** Frito-Lay (SunChips)
Awardee: American Energy Assets
PIER Amount: $700,000
Match Funding: $995,000
Purpose: This project involved researching the viability of producing high temperature industrial process heat from the sun's energy. The installation of a large scale industrial solar thermal system provides an opportunity for evaluating the technical and economic hurdles that would be encountered by similar systems in California.

The research was performed through the design, construction, operation, and analysis of a high temperature solar thermal system at a Frito-Lay snack food plant located in Modesto, California. In this installation, high temperature water in excess of 232°C (450°F) is produced by a concentrating solar field which in turn is used to produce approximately 300 pound per square inch (20 bar) process steam. The solar system is intended to improve plant efficiency with minimal impact on day to day production operations. This project demonstrated that a large scale industrial solar thermal system can effectively offset natural gas used for process steam used for cooking, heating, baking and heating hot water for cleaning and sterilization processes. As a result, the Frito Lay plant was able to reduce its greenhouse gas emissions.

The project had the official ribbon-cutting ceremony on April 22 (Earth Day) 2008.

Large Scale Industrial Solar Thermal System

5) **Project Title:** Super Boiler
Awardee: Gas Technology Institute
PIER Amount: $240,000
Match Funding: $319,030
Purpose: This project involved the development and demonstration of a new gas-fired steam generation system called the Super Boiler. This system consists of a boiler with a unique staged furnace design, a two-stage burner system with engineered internal recirculation, and a novel integrated heat recovery system to extract maximum energy from the flue gas. The Super Boiler can reduce natural gas use and lower emissions of nitrogen oxides (NOx) and carbon monoxide due to its advanced burner technology which additionally results in increased boiler efficiency. The Super Boiler can also reduce water usage.

The Super Boiler was demonstrated at Clement Papas, a juice making company in Ontario, California. The demonstration project showed that the Super Boiler delivered an average 92 percent fuel-to-steam conversion efficiency, compared to 80 percent for existing boiler technologies. This resulted in estimated annual natural gas savings of 13,336 therms, or about $13,336 in cost savings. The project also demonstrated lower levels of nitrogen oxide emissions compared to existing boilers. As a result of this PIER project, approximately 328 lbs of annual NOx emissions were avoided.

Super Boiler

6) **Project Title:** Flex-Flame Burner
Awardee: Gas Technology Institute
PIER Amount: $384,563
Match Funding: $2,224,903
Purpose: In California, more than 300,000 tons of scrap aluminum is melted each year and re-used by various industries. The reflective nature of aluminum makes it difficult to melt. As a result, current aluminum melting operates at low efficiencies with significant metal loss and produces high levels of air emissions. More efficient and less air-polluting methods of melting the scrap material are important to preserving this key industry in the state. To address these problems, the Gas Technology Institute and other project partners developed a specialized burner system called the Flex-flame technology. This technology creates a fuel-rich flame region near the surface of the molten aluminum and an oxygen-rich region higher in the furnace. This technology was demonstrated at Thorock Metals in Compton, California, where the Flex-flame was shown to reduce emissions of nitrogen oxides by nearly 40 percent and carbon monoxide by 44 percent.

Scrap Aluminum Metal

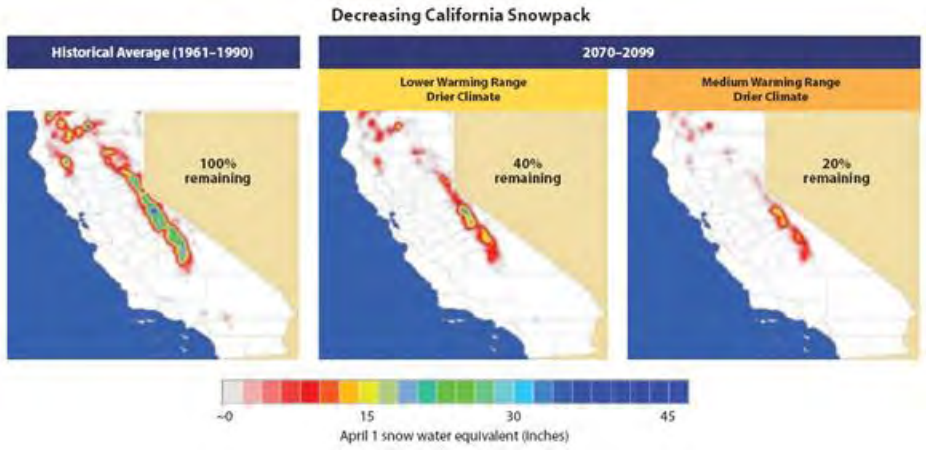
The Flex-flame technology can be retrofitted into existing furnaces or incorporated into new furnaces at minimal cost. This technology has the potential to cost-effectively reduce harmful air emissions from aluminum melting industries in California. The South Coast Air Quality Management District is evaluating this technology to determine whether it could be considered Best Available Control Technology (BACT) for the aluminum melting industry.

7) **Project Title:** Biogas-Fueled Low Emission Generator
Awardee: Makel Engineering, Inc
PIER Amount: $457,042
Match Funding: $149,995
Purpose: This project developed a low-cost, reliable, and highly-efficient distributed power generation system that operates on landfill gas as fuel and uses a simple and robust thermal control system to stabilize power production. While typical homogenous charge compression ignition (HCCI) engines are based on standard diesel engine designs, this HCCI system, coupled with an induction motor, allows for simplified power grid connection. A fuel to electricity efficiency of 35 percent was achieved while producing less than 5 parts per million (ppm) of nitrogen oxide (NOx) emissions and 25 kW of electrical power. Higher efficiency and power output was achieved with slightly higher (~10 ppm) NOx production. Lower NOx emissions were achieved (3 to 4 ppm) with slightly lower system efficiencies. The HCCI generator operated for up to 95 hours continuously with stable operation, and an analysis of the components predicted over 12,000 hours between major overhauls. A total of over 900 hours of testing was conducted at two separate sites using natural gas, simulated landfill gas, and actual landfill gas as fuel sources. This demonstration system showed that landfill gas-fueled HCCI engine technology is a viable pathway for distributed power generation using low energy density fuels. The project team was led by Makel Engineering, Inc., and included UC Berkeley, CSU Chico and the Butte County Public Works Department.

8) **Project Title:** 2006 Climate Change Impact Assessment
Awardee: The Regents of the University of California
PIER Amount: $480,000
Purpose: Climate change will affect energy generation (e.g., hydropower) and energy demand (e.g., electricity demand for cooling). In addition, considering the inextricable link between energy production from fossil fuels and greenhouse gas emissions, research into global climate change and its effects on California is a vital portion of the overall mission of the Energy Commission's PIER program. An Executive Order signed by the Governor on June 1, 2005, required the preparation of biennial reports on the potential impacts of climate change on California. PIER led the preparation of the 2006 report in coordination with other agencies.

The studies commissioned by the PIER program projected a warming trend for the rest of this century, decrease of Sierra Nevada snowpack, decreased reliability of the hydropower units that generate a substantial portion of the electricity generated in California, increased annual and peak electricity demand, worsening air pollution, more severe heat, and increased public health issues from respiratory and heat-related ailments. Increasing temperature will impact the availability of water for the agricultural industry and expand agricultural pests' and pathogens' ranges..Incidences of wildfires are projected to increase and California faces a rising sea levels along its 1,100 miles of coastline. These findings, summarized in a highly successful publication entitled "Our Changing Climate," were the scientific evidence that contributed to the passage of AB 32, the California Global Warming Solutions Act of 2006. Document16

Final Report at: http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF



9) **Project Title:** Climate Adaptation Planning in California using Google Earth: a Pilot Study

Awardee: Science Application International Corporation and Stockholm Environment Institute

PIER Amount: $140,099

Purpose: For the past several years PIER has been developing policy-relevant climate data and information that local entities could use when developing and evaluating their potential adaptive responses. However, the conveyance of this information to local decision-makers in an easy-to-access format has been a challenge. To facilitate the use of PIER-generated information in local, regional, and state-level adaptive decision making, PIER worked very closely with the Natural Resources Agency and Google.Org and in 2009 developed a prototype website, CalAdapt, using the Google Earth platform. The Governor unveiled the CalAdapt prototype website in December 2009 and, given its success, the 2009 California Climate Adaptation Strategy mandates enhancing and making this website fully operational by September 2010.

As an example of the products that will be available in the CalAdapt website, the map below shows cells for which climate scenarios (temperature and precipitation data) can be downloaded using GoogleEarth.

CalAdapt Website Screenshot

10) **Project Title:** Valley Fig Growers Anaerobic Digester
Awardee: Valley Fig Growers, Inc.
PIER Amount: $476,002
Match Funding: $731,223
Purpose: Valley Fig Growers (VFG), located in Fresno, California, is the largest handler of figs in North America. All of the commercially sold dried figs produced in the United States are grown in the Fresno area and the San Joaquin Valley. California represents 20 percent of the world production of dried figs. The research conducted by VFG demonstrates the use of an anaerobic digester to convert food processing waste and wastewater into biogas for electricity and heat. The purpose of the project is to design and construct a digester to pre-treat wastewater prior to disposal in the municipal sewer system and create an economically feasible solution to energy and wastewater issues facing VFG and other food processors in the state. VFG's earthen pond is capped with a cover so the biogas produced by anaerobic digestion of the fig wastes is collected and used to fuel a microturbine equipped with a heat exchanger.

Anaerobic Digester

The electricity produced by the generator is used at the VFG facility to offset a portion of its electricity purchases. Additionally, the waste heat from the digester is used to heat the digester influent and to heat water used for cleaning the figs. The following are the project results:

- The project reduced the biological content of the wastewater prior to disposal in the municipal sewer system, thereby saving VFG $100.000 per year in discharge cost
- The digester produced enough gas to operate a 46 kW microturbine, resulting in annual production of 340,984 kWh to be used at the VFG facility.
- The waste heat from the microturbine resulted in the equivalent of 24,638 therms being available to offset natural gas used at the VFG facility.

A2. Describe, in detail, the benefits the PIER program has provided to ratepayers.

The Energy Commission's PIER program has received substantial recognition in national and international trade publications, conferences and journals. Its research in energy related areas including on climate change impacts and energy efficiency in buildings is internationally and nationally recognized and has contributed to California's reputation as a center for energy technologies and ideas.

The results of five RD&D projects – television energy use research, external power supply energy research, residential attic/duct modeling, cool roofs, and residential furnace fan efficiency – were incorporated into California's Title 24 Building Efficiency Standards and Title 20 Appliance Efficiency Standards. This investment will result in estimated annual cost savings of $970 million for California electric and natural gas ratepayers. This benefit alone is annually worth more than ten times the PIER budget.

Ratepayers are also benefiting from other PIER research through lower energy costs as new, more efficient products are brought to the market. For example:

- PIER research resulted in state-of-the art fault detection and diagnostics procedures for heating, ventilation, and air conditioning packaged systems. These are now required under Title 24 standards and are saving up to 10 percent in each unit being commissioned using the procedures.
- A variety of products, including desktop and notebook (or laptop) computers, use advanced internal power supplies developed through PIER that could save California consumers and businesses more than $800 million in energy costs over the next five years.
- PIER research developed an electrodialysis technology to stabilize wine without refrigeration, resulting in 80 percent electricity cost savings in a critical wine processing step. Fetzer and Chandon wineries have adopted this technology.
- PIER developed new electric transmission system strategies to deliver wind energy from high quality resource areas to California load centers. These strategies are being applied to billions of dollars of transmission investments.
- PIER research resulted in new combined heat and power systems being developed that provide large consumers fuel-to-energy (electricity and heat) efficiency as high as 80 percent.
- Consumers are benefiting through a PIER developed Real-Time Transmission Line Rating System to allow the utilities to ease constraints on transmission line power transfer and voltage. Lower cost power can be transferred to consumers as a result of this technology and possible black-outs averted.
- PIER research has improved hydroelectric production of electricity through enhanced forecasting models to manage reservoirs.
- PIER is actively investigating "smart grid" solutions for the full spectrum of California's generation, transmission, distribution, and end-use customers. Smart grid technologies include advanced communications and controls, intelligent

software, and systems designed to avoid rolling blackouts. With minimal cost, these technologies benefit ratepayers by increasing efficiency while improving reliability.

- A PIER sponsored a demonstration of a flywheel system that provides ratepayer benefits through frequency control to the state's transmission system without fossil fuel combustion. The demonstration resulted in the California Independent System Operator (California ISO) certifying a flywheel technology manufactured by Beacon as a potential supplier for its frequency control services.
- Twelve changes to the 2008 Title 24 Building Standards resulted from technical research conducted by the PIER building efficiency RD&D program that helped demonstrate the cost-effectiveness of new technologies used in commercial and residential construction.
- PIER sponsored research developed "Strategic Value Analysis" tools to assist transmission system planners and operators to meet the state's Renewable Portfolio Standard goals. A set of state-of-the-art methodologies and tools were developed to guide where new renewable energy generation should be located to achieve this goal while also improving the reliability of the state's power supply.
- PIER research demonstrated technologies to reduce energy usage in Data Centers up to 28% through use of exclusive Direct Current (DC) systems rather than traditional Alternating Current (AC). More than 21 large companies participated in the demonstration, including the some of the largest California ratepayers such as Sun Microsystems, Intel, Hewlett Packard and Cisco Systems.

In a more systematic evaluation for determining benefits, KEMA conducted a study, *Assessment of the Benefits and Costs of Seven PIER-Sponsored Projects* (CEC-500-06-014. In this study, methods were developed to assess benefits attributed to PIER research projects, and then applied to seven PIER projects. This study quantified physical and financial benefits and costs associated with the development and deployment of certain technologies, and assessed PIER's role vis-à-vis other organizations that also supported the development and deployment of these technologies.

For the seven PIER projects reviewed, the study concluded that California ratepayers garnered benefits in excess of the PIER program's cost. When viewed in a United States context, the success of the PIER program was even more apparent. The study's preparers applied conservative assumptions when developing the benefits estimates. The potential benefits from the seven projects total $464 million.
Two projects considered in the study are described in detail below. The calculated benefits from the External Power Supply project range up to $105 million for California, while the benefits for the Real Time Display Monitoring System range up to $229 million. When viewed from a US perspective the benefits increase.

External Power Supplies are special circuits designed to reduce voltage delivered to electronic products from 120 volts to between 3 and 15 volts, convert it from AC to DC, and regulate the output to power a wide range of consumer electronics devices. Power supplies are used in a vast range of home and office electronics. The PIER External

Power Supply project was intended to support accelerated market acceptance of a more energy efficient external power supply technology. Ultimately, work carried out by the PIER project supported the incorporation of efficient external power supplies into California's Title 20 Appliance Efficiency Regulations by the Energy Commission, which in turn supported the incorporation of specifications into federal product standards that took effect in 2008.

The total cost of PIER support for the incorporation of efficient external power supply specifications into the California Appliance Standards was $577,082 for a two year project lasting from May 2003 to May 2005.

In the KEMA study a panel of six industry experts forecast what the market share of more efficient power supplies would have been if California and federal power supply standards had not been promulgated in 2007 and 2008, and also estimated how much PIER involvement accelerated the adoption of new standards for more efficient power supplies. Based on the results of in-depth interviews with industry experts and representatives of the California ISO, the study determined that PIER support of the development of the Real Time Display Monitoring System accelerated its development and deployment by at least 7 years. The study further estimated that use of the RTDMS results in a roughly 30 percent reduction of blackout events due to the early adoption of more efficient power supplies, which creates net economic benefits over the next 10 years attributable to PIER research of up to $170 million in California, and $470 million in the WECC (including California).[1] XXX

The Real Time Display Monitoring System (RTDMS) is a set of computational and visualization tools that enable the operators of California's transmission grid to use phasor measurements to identify potential reliability problems and to identify strategies to avoid them or mitigate their impact. Phasors are measurement devices that monitor local transmission system conditions at very short intervals – up to 20 times per second. The currently deployed network of phasors covers much of the California transmission grid. This type of system is needed to help observe repeated occurrences of low frequency voltage and current oscillations on the Western Electricity Coordinating Council system. Such oscillations are undesirable and can have detrimental effects on the electric power system.

Over the past nine years, PIER has provided approximately $7 million to the RTDMS project to support research and development of the various software and visualization tools required for real-time processing and display of phasor measurements.

The KEMA estimates did not include values for a number of hard-to-quantify benefits, such as mitigation of security threats associated with outages and relief of transmission system congestion. Nor did they include the benefits associated with increased ability

[1] KEMA, Inc Assessment Of The Benefits And Costs Of Seven PIER-Sponsored Projects. California Energy Commission, Media and Public Communications Office. CEC-500-2010-013.

to manage growing injections of intermittent power from renewable sources into the Western Electric Coordinating Council grid without compromising system stability.

An example of the benefits provided by the RTDMS occurred on January 26, 2008 when grid operators at the California ISO used the RTDMS to detect undamped low-frequency oscillations in a portion of the grid which could have spread and caused significant instability in the system, including outages. If unchecked, these fluctuations can lead to wide-ranging power disruptions or blackouts. This technology was used in January 2008 when grid operators at the California Independent System Operator used the RTDMS to detect low-frequency oscillations on the grid. The operators were able to take corrective action quickly to restore normal conditions. Preliminary estimates posit that 30 percent of transmission outages in California electrical service territory could be avoided by the use of this new technology. Estimated benefits from reduced outages over a 10-year period range from up to $170 million for California, and up to $470 million for the entire Western Electric Coordinating Council region (which includes California).

Beyond the projects considered in the KEMA study there are many additional examples of how PIER research has benefited ratepayers. Generally, the benefits that California ratepayers accrue from PIER program activities fall into three categories: economic benefits, environmental benefits, and security benefits.

1) Economic Benefits

Economic benefits result from the goods and services that are produced, as well as costs that are reduced, in California due to technological research and development conducted through PIER projects.

Bank of America saw the value of PIER-developed technology when they decided to use a PIER-developed fault detection system in their branch offices. Special sensors and software are used to identify problems in their rooftop heating, ventilating and air conditioning (HVAC) systems. The sensors are embedded in the HVAC units and continuously monitor equipment operations. This operational data is transmitted to a centralized data center where it is analyzed by artificial intelligence software. The software can detect faults in equipment operation and also when lighting has mistakenly been left on. The computerized monitoring and fault detection system has allowed a very small staff to identify problems, notify on-site personnel, and verify that corrective action has been taken. This has saved Bank of America money through energy savings, better maintenance scheduling, lower maintenance costs and improved occupant health and comfort. By August 2009, Bank of America had installed the system in 1400 of their U.S. branches and planned to complete the installation in all 2200 branches within a year. The system manager indicated that his small staff could even expand their operations beyond Bank of America, and that the operation could be spun off as an independent profit-making business unit.

Since 1978, California's Building and Appliance Efficiency standards have saved consumers more than $56 billion in electricity and natural gas costs. It is estimated that these standards will save an additional $23 billion by 2013. The PIER program is an integral part of making certain these standards capture the most efficient technologies and measures currently available that save energy and money for California's residential, commercial, industrial and agricultural consumers. The Energy Commission uses the results and expertise gained from PIER R&D to improve and accelerate highly efficient building technologies into building codes, standards and practices.

Examples of PIER projects used in the 2008 Title 24 Buildings standards 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
- Fault detection and diagnostics for packaged systems, air handling units and variable air volume
- Duct sealing measures to reduce energy losses

LED Night Light in Hotel Bathrooms

Examples of other PIER projects associated with the Title 20 appliance efficiency standards include:

- External power supplies
- Televisions

2) Environmental Benefits

Environmental benefits are based on changes in the quality of the environment that have occurred or may occur as a result of new technology or systems research within the PIER program. These benefits accrue to the California ratepayers in two key ways: (1) reducing emissions of toxic substances from energy-related activities in the state and, (2) reducing the impacts on California's ecosystem from all energy-related activities.

The Energy Commission funds RD&D through the PIER program to evaluate and resolve energy-related environmental impacts from electricity generation, transmission, and use. PIER research helps determine the impacts on air, water, and terrestrial resources. For example, Energy Commission-funded research on the effects of new building construction materials on air quality directly benefits public health and safety by helping reduce exposure to pollutants. Research on a technology that improves the performance of air-cooled condensers for power plants reduces water consumption

while improving electric generation efficiency. To help diversify the state's fuel supply, the Energy Commission is funding research to evaluate the efficiency and emissions of burners and engines by changing gas compositions.

The Energy Commission also conducts research to improve management practices for forest thinning and forest health to help meet the goal of producing 20 percent renewable energy from biomass resources. These are a few examples of how the Energy Commission leverages technologies across all the research areas to help create a healthy environment for the clean energy future.

PACT Tool. Developed a model, in partnership with Southern California Edison, to help analyze and communicate complicated energy facility siting decisions to policy makers and various stakeholders. The model, known as the Planning Alternative Corridors for Transmission (PACT) tool, inputs environmental and engineering information relevant for proposed energy developments to be compliant with California's Environmental Quality Act. The model allows utility and regulatory planners to conduct an analysis, and all stakeholders to view, investigate, and understand the analysis. Beginning in 2009, PACT will be demonstrated and validated through the development of a California Desert Natural Communities Conservation Plan to facilitate compliance with Executive Order S 14 08 to complete an NCCP and reduce permitting processing time for renewable energy developments by 50 percent.

WESTCARB Phase III Funding. Received a $65.6 million grant from the U.S. DOE to co fund Phase III of the West Coast Regional Carbon Sequestration Partnership (WESTCARB). Established in 2003, WESTCARB is one of seven regional research partnerships to explore opportunities to capture carbon dioxide from the atmosphere and store it securely underground. Phase III is a 10 year project to conduct a commercial scale carbon capture and sequestration demonstration to validate the feasibility, safety, and efficacy of storage in deep geologic formations. This research supports AB 32 and SB 1250 goals to advance technologies to reduce greenhouse gas emissions, and AB 1925 requirements to recommend how the state can develop parameters to accelerate the adoption of cost effective geologic sequestration strategies for the long term management of industrial CO2.

Ventilation Requirements in Building Efficiency Standards. Completed research to better understand how new homeowners use windows, doors and mechanical ventilation devices. This study was complemented by a field test of actual indoor air quality and ventilation practices of new homes. These studies found that the new single family detached homes in California are built relatively tight, that many occupants do not open windows and that, in those homes where the windows/doors are not opened for ventilation (e.g. for security, noise, odor, dust, thermal comfort concerns), the outdoor air exchange rates are typically low and indoor concentrations of some air contaminants with indoor sources can be significantly elevated. These results were used by the Energy Commission to develop the 2008 Title 24 Building Energy Efficiency Standards

requiring mechanical ventilation in new homes to provide a dependable and continuous supply of outdoor air to the residence.

3) Security and Reliability Benefits
Security and reliability benefits are based on changes in the probability or severity of unusual energy-related events that would adversely affect the overall economy, public health and safety, or the environment. An improvement in California's energy infrastructure security means that ratepayers experience less frequent and less dramatic power outages. While there is no way to prevent every disruption, the PIER program works to identify and develop technology and tools that reduce the duration and severity of such disruptions.

One example is the Real Time Display Monitoring System (RTDMS), which measures tiny fluctuations on California's electrical grid up to 20 times per second. If unchecked, these fluctuations can lead to wide-ranging power disruptions or blackouts. This technology was used in January 2008 when grid operators at the California Independent System Operator used the RTDMS to detect low-frequency oscillations on the grid. The operators were able to take corrective action quickly to restore normal conditions and limit the spread of the oscillations. Preliminary estimates posit that 30 percent of transmission outages in California electrical service territory could be avoided by the use of this new technology. Estimated benefits from reduced outages over a 10-year period range from up to $170 million for California, and up to $470 million for the entire Western Electric Coordinating Council region (which includes California).[2]

Another example of such a technology is the Advanced Distributed Sensor Networks for Electric Utilities. This project completed in June 2009 demonstrated a new generation, of advanced wireless mesh network system to detect intruders and threats. The project used a network of 89 wireless sensors on and around two switchyards, three adjacent transmission towers, and a nearby storage yard at an SDG&E transmission substation. The system successfully detected and localized simulated threats in scenarios that included intrusion, tampering, and fire during a 15-day period.

A3. During the last four years, has the PIER program been subject to any public criticism, critical press reports, or been involved in any substantial public controversy, such as a lawsuit (whether justified or unjustified)?

There have been numerous criticisms of PIER and the Energy Commission pays close attention to them and investigates allegations that have merit. There are likely many other criticisms that we are not aware of because they are not directed or made available to the Energy Commission. However, most criticisms are unfounded and are typically the result of a unsuccessful bidder or contractor who is not familiar in dealing with the State contracting process.

[2] KEMA, Inc Assessment Of The Benefits And Costs Of Seven PIER-Sponsored Projects. California Energy Commission, Media and Public Communications Office. CEC-500-2010-013.

Two cases may apply to A3:

1) Utility Consulting International
2) Former Chairman of the Assembly Utilities and Commerce Committee, Lloyd Levine

Utility Consulting International

Please describe the nature of the criticism, controversy or litigation I the party or parties who were involved, and your position

Utility Consulting International (UCI) filed a protest with the California Department of General Services (DGS) in July, 2009. UCI protested the Energy Commission's rejection of its proposal to a PIER solicitation for smart grid research (RFP 500-08-502).

***If the controversy was resolved, explain how it was resolved*.**

The Energy Commission determined that UCI had not submitted required information. UCI claimed that it had complied with the RFP requirements. DGS found for the Energy Commission on every count raised.

Was this resolution satisfactory to all parties? If not, what issues remain in controversy?

UCI has not pursued further action, although given their pursuit of the issue the issue may not have been resolved to their satisfaction.

Assembly Member Lloyd Levine

Please describe the nature of the criticism, controversy or litigation, the party or parties who were involved, and your position

Former Assembly Member Lloyd Levine, as Chair of the Committee on Utilities and Commerce, held a hearing in 2007 that in part dealt with the PIER program. Former CEC Chairman Jackalyn Pfannenstiel, Executive Director Melissa Jones, and former PIER Director Martha Krebs attended the hearing held before the Committee. Assembly Member Levine following up that hearing with a request for answers or information on the following issues that the Energy Commission took very seriously:

1. PIER's use of contractors to help administer the program;
2. The nature of PIER's relationship with the University of California and the California Institute for Energy and Environment; whether or not overhead on these contracts was similar to other contracts;
3. The role of the contractor Deputy Director of the PIER program and his/her authority, and whether or not the Deputy Director hires or supervises CEC staff or assigns staff to policy areas, and how he/she prioritizes projects; whether or not the full Commission approves project awards;
4. whether or not CEC staff report to contractors, and, if so, what is the nature of the relationship; reasons for hiring a contractor to serve as Deputy Director of PIER;

5. how does PIER ensure funds are allocated towards the most promising research, and how does the CEC ensure funds are not disproportionately awarded to a specific technology or contractor;
6. how does CEC ensure there is no conflict of interest.;
7. has the PIER program attained global notoriety by using an contractor Deputy Directory; what is the role of Mr. Thom Kelly;
8. how does the CEC ensure projects are selected based on the most valuable research rather than ease of contracting or established relationship;
9. do CEC staff report to these contractors; what work is performed by the 23 contractors, and why are they needed given that the PIER program has been authorized 76 positions;
10. why does the staffing plan only reflect 59 permanent positions when 76 are allocated; what do the 76 people do, and do they all work in PIER, or have some been assigned to other divisions;
11. why is there no staffing plan; why are we not using authorized positions for supervisors and leads, program directors, and the deputy director position;
12. explain why there are so few competitively bid contracts; did the CEC revise its strategic plan to comport with either SB 1250 (Perata) or SB 107 (Simitian); and
13. did the CEC develop an operations and procedural manual using the recommendations made by the Independent Panel Review.

***If the controversy was resolved, explain how it was resolved*.**
The PIER program provided a 57 page detailed response to each of these questions (California Energy Commission Response to Questions from Assembly Utilities and Commerce Committee, April 18, 2008). While the detailed response alleviated most of Assembly Member Levine's concerns, a few required further action. These include PIER's use of contractors and awarding sole source verses competitively solicited contracts. Actions have been implemented to alleviate the remaining concerns. The most significant actions taken as the result of this inquiry include:

1) PIER has reduced the number of staff support contractors. In 2008, PIER had 19 staff support contractors. Currently the Energy Commission has one contractor, a science advisor, on a part-time basis. The science advisor helps ensure that the program is coordinated with other state, national, and international scientific research programs to maximize PIER program leverage and avoid research duplication; attract cutting edge technology and development research; and provide extensive research experience, credential, and knowledge of research techniques, research organizations, and current research.
2) The Deputy Director for the R&D Division, which includes PIER, is a Career Executive Appointment (CEA) position.
3) PIER has increased the number of awards from competitive solicitations from 34 in 2004 to 110 in 2009 and reduced the number of sole source contracts from 13 in 2004 to 7 in 2009 (see answer to C3a).

Was this resolution satisfactory to all parties? If not, what issues remain in controversy?
Assembly Member Levine appeared satisfied with the response as there were no additional questions or follow up.

A4. Are there other public agencies/departments/other boards or commissions, federal, state or local, or academic which have some of the same or similar duties, responsibilities or functions to those provided by the PIER program? If so, please name them and explain why your entity should not be combined with or sunset in lieu of the other.

The U.S. Department of Energy has some duties, responsibilities and functions that are similar to PIER on behalf of the entire country. However, its investments are not driven by California's particular policy, geographical and economic circumstances. PIER has worked to leverage the DOE investments at the DOE Laboratories in California, at California Universities and in the private sector so that specific technologies are developed that are targeted at meeting California's innovative and often preeminent energy policy needs.

We do not believe that the PIER program is duplicated elsewhere in the state. Our unique focus of energy efficiency, renewable energy, smart grid, and other energy research areas is a different and broader focus than other state agencies and is unparalleled in producing focused results that save energy and money and improve the well being of the state's energy consumers.

We are aware of other research and development programs at the California Air Resources Board, CalTrans, and the California Public Utility Commission. Other Departments in the Resources Agency have energy-related technical and policy interests. We have coordinated and co-funded research with all of these State organizations. In addition because of our mandate to advance science and technology and show ratepayer benefits, we have higher mandated criteria to.

While California Universities may have research and education 'Centers' on their campuses, they are usually funded by Federal and State funds, including PIER funds for specific and targeted research. For PIER research at these Centers, the review and approval of proposed research by the Commission assures that this research is relevant to and contributes to California's energy and environmental goals and policies. If the PIER program funds were to be sent directly to such Centers, there would be no regular mechanism to assure that the R&D would be integrated with the rest of the state agencies: the Climate Action Team R&D Group assures this now for state agencies. Further, the state would lose the assurance that such R&D is implemented in the public interest and according to California energy and legislative policies.

A5. Are there any private organizations or businesses that have some of the same or similar duties, responsibilities or functions to those of the PIER program? If so, please name them and explain why the PIER program should not be combined with or sunset in lieu of the other.

Like no other energy research entities, PIER fills the role of an impartial coordinator for RD&D funding, from small businesses to universities, to California based national laboratories to utilities and energy companies, and to public interest and advocacy groups. The ability to coordinate across these domains sets PIER apart from other research programs. PIER does not serve one organization or group –as a university or a utility might – but advocates for the public interest of the people of California.

PIER has successfully built a national reputation for California-based energy RD&D. PIER creates and sustains energy research partnerships on both the state and national level. The combination of unbiased coordination and strategic partnerships helps PIER avoid research duplication, build on successful past work, generate new ideas, leverage investments, and ensure that RD&D provides benefits to the state's energy customers. This established array of connections would be difficult, if not impossible, to re-create If PIER functions were transferred elsewhere. The organization inheriting these functions would need to establish its own reputation, working relationships, and processes.

At the National level, the Electric Power Research Institute (Palo Alto, CA) and the Gas Technology Institute (Chicago, IL) have some research interest similarities to PIER. In fact, PIER funds research with both organizations when there are clear connections to California energy goals and policies. But these entities, as qualified as they are to perform certain research functions, are funded by utilities and transmission entities often having divergent financial interests that may not always be driven by the public interest goals established for PIER.

There are no private organizations or businesses that duplicate the functions of the PIER program at the State or local level. State energy and environmental policy needs to be supported by a portfolio of technology investments that are mindful of public benefits from scientific information as well as new technologies and tools. For example, it is in California's interest to have both public and privately owned dams relicensed by the FERC if they can alleviate concerns about environmental impacts on fish, wildlife and the environment. PIER supports fisheries and wildlife research that independently establish impacts as well as tools for assessing mitigation that can be used by both public agencies and private developers. Such research is often not pursued by private entities and, when it is, requires independent validation.

For-profit private entities tend to invest in specific technologies for which a market is well-defined and significant return on investment can be anticipated; few entities have the research capacity that could take on the PIER portfolio. A few large private entities may have a broader energy technology portfolio (e.g. GE, Siemens, Honeywell) and research capabilities. While they have activities in California, and may be aware of the

state's energy and environmental issues, they are not driven by the state's goals and interests.

A6. What other states currently have programs that perform a function substantially similar to the PIER program? Please list those states, the programs, and funding levels.

1) **State of New York**
The New York State Energy Research and Development Authority (NYSERDA) is the closest in size. In 1998, implementing its vision to restructure New York's electric utilities, the Public Service Commission (PSC) replaced utility-funded public benefit programs such as research and development and demand side management programs with a system funded by a system benefits charge. Between 1998 and 2005, the program was allocated $150 million dollars per year. From 2006, and predicted through 2011, the program will be $175 million dollars annually. Twenty-three percent of the fund – approximately $40 million per year – is used for Research & Development.[3] NSERDA uses 51 personnel-years (PY) to administer approximately $40 million on research per year, a dollars-to-PY efficiency of $0.8 million per PY. The Energy Commission's efficiency is 50 percent higher – $1.2 million per PY.

2) State of Wisconsin
Wisconsin has a $7.5 million state energy research program, but it is not currently funded. The state has $85 million per year funded from an energy tax to fund lower income energy assistance programs and for efficiency program rebates and incentives, with $1.5 million set aside for renewable energy research. The state also has a biofuels research center that receives $25 million in federal funding.

3) State of Iowa
The Iowa Energy Center advances Iowa's energy efficiency and renewable energy use through research, education and demonstration. The Iowa Energy Center, allowed to contract only with universities and non-profit companies, invests in initiatives that help Iowa industries and businesses run efficiently so they can be more productive and profitable. The Iowa Energy Center receives its funding from an annual assessment on the gross intrastate revenues of all gas and electric utilities in Iowa. For the current fiscal year 2008, the Energy Center has $3.9 million for R&D, 75% of which was directed toward research, education, and disseminating energy information to Iowans. The remainder of the funds was used to support the Energy Center's staff and its general activities in support of its mission.

[3] http://pulpnetwork.blogspot.com/2009/01/psc-authorizes-millions-for-submetering.html

A7. Are there some states that have had programs that performed a function substantially similar to the one the PIER program does, but which no longer do? Please describe.
a) Have any other states, in the last ten years, substantially reorganized an entity similar to the PIER program? Please describe.
b) Is there any evidence of public harm or public benefit in any of those states from elimination or reorganization of the entity?

We are not aware of any states that had a PIER like program and eliminated it. To the contrary, in the last four years, PIER staff has had requests for information from the states of Connecticut and New Jersey about the legislative authorities under which PIER operates with the possible objective of adopting a PIER-like program. We are not aware of whether these States established such programs.

The state of Iowa established the Iowa Office of Energy Independence (IOE) four years ago to (1) accelerate research and development, knowledge transfer, technology innovation, and improve the economic competitiveness of efforts and (2) increase the demand for and educate the public about technologies and approaches. Funding has averaged $9.3 million per year.

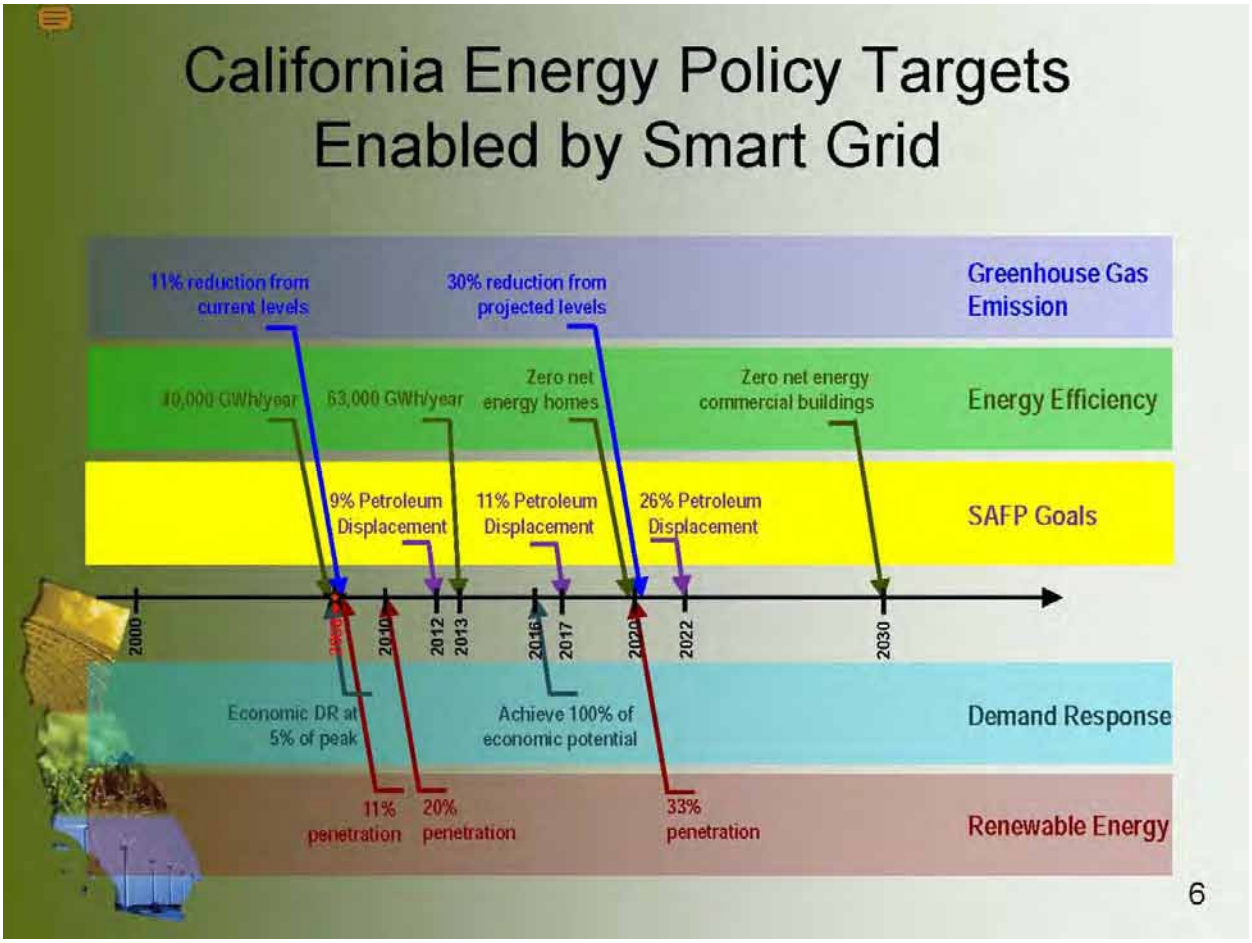
A8. Is the PIER program's mission impeded or enhanced by existing statutes, regulations, policies, practices, or any other circumstances, including budgetary, resource, and personnel matters? Explain.

The PIER program mission is created by, defined by and relies upon the statutory and policy guidance provided by the California Legislature to ensure that it selects projects that deliver the highest priority energy research and results. It successfully complies with all existing statutes, regulations, policies, and practices, and works within the resources provided by the Legislature.

Partial listing of existing statutes guiding PIER research

- **AB 1890** – Created PIER and set research goals
- **SB 1250** – Energy research goals & objectives
- **AB 32** – Global Warming Solutions Act aggressive 2020 goals
- **AB 118** – Transportation research
- **SB 1368** – GHG Emissions standards for POUs
- **AB 2021** – Energy Efficiency for POUs
- **AB 2160** – Green Buildings
- **SB 107** – Accelerated RPS Goals
- **SB 1** – Renewables Goals for New and Existing Residential and Commercial Structures
- **AB 2778** – Self-Generation Incentives for Fuel Cells and Wind

The figure below shows how some of the research is directed towards helping achieve energy policy goals.



a) Would statutory changes be needed to improve any aspect of the current program? Explain.

The legislature has played a vital role in establishing PIER and making important adjustments over the course of the past decade since its creation. The legislature is also an important partner in PIER's future to assure it achieves its potential, including the successful implementation of California's energy policy goals and demonstrating leadership for the rest of the nation.

There is more that can be done and the Energy Commission looks forward to an on-going conversation on strategies to further improve this important program. The following improvements are recommended for consideration by the legislature:

1.) Allowing PIER Contractors to Own Equipment

Existing DGS policy requires state agencies to own equipment that its contractors purchase in whole or in part with state funds. At the end of the contract, the state agency can either have the equipment returned or allow its use in another agreement (State Contract Manual Section 7.29).

This policy can unnecessarily cost the state money when applied to PIER agreements. A lot of equipment used in cutting-edge energy research has no other value than as part of the project. Requiring the Commission to deal with equipment at the project's end - possibly by selling it or hiring another contractor to dispose of it - can cost more than the equipment's residual value. In addition, some PIER contractors have used this policy to walk away from projects and leave the state with the liability for the equipment. For example, one PIER contract involved research related to a waterwheel, which the state had to own because the contractor used PIER funds for it. The contract did not work out, the contractor walked away from the project, and the Energy Commission had to quickly hire another contractor to dismantle the waterwheel before it damaged the canal it was in as the water level began to rise.

The Commission would like the authority to allow PIER contractors to own equipment in certain circumstances.

2.) The Energy Commission requests delegated authority for all amendments to agreements, contracts, work authorizations and grants that do not involve an increase in their overall budgets. This would include statement of work changes, no-cost time extensions and internal budget reallocations. Research proposals are often prepared a year or more earlier than research is conducted. It is unrealistic to constrain research contracts with no flexibility to adjust a research path given that as research progresses, there are often advances in understanding that require adjustments in the research work plan. Projects approved at a full business meeting often come back to the full commission for even limited revisions in work scope; budget reallocations or no-cost time extensions. These are time consuming and inefficient use of state resources. These minor reallocations should be delegated to the R&D Committee for consideration and possible approval.

b) Would budgetary, resource, and personnel matters changes be needed to improve any aspect of the current program?

Salaries for existing job classifications for energy specialists are not competitive with other research entities or other state agencies, which makes it difficult to recruit and retain experienced employees. For example, Energy Commission Specialists earn from $4,833 to $7,042 per month while Air Pollution Specialists at Air Resources Board with similar duties earn from $4,204 to $9,082 per month. PIER Managers II earn from $7,110 to $7,838 per month, while Program Managers II at the Department of Water Resources and Department of Fish and Game with similar duties earn from $7,265 - $8,008 per month. Non-state research staff rates are much higher. As a result, the PIER program suffers from losing highly skilled, seasoned staff to other State Departments or non-civil service job opportunities. Changing job classifications or increasing pay scales for existing PIER job classifications would attract and help retain the skill level required to maintain the current stature of PIER employee expertise. This is a very significant

issue as energy research and clean technology specialists are in increased demand throughout California.

c) Have you or anyone else proposed such changes? If so, explain whether they were adopted, rejected, or are still pending.

These salary issues have been taken up as part of the state's administrative process.

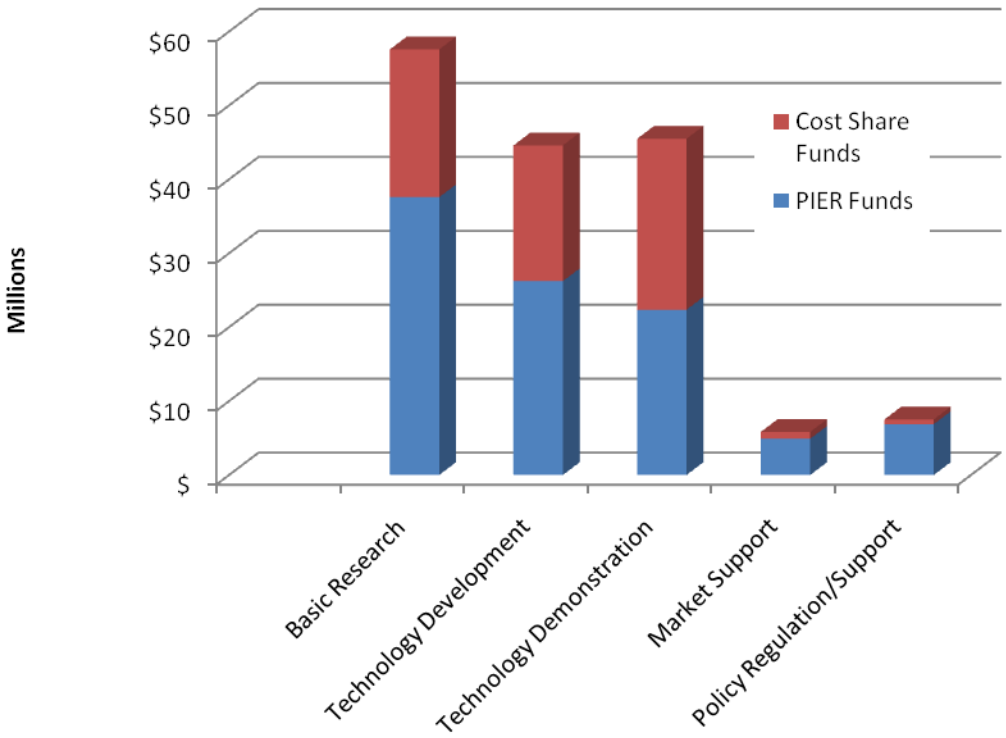
A9. Are there any federal mandates, federal matching funds, or other local or financial considerations that require the state to continue the PIER program? If so, please describe and provide citations. Could any of PIER's functions be transferred to another entity or program without jeopardizing such funding considerations or obligations?

There are no federal mandates that require the state to continue the PIER program. However, because the PIER program is well known nationally among organizations related to energy research and development, the Energy Commission attracts matching funds with projects and uses California as a base for those projects. In the 10 years of administering PIER, we have formed solid relationships with the US Department of Energy, the national labs, universities, and innovative technology companies. We have also established a process to seek and fund the most promising energy projects that will attract matching funds. PIER is in the best position to seek and leverage these funds. If PIER's functions transferred elsewhere, the organization inheriting these functions would need to establish this reputation, contacts, and processes.

The Energy Commission's RD&D process moves concepts from the basic research phase to eventual market commercialization. The process involves a great many investment steps along the way and often takes many years. Research is also inherently risky with no guaranteed outcomes. The Energy Commission developed a phased approach to help reduce this risk by evaluating results at each stage and assessing the risks and benefits before committing to the next stage.

The Energy Commission developed the following research stages: basic research, technology development, technology demonstration, market support, and policy and regulation support. Below is a graph of PIER's project and partner cost-share funding for 2009 according to research stage. This figure shows that one dollar of PIER funds leads to $1.64 spent for research, brought about by an additional $0.64 of cost-share funds from other research partners.

2009 PIER Project and Partner Cost-Share Funding by Research Stage



The following are three examples of PIER successfully attracting federal funds:

1) ARRA

In response to the current economic crisis, the federal government created the federal American Reinvestment and Recovery Act of 2009 (ARRA), which included more than $62 billion in energy related grants. This federal legislation presented an opportunity to improve California's energy infrastructure faster than would otherwise be possible using only state funds. As a result, the Energy Commission committed up to $47.4 million in PIER funds to help California businesses meet the federal matching funds requirement and bring Federal ARRA funding to California. Without the Energy Commissions committed funding, these businesses will not meet the federal cost share requirement and the awards will be canceled.

The Energy Commission recognized that ARRA funding could expand the job opportunities in California; allow these companies to highlight their products, skills, and expertise throughout the nation and the world; and help the state become the center of the oncoming clean technology revolution.

To date, $12 million of the Energy Commission total commitment of $47.4 million in cost-share funding has resulted in more than $400 million in U.S. Department of Energy (DOE) federal ARRA funds to these companies and leveraged an additional $387

million in third-party cost-share funding. This represents a leveraging ratio greater than 65 to 1 for clean technology implementation in California.

ARRA-Leveraged Funding

	PIER Program Funds	DOE ARRA Funds Into California	Third-Party Cost-Share Funds for California Projects	TOTAL
Grants Pending Energy Commission Approval	$12 million	$401 million	$387 million	**$800 million**
		$788 million		
Potential Awards after release of NOPA by the Energy Commission	$10.6 million	$133 million	$94 million*	**$238 million**
Grants Awaiting DOE Notice of Award	$4.8 million	$29 million	$7 million*	**$41 million**
Estimated Potential Awards for Future ARRA Federal Grants**	$20 million	$400 million	$84 million	**$504 million**
Total	$47.4 million	$963 million	$572 million	**$1,583 million**

Source: California Energy Commission

Through this effort, PIER has connected with companies working across the state. The Energy Commission continues to work with California-based ARRA applicants. Anticipating that California applicants may receive additional ARRA awards, the Energy Commission has set aside an additional $35.4 million in co-funding for potential projects.

2) WESTCARB

The West Coast Regional Carbon Sequestration Partnership (WESTCARB) is an example in which the Energy Commission PIER program is substantially leveraging federal and industry funding and bringing technology and jobs to California. WESTCARB's goals are to characterize regional carbon capture and storage opportunities and to conduct technology validation field tests. For the three phases of the WESTCARB program – a research program that will span more than 10 years – the PIER program is able to leverage an investment of less than $10 million in state funds to bring more than $110 million to California and the western state partners.

3) The Geothermal Resources Development Account

The Geothermal Resources Development Account (GRDA) was created in 1981 (Assembly Bill 1905). Under GRDA, royalties from geothermal leases to the federal government are returned to the state for use in supporting geothermal energy. Specific

GRDA components include planning, mitigation of geothermal environmental effects, sharing development costs, and RD&D related to geothermal applications. Funds are dispersed through competitive solicitations open to private and public agencies.

Although PIER and GRDA have different emphasis, the two programs complement each other. With GRDA placing more emphasis on geothermal exploration and development and PIER on innovative electricity-related RD&D, the two programs together are able to leverage funds and to build upon each other's projects. For example, a PIER contract awarded in 1999 to a California business led to the successful development of an innovative geophysical exploration tool that later was further tested and demonstrated at a major California geothermal field with GRDA funding. Both of these efforts were supported by US DOE match and private match. A pioneering geothermal well drilled at The Geysers with the aid of GRDA funds is now the site of a PIER project involving the production of electricity from a turbine placed in the well, demonstrating the ability to exploit the energy of falling water as it is injected into the reservoir via the well. A joint PIER-GRDA solicitation in 2003-2004 combined funds from both programs to address broader-based goals allowing for larger awards.

Joint activities between these two programs supports the state's goals for increasing renewable energy resources while protecting and enhancing the environment, reducing costs, and helping to increase geothermal generation for the state. Geothermal provides the state with a reliable source of renewable base load energy, which can help California meet its RPS goals, and reduce greenhouse gas emissions. By providing funding from these two sources, we can seek highly creative projects such as co-location of solar with geothermal which can increase the amount of energy produced at a site.

USDOE's interest in geothermal development and advanced exploitation techniques is reinvigorated, with interest in enhanced/engineered geothermal systems (EGS) and in carbon capture and storage (CCS). PIER RD&D can leverage GRDA funds to help address issues associated with this type of energy development.

A10. Explain any efforts, which have been made by the PIER program, or by anyone else, to improve any aspect of your program, other than the legislative or regulatory changes discussed in question A8. Are there any program or organizational changes that the entity is considering to improve its operations and increase the program's ability to operate more in the public interest?

In addition to seeking guidance from the PIER Advisory Board, the program conducts project meetings, workshops and conferences and project advisory and progress meetings with stakeholders and interested members of the public to ensure that the programs are current and are in the public interest. All proposed contracts are presented and discussed at the Energy Commission's business meetings.

During the year, RD&D Division staff host and participate in many meetings, workshops and events, including Integrated Energy Policy Report (IEPR) process, to ensure that the state's research needs were considered, reviewed, discussed and identified. Specific research needs and shortcomings are specifically addressed and recommendations for future high-priority research activities are included in each current IEPR. Additionally, the PIER Program also evaluates the success and appropriateness of research by working actively with key California stakeholders through groups such as the Transmission Research Program Advisory Committee, the Emerging Technology Coordinating Council, various PIER Program Area Technical Advisory Committees, nine advanced Research Centers created or supported by PIER funds, and through other public workshops and technical meetings. We also obtain direct feedback, "gap" analysis and recommendations from utilities, other state agencies, academic experts, industry associations and technology experts. These meetings, workshops, and working groups provide a vehicle for California stakeholders to understand past, present and future research as well as to provide guidance, recommendations and improvements for the current program. The Energy Commission will conduct more workshops and other activities with the public and stakeholders to identify program improvements.

The Energy Commission is working to develop better methods for assessing and reporting the benefits of PIER research. This is a persistent challenge for any research organization primarily because advertising and marketing are not usually included in the skill sets of RD&D practitioners. The Energy Commission has been describing benefits assessment efforts in the PIER annual reports to the legislature. As part of this effort, the Energy Commission is beginning a campaign for program outreach and education through project and program presentations, press releases and public events. Fact sheets for specific RD&D projects are being prepared to provide the public and technical communities with the status of its projects prior to the final reports.

We plan to have a stronger emphasis on technology transfer. PIER funded research, particularly at academic institutions, should incorporate commercialization as the end goal of research and technology transfer efforts. For small projects, the contractor might be required to work with a CEC approved commercialization expert.

The RD&D Committee is considering having staff make a semi-annual report to the full commission on PIER research. The report would contain information about research results and suggestions for process improvements.

A11. Explain why the PIER program, in your opinion, should or should not be sunset. Provide as much documentation as possible from sources outside the entity (academic or policy studies, newspaper or magazine articles, court decisions, etc.) that would support your position.

a) Explain why the PIER program, in your opinion, should or should not be sunset.

The PIER Program should not be sunset. The PIER Program has been an enormous financial success for California citizens, has provided much of the basis for key energy policy goals for the state, and has demonstrated considerable foresight on the part of the legislature for its creation.

In an era of looming climate change, decreasing energy security, and the increased off-shoring of green technologies, this would be the worst possible time for California to sunset the Public Interest Energy Research program. On the contrary, now is the time to increase support for PIER to help California continue to reduce greenhouse gas emissions, create high paying green jobs in California, and protect the California economy and consumer from the vicissitudes of unstable foreign energy sources.

Public interest energy research serves the vital purpose of developing beneficial energy technologies according top state policy guidance absent potentially conflicting parochial interests of the private, academic or regulated sectors. The RD&D Working Group Report of September 6, 1996, pursuant to the CPUC's joint Order to Institute Investigation (OII I.94-04-031) and Order to Institute Regulation (OIR R94-04-032) found that the administrator of a public interest research program has three goals:

1. To serve the broad public interest
2. Support state energy policy, and
3. Address needs of consumers

The Working Group also developed performance criteria for the research program administrator:

- Provide an open planning process
- Conduct effective and efficient program implementation
- Maintain public accountability, and
- Collaborate to effectively leverage funds and enhance RD&D infrastructure.

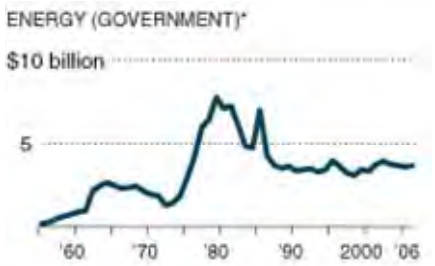
These and other Working Group findings became the basis for legislative direction in AB 1890, which designated the Energy Commission as administrator of the new, public interest energy research program, and the subsequent CPUC Decision D. 97-02-014 which established the funding levels for the new program.

As the eighth largest economy in the world, California has the ability, the duty, and a strong self interest in funding innovative energy research through the PIER program. Leaving R&D investment decisions solely to the free market has historically been shown to result in decreases in such investments in favor of increasing short term profitability. Discussing the creation of the PIER program in its Docket No. 96-RDD-1890, the CPUC noted that, "…RD&D activities which serve a broader public interest 'should not be lost in the transition to a more competitive environment.'"

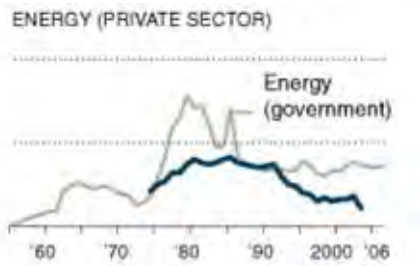
The Energy Commission took to heart the legislative, regulatory and stakeholder directions and findings when it started PIER in 1997. Taking into account these directions and findings and the requirements placed upon the Energy Commission as administrator of the PIER program, the second Independent PIER Review Panel noted in its June, 2005 report to the legislature:

> The PIER program is essential and since being established has demonstrated its importance to the state. Through the CEC, PIER is contributing to the State of California Energy Action Plan. In the future, PIER can and should provide the sophisticated planning tools and capabilities that must be available if the state is to set optimal energy policies for both gas and electricity supply, transmission and utilization. The promise of the PIER program is that it can cast its activities in the context of California's unique environmental, economic, and demographic forces. The PIER program can leverage collaborative work with other states through the Association of State Energy Research and Technology Transfer Institutions (ASERTTI), the U.S. Department of Energy, and other federal agencies, all in ways that provide California policymakers and administrators the data and information they need to develop well-informed solutions for addressing the state's energy, environmental, and economic needs.

California cannot count on federal funding or private industry to meet the needs for R&D investment into renewable energy if history is any guide. Energy R&D has been woefully underfunded for decades by both the private and public sectors. Overall investment in energy R&D collapsed following energy crises in the 1970s and it has never recovered; falling globally by two-thirds between 1974 and 2006 [Nature 444, 519 (30 November 2006) | doi:10.1038/444519a; Published online 29 November 2006]. In the US, federal spending on all energy R&D, not just renewable or low-CO2 technologies, fell from an inflation-adjusted peak of $7.7 billion in 1979 to just $3 billion in 2006 [Budgets Falling in Race to Fight Global Warming, Andrew C. Revkin, New York Times, http://www.nytimes.com/2006/10/30/business/worldbusiness/30energy.html?pagewanted=1&_r=5].



Federal energy R&D investment in inflation adjusted dollars. Sources: American Association for the Advancement of Science; Dan Kammen, University of California at Berkeley.



Private energy R&D investment in inflation adjusted dollars (dark line). Sources: American Association for the Advancement of Science; Dan Kammen, University of California at Berkeley.

The decline in energy R&D was not a characteristic of one presidential administration, but extended over many presidential administrations as illustrated above (left). The decline in energy R&D investment at the federal level was matched by a decline in energy R&D investment in the private sector, also illustrated above (right). This collapse in investment occurred despite the growing awareness over that time period of the threats posed by greenhouse gas emissions and reduced energy security. At the national level, energy R&D has traditionally been totally eclipsed by R&D into other areas such as the military, which received 85 times more R&D funding in industrialized countries than renewable energy in 2006. [4]

The current administration in Washington and the ARRA stimulus plan there has resulted in an upswing in federal energy R&D funding. However there are no guarantees this will last, particularly if there is a change in administration. Furthermore even if the federal government maintains higher levels of energy R&D investment, there is no guarantee that the funding will come to California. California has traditionally received far less than its proportional share of federal funds, typically among the lowest of all 50 states in-terms of federal dollars received by the state per dollars paid from California in federal taxes.[5] Therefore without California funding energy R&D through programs such as PIER, more of the energy R&D and associated green economy jobs may move to other states that typically receive more than their fair share of federal funding.

Even with the recent emphasis on energy R&D at the federal level, other nations such as China are rapidly gaining on, or in some cases racing past the US in many areas of renewable energy technology such as the photovoltaics and lithium batteries, where US

[4] [Military R&D 85 Times Larger Than Renewable Energy R&D, Dr. Stuart Parkinson, http://www.inesglobal.com/_Conferences/2008/Geneva/Parkinson.PDF

[5] California Performance Review, http://cpr.ca.gov/CPR_Report/Issues_and_Recommendations/Chapter_1_General_Government/Increasing_State_Revenues/GG07.html

companies currently have less than 10% and 1% respectively of global market share.[6] The new federal funding for energy R&D, if anything needs to be augmented by R&D funding from California in order to help ensure that a large part of the future green economy is in the US and California in particular. Now is not the time for California to back-off on its commitment to renewable and clean energy technologies.

This historical record demonstrates that California cannot expect either the federal government or the private sector to share the priorities California has placed in reducing greenhouse gas emissions, and developing renewable and sustainable energy technologies as part of a green economy. As it has in many other areas such as clean air and water, California must again take the lead in promoting a greener, more sustainable economy. If California wants to meet the objectives in GHG reductions laid out by legislation such as AB 32 and SB 1368 and objectives in renewable energy as laid out by SB 107 and Executive Order S-21-09, it cannot wait for others to fund the energy R&D that will enable these goals to be reached. The California economy also cannot afford to have the innovations that will help us reach our GHG reduction and renewable energy goals be developed elsewhere.

This is no less true in transportation research. For example, Assembly Bill 2076 (Shelley, Chapter 936, Statutes of 2000) called for a report and strategy for accomplishing significant petroleum reduction for California. The resultant report, Reducing California's Petroleum Dependence (P600-03-005F) provides strategies to reduce California's petroleum consumption to 15% below 2003 levels by 2020. This would be a decrease of approximately 65 billion gasoline gallon equivalents (gge) from 2010 to 2020, or a shift of nearly $200 billion from the petroleum sector to a combination of increased vehicle efficiency, and non-petroleum fuel substitutes, such as electricity.

According to the joint ARB/CEC State Alternative Fuels Plan (CEC-600-2007-011-CTF), electricity could displace nearly 380 million gge of fossil fuels by 2022. This is the equivalent of 4.5 billion kilowatt-hours of electricity; enough to serve 748,000 average California homes for a year. Achieving this level of electricity use in the transportation sector will require technology advances in vehicles, batteries and the emerging smart grid. It will also require an electricity regulatory structure that recognizes and facilitates the beneficial integration of electric "fuel" and California's unique electricity system. Conversely, if the desirable regulatory structure is not implemented, electric vehicles could become a disastrous system liability.

The PIER program has completed trend-setting research that identifies and proposes business structures and regulatory approaches that would link electric vehicle implementation with electricity system benefits. The results of this research, available in

[6] Smart Power Market Watch, David Leeds, http://www.smartpowercommunity.com/2010/03/arpa-e-is-under-funded-to-compete-with-china/

the report, Strategies for Transportation Electric Fuel Implementation in California: Overcoming Battery First-cost Hurdles (CEC-500-2009-091) show that vehicle traction batteries have a second use potential as home or neighborhood deployed storage, and that the second use storage value could significantly off-set the first cost of the battery in the vehicle. The research results have been noticed by electric utilities, vehicle OEMs and the press (Greentech Media, "V2G: Transportation Electrons vs. Power Electrons", Eric Wesoff, April 7, 2010). PIER's research findings on traction battery second use also influenced the federal DOE's decision to issue a $700,000 national solicitation calling for advanced vehicle battery second use approaches (Request for Proposals No. RCI-0-40458).

Southern California has a great abundance of renewable energy resources with some of the best land for onshore wind and solar power in the whole nation. It would be of great benefit to Southern California and the state as a whole if these rich renewable energy resources were tapped using technologies made in California by Californians. It is also imperative that these renewable resources be tapped in a way that preserves and protects Southern California's unique and sensitive environment. One way to ensure such a positive outcome is to increase the energy R&D performed through PIER funding. PIER funding helps create new energy technologies in California that are directed towards California's unique requirements. The PIER program is particularly well suited to direct California funding of energy R&D since PIER works in an impartial manner with a variety of California-based stakeholders in the renewable and clean energy sectors including small businesses, the UC and California State university systems and community colleges, private universities, California-based national laboratories, utilities and energy companies, and non-governmental and advocacy groups.

The Energy Commission offers the following conclusion from the June, 2005 Independent PIER Review Panel Report:

> *The PIER program and its resources represent perhaps the only contemporary opportunity California's government and citizenry have to fashion an energy research and development program with the flexibility, autonomy, knowledge base, and authority to support the break-through research and discovery on which California's energy future will depend.*

The Energy Commission believes this statement is as applicable today as it was in 2005.

b) Provide as much documentation as possible from sources outside the entity (academic or policy studies, newspaper or magazine articles, court decisions, etc.) that would support your position.

Most of these categories of publications would not normally be expected to provide support for this or any other RD&D organization and the Energy Commission has not

compiled such information in the past. However, a recent search of publications (Appendix C) resulted in numerous examples from outside sources that support the position of reauthorizing PIER.

A12. The funding for the PIER program is static and is not adjusted over time. If the funding is renewed how would you recommend the funding be structured? At what rates?

Because the PIER Electric program funding is static at $62.5 million per year, the Energy Commission has constrained the program to fit the limited resources available. To maximize the program's ability to invest maximum funds in RD&D and ensure that the RD&D portfolio provides benefits to the state's electric customers, the Energy Commission leverages public and private investments, builds on previous successful R&D efforts, and relies on strategic partnerships with other state agencies, local and regional entities, industry, utilities. With additional funding, the PIER program could achieve much more.

The seven sections below demonstrate how most PIER program areas were limited by their budget based on competitive solicitations released in the last two calendar years. Forty-eight worthwhile proposals totaling $30 million and 153 small grants totaling $8 million had to be rejected because of lack of funds even though they passed technical merit and had potential to advance technologies and provide public benefits. This represents lost RD&D opportunity at the rate of almost $20 million per year. The information below does not account for the potential research partner match share, which in most cases can add up to 50 percent of the contract amount, and it does not account for the potential public benefits that could have been achieved.

PIER Program Areas Solicitation Results

1. <u>Advanced Generation</u>

   In 2009, the PIER Program's Advanced Generation area released two Notice of Proposed Award (NOPA) letters. In the April 9, 2009 NOPA, Advanced Generation stated it would recommend funding three proposals that passed technical merit in the amount of $1.99 million. With additional PIER funding, Advanced Generation could have funded three more projects totaling $1.5 million as they had also passed technical merit.

   In the December 1, 2009 NOPA, Advanced Generation stated it would recommend funding for three proposals that passed technical merit in the amount of $3.8 million. Although Advanced Generation already made a request for additional PIER funding in the amount of $5.2 million for five proposals that passed technical merit, with more PIER funds, Advanced Generation could have funded three more projects in the amount of $5.15 million as they also passed technical merit. Overall, Advanced Generation could have funded a grand total of six more proposals in the amount of $6.65 million in 2009.

2. Energy Related Environmental Area
   Climate Change Research on and Impacts and Adaptation Studies and Reducing Green House Gas (2008):
   - Funded 10 projects: $2,729,644
   - Passed 11 proposals, but not funded: $3,313,569.

3. Buildings
   Technology Innovations for Buildings and Communities (2008):
   - Funded 10 Projects: $15,985,750
   - Passed 3 proposals, but not funded: $5,814,673

   Technology Innovations for Buildings and Communities II (2009):
   - Funded 9 projects: $14,623,399
   - Passed 4 proposals, but not funded: $7,101,047

   Building Energy Research Grant (BERG) 2008:
   - Funded 11 projects: $2,485,092
   - Passed 11 proposals, but not funded: $2,674,689

   State Partnership for Energy Efficient Demonstrations (SPEED):
   - Funded: estimated $1 million/year
   - Cannot fund at least 10 demonstrations per year or $1 million/year.

4. Transportation
   No solicitations were issued in the last two calendar years with PIER Electric funds.

5. Industrial Agriculture and Water
   All passing proposals were funded in the last two years.

6. Energy Innovations Small Grants Program
   The Energy Innovations Small Grants (EISG) program releases multiple energy research solicitations every year that attract a large number of research project proposals, many of which pass the program's technical review process. However, over the past two of years, the EISG program has only been able to recommend 13 percent of the applications the program receives for grant awards. This number is due to three factors: 1) the highly competitive nature of the program's process, 2) the thorough review process that the research project proposals undergo, and 3) the limitations in the amount of funding the EISG program has to award. The following information is for the EISG competitive electricity research solicitations that were approved over the past 2 years:

   - Number of Competitive Solicitations: 9
   - Number of Proposals Received: 495
   - Number of Proposals that Passed Initial Screening: 213

- Number of Proposals that Passed Technical Review: 153
- Number of Proposals that Passed Program Technical Review Board (PTRB) and Recommended for funding by the California Energy Commission: 66
- Total PIER Funding: $5,878,305

Of the 495 applications received, 153 applications passed the minimum technical review requirements and moved on to the PTRB for review. Due to funding limitations, the PTRB can only recommend the "cream of the crop" research project proposals to be awarded grant money by the Energy Commission. This limitation leaves behind numerous quality research project proposals that cannot be awarded funding. In fact, only 43 percent of research project proposals that pass the minimum technical review requirements actually receive grant funding. That means 57 percent of research project proposals that pass technical merit do not receive grant funding, which translates into 87 project applications that did not receive grant funding over this time period. If the EISG program were to recommend approval of every project that is reviewed and passes technical review, the EISG program would need up to an additional $8.26 million in funding.

The EISG program has an unprecedented track record of past grant awardees continuing the technological and economical success of their projects. Over the life of the program, past awardees of the EISG program have secured over $300 million in follow-on funding from various (public and private) funding sources. PIER's contribution of just over $21 million to the EISG program has resulted in a 14 to 1 ratio of money secured by EISG projects to initial PIER investment. EISG alumni include successful California companies such as Nanosolar, Greenvolts, Clean Energy Systems, Composite Support and Solutions, Inc. (CSSI), and One Cycle Control, Inc. (OCC) (see attached news articles).

7. <u>Renewables</u>

PIER Renewables released its first Renewable Energy Secure Communities Solicitation in 2009. We received 51 proposals. Of those, we were able to fund only 13. Although our budget originally called for $9.1 million, we were able to add an additional $3 million for a total in $12.1 million in funding. However, there were still approximately $3 million in projects (three projects) that passed technical merit that we were unable to fund. These additional projects would have provided $24 million in cost share.

The budget for PIER renewables for this fiscal year is $4.2 million. The Renewables area plans to release another solicitation early summer looking at utility scale renewable integration issues. However, at a pre-proposal workshop held in April, it was noted that this amount would not be enough to perform the research needed for renewable integration issues. The results of the research will be limited to integration modeling as opposed to integration demonstration projects. The typical utility scale integration project would likely require $5 million

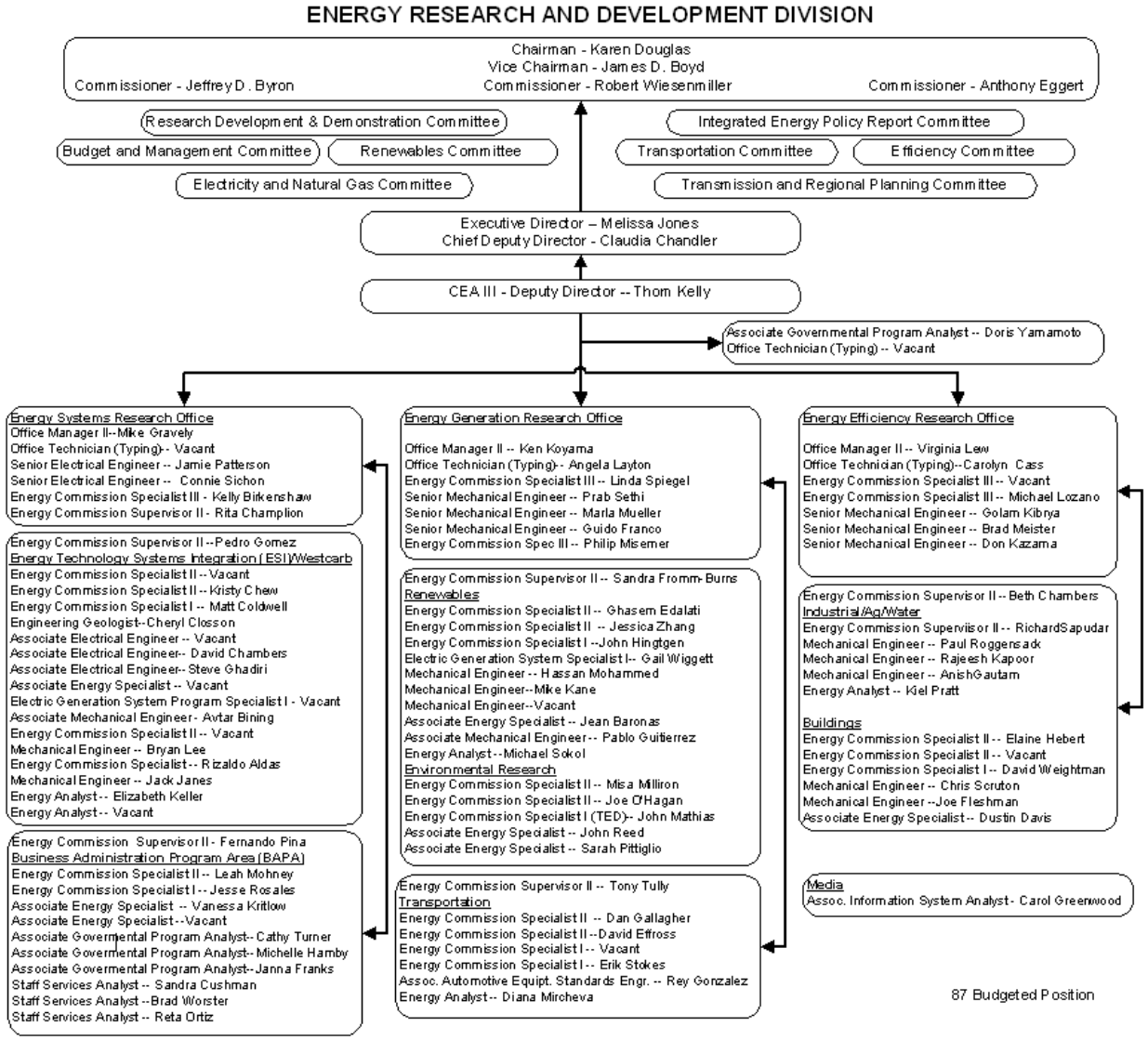
per project. Additional funding would enable the Renewables area to better address renewable integration issues on a much larger scale.

Despite the Energy Commission's static budget, it is committed to finding new opportunities that stretch its budget to provide the most public benefits for each dollar invested. The PIER program is leveraging advances in multiple technologies by deploying demonstration projects that provide innovative integration solutions. The Energy Commission's 2009 Renewable-based Energy Secure Communities project is focused on community solutions, renewable energy resources, and conversion technologies over a large geographic area. With this creative PIER investment, the potential public benefits will come from multiple technology areas such as efficiency, demand response, distributed generation, energy storage and co-production of transportation fuels. This PIER investment also leveraged: 1) Electric and Natural Gas funds; 2) lessons learned from multiple technology advancements, including multiple energy conversion technologies; and 3) public and private match. Further, this investment provides a potential for economic, environmental and other public benefits that would take longer to achieve had these funds been invested in separate technology demonstration projects.

The PIER programs partnerships, collaborations and innovative leveraging are essential to performing the right research for the greatest benefit to California's ratepayers. The Energy Commission is committed to continuing its hard work to find creative ways to stretch its budget so that each dollar invested provides the greatest public benefits. Therefore, the Energy Commission recommends that the PIER program be reauthorized at a minimum of $62.5 million.

A13. Provide an organization chart of the PIER program administrative and staff structures (including committees and divisions if appropriate).

The Energy Commission does not regularly maintain organization charts or staff memberships in divisions for past years, and it would be extremely time-consuming to try to re-create them from fragments of information or rely on staff memories. Staff turnover, through promotions or higher salaries, also makes tracking of changes difficult. The organization chart below provides a good representation of the Division, offices and research teams for the last three years.



a) Provide a detailed summary of names and position titles, authorized positions, and actual salary expenditures by job for the past six years.

The tables included in Appendix F list the classifications used in the R&D Division currently and for the last six years, the salary range of each position, and the names of the personnel currently in each of those classifications. Pay for each person is within the range for the classification, and the step within the classification will vary by person and length of service in the class. Because this data changes every month, depending on a person's anniversary date of hire/promotion, and by year, depending on merit salary adjustments and salaries authorized in the budget each year, we have not tried to re-create individual salary histories.

b) Also include proposed changes for staff and salary expenditures for the current and next fiscal year (2009-10 and 2010-11)

For fiscal years 2009/10 and 2010/11, the PIER Program will reclassify an ECS III to become the Deputy Division Chief (DDC) that reports to the Deputy Director. The salary range for a DDC is $7,110.00 - $7,838.00. No new resources are needed.

A14. Does the PIER program staff require or receive any specialized training? If so, please explain the nature of the training, the reason for it, which staff levels and positions need the training, and describe how the training is generally conducted.

PIER technical staff includes engineers, geologists, economists, mathematicians, soil and water scientists, biologists, planners, and other specialties. All technical staff have at least a bachelor's degree and several have masters degrees and doctorates, and some have previously worked in R&D in the private sector. Staff is encouraged to attend meetings in their field of technical expertise.

The Energy Commission provides extensive in-house contract and project management training and has staff conduct and attend workshops on research projects and techniques. A recent example is the California Energy Institute training course on energy, economics and the environment that was taught by the Haas Business School at the University of California Berkeley.[7] Typically at least five R&D staff are selected for this annual training.

A15. Please describe five things that could be improved upon and how they could be accomplished. Also, please explain, in detail, the barriers to such improvement, if any.

- Increase outreach and awareness of the RD&D Program projects and results. The Energy Commission is beginning a strategic campaign for outreach and increased awareness. This will be accomplished through program presentations, press releases, ribbon cuttings and other activities. The Energy Commission is currently preparing fact sheets to describe RD&D projects through each project

[7] http://ei.haas.berkeley.edu/exe-EEE.html

phase (i.e. kickoff of project, critical project stages, and project completion). These fact sheets will provide the public with the status of each project instead of waiting for each technology to be developed or final report to be published.

- Hold additional workshops and focus groups with the public and stakeholders to identify program improvements and needs.

- Increase the number of successful RD&D proposals submitted in response to competitive solicitations. The Energy Commission could hold statewide/webex grant writing seminars to provide targeted instructions to potential future competitors. This may require a statutory change to include grant writing training. This could require additional PIER funding.

- Allow many types of organizations, such as public universities, national laboratories, public agencies and private organizations to compete together in one solicitation, rather than having individual solicitations for like organizations. Recently, the Department of General Services Legal Department began to disallow multiple types of organizations to compete in the same solicitation: private companies can no longer compete for work against public universities or national laboratories. The reason is because the contract terms and conditions are different for the different organizations. This prohibition results in duplicative administrative work, requires multiple solicitations for the same purpose, and can result in not obtaining the best or lowest cost proposals.

- Establish a low interest loan pilot program to finance the purchase and installation of emerging energy efficiency, demand response, renewable and other technologies developed and/or evaluated through the PIER Program. The program could be initially offered to public and non-profit agencies, such as local governments, hospitals, K12 schools and higher educational facilities. The State Partnership for Energy Efficient Demonstration Program can provide the technical assistance to identify prospective entities and determine project cost effectiveness. Loan repayments would be based on energy, water or other quantifiable savings associated with the project.

  As background for this last recommendation, the Energy Commission already has an energy efficiency loan program for conventional energy efficiency technologies that focuses only on energy saving projects, so start up administrative costs will be minimal. This pilot loan program would focus only on emerging technologies developed and/or evaluated by the PIER Program. These technologies often have not been well demonstrated and have longer paybacks than conventional technologies funded by the Energy Commission's existing loan program. In addition to energy savings, other project savings would be considered such as reductions in water and wastewater disposal cost. This loan program would help accelerate the market for PIER funded or evaluated

technologies into the marketplace. The main barrier to such an improvement is whether there is public interest in such a program.

Advisory Groups

B1. The Legislature directed the CEC to form an advisory board to provide strategic guidance on funding priorities for the PIER program. Please provide names, affiliations, and appointment dates for each member of the advisory group.

The Advisory Board is composed of the members listed below.

Name	Affiliation	Appointment Date
Honorable Alex Padilla	California State Senate	2008
Honorable Alan Lowenthal	California State Senate	2008
Honorable Joe Simitian	California State Senate	2008
Honorable Mike Feuer	California State Assembly	2008
Honorable Filipe Fuentes	California State Assembly	2008
Mark Krusse	Pacific Gas & Electric	2007
Hal Snyder	Southern California Gas	2007
Paul DiMartini	Southern California Edison	2007
Chuck King	CAISO	2008
Jim Shetler	SMUD	2007
William Keese	Member	2007
Karen Lindh	Member	2008
James Sweeney	Stanford University	2007
Peter Gleick	Pacific Institute	2008
Peter Miller	NRDC	2008
James Boyd	Commissioner, Energy Commission	2007
Mary Nichols	Chairman, Air Resources Board	2007
Tony Brunello	Resources Agency	2008
Paul Clanon	CPUC	2007
Eileen Tutt	Cal EPA	2007
Jeff Byron	Commissioner, Energy Commission	2010

B2. Please provide a list of all meeting dates, agendas and minutes for each advisory group meeting for the past four years.

The PIER Advisory Board was established in 2007. In 2008, and again in 2009, the Advisory Board met to help assist the Energy Commission in establishing its strategic PIER research investment planning goals. A major result of the 2009 Advisory Board meeting (see B3 below) was that staff directed the majority of its efforts for the 2009/10 budget to seeking maximum federal ARRA funding for California entities. The next meeting is expected in the autumn of 2010 after the final results of the current year PIER emphasis on seeking ARRA research funds are known. Please see Appendix B for the meeting dates, agendas, and minutes.

B3. Has the commission developed guidelines, directives, or objectives for the advisory group or has the advisory group done so?

Both. SB 1250 provides that the Advisory Board help guide the PIER program. The Energy Commission's RD&D Committee works with the Advisory Board to establish goals and objectives for each meeting to:

- ensure that the program is focused on public interest research consistent with the goals established by SB 1250,
- develop and maintain a vision for the state's energy research, development and demonstration (RD&D) needs,
- provide strategic input in establishing funding priorities within the context of a balanced public interest RD&D portfolio in appropriate focus areas,
- tap the technical, market, economic, and environmental expertise within their organizations (and other relevant public and private sector entities) to identify research needs and guide research initiatives, and
- facilitate application of promising new technologies, planning tools, and knowledge resulting from the RD&D initiatives funded by the PIER Program, in cooperation with other partners.

The Advisory Board provides a wide range of knowledge and expertise to address energy R&D issues faced by the PIER research program and as these issues change over time, the resulting goals, objectives and directives of the meetings change from meeting to meeting..

B4. What role does the advisory group have in setting priorities and program goals for the PIER program? For contract reviews or approvals?

The role of the Public Interest Energy Research Program Advisory Board is to provide advice and strategic guidance in the planning and funding of the portfolio of public interest energy research, development and demonstration (RD&D) programs and projects administered by the Energy Commission that provide tangible benefits to California's electricity and natural gas consumers.

The Advisory Board also reviews and provides advice on programs and projects to be funded within the broader context of current energy policies, national and international efforts to address energy RD&D needs, and newly emerging funding and research opportunities. Although priorities and decisions for individual projects are not set at meetings, the Advisory Board is brought up to date on the Energy Commission's PIER Program and selected RD&D activities, and asked to provide guidance on strategic issues facing the program.

B5. Has the advisory group, in the past four years, made any recommendations to the commission? If so, what were the recommendations and what action has the commission taken on each one?

Yes. The recommendations are included in the extensive Advisory Board meeting minutes in Appendix C. A few key recommendations provided by the Advisory Board members are that PIER seek sustainable energy development, additional energy efficiency, more research on plug-in technologies, smart grid, and climate change, pursue American Reinvestment Recovery Act funds, find match funds to leverage the PIER fund, link with other agencies, and develop "roadmaps" for where we see the program going for several years into the future. PIER has implemented or is implementing every recommendation.

B6. What organization(s) or group(s) has an interest or stake in the operations of the PIER program, whether cooperative or generally taking positions in opposition to the use of PIER program funds? Please provide as complete a list as possible of those who you regularly deal with or who regularly come before you, along with a description of what the nature of the stake is and contact information.

This is an overwhelming question that is impossible to answer completely. PIER staff has had varying degrees of contact with virtually all businesses, environmental organizations, building contractors and subcontractors, institutions of higher education, research organizations throughout the world, consultants, lobbyists, and members of the public that have an interest in energy issues in California. We have held numerous PIER, project and program workshops, plus a series of Integrated Energy Policy Report workshops and hearings that had hundreds of participants, and we could provide lists of attendees if needed. Of course, PIER contractors might be considered to have the highest degree of interest or stake in the Program, but bidders that did not receive contracts from PIER solicitations could be considered as having an interest or stake in PIER program; we could also provide that kind of list if needed. We also have a large number of stakeholder groups that provide input to the PIER program. They are listed, along with their members, in Appendices A, D and E.

One of the most important sources of stakeholder involvement that PIER staff works with on a regular basis is Project Advisory Committees (PAC). The purpose of PACs is

to provide guidance in research direction. The guidance may include scope of research; research methodologies; timing; coordination with other research. The guidance may be based on:

a) technical area expertise
b) knowledge of market applications
c) links between the agreement work and other past, present or future research (both public and private sectors) they are aware of in a particular area.

The PAC may be composed of, but is not limited to, qualified professionals spanning the following types of disciplines:

a) Researchers knowledgeable about the project subject matter
b) Members of the trades who will apply the results of the project (for example, designers, engineers, architects, contractors, and trade representatives)
c) Public Interest Market Transformation Implementers
d) Product Developers relevant to project subject matter
e) U.S. Department of Energy Research Manager
f) Public Interest Environmental Groups
g) Utility Representatives
h) Members of the relevant technical society committees

The number of PAC members can vary depending on potential interest and time availability. The exact composition of the PAC may change as the need warrants. PAC members shall perform the following:

a) Review products. Provide specific suggestions and recommendations for needed adjustments, refinements, or enhancement of the products.
b) Evaluate tangible benefits to California of this research and provide recommendations, as needed, to enhance tangible benefits.
c) Provide recommendations regarding information dissemination, market pathways or commercialization strategies relevant to the research products.

Program Funding & Contracting

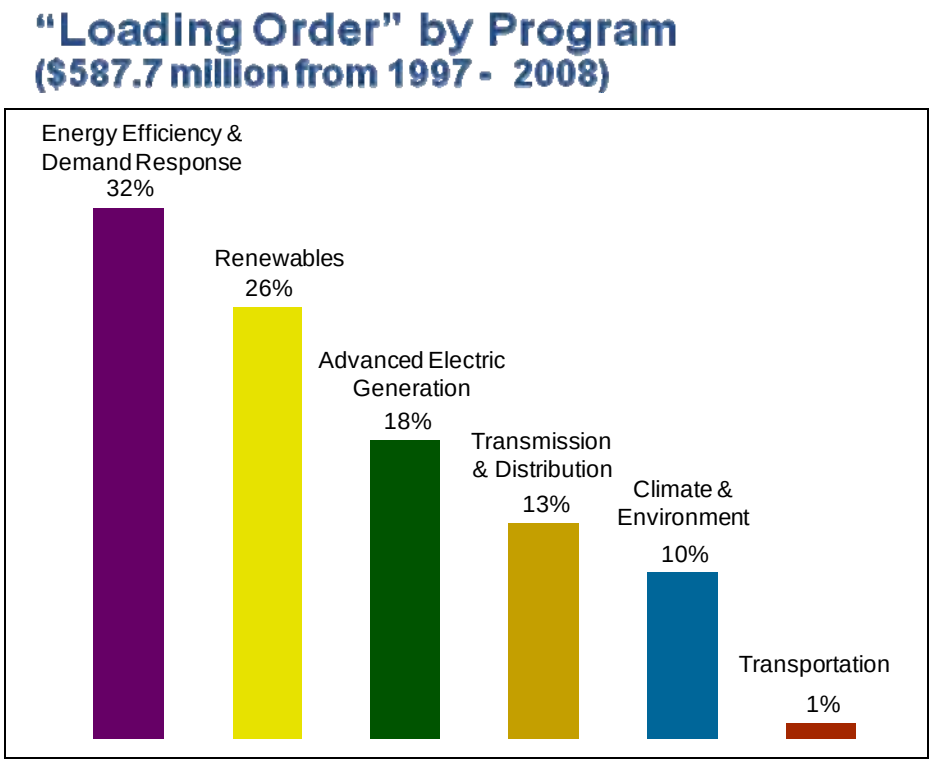
C1. How are PIER program funding objectives established and prioritized? How do you measure whether these objectives are being fulfilled? How often are the priorities reassessed and by whom?

PIER funding priorities and objectives are assessed annually. Program Budgets are developed at the staff level following RD&D Committee general guidance and go through multiple levels of review prior to being submitted to the Research and Development Policy Committee (RD&D Committee) for final review and approval. Once program budgets have been approved, agreements are developed to meet the agreed upon program funding objectives. The agreement approval process is described in more detail in the answer to C2.

PIER energy research investment decisions are driven by energy policy, including legislation. The state's energy policy document is the Energy Commission's Integrated Energy Policy Report (IEPR). This biennial policy report contains an integrated 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 section 25301(a)).

During 2008, the Energy Commission's Research, Development, and Demonstration Committee began a new strategic planning cycle for the PIER program. As part of that process, the PIER program staff reviewed the PIER investments made from 1997 through 2007 for consistency and responsiveness to the state's policy direction. The review affirmed that the Energy Commission's total RD&D budget has been allocated in accordance with the state's energy priorities.

The 2009-10 allocations largely mirror the 10-year historical averages. When making allocations among the PIER research program areas, the RD&D Policy Committee considers existing energy R&D legislation, the state's priority loading order for resource additions, and the latest IEPR recommendations for appropriate research in: energy efficiency; renewable resources; transmission and distribution infrastructure; climate adaptation; and advanced transportation technologies. These programmatic research priorities are implemented by the PIER research program managers maximize opportunities to partner with other research organizations and leverage PIER research funds. Also considered are unexpected or time-critical targets of opportunity and other research needs that should be addressed by the PIER program.



The Energy Commission uses multiple investment avenues to implement the strategic research and development vision embodied in legislative direction and state energy policy further energy policy goals through strategic investments in research and development. To identify and select the research projects that best reflect the state's energy priorities of 1) achieving all economic energy efficiency improvements, 2) increasing the use of renewable resources, 3) developing clean new technologies and improving the energy infrastructure, and 4) ensuring that energy research helps achieve California's greenhouse gases (GHG) reduction goals, the Energy Commission's PIER program employs these investment approaches:

- ***Research Roadmaps*** - identify technology gaps and cutting-edge research opportunities. The preparation of roadmaps often involve focus groups of interested stakeholders and meetings with the public regarding research direction.
- ***Competitive Solicitations and Small Grants*** - ensure that promising new technologies are developed and demonstrated.
- ***Achieve Economies of Scale*** - use community-scale research opportunities with multiple technologies and participants to achieve what individual projects alone cannot.
- ***Integrate Energy and Land Use*** - ensure that state land use policies reflect the impact of land use decisions on energy systems, including renewable resources, electricity generation, transmission corridors and transportation.

- ***Targets of Opportunity*** **-** work with individual companies on specific applications, such as testing new technologies on the California electricity grid; leverage other current research, such as enhancing "green buildings" initiatives; and respond to unexpected opportunities, such as the new federal economic stimulus package.
- ***Engage the Research Community*** **-** focus California's world-class scientists and engineers at its universities, national laboratories, and industries on the state's energy priorities, including support for new and existing collaborative campus based energy technology research centers.

The Energy Commission funds most new research projects through programmatic competitive solicitations, consolidating a number of related research issues into a single solicitation. These competitive solicitations stimulate a variety of proposals to meet the state's research needs, provide a low-cost bid competition and maximize staff efficiency in managing contracts.

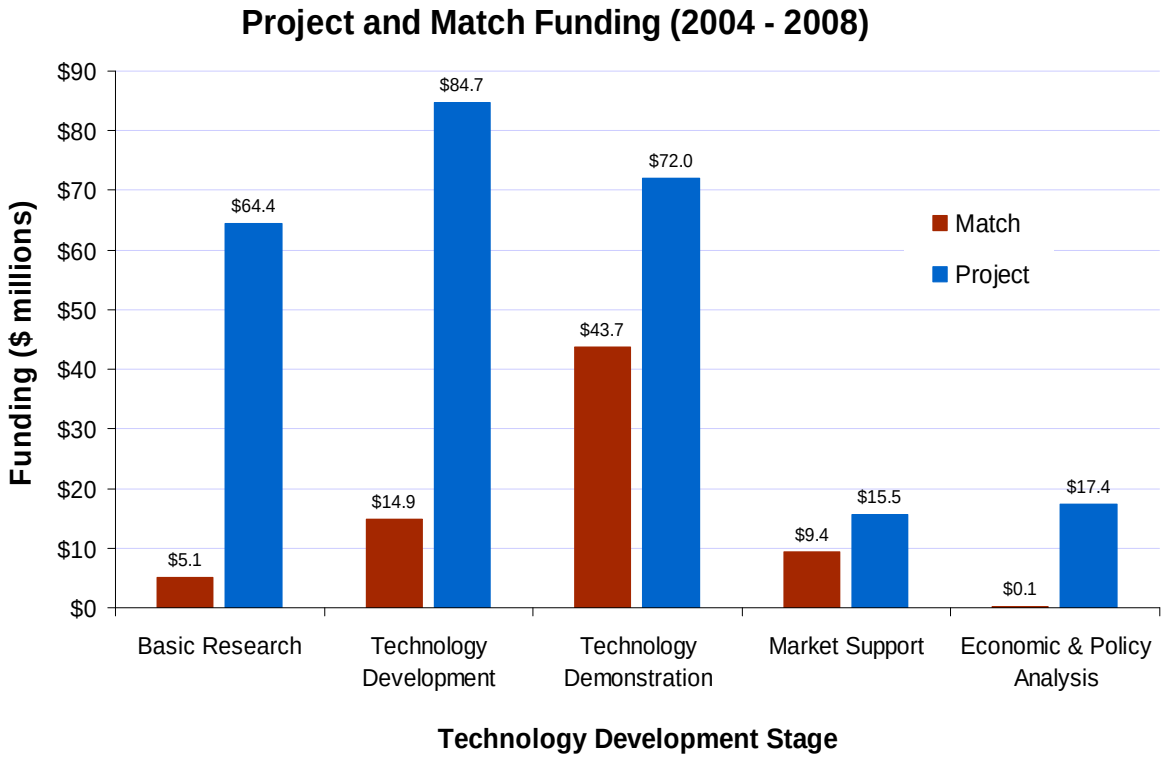
Once contracts are underway, the Energy Commission uses technical advisory committees to provide both technical critiques as well as stakeholder input to improve both the focus of research and the market acceptability of the developed products.

RD&D encompasses taking a concept from the basic research phase to eventual commercialization. The process involves a great many investment steps along the way, often takes many years and is inherently risky, as the outcome is not guaranteed. The Energy Commission has developed a phased approach to help mitigate the inherent risks of research. By implementing a phased approach to research, results are evaluated at each stage, and the risks and benefits are assessed before committing to the next stage. The following are examples of research stages:

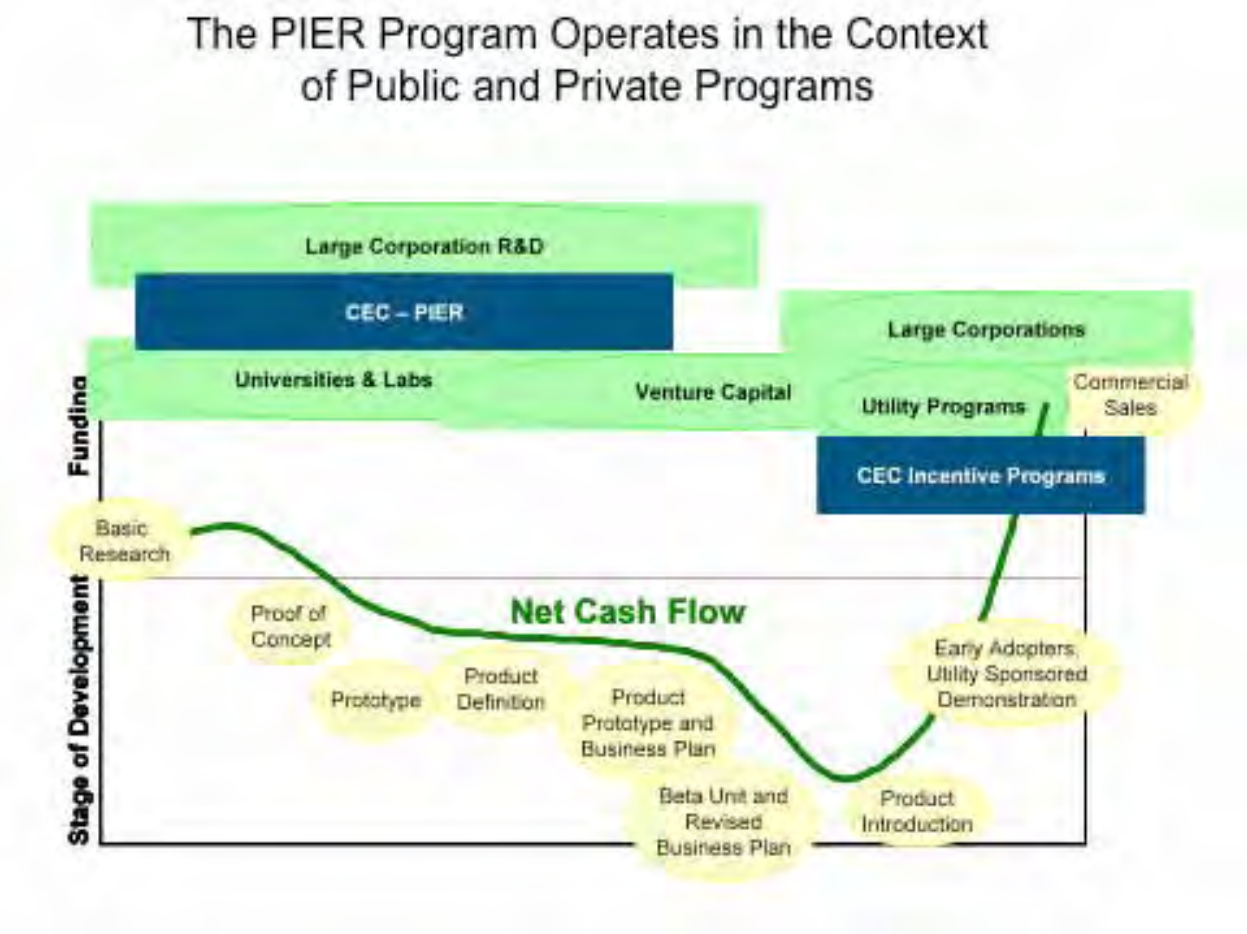
- ***Basic Research***: A preliminary study undertaken to ascertain the likelihood of the project success. Basic research provides information at the highest-risk end of the research continuum. Often, PIER takes the first step when there is a lack of market investors willing to explore the feasibility of new energy technologies or products. PIER research fills the niche when market research doesn't respond to public policy needs.
- ***Technology Development***: Research that seeks to gain knowledge or understanding necessary to determine how a recognized need may be met, including needs to achieve specific commercial objectives with respect to products, processes or services.
- ***Technology Demonstration***: Demonstrations help bridge the gap between research and market phase by constructing and demonstrating the viability of a new product, process or service.
- ***Market Support***: The technology transfer process of taking a new product from development to commercialization, including production launch and ramp-up, marketing materials and program development, supply chain development, sales

channel development, training development, training, service and support development.

- ***Policy and Regulation Support***: Research that informs decision makers and provides a factual basis for the development of policy, regulation and legislation.



PIER funding has proven to be successful in the early research stages when project proponents face difficulties in securing outside investors for investigating a theory or a premise during the basic research stage. Similarly, in the technology development and technology demonstration stages, the need for PIER funding increases. As a product moves closer to commercialization and a working prototype is necessary, however, the project proponent's ability to attract outside investors increases as the potential profitability of a product is realized. In the market support stage, the PIER funding decreases as the product is taken from the development stage to the market. This is potentially the most expensive stage, as shown in the following figure as the funding "valley of death" and typically requires more funding than the PIER funds available. PIER funding at this stage helps by implementing all of the services and promotion necessary to inform the public and make the product available and profitable for potential investors.



The policy and regulation support stage is a separate stage from the commercialization process. In this post-commercialization stage, PIER research may, through demand pull, help an energy saving product or a preferred energy generating technology to secure a place in the market through regulation.

As directed by SB 1250, the Energy Commission has increased its focus on bringing products to market, which involves a greater emphasis and coordination with venture capitalists, utility programs, manufacturers, and others. As research products get closer to commercialization, the Energy Commission seeks to decrease its funding and increase funding from others by handing off promising products to venture capitalists and other entities, such as the Emerging Technologies programs run by California utilities. These utility programs offer incentives to consumers to assist in getting new products to the market place.

C2. How does the program evaluate proposals for funding? How does the commission ensure that projects funded are consistent with statutory authority?

Program priorities for PIER funding are established through significant reviews at multiple staff, management and policy levels as explained in the response to C1. The

Energy Commission's energy specialists and engineers conduct extensive investigations and assessments to determine research gaps in meeting legislative mandated requirements for the PIER program. The Energy Commission's *Annual Report on the PIER Program* provides additional information about the policy guidance provided by legislation, the Energy Commission's Integrated Energy Policy Report, interagency coordination, and other sources.

Commission staff evaluates all technology and program options including soliciting input from stakeholders, the public, and experts to help determine research priorities. Stakeholders and the public are invited to participate through workshops and written comments. Domestic and international literature is reviewed for relevant and current information on the topic, and experts are interviewed and consulted. Roadmaps are frequently developed that provide focus, direction, and set priorities that will meet the common objectives of stakeholders, industry, the general public, and the research community. Based on this input, and weighing State energy and environmental policy goals, the Research, Development and Demonstration Committee (RD&D) – the policy committee in charge of research and development activities at the Energy Commission which consists of two of the five commissioners – provides direction for the PIER program and recommends funding allocations for individual research program and project areas through an annual budget process. Individual projects resulting from these recommendations are then provided to the full Commission for consideration in a publically noticed business meeting. The approved activities are examined for (1) appropriate use of competitive solicitations; (2) interagency and intergovernmental agreements; and (3) potential projects with special, unique or cost-effective circumstance that necessitate the use of non-competitive bids.

Competitive solicitation documents, such as requests for proposals, are developed by PIER program engineers and specialists and reviewed by Commission management, legal and contracts offices. After proposals are received, they are evaluated and ranked based on the scoring criteria in the solicitation documents. Bidders that meet the minimum scoring criteria are identified and the final score is calculated and additional points are added if the bidder is a small business or a California based entity. Once the final score is determined and all bidders meeting the passing score are identified, staff establishes the final ranking of projects and recommends funding for those for which there is sufficient funds available. A Notice of Proposed Awards (NOPA) is drafted by staff, and reviewed and approved by the RD&D Committee. Once the NOPA is approved, it is posted on the Commission website and staff begins the work of developing the contract documents and the scope of work.

After a scope of work is framed by the PIER Project Manager, contract proposals that follow RD&D Committee direction are developed. The proposed contracts are reviewed by PIER staff, by the Energy Commission's Contracts Office and Legal Office for accuracy and completeness, and by management. Interagency and intergovernmental agreements and other agreements not from a competitive bid are reviewed and considered by the RD&D Committee. All contract funding recommendations are

considered for approval at a public business meeting by the full Commission. If approved, the Contracts Office adds standard terms and conditions and obtains necessary signatures, and sends contracts in excess of $75,000 to the Department of General Services for final review and approval. If an agreement is to a sole source recipient, it requires special justification and is subject to 60 days review by the appropriate Budget and Policy Committee of the Legislature.

C3. How many sole-source contracts has the program approved in the last six years? When are sole-source contracts appropriate? What criteria is used to make sure sole-source contracts are necessary and in the public interest?

a) How many sole-source contracts has the program approved in the last six years?

PIER - Electric sole source agreements by calendar year	
Year	Sole Source
2004	13
2005	16
2006	8
2007	11
2008	8
2009	7
Total	63

b) When are sole-source contracts appropriate?

A competitive solicitation is the Energy Commission's preferred method of attracting projects. Sole-source contracts are appropriate only when a proposed project is not appropriately a candidate for competitive bid consistent with Section 25620.5 (f) of the Public Resources Code (PRC).

c) What criteria is used to make sure sole-source contracts are necessary and in the public interest?

Section 25620.5 (f) of the PRC allows the Energy Commission to make awards on a sole-source basis when the cost to the state is reasonable and any of the following determinations are made:

- The proposal was unsolicited and meets the evaluation criteria of this chapter.
- The expertise, service, or product is unique.
- A competitive solicitation would frustrate obtaining necessary information, goods, or services in a timely manner.

- The award funds the next phase of a multi-phased proposal and the existing agreement is being satisfactorily performed.
- When it is determined by the Energy Commission to be in the best interests of the state.

C4. How has the commission responded to the Department of Finance January 30, 2009 programmatic audit of the PIER program? Specifically, how has the program addressed the issue of non-compliance with provisions of the Public Resources Code?

The Energy Commission requested that the Department of Finance (DOF) complete a programmatic audit of the PIER program for process improvement. This audit performed by DOF's Office of State Audits and Evaluations (Finance), was completed for the period of July 1, 2008 through November 25, 2008 and reported on January 30, 2009. The audit states, "in most instances, the Energy Commission is operating the PIER program in compliance with the Public Resource Code, state laws, and regulations, and budget requirements." The audit also disclosed instances where performance deviated. As a result, Finance stated, "We recommend the following improvements to Commission practices to strengthen the administration, management, and operations of the PIER program:

- Revise PIER program contracting policies and practices to ensure an open and competitive contracting process that promotes accountability, fairness, and efficiency while limiting the risk of fraud, waste, and abuse.
- Develop and document PIER program policies, procedures, and best practices."

The Energy Commission's January 30, 2009 response states, "The audit report will assist the Energy Commission in improving our operation and oversight of this important program, as well as other Energy Commission programs. The Energy Commission has already taken steps to improve administrative oversight and operations." The Energy Commission also indicated that it is taking two primary steps to address the audit issues: 1) Work with the Department of General Services to update the PIER program policies and contracting procedures; and 2) Develop a comprehensive PIER Policy and Procedures Contract Manual and implement training on the new manual.

The Energy Commission has already addressed, or is in the process of addressing, all of DOF's audit observations, including those dealing with contractual noncompliance. The audit's first observation criticized PIER's subcontracting policy. Since DOF's audit, PIER has abandoned using it. Instead, PIER complies with State Contract Manual Section 3.06 just like every other state agency. Should the Energy Commission need different rules than Section 3.06 to carry out PIER's legislative mandate, the Commission will follow DOF's audit recommendation and work with the Department of General Services (DGS) to implement a new policy.

DOF's second observation found instances of noncompliance in two contracts and several work authorizations. As indicated in the Commission's response to the audit, the Commission has:

- Ended PIER's streamlined invoice process and replaced it with a secondary review of all invoices; and
- Implemented Legal Office review of all work authorizations.

In addition to these steps, the Commission has implemented a recent change by DGS regarding work authorizations: treat them as formal contract amendments, which DGS reviews and approves. Having DGS review and approve work authorizations in addition to the review by the Commission's Legal Office should prevent the problems identified in DOF's audit from recurring.

DOF's third observation indicated that the Commission does not have procedures for PIER staff to follow regarding intellectual property benefits. This could lead staff to inconsistently implement Public Resources Code Section 25620.4 (a), which indicates that a fair share of intellectual property benefits from PIER projects will accrue to the state.

In response to the audit, the Commission is creating a comprehensive compilation of policies and procedures for PIER contract managers to follow. How to track and deal with intellectual property benefits is one of the many issues that these policies and procedures will address.

The matrix showing the specific audit observations for the entire audit, recommendations, PIER responses/action, and existing documentation is located in Appendix G.

C5. Do the program's contracting rules still contain exemptions from state contracting rules? If so, what are the exemptions and why are they necessary? If the exemptions are still in place, why does the commission not concur with the Department of Finance that this fosters an environment of high risk to the state and the PIER program funds?

The Legislature, in enacting PIER-related statutes, has given the PIER program some needed differences from typical contracting rules. For example, many state programs must encumber funds within 1 year and liquidate them within 2 years. PIER funds have a longer period of 2 years to encumber and 4 years to liquidate (Public Utilities Code Section 384(a)). This extra time allows for the long lead times needed for the development and delivery of complex R&D projects that have never been done before. Another difference is that PIER is required to use a unique non-competitively bid or sole source process (Public Resources Code Section 25620.5(f & g)). These statutorily created differences in PIER contracting recognize the unique aspects of contracting for RD&D services, have not been criticized and were not identified in the Department of Finance (DOF) audit as a problem.

Observation 1 of DOF's audit criticized PIER's subcontracting policy. This policy, developed with the Department of General Services (DGS), exempted PIER agreements from State Contract Manual Section 3.06. Under Section 3.06, contracts with other government entities can only contain $50,000 or 25% of the contract amount, whichever is less, in subcontracts to private entities. PIER's subcontracting policy allowed a higher level of subcontracts to private entities under certain circumstances.

The Commission has not used the subcontracting policy since the DOF audit. All new PIER contracts with other government entities comply with State Contract Manual Section 3.06. Should the Energy Commission need different rules than Section 3.06 to carry out PIER's legislative mandate, the Commission will follow DOF's audit recommendation and work with DGS to implement a new policy.

It is important to note that RD&D contracting is unlike contracting for other goods or services, like paper clips and window washing. To achieve a higher degree of successful results from never-done-before projects and technologies, more latitude is needed for adjusting or redirecting work during the course of the contract as "things happen" like a burner tip needs to be re-fabricated or it takes more labor and less machinery to build a widget than was estimated in the original budget. Yes, such changing of internal budgets may have some element of risk because it is different from the original proposal and it may place an added burden on the contract manager to see that the changes are both necessary and proper, but adjusting the budget elements as the project satisfactorily progresses actually reduces the risk of project failure. We have

instituted a considerable amount of additional controls and approvals to mitigate contracting risk, including the oversight of RD&D by Commissioners.

C6. Please provide a list of each entity, in alphabetical order, that has received funding from the PIER program over the last six years. This list should include, but not be limited to, contract awards, memberships, sponsorships and administrative costs of the CEC. Please list the amount of funding, the purpose, date awarded, and, if a contract for research and/or development, whether the contract obligations and goals were accomplished.

See Appendix E for list of agreements.

Collaboratives

D1. How many collaboratives has the PIER program or the commission funded? What are the names and locations, and executive staff of each collaborative? How is each collaborative legally organized? Who are the members of each collaborative and each governing board? How does one become a member? What funding has the PIER program or the commission provided to each collaborative? What did each collaborative do with that funding? Did the funding stay within each collaborative or was it allocated, granted, or contracted to another entity? Do any of the collaboratives or their staff draft official guidelines, rules, or regulations for the commission or any other state department or agency? Please provide information for each question for the last six years.

How many collaboratives has the PIER program or the commission funded?
The PIER Program has funded the following collaboratives:

1. California Commissioning Collaborative
2. California Renewable Energy Collaborative (CREC) –this collaborative is an overarching collaborative for the Biomass, Geothermal, Solar Energy and Wind Energy groups

Each of these collaboratives is described in the next sections and members of the collaboratives are given in Appendix D. Neither the CREC, nor the Biomass, Geothermal, Solar Energy, and Wind Collaboratives, have a governing board, but each has formed an advisory board to provide scientific, technical, and policy review.

1) California Commissioning Collaborative
1a) What are the names and locations, and executive staff of each collaborative?

Governing Board Members

Name	Organization
Gregg Ander, FAIA	Chief Architect, Southern California Edison
Don Frey	Architectural Energy Corporation
Greydon Hicks	Pacific Gas and Electric
Jim Parks	Sacramento Municipal Utility District
Chuck Poindexter	San Diego Gas and Electric
Glenda Towns	Southern California Gas Company
Phil Welker	Portland Energy Conservation Incorporated

1b) How is each collaborative legally organized?
The CCC is a California nonprofit public benefit corporation

1c) Who are the members of each collaborative and each governing board?
The CCC has no formal members. Those on the governing board and the advisory Council are listed in Attachment 1.

1d) How does one become a member?
Anyone who lives or works in California and supports the goals and purposes of the organization can attend meetings and contribute ideas. The purposes of the CCC are:

- To improve building and system performance by developing and promoting viable building commissioning practices in California;
- To facilitate the development of cost effective programs, tools, techniques and service delivery infrastructure to enable the implementation of building commissioning processes;
- To educate and inform concerning building commissioning processes; and
- To identify opportunities, establish priorities and promote solutions relating to building commissioning processes in California.
-

1e) What funding has the PIER program or the commission provided to each collaborative?

The PIER Program has awarded the following contracts to the CCC:

Contract #	Purpose	PIER Amount	Status
500-05-035 (6/12/06-6/15/09)	Characterize the value of commissioning to building owners and decision makers, developed tool kits and provided strategic resources for commissioning providers to market and deliver services consistently and cost effectively.	$400,000	Complete
500-08-039 (5/25/09-10/25/12)	Address market and technical barriers to widespread implementation of building commissioning to achieve energy efficiency in California buildings. The integrated research addresses technical and market barriers related to HVAC, controls and diagnostics, lighting and lighting controls, whole building and community systems integration, codes and standards support, information resources and market connections. The project will also quantify savings from retro-commissioning by developing guidance for the selection and implementation of verification methods appropriate for retro commissioning projects and increase building efficiency through Title 24 efficiency code requirements.	$1,796,230	Active

1f) What did each collaborative do with that funding?
See the above table under purpose.

1g) Did the funding stay within each collaborative or was it allocated, granted, or contracted to another entity?
All the work on these contracts was or will be completed by subcontractors, as listed in the following table:

Contract #	Subcontractors
500-05-035	• Portland Energy Conservation, Incorporated • SDV-ACCI
500-08-039	• Portland Energy Conservation, Incorporated • Architectural Energy Corporation • Quantum Energy Services and Technologies • McHugh Energy Consultants • Enovity, Incorporated • Heschong Mahone Group • EMC Engineers • Diego and Sons Printing • Cogent Energy

1h) Do any of the collaboratives or their staff draft official guidelines, rules, or regulations for the commission or any other state department or agency?
The CCC has assisted the Energy Commission with its Building Efficiency Standards (Title 24, Part 6). The PIER program provides the data and analysis to support particular projects and strategies for incorporation into each future cycle of the buildings or appliance standards. For the CCC, the following table summarizes the assistance providing to the staff of the Building Efficiency Standards staff at the Energy Commission:

Year	Assistance
2004-2005	- Drafted scope of work for CEC acceptance testing trainings - Finalized project scope - Work with CEC to develop curriculum
2006	- Presented webcast training for Code Officials - Developed training presentation for Mechanical Providers (to be conducted in January 2007) - Developed draft revisions to Acceptance Testing. - Management of subcontractors - Coordination of teleconferences with project team and CEC to resolve issues - Attended ARI conference call to discuss relevant issues wwith manufacturers - Development of additional scope of work to cover completion of Title

Year	Assistance
	24 tasks
2007	- Revised HVAC and Lighting Standards, meeting deadlines for public review periods and workshops. - Held training webcast for mechanical test providers (20 attended) - Conducted evaluation of lighting test protocols at Iowa Energy Center - Held CEC workshop for public input on revisions to Standards - Began revision of compliance forms. - Revisions to HVAC and Lighting sections of the manuals are planned for mid 2008.
2008	- Revised lighting forms, HVAC/lighting manuals, team review/comment - Worked with CEC and SMACNA to plan curriculum development for code officials and contractors. This training is expected to be developed and delivered in the first half of 2009.
2009	- Contracted with Mark Hydeman (Taylor Engineering) to develop acceptance requirements training curriculum for building departments, test providers and designers - Collaborated with CEC, SMACNA and CALBO to develop a workshop targeted to building inspectors. Jon McHugh (McHugh Energy Consultants) was contracted to develop the curriculum (based on training developed by Mark Hydeman) and present the training. - Worked with SCE and CEC to develop a scope of work to determine recommendations for code requirements related to early design decision-making processes that will impact energy efficiency and optimized building operations and encourage commissioning best practices in non-residential buildings. The project is planned to begin in early 2010 and will follow the CASE project format and timeline, under direction from. - Conducted scoping activities to determine research and analysis needed to support CCC Policy Point of View statements and actions. Identified two projects: - Research to support potential for Title 24 requirement for building and/or system-level monitoring in new commercial buildings. - Research to support the value of ongoing performance monitoring in commercial buildings.
2010	- Finalized building inspector curriculum; conducted trainings at SMACNA training center in Sacramento in January, San Jose and San Diego in April. - Trained SMACNA trainers to lead the trainings and incorporate training materials into their curriculum. Additional trainings scheduled throughout 2010. - Finalized scope and work plan for design-phase Cx CASE project.

2) California Renewable Energy Collaborative (CREC)

The Energy Commission established the California Renewable Energy Collaborative through an interagency agreement with UC Davis to establish a venue for technical

expertise in renewable energy technologies that is beyond Energy Commission staff capabilities as well as for stakeholder input and coordination. The agreement set up the California Renewable Energy Collaborative to help identify possible research activities that will integrate different renewable energy technologies and systems. The agreement also covers specific sub-groups that cover the four main renewable energy resources:

- California Solar Energy Collaborative- (a joint collaborative between UC Davis and UC San Diego)
- California Biomass Collaborative
- California Geothermal Energy Collaborative
- California Wind Energy Collaborative

2a) What are the names and locations, and executive staff of each collaborative?

- CREC
  Dr. Gerry Braun – Technical Director
  The Collaborative and he, along with the sub-collaboratives, are based at the University of California, Davis, as part of the Energy Institute.
- Biomass Collaborative (CBC)
  Executive Director – Stephen Kaffka, UC Davis
  Biomass Executive Staff, Laura Lovgren - UC Davis
- California Geothermal Energy Collaborative (CGEC)
  Dr. William Glassley, Executive Director, UCD
  Judy Fischette, Associate Director, UCD
- California Solar Energy Collaborative (CSEC)
  Prof. Pieter Stroeve, CSEC Co-Director
  Prof. Joseph Ford, CSEC Co-Director
  Dr. Ruxandra Vidu, CSEC Associate Director
  Prof. Adam Moule, CSEC Technical Director at UCD
  Prof. Jan Kleissl, CSEC Technical director for UCSD
- California Wind Energy Collaborative (CWEC)
  Professor C.P. "Case" van Dam, Director (UC Davis)
  Professor and Dean of Engineering Bruce White, Co-Director (UC Davis)
  Henry Shiu, Associate Development Engineer
  Scott Johnson, Associate Development Engineer
  Steven Katen, Programmer

2b) How is each collaborative legally organized?

The Energy Commission contractually established the California Renewable Energy Collaborative through an interagency agreement with UC Davis to establish a venue for technical expertise in renewable energy technologies that is beyond Energy Commission staff capabilities. In addition the collaborative are tasked to organize stakeholders from industry, government, national laboratories, and universities for input and coordination. The agreement set up the California Renewable Energy

Collaborative to help identify possible research activities that will integrate different renewable energy technologies and systems. The agreement also covers specific sub-groups that cover the four main renewable energy resources of solar, biomass, geothermal and wind.

- CREC is part of the Energy Institute (EI) at UC Davis
- California Solar Energy Collaborative is a joint collaboration between UC Davis and UC San Diego)
- California Biomass Collaborative is part of the Energy Institute
- California Geothermal Energy Collaborative is part of the Energy Institute
- California Wind Energy Collaborative is part of the Energy Institute

Each of the collaboratives has a project advisory committee (PAC) to provide guidance, scientific and technical expertise, and coordination with research and development. While the PAC can make suggestions on specific Collaborative research projects, only the Energy Commission contract manager has authority to approve any tasks and expenditures consistent with state energy policy. The PACs, by virtue of their technical expertise, can bring to the attention of the Energy Commission contract manager promising renewable energy technologies as well as technologies that are no longer promising. Such information helps improve future Energy Commission competitive solicitations for renewable energy research and development.

2c) Who are the members of each collaborative and each governing board?

- None of the renewable energy collaborative have a governing board that has the authority to approve expenditures, tasks, or make changes. Only the Energy Commission contract manager has this authority.
- CREC will have an advisory board constituted of participants from diverse sectors of the renewable energy community: businesses, utilities, academia, state government, NGO's and the public will be selected.
- California Solar Energy Collaborative's current Advisory Board members are listed in Attachment 4.
- California Biomass Collaborative has over 600 members. Attachment 2 lists the CBC Advisory Board members consisting of participants from diverse sectors of the biomass energy community: businesses, utilities, academia, state government, NGO's and the public.
- California Geothermal Energy Collaborative's Advisory Board members are listed in Attachment 3.
- California Wind Energy Collaborative's Advisory Board members are listed in Attachment 4.

2d) How does one become a member?

- CREC does not have a formal membership, but it has a web-site which allows interested parties to sign up for the Cal-IRES mailing list. See http://cal-ires.ucdavis.edu/
- California Biomass Collaborative general membership is open to anyone. A person or company can join by filling out a form on the website (http://biomass.ucdavis.edu/membership.html). It is free.
- California Solar Energy Collaborative is a university-based research group, and is not a membership entity.
- California Geothermal Energy Collaborative membership is either by attending a meeting and signing up, or notifying the Executive Director or the Associate Director (phone call, email, writing, etc.). There is no fee.
- California Wind Energy Collaborative executive staff reviews names of key persons involved in wind energy with the goal of board diversity from wind manufacturing, wind research, government, environmental, venture capitalists, federal laboratories and universities and requests participation. All the information acquired and results obtained by CWEC with Commission funding is shared with industry, government and the general public and distributed to anybody interested in this information.

2e) What funding has the PIER program or the commission provided to each collaborative?

- Budget for the integration work for CREC is as follows:

Year	PIER Amount
2009-2011	$323,517

- California Solar Energy Collaborative

Year	PIER Amount
2009-2011	$697,376

- California Biomass Collaborative

Agreement	Year	PIER Amount
#1	2002-2009	$1,046,703
#2	2009-2011	$773,500
	Total	$1,820,203

- California Geothermal Energy Collaborative

Agreement	Year	PIER Amount
#1	2004-2008	$403,625
#2	2009-2011	$643,618
	Total	$1,047,243

- California Wind Energy Collaborative

Year	PIER Funding
2004-07	$2,799,556
2008	$402,270
2009-11	$549,334
Total	$3,751,160

2f) What did each the collaborative do with that funding?

- CREC funding is used to prepare deliverables related to cross cutting collaborative vision and development plan tasks related to the CREC master agreement. CREC will organize two events including a symposium in support of the Energy Commission's Renewable Energy Secure communities (RESCO) program and a forum on renewable energy integration as part of UC Energy Week.
- California Solar Energy Collaborative
    a . The $697,376 is divided equally between UC Davis and UC San Diego.
    b . The Associate Director is responsible for the outreach program, educational program and setting up a solar research program.
    c . Created a web site for the CSEC (http://solar.ucdavis.edu/), which includes information on the CSEC mission statement, objectives, staff and people, upcoming solar events, education and outreach, workshops, courses, seminars, solar resources, stakeholder's registration, publications, presentations, and research papers.
    d . Research papers focus on concentrated solar energy, storage of electricity, thin film solar cells, nano-structure solar cells (organic and inorganic).
    e . Established a graduate course in solar energy at UCD, and a solar energy seminar program that is available to the public and listed on the web site.
    f . A solar energy workshop was conducted at UC San Diego last year and a solar energy workshop will occur at UC Davis in May.
- California Biomass Collaborative
    a . Creation of the CBC databases and website
    b . Development of the biomass roadmap
    c . Recommendations for future development of biomass resources and technologies
    d . Educational activities, 6 annual forums (with the 7th next month) on issues important to bioenergy in California, as well as numerous other meetings, talks, and public activities
    e . Reports and white papers
- California Geothermal Energy Collaborative
    a . used for organizing and conducting research efforts, annual meetings, research-related workshops, outreach and education as indicated in the following table:

Year	Activity
2004-2008	• Supported the Geothermal Education Office • Participated in the U.S. Department of Energy Geopowering the West Program as representative for the state of California
2004-2010	• Provide the California Energy Commission with stakeholder-identified research, development, infrastructure and outreach needs through the following reports: - *California Geothermal Permitting Guide* - *Access and Transmission Planning Report* - *Salton Sea Transmission Interconnection Report* - *Analysis of the California Geothermal Resource Base* - *Development Plan/Strategic Plan Report* - *Summary Reports* of all annual meetings • Supported the California Energy Commission Geothermal Resource Development Account (GRDA) and PIER solicitations through identifying research needs and proposal reviewers • Participated in reviews of Energy Commission -generated documents, strategic plan development and IEPR and PIER goals
2005-2010	Organized and supported the following meetings: • Annual Geothermal Summits (2005, 2006, 2008, 2010) • Renewable portfolio standard workshop (2006) • Intertribal Council - CGEC workshop (2006) • CGEC-Geothermal Resources Council meeting (2006) • Transmission workshop (2006) • Development plan/strategic plan workshop (2007) • CGEC-DOE utility workshop (2007)
2006-2010	Assisted the United States Geological Survey in its reassessment of geothermal resources in California
2007-2009	Supported U.S. Bureau of Land Management revision of Programmatic Environmental Impact Statement, as it related to California

- California Wind Energy Collaborative
  a . The Intermittency Analysis Project (IAP) involved a series of scenario-based studies to examine the statewide system impacts of higher levels of intermittent renewables on the California electricity and transmission infrastructure. Based on the analysis, technical and operational strategies and mitigation measures were recommended for consideration by California's utilities and the California Independent System Operator. The findings of this project can be found at: http://www.energy.ca.gov/pier/project_reports/CEC-500-2007-081.html.

b . Wind energy conferences and workshops and outreach activities.

2g) Did the funding stay within each collaborative or was it allocated, granted, or contracted to another entity?

- CREC – funding stayed
- California Solar Energy Collaborative – funding stayed
- California Biomass Collaborative funding stayed largely within the CBC with the exception of the following subcontracts which total $84,975: (1) Randall Bates of Bates Consulting prepared: "Report on Biomass Power Generation Survey" Draft report Feb 2004; and (2) Ted Atwood of Global Greenlife Institute prepared: "European Biomass Experience and Implications for Development in California" Draft report May 2005.
- California Geothermal Energy Collaborative
  The subcontracts were used to provide the California Energy Commission with stakeholder-identified research, development, infrastructure and outreach needs. The allocations for each and the name of the contractor are indicated, as follows:

Year	Contractor	Purpose	Amount
2004-2010	Blaydes & Associates	California Geothermal Permitting Guide	$59,584
2004-2010	Olsen Consulting	Access and Transmission Planning Report	$22,176
2004-2010	Davis Power Consultants	Salton Sea Transmission Interconnection Report	$55,000
2004-2010	Geothermal Energy Association	Analysis of the California Geothermal Resource Base	$11,200
		Total	$147,960

- California Wind Energy Collaborative is part of the Energy Institute – funding stayed

2h) Do any of the collaboratives or their staff draft official guidelines, rules, or regulations for the commission or any other state department or agency?

- CREC – No
- California Solar Energy Collaborative – No
- California Biomass Collaborative created the Biomass Roadmap for the Energy Commission (http://biomass.ucdavis.edu/materials/reports%20and%20publications/2006/2006_Biomass_Roadmap.pdf) contributed to the state's Biomass Action Plan (http://www.energy.ca.gov/bioenergy_action_plan/).
- California Geothermal Energy Collaborative – No

- California Wind Energy Collaborative directors and staff do not draft official guidelines, rules, or regulations. However, CWEC supports the regulatory process by hosting workshops focused on particular issues, providing technical support to authors of legislation, and conducting scientific research that can be used by regulatory agencies. CWEC also has provided technical assistance directly to authors of legislation. The Small Wind Workshop hosted in October 2008 addressed the difficulties of permitting small wind turbines in the State. Following the workshop, a number of attendees, including CWEC staff, began working with state legislatures to address this issue. CWEC staff provided technical assistance to the authors of AB 45, which involved permitting of small wind turbines. The bill was signed by the Governor on October 11, 2009. Also in 2009, CWEC staff worked with the Yolo County Planner to review and comment on a county small wind ordinance. The guidelines were approved by the Yolo County commissioners in July 2009.

D2. Why is the collaborative form of an organization advantageous to the PIER program? What does the collaborative form of an organization provide to the PIER program and the commission that could not be provided by issue-specific advisory groups to the PIER program or the commission?

a) Why is the collaborative form of an organization advantageous to PIER?

One of the greatest challenges for policy makers, program developers, scientists and others who are involved in energy research and development issues is coordinating their knowledge to achieve optimal results. Too often, R&D projects are narrowly defined, support highly specialized activities and target populations, and are short term and uncoordinated. Energy R&D collaboratives can help satisfy multiple needs in a comprehensive, coordinated and flexible manner, eliminating gaps and duplication of services that impede progress toward using resources effectively in pursuit of energy R&D in the public interest.

One of the many advantages to having the Energy Commission administer the PIER program is that the program and research are developed in the full light of public exposure. Not only do they benefit from a wide variety and extensive participation of research and development expertise and interests, but the results go into the public domain because the Energy Commission is not operating the PIER program with the intent of making a profit. In fact, by emphasizing research that can be later brought to the market by private industry, in some ways this could be considered the R&D equivalent of “open architecture” in the computer world.

There are two types of collaboratives funded by PIER:

- Independent organizations: Each of these organizations, typically a non-profit (e.g., 501 C3), has its own governing board and charter. Members have shared goals, ideals and purposes and can include governmental agencies, utilities, and industrial members. They are formed for a long term purpose rather than just a

onetime need. These entities can hold periodic meetings to get stakeholder input and respond to solicitations and compete for contracts and grants. An example is the California Commissioning Collaborative.

- Renewable Energy collaborative: This collaborative and its component groups ("the collaboratives") are impartial forums facilitating and informing interactions among government, industry, academia, environmental and non-profit organizations, and the public around a particular energy development. The collaboratives conduct research, technology development, system integration, and other aspects and support strategic planning, public policy and government regulations and standards. The collaboratives also provide public education and outreach through short courses, workshops, meetings, and annual forums in addition to maintaining public web sites and electronic databases. Each collaborative and program is led by an executive director or co-directors, all of whom are UC employees. Collaborative staff includes research and administrative personnel to carry out contract responsibilities in support of the research, education, and outreach missions. Funding is usually donations and grants from governmental agencies.

- Renewable energy collaborative provides a unique multi-sector structure for comprehensively and independently addressing issues facing large-scale renewable energy development and deployment in California. It combines the technical resources of the university with broad stakeholder interactions to investigate how California can sustainably achieve environmental, social, and economic goals embodied in the Renewable Portfolio Standard (RPS), California Global Warming Solutions Act of 2006 **(**AB 32), the Low Carbon Fuel Standard, the Bioenergy Action Plan, and many other policies and actions of the state, as well as providing integrated strategic planning to help guide future research, education, and policy. The collaboratives can undertake research, out-reach and coordination efforts at a fraction of the cost that would be incurred if these efforts were out-sourced to tech support contractors, whose overhead rates are hundreds of percent higher and whose technical staff salaries are also higher.

Additional benefits and added value are:

- The collaboratives consist of over 100 members from government agencies, universities, utilities, national labs, and industries. They provide critical technical review and input concerning new renewable energy technologies that can help the Energy Commission identify future research programs for renewable energy.
- The collaboratives have completed research projects that have directly contributed to the improvement of renewable energy technologies for wind, geothermal, and biomass. The solar sub-group has just begun work on projects related to technology development.
- Because members come from a wide range of public and private sectors, they can provide assistance in coordination and collaboration with projects funded by other organizations. An example is the improvements made to photovoltaic cells funded by federal funds and deployed in California.

- The Energy Commission can also leverage research performed by collaborative members, and avoid duplicative research through this coordinated effort.
- The early work from the collaborative suggests that aggressive renewable energy goals may be achievable.

b) What does the collaborative form of an organization provide to the PIER program and the commission that could not be provided by issue-specific advisory groups to the PIER program or the commission?

The renewable collaboratives strive to provide broad, technically sound independent information that forms a long term strategic perspective. They are tasked with specific research projects with deliverables and due dates. While the collaboratives use advisory groups to provide scientific and technical expertise, the Energy Commission's agreement with all of the collaborative goes beyond what advisory groups can provide.

For instance, CREC is tasked by the Commission to undertake specific research, feasibility and assessment tasks that could not be accomplished through voluntary efforts by issue-specific groups. Issue-specific groups may not have the capacity to conduct credible research that requires multi-disciplinary attention and deep subject matter expertise.

The California Commissioning Collaborative is tasked to address market and technical barriers to widespread implementation of building commissioning to achieve energy efficiency in California buildings. Additionally the organization provides an opportunity to learn about commissioning issues and to determine what research is needed to develop and promote commissioning practices in California. Participation allows information exchange with other commissioning practitioners to avoid the potential of duplicative research and to ensure that future research will be beneficial and meaningful. By being a public participant of the collaborative, PIER staff is able to ensure that the state's research concerns and issues are raised and addressed.

D3. Over the last six years, what advisory groups have been formed by the commission and for what purpose?

Other than organizations and stakeholders listed in the response B6, some of the groups discussed in response to question D1 do have an advisory group. Examples include the California Commission Collaborative and the California Wind Energy Collaborative. Members are listed in the response to question D1.

D4. Do any commissioners or commission staff or staff of any other state agency, department or division sit on any of the governing boards of these collaboratives? Do any commissioners or staff receive any reimbursements or other payments from these collaboratives? Do any state employees or commissioners who are involved in contracting participate in any way with these collaboratives?

a) Do any commissioners or commission staff or staff of any other state agency, department or division sit on any of the governing boards of these collaboratives?

Yes. Commission staff is on advisory boards of the following collaboratives:

- California Renewable Energy Collaborative (CREC)
  - California Biomass Collaborative (CBC)
  - California Geothermal Energy Collaborative (CGEC)
  - California Solar Energy Collaborative (CSEC)
  - California Wind Energy Collaborative (CWEC)
- California Commissioning Collaborative (CCC)

PIER Program staff are no longer on the board or advisory council of the California Commissioning Collaborative pending review. The staffing of these collaborative and their affiliation is listed in Attachments 1-5.

b) ***Do any commissioners or staff receive any reimbursements or other payments from these collaboratives?***

No.

c) Do any state employees or commissioners who are involved in contracting participate in any way with these collaboratives?

Yes. PIER program staff involved with the renewable energy collaborative (and its affiliated CBC, CGEC, CSEC and CWEC) are involved in solicitations and contracts on renewable energy research projects.

PIER program staff attend CCC advisory council meetings as public members. These staff may be involved in contracting and solicitations. The CCC provides an opportunity to learn about commissioning issues and to determine what research is needed to develop and promote commissioning practices in California.

D5. Do any commissioners or staff that sit on these boards or attend collaborative meetings take part in the evaluation or ranking of proposals for funding by the PIER program?

Yes. PIER Program staff that are on the board of the renewable energy collaboratives group (CBC, CGEC, CSEC and CWEC) also take part in the evaluation or ranking of proposals for funding. These collaboratives cannot respond to solicitations because none are legal entities.

No PIER program staff is on the California Commissioning Collaborative board or advisory council.

Appendix A: Stakeholder/PAC Members Listings

Name	Phone Number	Affiliation	Purpose
Aaron Katzenstein	909-396-2219	South Coast Air Quality Management District	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Multi-Episodic and Seasonal Study
Abby Young		Bay Area Air Quality Management District	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Abe Doherty		Ocean Protection Council	Steering Committee - Climate Change Impacts and Vulnerability Studies
Adam Muliawan	909-472-4111	International Association of Plumbing and Mechanical Officials (IAPMO)	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Adriano Pangelinan	713-241-3421	Shell North America LNG	Technical Advisor to the Natural Gas Interchangeability Project Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Ajay Agrawal	205-348-4964	University of Alabama	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Akula Venkatram	951-827-2195	UCR	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Al Alvarado		CEC Electricity Office	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Al Baez	909-396-2516	South Coast Air Quality Management District	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Al Weverstadt	313-665-2959	General Motors	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.

Name	Phone Number	Affiliation	Purpose
Alan Sweedler		CSU San Diego	Provides technical evaluation of proposals submitted to the Energy Innovations Small Grants program
Amber Pairis	916-651-7252	California Department of Fish and Game	Steering Committee - Climate Change Impacts and Vulnerability Studies
Amrith Gunasekara	916-445-0444	California Dept of Food and Agriculture	Collaborative research effort with the California Energy Commission (CEC) on N2O Emissions from Agricultural Soil
Amy Zimpfer	415-947-4146	EPA/Region 9	Provided expert input and guidance to the Transportation Research Area staff in developing a roadmap for land use and community design research.
Andrew Altevogt	916-322-2569	California Environmental Protection Agency	Steering Committee - Climate Change Impacts and Vulnerability Studies
Andy Freeman		Ingersoll Rand	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Angelo Karas		Fni-FSTC	PAC Member for CEC PIER Water Heater Research Project
Anish Gautam		California Energy Commission	Water/wastewater (Efficiency PACs and TACs)
Annmarie Mora	916-323-1517	California Air Resources Board	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Anthony Bernheim		AECOM	New Buildings Institute PAC (500-08-049)
Arash Guity		Mazzetti+Nash	New Buildings Institute PAC (500-08-049)
Armand Gonzales	916-358-2876	California Department of Fish and Game	Steering Committee - Climate Change Impacts and Vulnerability Studies
Arnold Alderman		PSMA	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Art Diem	202-343-9340	EPA-HQ	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Art Hinojosa		Department of Water Resources	Integrated Forecasting and Reservoir Management Program advisory committee

Name	Phone Number	Affiliation	Purpose
Ash Lashgari	916-323-1506	California Air Resources Board	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study
Aubrey Sideco		California Air Resources Board - Stationary Source Division	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Austen D'Lima		San Diego Gas and Electric	Water/wastewater (Efficiency PACs and TACs)
Barry R. Wallerstein	909-396-3131	South Coast Air Quality Management District	Program Advisor for Natural Gas Program Research Needs
Bart Croes	916-323-4519	California Air Resources Board	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Multi-Episodic and Seasonal Study Program Advisor for Air Quality Program Research Planning Steering Committee - Climate Change Impacts and Vulnerability Studies
Bart Ostro	510-622-3157	California Office of Environmental Health Hazard Assessment	Steering Committee - Climate Change Impacts and Vulnerability Studies
Ben Ho	281-366-2369	BP America Inc:	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project Technical Advisor to the Natural Gas Interchangeability Project
Ben Machol	415-972-3770	EPA Region 9	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Ben Zinn	404-894-3033	Georgia Tech University	Technical Advisor to the Natural Gas Interchangeability Project
Bentley Hetrick		Fatburger Corporation	PAC Member for CEC PIER Water Heater Research Project. ET Project (In Progress) – Instantaneous water heater in Quick Serve Restaurant
Beth Faber		US Army Corp of Engineering	Integrated Forecasting and Reservoir Management Program advisory committee
Beth Jines	213-978-0850	City of Los Angeles, Department of Environmental Affairs	Provided expert input and guidance to the Transportation Research Area staff in developing a roadmap for land use and community design research.

Name	Phone Number	Affiliation	Purpose
Bill Boyce	916-732-6981 916-732-6839	Sacramento Municipal Utility District	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Bill Calvert	214-231-1458	BAF Technologies	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Bill Liss	847-768-0753	GTI	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Bill Pennington	916-698-0604	California Energy Commission	Technical Advisor for New Homes Field Study
Bill Pietrucha		PG&E	PAC Member for CEC PIER Water Heater Research Project
Bill Reinert	310-468-4047	Toyota Motor Sales	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Bill Welch		University of California – Riverside	PAC Member for CEC PIER Water Heater Research Project. Food service equipment emissions testing expertise.
Bill Zeller	415-973-4227	PG&E	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
BK Richard	805-782-0899	Land Conservancy of SLO County and Sierra Club Energy Task Force for SLO County	Provide renewable technical expertise for critical project reviews during the course of the project.
Bob Bornstein		San Jose State University	Technical Advisor for Near Source Modeling Projects
Bob Fletcher	916-324-8167	California Air Resources Board	Program Advisor for Air Quality Program Research Planning
Bob Hawkins	707-562-8699	USDA Forest Service	Planning For Alternative Corridors Steering Committee
Bob Marino	707-445-5434x302	DG Fairhaven Power	Provide renewable technical expertise for critical project reviews during the course of the project.

Name	Phone Number	Affiliation	Purpose
Bob Wilson	516-545-2580	Keyspan	Technical Advisor to the Natural Gas Interchangeability Project
Brad Jacobson		EHDD Architects	New Buildings Institute PAC (500-08-049)
Brad Meister	916-653-1594	California Energy Commission	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Brian Sehnert		Green Building Services	New Buildings Institute PAC (500-08-049)
Brian Walton	831-588-3884	UCSC Predatory Bird Research Center	California wind-wildlife guidelines science advisory committee
Bronwyn Hogan	209-932-2394	Department of Fish and Game	California wind-wildlife guidelines science advisory committee Energy-Related Environmental Research Scoring Team; PAC Member
Bruce A. Wilcox,	510-528-4406	Berkeley Solar Group	Technical Advisor for New Homes Field Study
Bruce Maeda	916-564-0278	California Energy Commission	Technical Advisor for New Homes Field Study
Bruce Rising	407-736-5378	Siemens Westinghouse Power Corporation	Program Advisor for Natural Gas Program Research Needs
Bryan Jenkins	530-754-853	UC Davis	Provide renewable technical expertise for critical project reviews during the course of the project.
Bud Offerman	415-567-7700	Indoor Environmental Engineering	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
C. Arden Pope	801-422-2157	Brigham Young University,	External Peer Review Committee - Environmental Justice Project
Carl Bauer		National Energy Technology Laboratory and Chairman CCS Review Panel	WESTCARB CCS Review Panel
Carl Suchovsky	440-232-3200	Gas Consultants Inc.	Technical Advisor to the Natural Gas Interchangeability Project
Carlos Haiad		Southern California Edison Company	PAC Member for CEC PIER Water Heater Research Project. Manages food service products.
Carol Bohnenkamp		EPA Region 9	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Multi-Episodic and Seasonal Study
Carson Cox		National Heritage Institute	Research on Instream Flow Determinations for Hydropower Applications in California advisory committee

Name	Phone Number	Affiliation	Purpose
Casey Walsh Cady	916-654-5044	California Department of Food and Agriculture	Provide renewable technical expertise for critical project reviews during the course of the project.
Catherine Reheis-Boyd	916-498-7750	Western States Petroleum Association	Program Advisor for Natural Gas Program Research Needs WESTCARB CCS Review Panel
Cathy Bleier	916-657-0561	California Department of Forestry and Fire Protection	Steering Committee - Climate Change Impacts and Vulnerability Studies
Cathy Higgins		NBI	New Buildings Institute PAC (500-08-049)
Cathy Turner		NBI	New Buildings Institute PAC (500-08-049)
Cecilia Tai		Pacific Gas and Electric	Water/wastewater (Efficiency PACs and TACs)
Charlene Bayer	770-955-4060	Georgia Tech	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Charlene Spoor		PG&E	PAC Member for CEC PIER Water Heater Research Project
Charles Anderson	916-874-4831	Sacramento Metropolitan Air Quality Management District	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Charles Bohlig		East Bay Municipal Utility District	PAC Member for CEC PIER Water Heater Research Project. May have interest in water useage. Supports energy/water liaison.
Charles Powars	408-723-1216	St. Croix Research	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Charles Smith	703-860-5160	UWIG	Provide program guidance on research initiatives and needs.
Charles Wallace		Fni-FSTC	PAC Member for CEC PIER Water Heater Research Project
Charlie Ker	604-718-2046	Westport Innovations	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area

Name	Phone Number	Affiliation	Purpose
Cherif Youssef	213-244-5325	Southern California Gas Company	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area. On Advanced Generation ICF PAC to provide guidance in research direction, with emphasis on market pathways or commercialization strategies. Grant Number: PIR-07-006
Chris Brown	916-552-5885	California Urban Water Conservation Council	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Chris Lyons		Solar Turbines	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Chris Marnay		LBNL	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Chris Muller	770-662-8545x341	Purafil	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Chris Scruton		California Energy Commission	PAC Member for CEC PIER Water Heater Research Project. Manages various PIER water heater research projects.
Chris Stoneman		EPA- OAQPS	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Christian Mohrdieck		Daimler Chrysler, Hybrid Development Center	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Chuck Baukal	918-234-2854	John Zink Company, LLC	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Chuck Linderman	202-508-5652	Edison Electric Institute	Program Advisor for Natural Gas Program Research Needs
Chuck Mullett		ONSemiconductor	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Chung Liu	909-396-2105	South Coast Air Quality Management District	Program Advisor for Air Quality Program Research Planning

Name	Phone Number	Affiliation	Purpose
Cincin Young		UC Davis Center for Aquatic Biology	Research on Instream Flow Determinations for Hydropower Applications in California Advisory Committee
Clark Bisel		WSP Flack and Kutz	New Buildings Institute PAC (500-08-049)
Cody Livingston		California Air Resources Board - Stationary Source Division	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Cody Taylor		HDR Inc.	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Craig Selover	313-792-4457	Masco Corporation	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Craig Webster	604-590-7413	Powertech Laboratories	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Dan Geiger		NC USGBC Chapter	New Buildings Institute PAC (500-08-049)
Dan Harris		NBI	New Buildings Institute PAC (500-08-049)
Dan Heinfeld		LPA	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Dan Skopec		California Carbon Capture and Storage Coalition	WESTCARB CCS Review Panel
Daniel Bernstein	202-431-2984	Gaia Geothermal	Provide geothermal technical expertise for critical project reviews during the course of the project.
Dave Hanson	916-732-6733	SMUD	Provide renewable technical expertise for critical project reviews during the course of the project.
Dave Sanderlin		GEA Power Cooling Systems, Inc.	Field Testing and CFD Modeling of Wind Effects on ACC Performance advisory committee
David Berokoff		Sempra Energy Utilities	Technical Advisor for Realistic Application and AQ Implications of DG-CHP Provides technical evaluation of proposals submitted to the Energy Innovations Small Grants program
David Collier	815-637-7216	Eclipse Inc.	Technical Advisor to the Natural Gas Interchangeability Project

Name	Phone Number	Affiliation	Purpose
David Gier	858-650-6131	SDG&E	Provide program guidance on research initiatives and needs.
David Grimsrud	530-581-1232	Consultant	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
David Hawkins	916-351-4465	California ISO Natural Resources Defense Council	Provide renewable technical expertise for critical project reviews during the course of the project. WESTCARB CCS Review Panel
David Kalensky		Gas Research Institute	PAC Member for CEC PIER Water Heater Research Project. Currently conducting PIER research on tankless water heaters and on developing an advanced gas water heater.
David Kaneda		Ideas	New Buildings Institute PAC (500-08-049)
David Lehrer		Center for the Built Environment	New Buildings Institute PAC (500-08-049)
David Lobell	650-721-6207	Stanford	Climate Change Research Solicitation Reviewer
David Mehl	916-323-1494	California Air Resources Board	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project Technical Advisor for Realistic Application and AQ Implications of DG-CHP
David Rohy		San Diego State Research Foundation	Provides technical evaluation of proposals submitted to the Energy Innovations Small Grants program
David Rubin	415-973-1857	PG&E	Provide renewable technical expertise for critical project reviews during the course of the project.
David Thimsen	651-766-8826	EPRI	Provide renewable technical expertise for critical project reviews during the course of the project.
David Vasnaik		PGE	New Buildings Institute PAC (500-08-049)
David Warner	559-230-6000	San Joaquin Valley Unified Air Pollution Control District	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
David Weightman		CEC	New Buildings Institute PAC (500-08-049)

Name	Phone Number	Affiliation	Purpose
David Zabrowski		Fni-FSTC	PAC Member for CEC PIER Water Heater Research Project
Dean Bloudoff	916-322-1521	California Air Resources Board - Stationary Source Division	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Dean Neff	209-473-5073	ConSol	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Deanne Meyer	530-752-1250	UC Davis	Provide renewable technical expertise for critical project reviews during the course of the project.
Debbie Treadway	916-653-4038	Native American Heritage Commission	Planning For Alternative Corridors Steering Committee
Deborah Orrill		Department of Conservation	Climate Change Research Solicitation Reviewer
Dennis Sanke	608-787-3608	Trane	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Dennis Smith	202-586-1791	Department of Energy	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Dennis Westcot	530-758-8373	Westcot Consulting	Provide renewable technical expertise for critical project reviews during the course of the project.
Dick Anderson	530-758-4672	Energy Commission consultant	Energy-Related Environmental Research Scoring Team; PAC Member
Dilip Mahendra	916-732-6180	Sacramento Municipal Utilities District	Planning For Alternative Corridors Steering Committee
Dillip Ballal	937-229-3961	University of Dayton	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Dipak Bishnu	626-575-6696	California Air Resources Board	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Don Dame	916-781-4207	NCPA	Provide renewable technical expertise for critical project reviews during the course of the project.
Don Ferguson	304-285-4192	US Department Of Energy	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project

Name	Phone Number	Affiliation	Purpose
Don Fisher		Fni-FSTC	PAC Member for CEC PIER Water Heater Research Project
Don Petersen		Pacific Gas & Electric Company	Program Advisor for Natural Gas Program Research Needs
Donald Dabdub	949-824-6126	University of California, Irvine	Technical Advisor to the Natural Gas Interchangeability Project
Dongmin Luo	916-324-8496	Air Resources Board	Climate Change Research Solicitation Reviewer
Doug Horne	770-424-8575	Doug Horne LLC Clean Vehicle Education foundation Clean Vehicle Coalition	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Doug Leisz	530-626-3377	Hydro Advisory Panel	Provide renewable technical expertise for critical project reviews during the course of the project.
Doug Straub	304-285-5444	US Department of Energy	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Doug Wickizer	916-653-5602	California Department of Forestry and Fire Protection	Steering Committee - Climate Change Impacts and Vulnerability Studies
Dough Mahone		Heschong Mahone Group	New Buildings Institute PAC (500-08-049)
Douglas Kosar	847-768-0725	Gas Technology Institute (GTI)	Provide renewable technical expertise for critical project reviews during the course of the project. On Advanced Generation ICF PAC to provide guidance in research direction, with emphasis on system integration and performance evaluation. Grant Number: PIR-07-006 Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Duane Marti	916-978-4675	US Bureau of Land Management	Planning For Alternative Corridors Steering Committee
Ed Becker		SDG&E	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007

Name	Phone Number	Affiliation	Purpose
Ed Harte	213-244-2847	Sempra / Southern California Gas	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Ed Kjaer	626-302-1324	Southern California Edison	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Ed Wall	202-586-8055	Department of Energy	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Edward Rubin		Carnegie Mellon University	WESTCARB CCS Review Panel
Edward Vine	510-987-9200	Center for Institute for Energy & the Environment	Climate Change Research Solicitation Reviewer
Eric Smith	540-23-5657	Virginia Tech University	PAC Member
Eric Truskoski	269-795-3364x3288	Bradford White	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Eric Wong		Cummins Power Generation	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Erik Neandross	310-573-8553	Gladstein, Neandross & Associates	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Floyd Vergara		California Air Resources Board	Technical Advisor to the Natural Gas Interchangeability Project
Floyd Vergara		California Air Resources Board	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Francis Chung		Department of Water Resources	Steering Committee - Climate Change Impacts and Vulnerability Studies
Frank Stanonik	703-525-7060x221	GAMA	Program Advisor for Natural Gas Program Research Needs

Name	Phone Number	Affiliation	Purpose
Gail Brager		Center for the Built Environment	New Buildings Institute PAC (500-08-049)
Gail Mosey	303-384-7356	NREL	Provide renewable technical expertise for critical project reviews during the course of the project.
Gary Klein		California Energy Commission	PAC Member for CEC PIER Water Heater Research Project. Expertise in water heater research and application.
Gary Smith		California Department of Fish & Game (retired)	Research on Instream Flow Determinations for Hydropower Applications in California advisory committee
George Mozurkewich	734-994-4431	Former Ford Scientist	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Gerald Braun	916-402-4143	UC Davis Energy Institute	Provide renewable technical expertise for critical project reviews during the course of the project.
Gerry Bemis	916.654.4960	California Energy Commission	Climate Change Research Solicitation Reviewer
Glenn Morrison	573-341-7192	University of Missouri, Rolla	Technical Advisor to the Natural Gas Interchangeability Project
Greg Anders		SCE	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Gregory McMahon		California Air Resources Board - Stationary Source Division	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Guido Franco	916-654-3940	California Energy Commission	Climate Change Research Solicitation Reviewer
Hank Seiff	703-534-6151	Clean Vehicle Coalition Clean Vehicle Education Foundation	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Harvey Sachs	202-507-4000	American Council for an Energy Efficient Economy (ACEEE)	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060

Name	Phone Number	Affiliation	Purpose
Hector Maldonado	916-445-6015	California Air Resources Board - Research	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Henry Mak	213-244-5323	Southern California Gas Company	Provide renewable technical expertise for critical project reviews during the course of the project.
Henry Wong		Intel	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Howard Choy	323-881-3939	County of Los Angeles, Office of Sustainability	Provided expert input and guidance to the Transportation Research Area staff in developing a roadmap for land use and community design research.
Howard Lange	909-396-3658	South Coast Air Quality Management District	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Ivin Rhyne		California Energy Commission	Water/wastewater (Efficiency PACs and TACs)
Jack Broadbent	415-749-5052	Bay Area Air Quality Management District	Program Advisor for Air Quality Program Research Planning Program Advisor for Natural Gas Program Research Needs
Jack Brouwer	949-824-1999x221	UC Irvine	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Jack Truschel	916-323-1787	Div. of Oil, Gas, and Geothermal Resources	Provide geothermal technical expertise for critical project reviews during the course of the project.
Jackie Crabb	805-543-3654	SLO County Farm Bureau	Provide renewable technical expertise for critical project reviews during the course of the project.
Jacques Franco	916-341-6608	CalRecycle - Department of Resources Recycling and Recovery	Provide renewable technical expertise for critical project reviews during the course of the project.
Jaime Lam		Sacramento Metropolitan Air Quality Management District	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study
James Boyd	916-654-3787	California Energy Commission	Program Advisor for Air Quality Program Research Planning
James Filanc		Southern Contracting	Water/wastewater (Efficiency PACs and TACs)

Name	Phone Number	Affiliation	Purpose
James Patterson		SLO County Government Center	Provide renewable technical expertise for critical project reviews during the course of the project.
James Sedinger	775-784-6556	University of Nevada, Reno	California wind-wildlife guidelines science advisory committee
James York	770-632-4360	Rinnai	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Jan Sharpless	916-421-7838	Ex Commissioner/ARB Chair and consultant	Program Advisor for Air Quality Program Research Planning
Jananne Sharpless	916-421-7838	Former Energy Commission Commissioner	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Jane Turnbull	650-559-1766	League of Women Voters	Planning For Alternative Corridors Steering Committee
Janika McFeeley		EHDD Architects	New Buildings Institute PAC (500-08-049)
Jay Lund	530-752-5671	UC Davis	Climate Change Research Solicitation Reviewer
Jayne Ng		Pacific Gas and Electric	Water/wastewater (Efficiency PACs and TACs)
Jean Getchell		Monterey Unified Air Pollution Control District	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Jean-Pierre Delplanque	530-754-6950	UC Davis	Provide renewable technical expertise for critical project reviews during the course of the project.
Jed Waldman	510-620-2864	California Deparment of Health Services	-Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24 -Technical Advisor for New Homes Field Study Technical Advisor to the Natural Gas Interchangeability Project
Jeff Cox	909-396-3092	Fuel Cell Energy South Coast Air Quality Management District	Technical Advisor for Realistic Application and AQ Implications of DG-CHP Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project

Name	Phone Number	Affiliation	Purpose
Jeff Leonard	707-502-2701	RCEA/ City of Eureka	Provide renewable technical expertise for critical project reviews during the course of the project.
Jeffery Siegel	512-471-2410	University of Texas at Austin	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Jennifer de Tapia	800-920-1166	Trillium	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Jennifer Parker	301-458-4419	National Center for Health Statistics	External Peer Review Committee - Environmental Justice Project
Jensen Zhang	315-443-1366	Syracuse University	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Jesse Maestas		URS Corp	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Jill Egbert	530-757-5235	Pacific Gas and Electric	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Jim Boyd	916-654-3787	California Energy Commission	Program Advisor for Natural Gas Program Research Needs
Jim Canaday		State Water Resources Control Board (retired)	Research on Instream Flow Determinations for Hydropower Applications in California advisory committee
Jim Cole	895-239-0147	California Institute for Energy and the Environment	Provide renewable technical expertise for critical project reviews during the course of the project.
Jim Detmers	916-351-2123	CAISO	Provide program guidance on research initiatives and needs.
Jim Lutz		Lawrence Berkeley National Laboratories	PAC Member for CEC PIER Water Heater Research Project. Storage

Name	Phone Number	Affiliation	Purpose
Jim Meacham		CTG EHDD Architects	Technical Advisor for Realistic Application and AQ Implications of DG-CHP New Buildings Institute PAC (500-08-049)
Jim Watts		Ingersoll Rand	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Jim Woolsey	202-497-0026	Booz Allen Hamilton	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Joe Boros	334-260-1389	Rheem	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Joe Cantwell		Science Application International Corporation	Water/wastewater
Joe Cantwell		Science Application International Corporation	Water/wastewater (Efficiency PACs and TACs)
Joe O'Hagan	916-653-1651	California Energy Commission	Climate Change Research Solicitation Reviewer
Joe Silva		California Power Partners	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Joe Touma		EPA	Technical Advisor for Near Source Modeling Projects
Joel Pointon	858-654-8767	SEMPRA, San Diego Gas and Electric Company	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Joesph Lynch	619-532-3646	US Deptarment of Defense - Navy	Planning For Alternative Corridors Steering Committee
John Andrews	916-653-5791	Department of Water Resources	Climate Change Research Solicitation Reviewer Integrated Forecasting and Reservoir Management Program advisory committee Steering Committee - Climate Change Impacts and Vulnerability Studies
John Bidwell		QuEST	Water/wastewater (Efficiency PACs and TACs)

Name	Phone Number	Affiliation	Purpose
John Confrey	714-433-2905	Noritz	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
John E. Bryson		Edison International	WESTCARB CCS Review Panel
John Geyer	360-882-5050	John Geyer & Associates, Inc.	Provide renewable technical expertise for critical project reviews during the course of the project.
John Howard		Power and Process Engineers	Water/wastewater (Efficiency PACs and TACs)
John King		North American Carbon Capture & Storage Association	WESTCARB CCS Review Panel
John Mathias	916-651-9525	California Energy Commission	Energy-Related Environmental Research Scoring Team
John Menke	916-341-5587	State Water Resources Control Board	Provide renewable technical expertise for critical project reviews during the course of the project.
John P. Hayes	352-846-0552	University of Florida	PAC Member
John Scallone		California Power Partners	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
John Sugar		California Energy Commission	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
John White		Center for Energy Efficiency and Renewable Technology	Program Advisor for Air Quality Program Research Planning
Jon Bonk-Vasko		Energy Center (SDREO)	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Jon Klassen		San Joaquin Valley Unified Air Pollution Control District	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Multi-Episodic and Seasonal Study
Jonathan Loiacono		City of San Francisco	Water/wastewater (Efficiency PACs and TACs)
Jorge Gutierrez	562-806-4351	Southern California Gas Co.	Technical Advisor to the Natural Gas Interchangeability Project
Judy Nickel		Fni-FSTC	PAC Member for CEC PIER Water Heater Research Project

Name	Phone Number	Affiliation	Purpose
Julian Crocker	805-543-7732	SLO County Office of Education	Provide renewable technical expertise for critical project reviews during the course of the project.
Julie Gill	916-608-7284	CA Independent System Operatior	Planning For Alternative Corridors Steering Committee
K.C. Spivey	415-973-1525	PG&E	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Karen Mills	916-561-5657	California Farm Bureau Federation	Planning For Alternative Corridors Steering Committee
Karin Sinclair		National Renewable Energy Laboratory	Energy-Related Environmental Research Scoring Team
Karl Brown		CIEE	New Buildings Institute PAC (500-08-049)
Kate Blumberg	415-202-5749	International Council on Clean Transportation	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Kate Conway		Procurement Specialist	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Kathleen O'Connor		NYSERDA	Water/wastewater (Efficiency PACs and TACs)
Kathy Diehl		EPA Region 9	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study
Katy Mannion	916-447-4806	Regional Council of Rural Counties	Planning For Alternative Corridors Steering Committee
Keith Davidson		DE Solutions	Technical Advisor for Realistic Application and AQ Implications of DG-CHP. On Advanced Generation ICF PAC to provide guidance in research direction, with emphasis on linkages and enhancing tangible benefits to California. Grant Number: PIR-07-006
Keith Roderick	916-327-7838	California Air Resources Board	Technical Advisor for Air Emissions Reductions Through Energy Reductions/RPS Project
Kemal Gurer		California Air Resources Board	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study

Name	Phone Number	Affiliation	Purpose
Kenneth Walsh		CSU, San Diego	Provides technical evaluation of proposals submitted to the Energy Innovations Small Grants program
Kevin Dasso	415-973-6998	PG&E	Provide program guidance on research initiatives and needs.
Kevin Goishi	530-889-3304	PG&E	Provide renewable technical expertise for critical project reviews during the course of the project.
Kevin Hydes		Integral PE	New Buildings Institute PAC (500-08-049)
Kevin Martin	858-793-5102	Acciona Energy	PAC Member
Kevin Murray		The Murray Group	WESTCARB CCS Review Panel
Kevin Powell		GSA	New Buildings Institute PAC (500-08-049)
Kimberly Kemp	925-974-4266	Pacific Gas & Electric Company	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Kipp Coddington		Mowrey Meezan Coddington Cloud LLP (M2C2)	WESTCARB CCS Review Panel
Klaus H. Hemsath	941-723-7300		Provide renewable technical expertise for critical project reviews during the course of the project.
Kris Kjellman	949-798-7952	Edison Mission Energy	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Kris O'Connor	805-369-2288	Central Coast Vineyard Team	Provide renewable technical expertise for critical project reviews during the course of the project.
Kurt Malchow		Natural Resources Agency	Steering Committee - Climate Change Impacts and Vulnerability Studies
Lakshmi Mandyam		Coldwatt	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Lance DeLaura		San Diego Gas and Electric Company/SEMPRA	PAC Member for CEC PIER Water Heater Research Project. Heads up the Water Heater PAGette.
Lance Wallace		U.S. EPA, retired	Technical Advisor for New Homes Field Study
Larry Palmiter		Ecotope Inc.	Technical Advisor for New Homes Field Study
Lee Hannah	805-893-7067	UC Santa Barbara	Climate Change Research Solicitation Reviewer
Lee Stewart	619-696-2000	San Diego Gas & Electric Company	Program Advisor for Natural Gas Program Research Needs

Name	Phone Number	Affiliation	Purpose
Lei Guo	916-322-8097	Air Resources Board	Collaborative research effort with the California Energy Commission (CEC) on N2O Emissions from Agricultural Soils
Leon Alevantis		California Deparment of Health Services	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Leon Tolbert		University of Tennessee	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Leonard Angello	650-855-7939	EPRI	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Les Bamburg	619-696-4315	Sempra LNG	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Lesley Ewing		Coastal Commission	Steering Committee - Climate Change Impacts and Vulnerability Studies
Lillian Kawasaki	213-367-4211	LA Dept. of Water and Power	Planning For Alternative Corridors Steering Committee
Linda Lee	916-327-1541	California Air Resources Board - Stationary Source Division	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Lisa Van de Water	559-230-5819	San Joaquin Valley Unified Air Pollution Control District	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Liz Battacletti	703-836-0304	Bob Lawrence & Associates	Provide renewable technical expertise for critical project reviews during the course of the project.
Lou Lautman	847-768-0760	GTI	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Luke Cowell	619-544-5916	Solar Turbines	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Malcolm Lewis		Constructive Technologies Group	Technical Advisor for Realistic Application and AQ Implications of DG-CHP. New Buildings Institute PAC (500-08-049)
Manual Alvarez	916-441-2360	Southern California Edison	Planning For Alternative Corridors Steering Committee
Marcus Yee		California Dept. of Water Resources	PAC Member

Name	Phone Number	Affiliation	Purpose
Margot McDonald	805-756-1298	Cal Polytechnic State University	Provide renewable technical expertise for critical project reviews during the course of the project.
Mark Crane	404-624-8730	Mckinneys Mechanical Contractors and Engineering	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Mark Duvall	650-855-2591	Electric Power Research Institute	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Mark Frankel		NBI	New Buildings Institute PAC (500-08-049)
Mark Hughes		Solar Turbines	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Mark Meldgin		PG&E	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Mark Wenzel		California Environmental Protection Agency	Steering Committee - Climate Change Impacts and Vulnerability Studies
Martha Brook	916-654-4068	California Energy Commission Buildings	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24. New Buildings Institute PAC (500-08-049). Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project.
Martin Thomas		Natural Resources Canada	PAC Member for CEC PIER Water Heater Research Project. Headed up instantaneous water heater research project for both residential and commercial market sector for NRCan.
Marty Kay - retired		South Coast Air Quality Management District	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Mary Ann Dickinson		California Urban Water Conservation Council (CUWCC)	PAC Member for CEC PIER Water Heater Research Project. May have interest in water useage. Supports energy/water liaison.

Name	Phone Number	Affiliation	Purpose
Mary Deming	626-302-9528	Southern California Edison	Planning For Alternative Corridors Steering Committee
Mary Mylan	805-489-1336	Rabobank	Provide renewable technical expertise for critical project reviews during the course of the project.
Mary Scruggs	916-653-5791	Department of Water Resources	Climate Change Research Solicitation Reviewer
Matt Miyasato	909-396-3249	South Coast Air Quality Management District Science and Technology Advancement	- Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis. -Technical Advisor for Realistic Application and AQ Implications of DG-CHP -Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Melisa Marks		Southern California Gas Company	PAC Member for CEC PIER Water Heater Research Project. Manages food service products.
Meredith Colket	860-610-7481	United Technology	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Meredith Minkler	510-642-4397	UC Berkeley School of Public Health	External Peer Review Committee - Environmental Justice Project
Merwin Brown	916-551-1871	Center for Institute for Energy & the Environment	Planning For Alternative Corridors Steering Committee
Michael Fitzgibbon		California Air Resources Board	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Multi-Episodic and Seasonal StudyCollaborative research effort with the California Energy Commission (CEC) on N2O Emissions from Agricultural So
Michael Green	503-872-2707	U.S. Fish and Wildlife Service Pacific Region	California wind-wildlife guidelines science advisory committee
Michael Jerrett	510-642-3960	UC Berkeley School of Public Health	External Peer Review Committee - Environmental Justice Project
Michael Mastrandrea	650-224-2070	Standford	Climate Change Research Solicitation Reviewer
Mike Brown	505-667-1788	Los Alamos National Laboratory	Technical Advisor for Near Source Modeling Projects

Name	Phone Number	Affiliation	Purpose
Mike Eaves	562-493-2804	California Natural Gas Vehicle Coalition Clean Energy	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Mike Francesconi	916-341-5988	Californai Department of Food and Agriculture	Provide renewable technical expertise for critical project reviews during the course of the project.
Mike Hertel		Southern California Edison	Program Advisor for Air Quality Program Research Planning
Mike Jackson	408-517-1550	TIAX	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Mike Landau	213-244-5349	Southern California Gas Co.	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Mike Montoya	626-302-1445	SCE	Provide program guidance on research initiatives and needs.
Mike Scheible - retired		California Air Resources Board	Program Advisor for Natural Gas Program Research Needs
Mike Waugh		California Air Resources Board	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Mohan Gupta	202-267-3496	Federal Aviation Administration	Technical Advisor for Improving Understanding of Regional & Near-source Air Quality Impacts of Distributed Generation
Nancy Gioia	313-317-7001	Ford Motor Company	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Nicole Dolney	916-322-1695	California Air Resources Board - Planning & Tech Support	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Nidia Bautista		Coalition for Clean Air	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Noah Horowitz		NRDC	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007

Name	Phone Number	Affiliation	Purpose
Obadiah Bartholomy	916-732-6835	SMUD	Provide renewable technical expertise for critical project reviews during the course of the project.
Paolo Baragetti		Enbridge Gas Distribution	PAC Member for CEC PIER Water Heater Research Project. Utility has funded considerable water heating research. Provides cofunding for FSTC gas research.
Partina Mack	650-233-0256x1	Vision & Execution	Provide renewable technical expertise for critical project reviews during the course of the project.
Pat Eilert		PG&E	PAC Member for CEC PIER Water Heater Research Project
Patrica Arons	626.302.9644	Southern California Edison	Planning For Alternative Corridors Steering Committee
Patricia Hoffman	(202) 586-5860	DOE	Provide program guidance on research initiatives and needs.
Patricia Monahan	510-809-1568	Union of Concerned Scientists	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Paul A. Mathew	510-486-5116	LBNL	Provide renewable technical expertise for critical project reviews during the course of the project.
Paul Bonv	970-209-0999	ClimateMaster	Provide renewable technical expertise for critical project reviews during the course of the project.
Paul Clanon	415-703-2782	California Public Utilities Commission	Program Advisor for Natural Gas Program Research Needs
Paul English		Department of Publlic Health	Steering Committee - Climate Change Impacts and Vulnerability Studies
Paul J. M. Nelissen		Howden Buffalo, Inc.	Field Testing and CFD Modeling of Wind Effects on ACC Performance advisory committee
Paul Kubicek		PG&E	Research on Instream Flow Determinations for Hydropower Applications in California advisory committee
Paul MacCready	626-357-9983	AeroVironment	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area

Name	Phone Number	Affiliation	Purpose
Paul Matthew		LBNL	New Buildings Institute PAC (500-08-049)
Pedro Restrepo		National Weather Service	Integrated Forecasting and Reservoir Management Program advisory committee
Peggy Jenkins	916-323-1504	California Air Resources Board	Technical Advisor to the Natural Gas Interchangeability Project Technical Advisor for New Homes Field Study
Peter Bloom	714-544-6147	Consultant	California wind-wildlife guidelines science advisory committee
Peter Kampa	209-532-5536	Utilities District	Provide renewable technical expertise for critical project reviews during the course of the project.
Phil Martien		Bay Area Air Quality Management District	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study
Pollock, Kenneth	919-515-3514	North Carolina State Univ.	California wind-wildlife guidelines science advisory committee
Prakash Karadwalal		Atmosperic and Environmental Research	Technical Advisor for Improving Understanding of Regional & Near-source Air Quality Impacts of Distributed Generation
Rainey, William	510-845-5317	University of California, Berkeley	California wind-wildlife guidelines science advisory committee
Ray Ehrhard		Washington University in St. Louis	Water/wastewater
Ray Ehrhard		Washington University in St. Louis	Water/wastewater (Efficiency PACs and TACs)
Ray Laster	407-736-5796	Siemens	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Reinhard Seidl		Taylor Engineering	New Buildings Institute PAC (500-08-049)
Rene Flores	818-407-3641	Capstone Turbine Corporation	On Advanced Generation ICF PAC to provided guidance in research direction, with emphasis on technical design and system development. Grant Number: PIR-07-006
Renee Culver	925-245-5522	FPL	PAC Member
Reza Navai	916-653-3424	Caltrans	Steering Committee - Climate Change Impacts and Vulnerability Studies
Richard Biljetina	202-251-8902	Energy Solutions Center Inc.	Provide renewable technical expertise for critical project reviews during the course of the project.

Name	Phone Number	Affiliation	Purpose
Richard Fassler		Power Integrations	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Richard McNitt	225-771-2262	CSA America	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Richard Parish	303-825-7550	CalStart	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Rick McCaffrey		Brinker International	PAC Member for CEC PIER Water Heater Research Project. ET Project (Complete) – Chili's
Rick Rayburn	916-653-6725	Department of Parks and Recreation	Steering Committee - Climate Change Impacts and Vulnerability Studies
Rick Slama	916-928-5879	AFV specialist, DGS (Office of Fleet Administration)	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
RK Stewart		Perkins and Will	New Buildings Institute PAC (500-08-049)
Rob Hartman		National Weather Service	Integrated Forecasting and Reservoir Management Program advisory committee
Rob Mercer	714-656-1200	IMPCO	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Robert Bornstein		Department of Meteorology, SJSU	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Multi-Episodic and Seasonal Study
Robert Cheng	510-486-5438	LBNL	Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Robert Levine		SCE	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Robert Nakamura	510-286-7005	CALOSHA	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Robert Wolpert	919-684-3275	Duke University	PAC Member

Name	Phone Number	Affiliation	Purpose
Rock Zierman	916-447-1185	California Independent Petroleum	Program Advisor for Natural Gas Program Research Needs
Roger Hooson	650-821-6511	SFO	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Roger Johnson	916-654-5100	CEC - Siting Division	Planning For Alternative Corridors Steering Committee
Roland Hwang	415-875-6100	NRDC	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Ron Eickelman	615-301-5322	FAB Industries	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Ron Lorenz		California Power Research	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007
Ron Stoltz	925-519-2025	Sandia National Lab	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Ronal Ishii		AESC, Inc.	Provides technical evaluation of proposals submitted to the Energy Innovations Small Grants program
Rosemarie Halchuck	303-571-7388	Xcel Energy	Technical Advisor to the Natural Gas Interchangeability Project
Rudy Perez		SCE	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Sally Benson		Stanford University	WESTCARB CCS Review Panel
San Cantrell		Raley's	PAC Member for CEC PIER Water Heater Research Project. Working with FSTC to characterize energy use and cost associated with water heating in the Raley's supermarket.
Sandy Mendler		Mithun San Fran	New Buildings Institute PAC (500-08-049)
Sang-Mi Lee	909-396-3169	South Coast Air Quality Management District	Technical Advisor for Improving Understanding of Regional & Near-source Air Quality Impacts of Distributed Generation
Sanjiv Lakhanpal		AMD	Final PAC Member for Consumer and Office Electronics Project Contract #500-06-007

Name	Phone Number	Affiliation	Purpose
Sara Graham		HDK	New Buildings Institute PAC (500-08-049)
Sarah Jackson		Earth Justice	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Sarah Pittiglio	916-654-3962	California Energy Commission	Climate Change Research Solicitation Reviewer
Sarvy Mahdavi		US EPA Region 9	Technical Advisor for Air Emissions Reductions Through Energy Reductions and RPS Project
Scott Shell		EHDD Architects	New Buildings Institute PAC (500-08-049)
Scott Shippey		Chipotle Mexican Grill	PAC Member for CEC PIER Water Heater Research Project. Working with FSTC to characterize energy use and cost associated with existing water heating system in San Ramon store.
Scott Williams	612-761-1623	Target	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Sharareh Moaddeli	213-244-5213	SEMPRA (SoCal Gas and SDG&E)	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Shiva Subramanya		Energy & Power Solutions	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Simon Minett		Delta Energy & Environment	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Siva Sethuraman		Pacific Gas and Electric	Water/wastewater (Efficiency PACs and TACs)
Stella Ling-Taylor		California Air Resources Board - Stationary Source Division	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project
Stephen Memory	414-359-4246	A. O. Smith	Project Advisory Committee (PAC) Member for Residential Water Heating Program, PIER Contract 500-08-060
Steve Gillette	818-407-3647	Capstone Turbine Corporation	Technical Advisor for Realistic Application and AQ Implications of DG-CHP
Steve Goldbeck	415-352-3611	San Francisco Bay Conservation and Development Commission	Steering Committee - Climate Change Impacts and Vulnerability Studies

Name	Phone Number	Affiliation	Purpose
Steve Hanna	207-967-4478	Harvard University	Technical Advisor for Near Source Modeling Projects
Steve Moore	858-586-2750	San Diego County Air Pollution Control District	Technical Advisor for Effect of Natural Gas Fuel Composition on Vehicle Project Technical Advisor for Gas Fuel Interchangeability Criteria Development Project
Steve Oliver		SMUD	New Buildings Institute PAC (500-08-049)
Steve Tuggle	916-353-4549	Western Area Power Administration	Planning For Alternative Corridors Steering Committee
Steve Ziman	415-566-5318	retired from Chevron	Technical Advisor to the Natural Gas Interchangeability Project
Steven Lau		Sacramento Metropolitan Air Quality Management District	Technical Advisor to Urban Surface Modification as a Potential Ozone Air-Quality Improvement Strategy in CA - Fine Resolution Study
Stu Townsley		US Army Corp of Engineering	Integrated Forecasting and Reservoir Management Program advisory committee
Susan Fischer	916-324-0627	Air Resources Board	Climate Change Research Solicitation Reviewer
Susan Fischer	916-324-0627	California Air Resources Board	Steering Committee - Climate Change Impacts and Vulnerability Studies
Susan Sanders		Energy Commission consultant	Energy-Related Environmental Research Scoring Team
Tariq Kadir	916-653-3513	Department of Water Resources	Climate Change Research Solicitation Reviewer
Ted Williams	202-824-7313	American Gas Association	Program Advisor for Natural Gas Program Research Needs
Theo Fleisch	281-366-7133	BP	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Thomas Philips	916-445-0753	California Air Resources Board	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
Thresher, Robert	303-384-6922	National Renewable Energy Laboratory Golden, CO	California wind-wildlife guidelines science advisory committee
Tim Papandreou	415-701-4333	San Francisco Municipal Transportation Association	Provided expert input and guidance to the Transportation Research staff in developing a roadmap for land use and community design research.

Name	Phone Number	Affiliation	Purpose
Tim Robards	916-657-4778	California Dept of Forestry	Climate Change Research Solicitation Reviewer
Tod Bedrosian		Bedrosian and Associates	New Buildings Institute PAC (500-08-049)
Tom Acuna	858-637-3701	San Diego Gas & Electric Company	Planning For Alternative Corridors Steering Committee
Tom Bialek		SDG&E	Provide program guidance on research initiatives and needs.
Tony Lindsay	847-768-0530	GTI	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the PIER Transportation Research Area
Toshio Hirota	615-725-5813	Nissan Motor Company	Provide expert input and guidance within the context of applicable legislation, policies, trends and drivers to the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center @ UC Davis.
Tracey Eden-Bishop	530-621-7668	El Dorado County Water Agency	Provide renewable technical expertise for critical project reviews during the course of the project.
Vahid Nowshiravan		Caltrans	Steering Committee - Climate Change Impacts and Vulnerability Studies
Valentino Tiangco	916-732-6795 530-304-1280	SMUD	Provide renewable technical expertise for critical project reviews during the course of the project.
Vlad Isakov	919-541-2494	EPA	Technical Advisor for Improving Understanding of Regional & Near-source Air Quality Impacts of Distributed Generation
William C. Boyer	661-763-6174	Occidental of Elk Hills, Inc.	Program Advisor for Natural Gas Program Research Needs
William Chadwick	315-432-6944	Carrier Corp	Technical Advisor to ASHRAE 62.1 Indoor Air Quality Procedure: Suitability for CA Title 24
William Wurtz		SPX Cooling Technologies, Inc.	Field Testing and CFD Modeling of Wind Effects on ACC Performance advisory committee
Woodrow VanWhy	716-857-7853	National Fuel Gas	Provide renewable technical expertise for critical project reviews during the course of the project.
Yvonne Hunter	916-658-8200	League of CA Cities	Planning For Alternative Corridors Steering Committee
Zorana Bosnic		HDK	New Buildings Institute PAC (500-08-049)

Appendix B
Meeting Dates, Agendas and Minutes

1) PIER Advisory Board Meeting
Date: January 22, 2008

Agenda
9:30 Welcome and Introductions
10:00 Charter and Purpose of the Program and Advisory Board
10:30 Overview of the PIER Program
11:30 PIER Buildings Efficiency R&D
12:15 Lunch
1:15 PIER Distributed Energy Resources R&D
2:00 Climate Change Science R&D
2:45 Break
3:00 Discussion
4:15 Public Comments
4:30 Adjourn
Part 2: Meeting Minutes

2) PIER Advisory Board Meeting
Date: May 27, 2009

Agenda

- Welcome and Introductions
- ER Program Overview & Investment Planning
- PIER Program Opportunities
    - Energy Efficiency & Demand Response
    - Renewable Energy & Advanced Electricity Generation
    - Transmission & Distribution
    - Climate & Environment
    - Transportation
- Public Comments
- Concluding Remarks

PIER Advisory Board Minutes
PIER Advisory Board
January 22, 2008
Minutes
9:30 a.m. – 12:30 p.m.

Welcome given by Commissioner Rosenfeld

Introductions from Board Members:

Art Rosenfeld

Chair of the Research and Development Committee

Paul Clanton

Executive Director of California PUC, as partners the California Public Utilities Commission is interested in supporting the California Energy Commission and the work it is doing.

Karen Lind

An energy consultant, Has over 30 years of experience in the energy field, publisher of California Onsite Generation which focuses legislative and regulatory impacts on DG and CHP, 1976 began work at the California Manufactures Association, has perspective of a large user and wants to make sure that the funds rate payer pay into the program pays dividends to the people who are actually paying the freight.

James Kelly

Southern California Edison Vice President of Engineering and Technical Services, Edison is deeply involved in Energy Efficiency and Demand Response he is deeply involved in the "Smart Grid".

William Keese

Has worked as the Chairman here at the Energy Commission, 1997 was involved in the program when it was formed, also he has experience in R&D program at the DOE and attempted to coordinate them with the state, and saw many mistakes made, and hope he can help prevent them from being made. He also works for the western governors on implementing the Schwartzenegger-Richardson Program to develop renewables and energy efficiency in the west. The goal is to have the west to be self sustained with out natural gas or oil. There are barriers and he hopes that through R&D these barriers will be overcome.

Martha Krebs

Has worked as Deputy Director for Research and Development her at he California Energy Commission for 3 years, has previous experience in energy working on the hill, then at LBNL and at the Dept. of Energy.

Arthur Rosenfeld

Former a particle physicist at UC Berkeley, a former student of Enrico Fermi, 1973 he left physics and help develop better lighting, better windows and better computer programs to help with the energy crisis. He started in hardware development and eventually drifted into Policy.

Brad Witcomb

Vice President of customer products and services at PG&E, he is in charge consumer insight, product development marketing and sales for all of their Demand side products. Feels that R&D need some breakthroughs.

Jim Shelter

SMUD, Assistant General Manager Energy Supply, SMUD currently has some R&D efforts and has worked with the Energy Commission R&D program. SMUD is looking for new technology that is the key to dealing with the future of the electric industry. Feels we need to look for solution is both supply and demand, energy efficiency, new technologies from a distributed and renewables standpoint.

Peter Miller

20 years experience looking into Energy Efficiency, sustainable energy development and climate change, mostly for NRDC. Was also involved on the Independent review Panel PIER had.

Sherif Usef

Manager of technology development for SEMPRA, their main goal is to coordinate with the utilities R&D program and PIER program, as well as all other R&D programs within the state.

Michael Shames

He the founder of a Public Interest Energy Advocate group in San Diego. He wrote an article in the Harvard Business Review in 1994 on Energy Convergence. He is very interested in new technologies, emerging technologies. He represents small business owners and residential customers.

Jane Turnbul

From the League of Women Voters in California. She chairs the energy committee for the league. She started work at PG&E's technical person in Washington D.C. Has worker in R&D Program for a number of years with Carl Wienberg and Merwin Brown. The League feels that the state isn't paying sufficient attention to is land use planning, and the impact of land use planning on energy.

California Energy Commission PIER Program Advisory Board

Opening Remarks – California in Energy Efficiency

Presentation by: Commissioner Arthur H. Rosenfeld

Questions:

Q: Brad Witcomb- We used your famous chart about the California energy consumption being flat quite often. One question I get on that is, we talk about per capata. Are you taking the total energy consumption in the state of California and dividing it by the number of people? Or is this limited to residential use.

A: Commissioner Rosenfeld- No. This is absolutely macro. It is a total send out by the utilities divided by 33 million people.

Q: Jane - How about the time lapse in terms of the investment versus the savings? Is there a measurable time lapse, or are you assuming that they are simultaneous?

A: Commissioner Rosenfeld – There is an inevitable time for stock turnover. In fact just to give you an example, in the OPEC years of 1973-1985 when prices were high and fuel economy standards were coming down, the rate at which fuel economy was coming down from 14 mile per gallon to 28 miles per gallon was 12% a year. But in fuel economy it only showed up as 5% a year because the cars last 12 years and there is this turnover time. But all these figures I gave you are real figures and don't show the much faster improvements that were made in refrigerators themselves and fuel economy themselves. Did I answer your question okay?

Q: Jane – To some extent. I am very impressed by the savings on the left hand side, and yet I know there are businesses out there that say that they don't want to put money into these kinds of investments because they're not going to payoff for a period of time.

A: Commissioner Rosenfeld- That is a slightly different question. Which is what is the payback time in a measure, for example, to commission and retrofit my building and so on. It is not a complete answer to your question. When we put a measure into new buildings standards for example, or new appliance standards, it is tradition that their cost benefit ratio life cycle must be better than 1. That corresponds at a reasonable discount rate to about 7-8 year payback time. In new buildings and new appliances, you can mandate that and people will go along. When it comes to voluntary retrofit, as you

just said, there are an awful lot of land owners, building owners and so on, who say they can't afford to wait for an eight year payback. That is where the utilities programs come in and buy down that payback and giving design assistance, and help with commissioning, and so forth.

Public Interest Energy Research

Program Advisory Board Charter

Presentation by: Martha Krebs

Questions:

Q: Brad Witcomb - What is Committee that will actually decide which projects go forward? Would be overseen by this board?

A: Martha- I will discuss the funding process in the next talk. Essentially the Energy Commission has the responsibility for administrating the program. Almost in sole for the electricity funds that come to the program and in conjunction with approval of an annual plan, by the PUC, for the natural gas program. The Energy Commission has a number of what they call policy committees. There is an RD&D Policy Committee. The RD&D Policy Committee carries out an annual budget planning process. This allocates funds on an annual basis. The staff then works with that, and brings projects through either through solicitations or sole sources back to the RD&D committee. The RD&D Committee, then after questioning will forward with recommendation projects, to the full Energy Commission. But every contract, every grant, that we put out has to be approved at an Energy Commission business meeting.

Q: Commissioner Rosenfeld: I think what Brad is asking is where this group now fits into that process?

A: Martha – The way I see it, is that Art is the Chairman of the RD&D Committee. The extent to which, he is also the Chairman of this advisory board. Your recommendations and advice will feed into the consideration of the RD&D Committee, as the staff brings forward recommendations for activity, in the budget process as well as individual projects.

C: William Keese – If the question is, should this group look at specific projects, I think the answer and recommendation is no. The PIER Program is very much stakeholder driven as to where it should go. I think it should be our job to review to say, is the Commission allocating resources in the right place. But if we get down to looking at specific projects in specific areas, I think we will be in the morass that I see at the federal level. I'll pick ethanol. Ethanol projects on the federal level are largely determined by the congressional representative for the lab or university that resides in their district, totally uncoordinated. In my mind, it is like saying in California that the legislature can build the most important bridge in their district, but we won't worry about the roads that get you

from one bridge to the other. It's a fiasco in clean coal at the federal level, and fiasco in ethanol. You don't have coordinated programs. At the Energy Commission the programs are coordinated. They go towards what the stakeholders say is important. I would like to see this group review the program the Commission put together and given them guidance as to, you are going to heavy in this you are going to heavy in that. But not get involved specific projects.

Q: Michael- Is there a roadmap that the PIER group have put together as to where they see the investment dollars for their program going over the next 3 to 5 years?

A: Martha – There are many roadmaps in PIER, partly because the breath of the program. But these roadmaps are generally identification of research opportunities, rather than a budget plan.

Q: Michael: It would be helpful for me to get a sense of where you see over the next 5 years, some of the biggest opportunities, the attention that needs to be given by the state. The emerging technologies that your stakeholders are saying are important. I think that would help us, in terms of being able to give you guidance. I couldn't find it on the web.

Q: Paul – I was wondering if there is a timeline for the work of this group. If there is for example, a particular time when the full Commission takes up PIER projects, or do they come one by one? Is there a kind of strategic plan that Commission will be setting for PIER sometime during the next year that we can feed into? I'm just wondering what I should have in my head for when I need to have gotten up to speed on everything and actually have thoughts about the over arching goal.

A: Commissioner Rosenfeld: To answer Michael's question, is there a roadmap? We cover such a diversity that a roadmap for the state is hard. We have seven teams, with names like buildings, industry, and Ag, and so on. Within those teams there are roadmaps. I think the place we are most fixable is comments by you all, about the relative size of those teams. They are about equal now.

A: Martha – Art, they are not necessarily about equal. But I think perhaps the best thing for me to do is go into my next presentation. Then, please Art, jump in and anyone else.

Q: Jim – Within fair game of what we are talking about, is not just the particular policies and programs and portfolios, but the set of practices that get there. For example, a set of practices that keep you link tightly or not so tightly with the PUC or with the ARB. That leads you to those. Presumably then that is what we are going to talk about as well. My request is that as we go forward, there is some emphasis to those things along with the discussion of just the technologies and the portfolios per se.

A: Martha – I think that is an important area where people can help. There is a lot of flux in that situation, partly with the new emphasis from the legislature on climate change, and the expectations for coordination between all the principle energy and environment

programs in the state, but also with other parts of the state government. I think that you will see that PIER has been working from the beginning on having effective relationships with the different elements with both the California Energy Commission and the state government. I thinking the expectation has been raised for PIER. And although there are other R&D programs in the state for energy and to some extent the environment, PIER is still the largest element at this moment. It may be that we'll be out done by other initiatives, but at least now we're that major source of funding. But yes, the way we can improve both the level and effectiveness of our coordination is really important.

Public Interest Energy Research Program Overview

Presented by: Martha Krebs

(01:23:00)

Questions:

SB 1250 Goals for PIER Are Solution – Focused … (slide)

Q: Jim- I want to understand how to interpret a couple of the words here. A lot of the language is to provide tangible benefits to electrify utility customers. Does that have to be in the role of electricity customers or just customers of electricity and they are getting benefits totally unrelated to their use of electricity. For example, if their automobile gets better fuel economy and has nothing to with electricity whatsoever, but people who drive cars also have light bulbs in their homes and they are electricity utility customers, so you don't have to worry about the linkage between what you are doing in electricity. So what does this mean? Which of the two interpretations is important for guiding what you do?

A: Martha- I can tell you from the perspective of the staff, the impact and feedback on the electricity and natural gas systems is something that we look at very strongly. It's more straight forward I would say when we're dealing with electric transportation, a little less straight forward on the natural gas side. On the other had, we can do good work, basically I'm going to give you an example of a project that we began in natural gas that focuses on alternatives uses on natural gas, for example biogas. Biogas used for heavy duty vehicles. I would say it is not a settled distinction and advice here would be helpful.

Q: Sherif – SB1250 talks specifically about providing tangible benefit to electric customers. What about natural gas? Is this Advisory Board also going to be responsible to look at Natural Gas program?

A: Martha – We are going to review with you natural gas activities. You know with as many pieces of legislation, it is not a perfect or completely consistent document. And so that is one of the reasons why I think it is really important to have a Board like this. To help us make these distinctions. It is our intent to review natural gas activities. And I have a couple examples in my overview. Essentially what we have done with the natural gas program, we have put natural gas funds into each of the different elements of the

program. So, our program staff are managing natural gas in an integrated and certainly a complimentary way. So it would be very hard for us to present our program without letting you see both electricity and natural gas program.

California Energy Commission Integrated Energy Policy Plan for 2007…. (Slide)

Q: Jane – In the case of the electric distribution system that Martha just referred to, those particular aspects appear to be ones where there will be more societal resistant to adoption in contrast to some of the others. Is there recognition of the need to bring society along when you're dealing with this level of sophistication?

A: Martha – I think the Commission recognizes that. One of the things Mike Gravely is going to talk about is demand response this afternoon in his talk. And that might be a better place to have some of this discussion. We are working in that area to have more understanding of human systems, so that people are ready for these kinds of advances. But I think that maybe if we talk about it with Mike, because he is also responsible for the distribution program as well as DR, that may be the place, where we can have a broader discussion.

End of presentation…

C: Commissioner Rosenfeld – I am going to make one comment. That was a very good overview. One thing I think we need to say is that we are extremely sensitive to the needs of the building and appliance standards people. So a lot of that standards that have passed or impacts which we've had on the federal standards, wouldn't have happened without the PIER support.

PIER Program Advisory Board Meeting

Buildings Energy Efficiency End-Use

Presentation by: Norm Bourassa

Questions:

CLTC – LRP : Products Available in Market … (slide)

C: Commissioner Rosenfeld – I want to make a comment. Standards and the importance of standards… the same program did an analysis a few years ago. On the amount of light that leaked upward where it didn't do any good, from parking lot lights and street lights. On the average in the United States, 16% of the light didn't go down on the ground to illuminate the cars or whatever. It just leaked up to space. Under the standards that has got to be less than 6%. Just to show you, everybody sort of takes it as a sign of civilization these wonderful NASA maps of the world. And you see the east coast and the United States illuminated, and the Nile valley… We all take that as a sign of civilization. If California has its way, California will disappear off of those maps.

A: Norm – Thanks for pointing that out. And that is included in the smart outdoor lighting aspect of this research work. I was only focusing on the energy savings. I would point out that all of these products are already included in the 08 standards.

Q: Jim - I just want to understand the limits of the lighting work. There is really in some sense two parts to it. One is that LED they are advancing really rapidly technology. The other is designing the LED into light fixtures. Are you involved in the former at all or inclusively in the latter?

A: Norm – All of the above.

Q: Jim – Okay, so with the former are you doing it through the UC or are you working with CREE?

A: Norm – We are working with them all. We just started a recent project through the Building Research Grants. The CLTC submitted a proposal for decorative residential LED lighting. They struck up collaboration with a manufacture to produce light, decorative attractive light that will be marketed at Home Depot. They have gotten a prior agreement with Home Depot. These products will actually be available with cost competitive price points. So we are working on all sides of the fence, helping them produce stuff that will actually make an impact in the market.

WCEE Western Cooling Efficiency Center … (slide)

C: Martha – Can I say something here? Because I think it is important to know that UC Davis won an award to establish an energy efficiency center form the California clean energy fund. And it is with some of that award that they establishing both some of the initial funding and the faculty positions for the director of this center.

A: Norm – Yes, and the utilities have helped with the seed funding. And the new director is Mark Madera. He has a very good track record and we area all very excited about what kind of creative work he can do in this area.

End of presentation…

No questions or comments

PIER Advisory Board Meeting

Meeting Notes

27 May 2009

Follow-up Items for Next Board Meeting

Summary of items to be considered for next Advisory Board meeting (fall 2009):

- Talk about higher level policy drivers (including IEPR discussion)
- Look at opportunities over different time scales – short, medium, and long term (out to 2050)
- Perhaps climate change should be the unifying theme for the next Advisory Board meeting
- Discuss match funding obtained for PIER programs
- Discuss royalties that have resulted from PIER projects
- Describe what fraction of PIER funding is driven by standards and other regulatory interests
- Provide information on how much of annual budget ($62.5 million) is typically available for new projects each year, and how much is typically committed as a result of past awards

Attendees

A total of 14 representatives were seated at the Advisory Board members table (horse shoe shaped arrangement). A list of attendees and invited guests is attached at the end of this summary.

Meeting Notes

- Chairman Karen Douglas started the meeting shortly after 1:00 PM. She and Commissioner James Boyd both provided brief introductory comments.
- Thom Kelly then started with PIER Overview and Investment Planning slides (15 total slides)
  - Had WebEx technical glitches and first 3 slides were not shown, but first two covered in Chairman's remarks. (Board members all had briefing books with full set of all slides).
  - A few comments that Thom made during presentation:
    - PIER funding gets on average $1.44 of match funding for every dollar of PIER funding.
    - In current year, PIER is receiving about $2 million in royalties as a result of past investments that have produced commercially available products.
    - Evolution of research from component focus to system focus to community/ network level.
    - Has potential for attracting federal stimulus funds to PIER projects.
  - Thom introduced speakers and programs that will follow:
    - Virginia Lew, Energy Efficiency (EE) & Demand Response (DR)
    - Ken Koyama, Renewable Energy (RE) and Advanced Electricity Generation

- Mike Gravely, Transmission & Distribution (T&D)
- Linda Spiegel, Climate & Environment
- Ken Koyama, Transportation

➢ Questions for Thom from Board members

- Jim Shetler (SMUD) asked if legislature dictated dollar amounts.
  - Answer: Total budget ($62.5 million) is set by legislature, but investments in particular programs are set by PIER using relevant legislative policy drivers and energy policy targets.
- Felipe Fuentes (Assembly) asked if there was room to carve out another area
  - Answer: Yes, but it is a "zero sum game." If funding in one program area is increased, then funding in other areas will need to be decreased to stay within $62.5 million.
- William Keese (Board Member) asked if federal stimulus funding numbers shown were "dream numbers".
  - Answer: PIER is planning to leverage funds to attract federal stimulus dollars. We are going after every R&D dollar we can leverage. More details will be provided in individual program discussions.

■ Virginia Lew, EE and DR

➢ Highlighted State Partnerships for Energy Efficient Demonstrations (SPEED).

➢ Mentioned data centers. Energy use doubling every 5 years. Franchise tax board reduced energy consumption 15%.

➢ Working with LBL on DR

➢ Questions

- Randy Chinn (representing Senator Padilla) asked about rationale for determining funding amount for EE and how projects were selected.
  - Thom said that CEC staffs take information to R&D Committee. The Committee spends a full 2 days reviewing opportunities at the start of each budget year. Committee then weighs opportunities and policies to select balanced portfolio.
  - Karen Douglas (CEC Chairman) added that staff provides recommendations to Committee. Committee then decides how to proceed.
  - Jim Boyd (CEC Commissioner) mentioned that R&D Committee then takes budget recommendation to full California Energy Commission (CEC) for approval.
- Randy Chinn asked about how projects are picked
  - Virginia said that key elements are:
  - CEC seeks stakeholder input and develops roadmaps that identify targeted research areas.

- CEC issues RFP's for selected technologies, reviews proposals with the R&D Committee, and Committee then balances the portfolio to get the best value for the money.

- Paul Clanon (CPUC) raised two questions and/or comments:
  - How can Advisory Board be of most value to R&D Committee? Going through projects or programs may not be the best use of time. Perhaps the Advisory Board can be used for identifying and debating more strategic issues. For example, discussing one year and five year strategic plans.
  - How are past decisions being evaluated? How is this analysis used to shape future decisions?
- Karen Douglas summarized the interests and the level of involvement of the Board as she went along and then later at the end.
- Karen Douglas asked if Thom could mention what fraction of PIER funding is driven by standards or other drivers. Need to include this information for next Advisory Board meeting.
- Peter Miller (NRDC) asked about flow of budgets over time. How much of annual budget is allocated to new projects (10%, 20%, 30%)? How much is new funding and how much is prior year funding? What percentage of PIER projects are funded on a multi-year basis?
  - Virginia mentioned that Centers are typically 3 year projects
  - Solicitations are typically done annually
  - Norm B. (CEC staff) talked about process of selecting projects, but did not provide quantitative answer to Peter Miller's question.
- William Keese talked more about process of selecting projects.

- Ken Koyama, RE and Advanced Electricity Generation
  - CHP is bread and butter for Advanced Electricity Generation
  - Talked about Solar Tracker as a notable project.
  - Mentioned need to reduce emissions for IC engines
  - Looking at improving reliability for turbines
  - For fuel cells, the barrier is reducing costs.
  - Questions
    - Mark Krusse (PG&E) asked about how environmental impacts are prioritized in the PIER program. Are more small plants better than large plants with respect to the environment? What are the environmental impacts of renewable generation (e.g., land use issues)?
      - Karen Douglas talked about CEC tool that is used to assess siting issues.
      - Karen Douglas talked about impacts on a project by project basis for evaluating large solar projects.
      - Karen Douglas talked about land use conflicts in Colorado and Sonoran deserts

- Jim Boyd commented that PIER has looked at avian issues.

- Karen revisited question from Paul Clanon on what type of Board input would be of most value. Karen indicated that input on environmental impacts from renewable energy projects one area where Advisory Board input would be valuable
- Paul DiMartini (SCE) stated that it is important to look at interactions / system dynamics. Is this area being addressed by PIER? What about information systems? There are R&D opportunities here, and what is PIER doing to tackle these issues?
- Jim Boyd talked about necessity of looking at the system ramifications of projects.
- William Keese talked about changing policy drivers. In recent history, policy objectives have been changing quickly. However, policy objectives will probably not change much in the next few years. Given the current set of policy objectives, what objectives should PIER focus on? Maybe the focus should be 20% EE. Or, maybe it should be 33% renewables.
- Karen mentioned that IEPR is another driver. For big picture questions, Karen suggested that one should consider looking at the IEPR
- Randy Chinn commented that 33% renewables is getting attention in the legislature.
- Gina Adams (Utilities and Commerce) commented on parallel and inconsistent directives from legislature. Gina said that the legislature wants the IEPR to be based on rigorous and transparent analysis. Gina said that this in-depth analysis has been missing in past IEPRs. This analysis would help policy makers reach the best decisions.
  - Karen mentioned that CEC struggles with IEPR creep.
  - Karen invited Gina to talk with her off-line about research issues. If research has not been rigorous, Karen would like to dig into this.
- Paul DiMartini said it would be helpful to have a summary of capstone projects that cut across programs (EE, DR, environmental, etc.).
- Jim Shetler talked about competing regulations between air quality, water quality, and achieving GHG reductions (AB 32).
- Jim Boyd talked about collision of different regulations. On-going problem.

- Mike Gravely, Transmission & Development
  - 3-5 rounds of grants per year. Award 30-50 grants per year.
  - Received $65 million federal co-funding for WESTCARB.
  - Talked about syncrophasors as a notable project.
  - Questions / Comments
    - Commissioner Jim Boyd said that he thought there had been great success with projects like SolFocus and ClipperWind.
    - Bill Keese asked for clarifications on budget and asked about coordination with other agencies.
      - Mike indicated that $6 to $8 million of PIER funding is being directed as co-funding for stimulus projects.

- Paul DiMartini asked about NIST standards work. Paul suggested that CEC put more effort into understanding how NIST is moving forward with standards. Lots of activity underway and moving quickly. CEC should understand national standards and be well coordinated. Paul thinks it may not be useful for CEC to launch a cyber security effort that could end up being inconsistent with national level cyber security standards.
  - Mike said that CEC is taking the lead in standards such as open Automatic DR (ADR). Open ADR was presented to NIST (and accepted).
- Randy Chinn said that Alex Padilla is a big proponent of smart grid.
- Randy Chinn asked how PIER program makes sure that CEC efforts are not duplicative (there is a statutory requirement that money not be used to duplicate work of others).
  - Mike Gravely said that there was an EPRI workshop where CEC asked what the best role for CEC in smart grid would be. Two takeaways:
    - → CEC PIER is good at bringing together stakeholders
    - → CEC PIER is good at conducting demonstrations
- Karen asked about public owned utility (POU) involvement in smart grid.
  - Mike said that CEC has been working SMUD and LADWP.

- Linda Spiegel, Climate & Environment
  - Questions
    - Karen Douglas said that she is interested in Advisory Board thoughts on the appropriate mix of environmental research
    - Randy Chinn said that he thought some of the environmental research done by PIER probably has the weakest ties with the policies that drive CEC.
    - Randy Chinn said that one reason the Climate Institute was started was to conduct research that no one else was doing.
    - Joseph Abhulimen, Division of Ratepayer Advocate, at CPUC (in audience) asked about siting tool. He wanted to know if it was a web based tool.
      - Linda said that the tool is not yet in the public domain. However, the tool will be migrated from the developer (worked with SCE) to CEC. When migrated, the tool will be in the public domain.
- Ken Koyama, Transportation
  - Mentioned PHEV Center at UC Davis as a notable project.
  - Questions
    - Karen mentioned that CEC does a lot of transportation work driven by AB 118. However, only a small part of AB 118 work is done within PIER.
    - Jim Boyd said that all PIER transportation work needs to have a clear connection to ratepayer funding.

- Paul Clanon asked about how PHEVs fit into smart grid and other cross cutting activities?
  - Ken said that PHEV Center will tackle a lot of these issues.
  - Jim Boyd said that there has been a lot discussion about V2G and V2H (vehicle to home). V2G depends on development of smart grid, and V2H is probably a nearer term option.
- Phil talked about home energy appliance (common battery used in vehicle and in home).
- Paul Clanon said that he thought V2H and V2G is an area where PIER can get the greatest bang for the buck.
- Paul DiMartini thought distribution system impacts are important. Paul said that SCE has a medium market penetration scenario that forecasts one million PHEVs on the road by 2020.

- Discussion
  - Following the five program presentations, Karen went around the table and asked for comments from Board members.
    - Bill Keese asked about big picture risks. For example, is $62.5 million budget at risk?
    - Bill also asked about how stimulus funds would impact PIER program. If a lot of federal money is won, can PIER staff get the work done?
    - Randy Chinn said that he has heard of no talk about taking PIER funds. However, there are no guarantees.
    - Gina Adams suggested that current budget is probably going to stay the same through current funding cycle. Reauthorization is required for 2012, and reauthorization could result in a budget change. Gina encouraged PIER to go after federal stimulus funding.
    - Randy Chinn said that it is important to use PIER funding to help the maximum number of people in California.
    - Karen wants to have agenda item on next meeting that talks about how much funding is used in state versus out of state.
    - Martha Krebs said that there is a state mandate to give preference to California companies. Mandate is followed by PIER, and this has been their priority.
    - Paul Clanon suggested that PIER should go back to square one and use leveraging as the primary goal for funding
      - Get as much federal money as possible (ARRA)
      - Leverage private dollars (PHEVs)
      - Impact California as much as possible. For example, create green jobs.
    - Karen cautioned that chasing someone else's research agenda to maximum leverage would lead to PIER program abandoning its own research agenda.
    - Randy Chinn agreed it is a balancing act.

- Board members were asked whether staff initiatives are headed in the right direction?
  - Paul Clanon said no. Go back to square one and use leveraging as the primary mode of selecting where to place PIER funding.
  - Randy Chinn said he did not know.
  - Jim Shetler said he did not know. Intrigued by leveraging concept. But did not think it should be primary driver. Suggested that this could be a topic for debate at the next meeting. He suggested that climate change is the most important topic that needs to be addressed. What about 2050? Jim suggested that it might be good to talk about vision at the next meeting.
  - Mark Krusse talked about following policy.
  - Jeff Reed said that total systems analysis is important. He thought that shift towards T&D issues (like smart grid) is good. Suggested that a gap analysis would be helpful in determining where PIER fits in.
  - Gina Adams endorsed systems issues. She said that she is coming to the conclusion that central power plants with long transmission lines may not be the best way to go. Gina liked the T&D implementation initiatives.
  - Paul DiMartini thinks that program is generally heading in the right direction. Struggle with huge amount of investment required to re-build the grid. Suggested that cost studies need to be done to understand cost implications.
  - William Keese thinks that programs are generally headed in the right direction. Definitely go get federal stimulus funding. Climate, PHEVs, and smart grid.

- Next Steps
  - Karen suggested that that Fall 2009 Advisory Board Meeting be organized as follows:
    - Talk about higher level policy drivers (including IEPR discussion).
    - Look at opportunities over different time scales – short, medium, and long term (out to 2050).
    - Perhaps climate change should be the unifying meeting theme.
  - Jim Boyd
    - Suggested that next meeting should include discussion of IEPR.
- Public Comments – none
- Meeting adjourned near 5:00 PM.

List of Meeting Attendees

Advisory Board Members

Name			Affiliation	Attendance
Title	First	Last		(27 May 2009 Mtng)
Honorable	Mike	Feuer	California State Assembly	
Honorable	Felipe	Fuentes	California State Assembly	Yes
Honorable	Alan	Lowenthal	California State Senate	
Honorable	Alex	Padilla	California State Senate	Yes – Randy Chinn for
Honorable	Ira	Ruskin	California State Assembly	
Honorable	Joe	Simitian	California State Senate	Yes – Alan Gordon for
Chairman	Karen	Douglas	Chairman, CEC	Yes
Commissioner	James	Boyd	Commissioner, CEC	Yes
	Tony	Brunello	Resources Agency	
	Paul	Clanon	CPUC	Yes
	Paul	DiMartini	Southern California Edison	Yes
	Peter	Gleick	Pacific Institute	
	William	Keese	Board Member	Yes
	Chuck	King	CAISO	
	Mark	Krusse	Pacific Gas & Electric	Yes
	Karen	Lindh	Board Member	
	Peter	Miller	NRDC	Yes
	Mary	Nichols	Chairman, CARB	
	Jim	Shetler	SMUD	Yes
	Hal	Snyder	Southern California Gas	Yes – Jeff Reed for Sempra
	James	Sweeney	Stanford University	
	Eileen	Tutt	Cal EPA	

Other Invited Attendees

Name			Affiliation	Attendance
Title	First	Last		(27 May 2009 Mtng)
	Gina	Adams	Utilities and Commerce	Yes – at table
	Keali'i	Bright	Budget Analyst	
	Lawrence	Lingbloom	Natural Resources Committee	
	Kip	Lipper	Policy Unit of the Senate	
	Edward	Randolph	U&C	
	Tiffany	Roberts	LAO	Yes – at table
	Seija	Virtanen	Budget Fiscal and Review	
	Cherif	Youssef	Southern California Gas	Yes – in audience

Appendix C
Documentation from Outside Sources that Support the Position of Reauthorizing PIER

Plug-ins going for a spin

100 Northern California households to put modified Priuses through their paces

Michael Taylor, San Francisco Chronicle Staff Writer

Wednesday, October 31, 2007

http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/10/31/BAUIT3FBN.DTL

(10-31) 04:00 PDT **Davis** --

One hundred Northern California households will be given the use of experimental, plug-in hybrid cars next year in the first widespread consumer testing of the super-high-mileage vehicles in the nation, under a program announced Tuesday by UC Davis transit planners and an auto club.

The households, to be chosen from the ranks of more than 4 million members of AAA of Northern California, will each have an eight-week loan of a Toyota Prius converted to run on batteries that are twice as powerful as those originally installed by the automaker.

The cars can easily get 100 miles per gallon on their combined power from electric motors and gasoline engines. They also spew out far fewer environment-harming emissions than even conventional hybrid cars.

"This is the first large consumer study of plug-in hybrids," said Tom Turrentine, director of the Plug-In Hybrid Center at the UC Davis Institute of Transportation Studies. "We're the advance guard of putting a lot of these (cars) in households." The program is scheduled to start in the spring of 2008.

Plug-in hybrids are in their infancy - perhaps 50 of them are in fleets maintained by utility companies, universities and other organizations - and so far there has been no large testing of how they work in everyday use.

Normal hybrids use a combination of electric and gasoline power to eke out better mileage than gasoline-only cars, largely by having the electric motor take over in situations where the car does not require much power, such as crawling down a city street or in a freeway traffic jam. The electric power is created by on-board generators and regenerative braking, freeing the car from the leash of a power cord and hours of recharging that purely electric cars required.

Plug-in advocates say the converted hybrids constitute the best of all worlds: By equipping the car with more powerful batteries and then letting them recharge overnight, the next day's journey can be done mostly on electric power, saving the car's gasoline engine for more stressful situations such as zooming onto a freeway or for long-distance travel.

The downside of plug-in hybrids, critics say, is that the converted cars, by using household electricity for daily recharging, are simply sucking more energy from the already polluting coal-fired power grid, and that in the long run this is just as bad for the environment as having a gasoline-only car.

Turrentine conceded that the United States "should clean up its coal-fired plants," but said that in states such as California, which gets much of its power from cleaner sources such as hydroelectric plants, plug-in hybrids will only help.

The 10 Priuses to be used in the test are being turned into plug-ins by Pat's Garage, a San Francisco firm that has been doing such conversions for several years. Each car costs about $15,000 to convert. The program is being funded by the California Energy Commission and the state Air Resources Board.

Driving a plug-in Prius is much like driving a normal one. The major difference is that the car is more silent than a conventional hybrid because its electric motor is whirring away far more often than the gasoline engine.

"We're going to be interviewing households every week," Turrentine said. "We want to know how people respond to the car. Are they excited because it is cheaper (to operate)? Are they excited because they are saving the world?"

The guidelines for choosing test households are pretty simple: The program is seeking people who have a garage, carport or parking place with a nearby 110-volt outlet and who will not only be willing to plug in their hybrids every night but will remember to do it. Turrentine also said they will be seeking people with daily roundtrip commutes from 20 to about 120 miles.

He said the type of households chosen for the plug-in exercise will have different lifestyles - "it could range from a typical American family to a young urban dweller to a retired couple living in Tahoe."

UC Davis officials said AAA plans to select program participants from the association's member rolls, rather than open it up to volunteers.

AAA senior vice president Alexandra Morehouse said her organization got involved because "our members are overwhelmingly interested in alternative-fuel vehicles. Our mission (in this program) is to get people to think, 'I could drive a plug-in hybrid electric vehicle. It's not that different, and it could be part of my life.' "

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This article appeared on page **B - 1** of the San Francisco Chronicle

Read more: http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/10/31/BAUIT3FBN.DTL#ixzz0mL8szdeD

To PHEV or Not To PHEV (At Least in the Near-Term)

17 February 2008

http://www.greencarcongress.com/2008/02/to-phev-or-not.html

Two of the consistent threads in the discussions and presentations of the 2008 SAE Hybrid Vehicle Technology Symposium last week in San Diego were (a) explorations of the near- to -medium-term technical viability of plug-in hybrid electric vehicles (PHEVs)—which mainly (although not entirely) means the viability of the lithium-ion battery technology—and (b) the desirability of pursuing PHEVs now, versus alternatives such as focusing on broadening the conventional HEV market and treating PHEVs as a longer range solution.

Looming over both threads was the question of market demand and behavior: would a sufficient number of consumers buy PHEVs to make the effort required to develop and to produce them financially and environmentally worthwhile?

On the OEM side, the most forceful proponent of a plug-in approach was GM, as Pete Savagian, Engineering Director, Hybrid Powertrain Systems Organization, outlined some of the market rationale driving GM's decision to push hard on the Volt Extended Range Electric Vehicle (E-REV), as well as describing some of the company's recent analysis of real-world benefits. (Earlier post.)

Although both Chrysler and Ford have PHEV trial projects underway (the Sprinter PHEV for Chrysler and a plug-in version of the Escape hybrid for Ford), their presentations reflected the lower level of shorter-term commercialization commitment those companies currently have made to the plug-in platform, compared to GM.

In his presentation outlining Ford's next-generation hybrids (earlier post), Sherif Marakby, Ford's Chief Engineer for Sustainable Mobility Technologies, said that PHEVs represent a potential opportunity to reduce petroleum fuel consumption, essentially buying society time by closing the gap until more advanced technologies and renewable fuels become readily available.

Ford is collaborating with Southern California Edison a set of research Escape PHEVs. The Escape PHEV is based on a 10kWh Li-ion battery pack developed in partnership with Johnson Controls-Saft (earlier post), and are getting as much as 120 mpg in testing, according to Marakby. The Escape PHEV powertrain operates in three distinct modes: electric drive (ED) mode, blended mode (a combination of engine operation and charge-depleting electric drive), and conventional hybrid mode. Ford and SCE are also exploring V2G applications of the PHEV platform.

Chrysler's Gary Oshnock, Environmental and Energy Planning, while spending more time describing his company's upcoming two-mode hybrid, noted that the test fleet of

Sprinter PHEVs will give Chrysler the opportunity to develop lithium-ion battery technology which will complement its future hybrid, fuel cell and pure electric systems.

In his presentation describing Nissan's work with its next-generation lithium-ion batteries (earlier post), Toshio Hirota noted that the company sees plug-in hybrids as a potential mechanism to reduce CO_2 output in the shorter term, but that it has concerns that include battery cost, market demand, and the CO_2 intensity of electricity.

None of the three more engineering-oriented presentations from Honda or Toyota dealt with the PHEV topic. Toyota described the evolution of its motor design as implemented in the Lexus LS600h and LS600hL luxury hybrid transmission. Honda described its model-based approach to hybrid-electric vehicle design, as well as a concept Rankine-cycle system coupled with a hybrid drive. (Earlier post.)

However, John German, Manager of Environmental and Energy Analysis for Honda and one of the organizers of the SAE symposium, took an unscheduled opportunity to present a few slides calling into question the near-term benefit of plug-ins.

While acknowledging that "*plug-ins are likely to be one of the alternatives to fossil fuels*," German said that given the projected near-term economics, a premature focus on plug-ins might deliver less benefit than focusing on expanding the market share of conventional hybrids. In his remarks, German referenced economic payback analysis from the American Council for an Energy Efficient Economy (ACEEE), as well as a detailed May 2007 study by Matthew Kromer and John B. Heywood at MIT on the prospects for electric powertrains in the US.

The plug-in hybrid offers a striking opportunity to reduce petroleum consumption to a level half of that offered by the hybrid vehicle. In addition, while the plug-in hybrid's business-as-usual GHG emissions do not project a significant benefit, they offer a continuous path for incremental improvement through decreased carbonization of the power sector—an opportunity that does not exist for the hybrid vehicle.

...At the same time, the PHEV is a less cost-effective way to reduce petroleum and greenhouse gas emissions than the hybrid (particularly in the near-term); and, due to its higher upfront cost, it will have a harder time penetrating the market. The plug-in hybrid also faces greater technical and infrastructure risk than the HEV: while the hybrid has already enjoyed market success, the plug-in hybrid still requires significant improvements in battery technology to meet the rigors of an automotive duty cycle. And while the infrastructure for supporting hybrid vehicles is already mature, deploying the plug-in hybrid at scale will require regulation to ensure that off-peak generation capacity is used; depending on geography, it could also require capacity expansion. While the infrastructure issues represent a relatively low barrier to deployment, the technical challenges will delay the time-to-market for the plug-in hybrid.

Taken together, the long time to market penetration and the lower cost-effectiveness of the plug-in hybrid suggest that the HEV offers a higher leverage, lower-cost path to reducing petroleum and GHG emissions in the near-term. However, given the upper bound on the HEV's effectiveness, the plug-in hybrid offers a mid- to long-term path to continued reductions.

—Kromer and Heywood (2007)

At the conference, Menahem Anderman of Total Battery Consulting would develop aspects of that argument more fully in his presentation on prospects for the lithium-ion battery market.

Anderman, a consultant to the automotive energy storage industry who also organizes the annual Advanced Automotive Battery and Ultracapacitor Conference, publishes an annual report on the industry. The 2008 report will be published later this year, but Anderman presented some updated results on the 2007 report.

Based on his interviews with automakers, integrators and cell and battery pack developers, he anticipates the entire market for hybrids to hit about 1.1 million units in 2010, with about 750,000 of those being from Toyota. Those HEVs will predominantly use NiMH packs, with Panasonic EV being the dominant provider, and Sanyo in the number two position.

The lithium-ion battery market, by contrast, is much more volatile, and still faces a technology shake-out in terms of cathode and anode chemistries, cell design and packaging, manufacturing, safety and cost. There are more than 20 providers who say they expect to be in the market in 5 years, according to Anderman.

If I believed what everyone says about the viability of other cathodes [than their own], there would never be a lithium-ion automotive battery.

—Menahem Anderman

Anderman projects that lithium-ion cells batteries will represent a market of about $300M by 2012, and begin their ramp-up in 2013. That means, he noted, a major shift to Li-ion for hybrid platforms around 2014. Lithium-ion will be the preferred technology for hybrids "*at some point in the future*," he said.

However, a PHEV, he said, due to the requirements of battery size, drive system and vehicle design, is too expensive for the value. Anderman projected a cost of $600/kWh for the pack. (In an earlier presentation, Ric Fulop from A123Systems projected $500/kWh.) "*I don't like it, but it is. Not liking it will not solve the problem.*"

The environmental and societal benefit in moving from HEVs to PHEVs is smaller than that of moving from conventional vehicles to HEVs, but there is a much larger negative

impact on consumer value. In moving from a PHEV to fuel cell HEVs, there is no additional benefit—and maybe even less. But the negative impact on consumer value is much higher. With battery electric vehicles, there is more benefit, but also more negative impact. The PHEV may be a long term solution.

—Menahem Anderman

Anderman's current take is that PHEVs are unlikely to reach commercial volumes in the next seven years, and that while it is not ready for commercial introduction now, the business risk in pursuing the platform now is "*tremendous*".

PHEVs are, however, he noted, considerably more realistic than fuel cell vehicles in the 10-20 year timeframe. In the longer term—assuming much higher cost of fuel or government policies—a PHEV in a blended control strategy could become attractive.

PHEVs are a detour and not a step forward, Anderman said, if:

- For the sake of the PHEV, car and battery companies dilute their efforts to expand conventional HEVs and to introduce li-ion batteries into the market;
- If governments miss the opportunity to provide incentives for conventional HEVs, "*the only electrified vehicle technology that can make an impact on the environment in the next 10 years*" and
- If the PHEV is rushed to market by bypassing prudent automotive engineering design, verification, qualification and supplier management standards.

PHEVs are a step forward, he said, if fuel cell vehicle development resources are redirected toward PHEVS.

Anderman's conclusions about the economic viability of PHEVs were vigorously questioned by Dr. Mark Duvall from EPRI (Electric Power Research Institute), who had just preceded Anderman on the dais with a presentation on the impact of PHEVs on emissions and on the utility industry.

I'm gratified to see $600/kWh cost figure. At $600/kWh there are many highly likely near-term scenarios where PHEVs can pay back. What I'm saying is that we did a cost study, we think it's credible...and it disagrees dramatically with you...There is greater leeway to discuss this. We can't assume the negative impact on consumer value. We have to look at entire value equation of the vehicle.

—Mark Duvall

The transportation sector has to do much more than plug-ins, Duvall noted. His most optimistic projections show plug-ins pulling up to 500 million tons of GHG out of the sector. "*The transportation sector has to do way more.*" Noting that HEVs would only

deliver a very small portion of the total reduction required, Duvall said that to say we should develop the HEV market fully and then pursue other avenues wasn't viable.

In one of the opening presentations of the symposium, Tom Turrentine, an anthropologist with the PHEV Research Center at the University of California Davis presented his research that indicates that contrary to what some in the auto industry may think, consumers tend not to calculate paybacks.

Consumers don't calculate paybacks, but they want better mpg. The dual fuel nature of the PHEV is a primary market feature for consumers...they can choose. It's the meanings which motivate buyers. Motivation is driven by emotions.

—Tom Turrentine

For its part, the California Air Resources Board (ARB) has a number of initiatives under way to support a more rapid development and deployment of PHEVs, as ARB's Craig Childers described in his presentation:

- In the more immediate term, the $1.6M Alternative Fuel Vehicle Incentive Program (AFVIP) provides grants of up to $5,000 to qualified individuals, businesses, public agencies and entities, and non-profit organizations that purchase or lease an eligible AFV. PHEV drivers will receive the full $5,000, although the PHEV must be ARB-certified and have at least a 10-mile equivalent all-electric range. PHEVs are the only flexible-fuel vehicle that qualify; conventional hybrids do not.
- California's AB 118, signed into law in October 2007, is a seven-year program funded by vehicle license fees that will provide around $205 million each year to be applied in clean air, fuel and vehicle technology.
- And ARB staff has proposed amending the Zero Emission Vehicle (ZEV) regulations to create a "New Path" that would provide a strong incentive for the development and deployment of PHEVs in the period from 2012-2017). (Earlier post.)

After a presentation by Lee Slezak from the Department of Energy that outlined the breadth of the DOE support activities for the development of PHEVs—development research on power electronics and electric machines (PEEM), research on energy storage, modeling & simulation, and testing & validation—Michael Duoba from Argonne National Laboratory (ANL) provided a more detailed update on the development of revised SAE J1711 test procedures—used to measure the exhaust emissions and fuel economy of HEVs—to accommodate PHEVs.

Test procedures are not something you think about at the end of a development project. You need to think about it in the beginning. PHEVs are significantly different from the conventional and hybrid vehicles and thus require a new testing paradigm. Since OEMs

have announced production PHEV plans, the need for a revised J1711 has become urgent.

—Michael Duoba

ANL PHEV testing is supporting the J1711 development—and also helps the fine-tuning of PHEV systems development as well. A slide used by Ric Fulop in his presentation used data provided by Duoba and his lab showing the progression of three-generations of the Hymotion PHEV conversion pack as it went through successive tweaks to address successfully the emissions issue caused by the conversion. (Earlier post.)

Duoba also noted that ANL has made public basic data from the dynamometer testing of hybrids and PHEVs via the Downloadable Dynamometer Database “D3.”

Resources

- Matthew A. Kromer and John B. Heywood (2007) Electric Powertrains: Opportunities and Challenges in the US Light-Duty Vehicle Fleet (LFEE 2007-03 RP)

Slide Show: Hybrid Trucks Are Here for the Long (Medium and Short) Haul

An explosion in the number and kind of commercially available hybrid trucks means battery power isn't just for lightweight commuter vehicles anymore

By Christopher Mims, April 20, 2009

http://www.scientificamerican.com/article.cfm?id=hybrid-trucks

This year, according to the Hybrid Truck Users Forum, manufacturers will sell more than 5,000 hybrid trucks, compared with fewer than 200 just three years ago. These vehicles range from medium-duty package delivery vans to cherry-pickers, garbage trucks and even massive "18-wheelers" used for long-haul shipping.

Slide Show: Hybrid Trucks

Hybrid trucks use 20 to 50 percent less diesel than conventional vehicles do, depending on how they're used, and that adds up: FedEx calculated that its fleet of 170 hybrid–electric trucks has racked up 3.5 million miles (5.6 million kilometers) of service. The 200 hybrid trucks United Parcel Service (UPS) will add to its fleet later this year are expected to save 176,000 gallons (665,000 liters) of fuel per year, which is the equivalent of taking 100 conventional package delivery trucks off the road. Coca-Cola Enterprises is the most avid consumer of hybrid trucks in the U.S., deploying 327 hybrids out of a total fleet of 30,000.

Depending on how its driven, a typical medium-duty hybrid delivery truck from Peterbilt will average 12 miles per gallon (5.1 kilometers per liter), versus nine mpg (3.8 kpl) for the conventional version of the same truck, according to Peterbilt. The largest trucks on the road average six mpg (2.5 kpl), so the increase to eight mpg (3.4 kpl) achieved by Peterbilt's hybrid technology is significant.

As conventional hybrids go mainstream, researchers including Andrew Frank, a professor of mechanical engineering at the University of California, Davis, and lead engineer at Efficient Drivetrains, Inc., are already working on what comes next: plug-in hybrids that can be charged overnight or at intelligent charging stations. (Plug-ins carry more batteries than conventional hybrids do, and so can go some distance on electricity alone; intelligent charging stations allow for quick recharges.), With his team, he is building a medium-duty plug-in hybrid delivery truck for the U.S. military. With conventional hybrids, he notes, "We might improve efficiency 20 to 30 percent. [But with plug-ins] we could conceivably displace 90 percent of [the] fuel used by conventional vehicles."

The transition to hybrids and plug-in hybrids will only happen if these trucks come down in price, says Mark Duvall, director of electric transport at the Electric Power Research Institute (EPRI). Buyers typically pay a premium of between 30 and 60 percent above

the price of a conventional truck for its hybrid version. For example, hybrid utility trucks used by Florida Power and Light Co. (FPL) cost $175,000, compared with around $115,000 for a conventional version.

Lee Slezak, a vehicle technology analysis and evaluation manager at the U.S. Department of Energy (DoE), says that one reason hybrids are expensive is that manufacturers simply aren't making enough of them. Eaton Corp., which is the nation's largest manufacturer of hybrid truck power trains, would have to produce between 5,000 and 10,000 trucks annually for these vehicles to be cheap enough for them to make sense economically for a majority of fleet operators, Kevin Beaty, hybrid business unit manager for Eaton, told *Fleet Owner* magazine.

Eaton expects to sell 2,000 power trains this year, says Dimitri Kazarinoff, general manager of emerging technologies at Eaton—quadruple what it sold last year. Government incentives are helping, Kazarinoff says, including $156 million in grants from the National Clean Diesel Funding Assistance Program (part of the American Recovery and Reinvestment Act of 2009), which will pay for 25 percent of the price of a new hybrid truck. (Because of the way the law works, however, almost all of the vehicles eligible for this credit are still going to be more expensive than conventional trucks.)

Even without economic incentives, some classes of trucks benefit more than others from hybridization and can pay for themselves with reduced fuel consumption in eight to 10 years, EPRI's Duvall says. (The payback was even quicker last year when diesel fuel peaked at $4 per gallon, before failing back to a little more than $2 per gallon today.) Utility vehicles, commonly known as cherry-pickers or bucket trucks, are a best-case scenario because they spend so much of the day idling in order to power their lifts, according to Dahlia Garas, program manager at the Plug-In Hybrid Electric Vehicle Research Center at U.C. Davis.

George Survant manages a fleet of 300 hybrid vehicles for FPL, 60 of which are medium-duty hybrid utility trucks. "A conventional truck will burn 1.9 gallons, [or 7.2 liters, of diesel fuel] an hour, and our hybrid trucks burn about a gallon [3.8 liters] an hour," Survant says.

Unlike passenger vehicles or long-haul trucks, a conventional utility truck spends on average half of every workday idling to power its bucket and other electronics. Survant's trucks, which were built by Navistar International Corp. using Eaton power trains, can run their bucket lifts for up to two hours on the electricity stored in their batteries.

Trucks that spend their days stopping and starting, such as garbage trucks, also see a significant benefit from hybridization. "In refuse applications...you're accelerating from house to house and slamming on [the] brakes to cover a lot of houses," Kazarinoff says. Package delivery trucks have similar "duty cycles," which is why in 2006 UPS partnered with the U.S. Environmental Protection Agency (EPA) and Eaton to develop an

innovative "hydraulic hybrid" that stores energy recovered from braking as a pressurized fluid rather than as electricity.

Peterbilt has deployed 14 hydraulic hybrid refuse trucks that use the energy recovered from braking as a "launch assist" to accelerate them faster than conventional vehicles. Peterbilt says this makes these vehicles both more fuel-efficient and productive because they can go from one stop to the next more quickly. In the next five years, hybrid vehicles of every kind will benefit from innovations in almost every component of their power trains—from batteries to motors, says Steven Boyd, a technology development manager at the DoE.

"In a future time when there [are] lots of [options for consumers] and batteries are less expensive, you could ultimately make the case for hybridizing almost every type of vehicle," industry veteran Duvall says.

As fleet operators buy more hybrid trucks, their prices will come down, he notes. Because hybrid trucks use less diesel, they make fleet operators less vulnerable to swings in the price of fuel.

"The model that we've used in the past as fleet operators—to wait and see what the market brings us, and wait and see what the government requires us to do—is frankly not a viable alternative in today's world," FPL's Survant says. "We can't afford to have the lassitude we've had historically.... I think we need an increased sense of urgency."

MSN Exhaust Notes: In New Jersey, BMW's Green Day

Electric MINIs and Rolls-Royces make for an odd couple under BMW's roof

Posted by Lawrence Ulrich on Wednesday, November 11, 2009 9:13 AM

http://editorial.autos.msn.com/blogs/autosblogpost.aspx?post=1376085

More than a decade after the first hybrids arrived, fewer than 30 percent of Americans understand that current hybrids run entirely on gasoline. Those consumer blind spots are among the insights of an ongoing hybrid car study by the Institute for Transportation Studies at the University of California at Davis, in partnership with BMW. The $2 million study was highlighted at BMW's North American headquarters in New Jersey, where the carmaker outlined its suite of alternative-fuel technologies, from clean diesels to the electric MINI Cooper E's parked out front. At the richer end of the spectrum, BMW's Rolls-Royce division showed off the new Ghost, the V-12 luxury sedan whose chassis and other key components are derived from the latest BMW 760iL. (Lacking any electric car of their own, apparently Rolls-Royce executives needed something else to plug).

The UC Davis study has put converted, plug-in Toyota Prius hybrids in the hands of about 60 households in the Sacramento area, with owners completing driving diaries and allowing researchers to track their driving habits during the short-term loans.

Dahlia Garas of UC Davis said that America's car culture, which historically judged a car strictly by how much horsepower it cranked up, is changing. Hybrid drivers enjoy showing off the technology and gadgetry of their hybrids. They also find a sense of power and independence from their cars: A hybrid lets them think they're "sticking it to the Saudis."

Some study participants noted that their air-quality concerns were as much local as global, especially in places like California. "One grandmother who drives her grandchild said she likes not polluting near her school," Garas said.

The study suggests that to succeed in the marketplace, hybrids need a distinctive styling identity -- such as is the case with the Prius -- and useful real-time displays that help drivers boost mileage and encourage green driving. Hybrid drivers in a household often compete to see who can get the best mileage, Garas said. And with plug-ins like the Chevy Volt on the horizon, consumers need a realistic, easy-to-grasp measurement of the car's energy consumption, an area where the traditional miles per gallon falls short.

Released from the "BMW University" classroom sessions, journalists took spins in both the MINI E and the somewhat dubiously green BMW X6 ActiveHybrid, which combines a twin-turbo 4.4-liter V8 engine with the 2-mode hybrid system that BMW jointly

developed with General Motors and Mercedes. The X6 hybrid manages just 18 mpg in combined city/highway driving, or 3 mpg better than the conventional V8 version. But the X6 is quite fast, if that's any consolation.

As for the MINI E, BMW has a test fleet of 450 cars in the hands of company-chosen consumers in New York, New Jersey and Los Angeles. The car can run roughly 80 miles on a charge, and recharges in three hours on 240-volt current -- but takes more than 20 hours on a household plug.

One journalist nearly ran out of juice on a drive down the nearby Garden State Parkway, coasting home with the car's power gauge displaying a big zero. And the near-stranding of the MINI E highlighted the major obstacle to the adoption of electric cars (beside high costs, unfamiliar technology and unproven durability): The lack of a handy, widespread recharging infrastructure, especially for urban apartment dwellers who don't have a garage. That's why many experts see plug-in hybrids, whose supplementary gas engines give them the coast-to-coast driving ability of conventional cars, as the middle step on the way to full EVs.

EV proponents say those infrastructure hurdles can eventually be addressed, and they'll have to be: When you're stuck on the side of the road in an EV, even a long walk and a gas can won't bail you out.

The oceans: The world's energy frontier?

Against a backdrop of peak oil, climate change and ocean acidification Jonathan Trent, lead researcher and scientist on NASA's OMEGA Project, takes an optimistic view of the future, focusing on what can be done using an innovative approach to replacing fossil fuels with carbon neutral, and sustainable biofuels.

Plants produce copious amounts of oil, and refining methods for transforming vegetable oils into fuels have been known since well before fossil forms of oil took over. Soybeans, for example, produce oil with a yield of approximately 50 gal/acre/year, while some species of palm produce 600 gal/acre/yr. The best oil producers are among the microalgae, which produce between 2,000 and 5,000 gal/acre/year.

Unfortunately, oil-producing plants in general, and algae in particular, cannot be cultivated on scales that make their oil economically competitive with fossil oil without significantly competing against agriculture for land, water, and fertilizer.[1] It has been suggested that this can be solved by growing algae in deserts or other remote sites using seawater and municipal wastewater and for these and other reasons, it is argued, that of all the oil-producing plants, only algae are practical for biofuels.[2]

Typically, algae are grown in shallow ponds called "raceways" or in enclosures known as photobioreactors (PBRs). Ponds can be excavated in deserts and PBRs can be set up almost anywhere. So what is the hold up? Why aren't algae the primary source of biofuels?

As is often the case, the devil is in the details. For example, if raceways and PBRs are set up in remote locations that do not compete with agriculture, it's not trivial to transport the required water, wastewater, and CO_2; and where will the harvested algae be processed? It is possible to pump, truck, or ship water, compressed gas, or the dried algae from one place to another, but all this requires energy — a lot of energy.[3] In addition, raceways are open to the air, which means there is an issue with evaporation. It is estimated that to replace the evaporated water and maintain appropriate salinities for growing marine algae on a scale relevant to biofuels would take trillions of gallons of freshwater — this competes with agriculture.

Evaporation may not be a problem for PBRs, which can be closed and sealed chambers. But algae require light and if the light comes from the sun, there is also heat. Sealed PBRs are functionally solar-thermal collectors and to maintain temperatures suitable for growing algae, they need to be cooled. It is possible to use evaporative cooling, but using freshwater for evaporative cooling again competes with agriculture, and pumping cooling water requires energy. PBRs already use a lot of energy for mixing and circulating algae cultures. Indeed, the energy involved in operating costs and the materials used for PBRs, make them prohibitively expensive for biofuels' production.

Algae seem to have great potential, but growing algae in raceways or in standard PBRs on a large enough scale to produce biofuels at a cost that can compete with fossil fuels remains an elusive challenge. Would it be possible to grow oil-producing microalgae without competing with agriculture for land, freshwater, or fertilizer, without pumping water great distances, and in a way that benefits the environment?

What about OMEGA (Offshore Membrane Enclosures for Growing Algae)?

The OMEGA system consists of individual modules that are closed photo-bioreactors made of inexpensive clear, flexible plastic with inserts of semi-permeable forward osmosis (FO) membranes. The modules are filled at coastal outfalls of domestic wastewater and towed off to incubation areas: "OMEGA farms." Each OMEGA module floats just beneath the sea surface. The algae absorb sunlight, but unlike PBRs on land, which have problems with heat and energy use, OMEGA modules transfer heat to the surrounding seawater, while mixing and circulating the algae is done using wave energy. The OMEGA system also uses buoyancy, gravity, and osmosis. Gas-filled bladders in the OMEGA structure maintain buoyancy and diffuse CO_2 into the culture through gas-permeable membranes. Water-filled bladders adjust the buoyancy and provide structural stability. Patches of FO membranes on the bottom of the plastic enclosures allow water to diffuse out into the surrounding saltwater. This process is driven by the salt gradient and during an incubation period of 10-20 days, >85% of the bulk water can be removed. The FO process stimulates algal growth by concentrating nutrients in the wastewater and assists in harvesting by initiating dewatering of the algae. Furthermore, the water passing through the FO membrane is clean (bacteria, viruses, and pollutants do not pass FO). This will help remediate dead zones in polluted coastal areas.

Each OMEGA module floats just beneath the sea's surface. The white squares in this polyethylene prototype, small scale OMEGA are forward osmosis membranes (Photo: Jonathan Trent/NASA Ames Research)

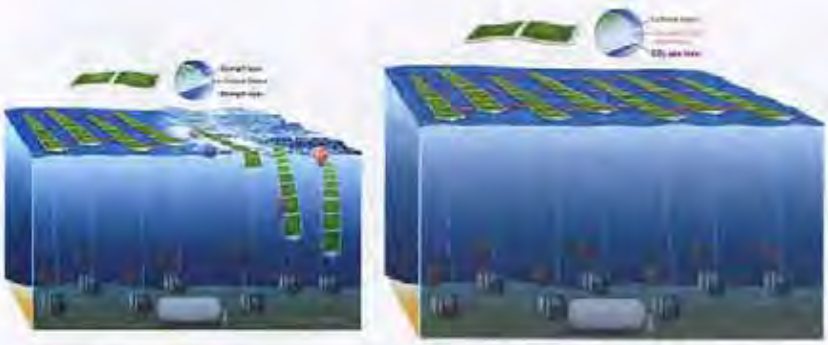
Location, location, location

OMEGA farms will be located in marine (salty) environment in the vicinity of a source of nutrient-rich freshwater and a source of CO_2, such as a coastal power plant. Other conditions, including temperatures, light, water clarity, frequency and severity of storms, geography, boat traffic, wildlife conservation, will all influence how the OMEGA farm will be configured and what algae will be cultivated. The plan is to cultivate only freshwater algae and to use wastewater that meets regulations for release into the marine environment. Therefore, if an OMEGA system accidentally leaks, the algae will be unable to survive and wastewater will have acceptable impact on marine ecosystem, at least by today's standards.

To accommodate sea birds and marine mammals, the OMEGA modules in a farm will be separated. This also allows light to penetrate into the water column between the modules. The number of OMEGA modules in a farm will depend on the location, shipping lanes and the amount of wastewater to be processed in a given location.

Obviously, OMEGA farms will be easier to build in protected bays, in areas surrounded by floating or otherwise constructed breakwaters, or in places with existing marine infrastructure such as offshore oil platforms or wind farms. In the case of wind farms, OMEGA farms would use the infrastructure for anchorage and organization and could

In addition to FO for partial dewatering, harvesting the algae from an OMEGA module can take advantage of buoyancy, wave power, and gravity. One scenario uses a float rolling under a module, pushing the algae slurry into a collection barge, where the dewatering process continues using gravity, wave, and possibly wind energy, while the algae are transported to onshore refineries.



OMEGA is a strong, flexible system and individual module strings can be retracted in bad weather. A tube provides CO_2 from a submerged tank

benefit from the source of local energy for pumping water, air, and CO2, as well as producing artificial light. In turn, the wind-farm benefits by using the algal biomass as a way to solve the problem of long-term storage of wind energy.

As designs and methods for OMEGA farming develop, exposed open ocean locations may also be used. These will require robotic systems for transporting wastewater from the major sewage outfalls and for return algae biomass to shore. On the other hand, with global warming and rising sea levels, OMEGA farms may take advantage of flooded coastal zones, forming a new coastal infrastructure for algae production, wastewater treatment, and carbon sequestration.

OMEGA farms can take advantage of the infrastructure of offshore wind-farms

Is OMEGA feasible and scalable?

A team of scientists, engineers, ecologists and economists, supported by NASA ARMD and the California Energy Commission, is carrying out a demonstration project to determine if OMEGA is feasible and scalable. This demonstration is meant to determine if OMEGA, as an example of "technology ecology" (an integrated system where wastes become resources), is feasible: technically, biologically, environmentally, and economically, and if it can be done on a scale that impacts the current use of fossil fuels. OMEGA is a complicated system of systems and the feasibility studies are non-trivial. The economics, for example, are based on a life-cycle analysis of products and services. Algae products include biomass, oil, fertilizer, animal fodder and high-value products such as dyes, nutraceuticals, cosmetics, and drugs. Services include wastewater treatment, dead-zone remediation, and CO_2 sequestration. OMEGA uses the "wastes" from one process as resources for another, and integrates solar, wave, and wind energy with gravity, buoyancy, heat-capacity, and osmosis. Analyses include considerations of the production of all materials and uses of these materials after OMEGA (cradle to cradle, rather than cradle to grave). The economic consequences of not doing OMEGA and the continued use of fossil fuels, are also considerations.

The goal of the OMEGA project is to demonstrate feasibility and scalability, and that OMEGA products and services do not compete with agriculture or damage marine ecosystems. Indeed, OMEGA is meant to improve the marine environment by removing nutrients that are currently contributing to the formation of dead zones and by sequestering CO_2 that is contributing to ocean acidification. The hope is that based on the results of the demonstration, people around the world will be motivated to develop OMEGA systems for their locations. Projects like OMEGA will require local experts supported by government agencies and private investors who all recognize the magnitude of global problems and the urgency of finding solutions. If such experts can be mobilized and openly share information, it is estimated that OMEGA technology can be developed to significant scales within 10 years. It is impossible to predict if OMEGA will contribute significantly to the needs of the rapidly growing population for declining resources in a changing environment, but, something needs to be done and failure is not an option. ◉

Reference and further reading

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[2] (Chisti, Yusef. 2009. Algae production: an overview of existing option. In Wind, Sea, Algae—Proceeding, Ed. J. Trent p. 61; http://wind-sea-algae.org/?page_id=305).

[3] Ronald Pate. 2007. Techno-economics, siting and resource use challenges for onshore algal biofuels production. In Wind, Sea, Algae Proceeding. Ed. J. Trent p. 103; http://wind-sea-algae.org/?page_id=305)

Articles about PIER-Funded Energy Efficiency Research

- ***New York Times*** (March 23, 2010) - published an article entitled "Smart Water Meters Take Hold in California." The article was based on a PIER-funded study (500-07-022) http://green.blogs.nytimes.com/2010/03/23/smart-water-meters-take-hold-in-california/
- ***Modesto Bee*** (March 4, 2008 and March 23, 2008) – published an article entitled "Frito Lay Solar System Puts the Sun in SunChips, Takes Advantage of Renewable Energy." http://www.modbee.com/2008/04/04/259206/frito-lay-solar-system-puts-the.html#ixzz0mLtKxCHD http://www.modbee.com/2008/04/23/277436/governor-on-hand-as-frito-lay.html
- ***Pepsi-Cola*** website contains an article entitled: "Using-The-Power-Of-The-Sun-To-Help-Make-Sunchips" http://www.pepsicojobs.com/PressRelease/Using-The-Power-Of-The-Sun-To-Help-Make-Sunchips-M.html
- ***Wine Business Monthly*** (July 2003) – published an article entitled "New Technology Reduces the Cost to Stabilize Wine, Electrodyalisis Could Replace Cold Stabilization." http://www.winebusiness.com/wbm/?go=getArticle&dataId=26469
- ***Architectural Solid State Lighting*** magazine (August 2008)- published an article entitled "Hybrid System has Potential to Revolutionize Office Lighting." Article describes the lighting technology developed for PIER by the California Lighting Technology Center and manufacturing partner, Finelite, Inc. of Union City. The article describes the research project and acknowledges the role of the Commission. **www.architecturalssl.com**
- ***LD+A*** *m*agazine by the Illuminating Engineering Society of North America (June 2008) –contained an article on the PIER research project to extend the industry standard Digital Addressable Lighting Interface (DALI) protocol to lighting control devices. As a result of PIER research, the lighting industry is considering a DALI for wall switches, occupancy sensors, photo sensors, etc.
- ***The Retail Green Agenda – Sustainable Practices for Retailers and Shopping Centers*** (August 2008?) –This publication discusses effects of daylighting on retail sales and extensively cites PIER daylighting research work by Heschong Mahone Group, including the October 2003 report, Daylighting and Retail Sales.
- **American Institute of Architects (AIA) Soloso** email distributed PIER technical brief on "Night Breeze Cuts Peak Demand, Keeps Residents Cool." The email blast went to all 80,000 AIA members.
- ***Electrical Line*** magazine (September/October 2008) contained an article entitled "Finding the Sweet SPOT for Daylight Sensors." This article was about the award winning sensor placement software developed for PIER. *Electrical Line* is a bimonthly Canadian trade publication. http://www.electricalline.com

- **Association of Energy Services Professionals (AESP)** industry information web page highlighted five new PIER technical briefs on its website: daylight harvesting, LED hybrid porch lights, uninterruptible power supply efficiency for data centers, internal power supply efficiencies and energy use of household electronics. AESP is a member based association dedicated to improving the delivery and implementation of energy efficiency, energy management and distributed renewable resources. http://aesp.org/displaycommon.cfm?an=1&subarticlenbr=107
- **ZDNET and RedHerring** (October/November 2008) are two online newsites that carried information of wireless lighting controls developed for PIER by Adura Technologies. The controls were highlighted at the West Coast Green Conference. http://content.zdnet.com/2346-9595_22-238381-8.html and http://www.redherring.com/blogs/25110
- **National Public Radio** – Morning Edition (October 15, 2008 broadcast)- PIER contractor Lawrence Berkeley National Laboratory (LBNL) was featured in a story on low-e glazing and shined a spotlight on energy efficiency aspects of commercial windows. The story included a photo of LBNL PIER project windows test site. www.npr.org/templates/story/story.php?storyId=95309739
- ***UC Davis* Magazine** (Fall 2008) discussed the PIER funded California Lighting Technology Center in an article entitled "100 Ways that UC Davis has Transformed the World." The UC Davis magazine is published quarterly for alumni, faculty, parents, donors and friends. http://ucdavismagazine.ucdavis.edu/issues/fall08/100ways.php?id=10
- ***Food Service Equipment and Supplies*** magazine (October 2008)-an article appeared in its October "Specifier" newsletter on variable speed kitchen hoods with data from field tests conducted for PIER. The *Food Service Equipment and Supplies* magazine is sent to more than 20,000 decision making readers in the food service industry.http://www.fesmag.com/article/CA6610152.html?nid=3456&rid=1249803917
- **Association of Energy Services Professionals (AESP)** (November 2008)-Industry Information web page highlighted five new PIER technical briefs on its website: battery charger efficiency, DC power distribution for data centers, task/ambient lighting, wireless lighting controls and variable air volume fan controls. AESP is a member based association dedicated to improving the delivery and implementation of energy efficiency, energy management and distributed renewable resources. http://aesp.org/displaycommon.cfm?an=1&subarticlenbr=107
- ***Davis Enterprise*** (November 2, 2008) newspaper citing the energy saving parking garage relamping project at UC Davis that was developed for PIER by the California Lighting Technology Center Industry. Estimated annual energy savings in the 30-40 percent compared to previous technology.
- ***Environmental Design + Construction (ED+C)*** and ***Sustainable Facility*** (2008) magazines awarded the 2008 Readers' Choice Energy Systems runner up award to

PIER lighting research manufacturing partner Cooper Lighting's LED Recessed Downlight.

- ***Triple Pundit*** (Feb/March 2009) on line publication contained an article entitled "Alaska's Lighting Revolution: Sustainability is More than Kilowatt Hours." The article acknowledges the smart outdooor lighting research work done for PIER by the California Lighting Technology Center. http://www.triplepundit.com/pages/alaskas-lighting-revolution-going-green.php
- ***Shopping Centers Today*** (SCT) (Feb 2009) contained an article entitled "Making Sustainability a Selling Point." The article cites research done for PIER by the Heschong-Mahone Group. http://www.myvirtualpaper.com/doc/icscvp/SCTFeb09/2009020401/
- ***Building Operations Management*** (January 2009) contained an article entitled "How Daylighting Can Improve IEQ." This article reported on research findings done for the Energy Commission by Heschong Mahone Group on daylighting as related to energy efficiency. http://www.facilitiesnet.com/lighting/article/How-Daylighting-Can-Improve-IEQ--10449
- ***MacWorld*** (April 2009) featured the Berkeley Lamp II in the "Hot Stuff-what we're raving about this month" column. The Berkeley Lamp was developed for PIER by the California Lighting Technology Center and its partner Full Spectrum Solutions.
- ***Better Homes and Gardens-Lighting*** (April 2009) – Better Homes and Gardens in partnership with the American Lighting Association issued a special interest publication, Lighting, the lighting industry's national consumer magazine. The publication features information on the Energy Commission's recognition of the best decorative energy efficient lighting fixtures. http://www.lightingfortomorrow.com/2008/08winners.shtml.
- ***Villa Monterey Press Conference*** (May 6, 2009) – press conference in Stockton to celebrate the completion and grand opening of a multifamiliy housing community. The Villa Monterey is the first green multi unit apartment community San Joaquin county.
- ***Franchise Tax Board Open House*** (May 7, 2009)-open house and media event at the Franchise Tax Board in Sacramento to highlight a PIER demonstration project on wireless control of fan cooling of datacenters. The demonstration used a low cost technology that resulted in over 20% reduction in energy use for the Franchise Tax Board data center.
- ***Greentechmedia.com*** (May 29, 2009) – published an article entitled "Is Mesh the Answer for Managing Buildings" that featured Adura Technology's wireless mesh network lighting controls which were initially developed with assistance from PIER's Small Grants Program. http://www.greentechmedia.com/articles/read/is-mesh-the-answer-for-managing-buildings
- ***Lighting Design and Application*** (July 2009) magazine contained an article about findings from research conducted by the PIER funded California Lighting Technology

Center (CLTC). The article, “Not Your Father’s HID Ballasts” addresses the energy-savings aspects of high-frequency electronic ballasts for high intensity discharge (HID) lamps.

- ***GreentechMedia.com*** (August 10, 2009) - listed Adura Technologies’ lighting controls systems in its article on the Top Ten Green Software products. Adura’s lighting controls systems were developed under PIER’s Energy Innovation Small Grants Program. Another PIER research activity with Adura is to add occupancy and daylight sensing functionality to its devices. GreenTechMedia.com is conducting research to define greentech market segments, predict technology winners, and analyze startup and incumbent players in the market. http://www.greentechmedia.com/articles/read/the-top-ten-in-green-software
- ***Western City’s*** (June 2009) - a magazine published by the League of California Cities, contained an article entitled “Tips for Your Community: How to Save Lighting Energy” by Dr. Michael Siminovitch of the UC Davis California Lighting Technology Center (CLTC). The article discussed the relationship between CLTC and PIER’s research and demonstration program, including the Energy-efficient Campuses Demonstrations. The article directs local governments to PIER’s demonstration program**.** http://www.westerncity.com/Western-City/June-2009/Tips-for-Your-Community-How-to-Save-Lighting-Energy
- ***San Francisco Chronicle*** (September 6, 2009) featured a cover article about an Energy Commission PIER Buildings program funded study on building commissioning. Chronicle staff writer, Matthew Stannard, wrote an article titled "Fine-tuning Buildings' Energy Systems Urged" which draws upon work under the High Performance Commercial Building Systems contract with Lawrence Berkeley National Lab (Contract #500-03-022). The article cites a comprehensive cost-benefit assessment of building commissioning recently completed by Evan Mills, Ph.D. http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2009/09/06/MN3P19FC1Q.DTL
- ***Electrical Contractor*** magazine (August/September 2009) published an in-depth article on office lighting, citing research work done for PIER at the California Lighting Technology Center (CLTC). The article, “How Low Can You Go,” discussed the evolution of typical office lighting power densities from 1.5 watts per square foot in 1990 to 1.1 watts per square foot in 2004-2007. The article noted that the PIER-funded innovative solid state task-ambient lighting system had shown occupant satisfaction at levels down to 0.5-0.7 watts per square foot. The article also pointed out that use of occupancy controls can reduce lighting power density even more, while a task-ambient design enables demand response functionality. http://www.ecmag.com/?fa=article&articleID=9337
- ***Intel Corporation*** showcased a PIER-funded project at the Intel Developer Forum (IDF) in San Francisco on September 22-24. The IDF is a major annual event that features announcements and break-through products for the next generation in processor technology. PIER funded a demonstration at an Intel data center using

temperature sensors for the processors inside the servers. The sensors were connected to a controller using wireless technology that enabled precise cooling control of the data center**.**

- ***US Department of Energy's Solid-State Lighting Quality Advocates Program* (September 2009)** granted the *Lighting Facts*™ Label for Finelite, Inc.'s Personal Lighting System (PLS) LED task lighting. The PLS, which can reduce energy used for office lighting by 50 percent, was developed for PIER at the UC Davis California Lighting Technology Center with Finelite as the manufacturing partner. PLS task lights have been installed on the second floor south offices in the Energy Commission as part of a demonstration project for the Department of General Services. The system is also in use at the Department of Motor Vehicle headquarters building and other state offices. The entire line of PLS undercabinet lights and desk lamps will carry the *Lighting Facts*™ Label. www.lightingfacts.com www.finelite.com/products/pls-overview
- ***Adura Technologies***, a PIER manufacturing partner, was one of the featured technology innovations in SmartPlanet.com's Top 10 most popular SmartPlanet videos of 2009. With PIER funding, first in a PIER Small Grants award and later through PIER Building's End-use Energy Research programs, Adura developed and manufactured a solution for energy-saving wireless lighting controls. The wireless lighting system is presented in SmartPlanet's video, "A Bright Idea for Wasteful Office Lighting." http://www.smartplanet.com/technology/video/a-bright-idea-for-wasteful-office-lighting/367125/?tag=content;col1
- ***Sacramento Bee*** (January 18, 2010) - PIER contractor California Lighting Technology Center (CLTC) at UC Davis was featured in an article entitled "Road to Recovery: Sacramento aims to be green tech center." CLTC was also spotlighted on SmartPlanet.com on January 21. These recent stories looked at innovative lighting products being developed by CLTC for PIER.
  http://www.sacbee.com/recovery/story/2469433.html
  http://www.smartplanet.com/people/video/intelligent-lighting-of-the-future-from-uc-davis/385995
- ***Centerline*** (Winter 2010) –Article entitled "Moving Air-Improving Design and Standards for Natural Ventilation" discusses PIER funded projects that will study energy and comfort in buildings with natural ventilation, using fans and personal controls to improve occupant comfort.
  http://www.cbe.berkeley.edu/centerline/winter2010.pdf
- **Clean Energy Systems, Inc**.
  "Emissions-Free Power Generation Eyes Both Climate Change, Grid Relief"
  http://www.cleanenergysystems.com/news/march_6_07.html
  "Building a better power plant – with no emissions"
  http://www.cleanenergysystems.com/news/Sac_Bee_CES_3_June_08.pdf

- **Composite Support Solutions, Inc.**
  "Charles Pankow Award for Innovation"
  http://content.asce.org/handa/Pankow_Award.html
- **Greenvolts, Inc.**
  "Most Successful U.S. Startups 2008"
  http://images.businessweek.com/ss/08/12/1217_hottest_startups/11.htm

  "California Clean Tech Open Winners Score Cash, Services"
  http://www.greentechmedia.com/articles/read/california-clean-tech-open-winners-score-cash-services-249/
- **Nanosolar, Inc.**
  "2007 Innovation of the Year"
  http://www.popsci.com/popsci/flat/bown/2007/green/item_59.html
  "Governor Arnold Schwarzenegger Visits Nanosolar HQ"
  http://www.nanosolar.com/company/blog/governor-arnold-schwarzenegger-visits-nanosolar-hq
- **One Cycle Control, Inc.**
  "2009 SBIR Achievement Award"
  http://www.ota.uci.edu/forms/OCCNews.pdf

Locations where PIER technology has been installed/demonstrated

- **Cal Poly San Luis Obispo**: integrated classroom lighting, LED task lighting, variable speed ventilation fans and range hoods, bi-level stair luminaires, bi level bollards and bi level parking lot lighting
- **UC Davis**: smart outdoor lighting in its parking garages. This project is the first step in relamping All campus parking structures with smart light fixtures. The new light fixtures were developed for PIER by UC Davis' California Lighting Technology Center.
- **State Partnership for Energy Efficient Demonstrations Program** - see attached spreadsheet for list of PIER funded technology demonstrations.

Spin off from PIER projects

- **Peerless Lighting** introduced a new classroom lighting system based on PIER's public specification for classroom lighting systems. PIER's classroom lighting results were embraced by the Coalition for High Performance Schools as an energy efficient lighting solution for excellent quality classroom lighting. The availability of the integrated classroom lighting system product choices are based on PIER design

template and fulfills PIER's intent that energy efficient products become broadly adopted in the marketplace.

- **Cooper Lighting** and PIER developed a new commercial product, the HALO LED can downlight. This light uses 15 watts, delivers 40 lumens/watt and is dimmable and meets Title 24 requirements.
- PIER funding of the **UC Berkeley Center for the Built Environment** have resulted in acceptance of an amendment by the American Society of Heating, Refrigerating and Air Conditioning Engineers to modify one of its Standards (Standard 55) on Thermal Environmental Conditions for Human Occupancy. Acceptance of the amendment will result in lower energy solutions rather than air conditioning systems.
- **US Environmental Protection Agency** (US EPA) (December 2008) adopted the PIER funded and developed Portfolio Manager for wastewater facilities . This benchmarking tool uses the methodology Energy Star uses for buildings applied to wastewater facilities.
- **Municipality of Anchorage** relamped streetlight using technologies first developed by PIER's smart outdoor lighting research.
- **Watt Stopper**-PIER research resulted in another commercial product by Watt Stopper. The Legrand LS-102 self calibrating daylighting controller provides closed loop, single zone, on/off switching. The controller uses simplified daylighting harvesting technology developed for PIER by the California Lighting Technology Center.
- **Raley's Stores** (November 4, 2009,) opened their new Tracy store which uses the PIER supported Melink Intellihood variable-speed commercial kitchen range hood, bringing to nine the number of Raley's stores that use the Melink Intellihood. The Intellihood has been shown to provide energy savings in excess of 50% with a payback period of 1-6 years. Raley's embrace of the variable-speed range hood system is an important contribution towards market penetration of energy-efficient building components.
- ***Natural Resources Canada*** - PIER-supported Automated Demand Response (ADR) is being tried in Canada. Natural Resources Canada, a branch of the Canadian government which manages energy conservation and research programs, is contracting to implement PIER supported Open Automated Demand Response (OpenADR) in several buildings, which will be studied to evaluate more widespread deployment. With more widely OpenADR being used, the closer it comes to being a standard, accepted operating practice, with consequent economic benefits. The economic benefits come from reducing the necessity for generation plants, greater resilience to emergencies, and better utilization of the existing and future electric transmission and distribution system.

Awards

- ***Green IT Award* - DASH - Data Automation Software and Hardware System, CA Franchise Tax Board**: In 2008, the Franchise Tax Board partnered with the Department of General Services and the California Energy Commission to find a way to reduce FTB's data center energy cost. The outcome was DASH - the Data Automation Software and Hardware System. The system includes Fusible Link Curtains and variable speed fans to provide cooling through the under-floor channels. The system is providing both electrical and carbon dioxide savings on a daily basis: Data Center efficiencies have resulted in 58 percent reduction in fan energy use, 14.6 percent reduction in total energy use, 300 tons less carbon dioxide produced per year, and 310,000 kilowatts less electricity used per year.
- ***Environmental Design + Construction (ED+C)*** and ***Sustainable Facility*** (December 2008) magazines awarded the 2008 Readers' Choice Energy Systems runner up award to PIER lighting research manufacturing partner Cooper Lighting's LED Recessed Downlight.
- ***Governor's 2008 Environmental and Economic Leadership Award for Climate Change-Energy Self Sufficiency by 2012*** (December 2008)**-** Dixon Ridge Farms in Winters won this award. The Commission supported Community Power Corporation's modular 50 kW biopower system that produces combined heat and power by gasification of walnut shells.
  http://www.calepa.ca.gov/Awards/GEELA/2008/WinnerSummary.pdf

- ***2009 Best Practices Awards*** (June 2009)– PIER driven projects were honored at the 2009 UC/CSU/CCC Sustainability Conference:
  1. *Cal Poly San Luis Obispo* - two awards for best practice (HVAC and lighting) design/retrofit for demonstrations of more than ten PIER technologies.
  2. *UC Davis* - two awards for best practice lighting design/retrofit for PIER-developed bi-level exterior lighting solutions and another for overall sustainable design for a new construction project heavily influenced by PIER technologies developed at UCD's California Lighting Technology Center.
  3. *UC Berkeley and CSU San Bernardino* garnered best practice awards for monitoring-based commissioning (developed by LBNL/PIER and CA utility partnerships).
  4. UC Merced earned an honorable mention for overall sustainable design in a deep-efficiency new construction project that grew out of PIER support for building performance evaluation.

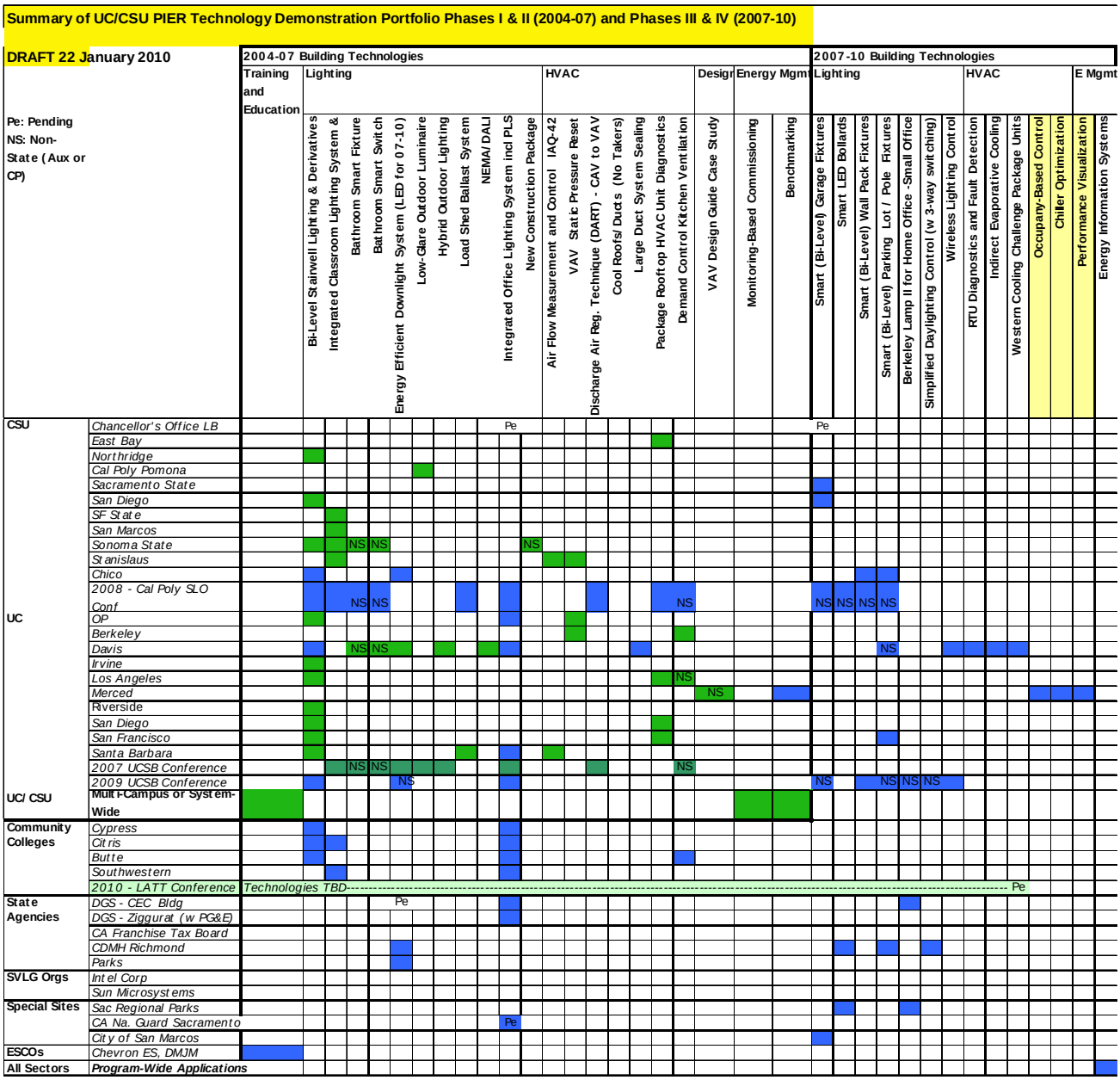
- ***Design Journal*** has presented a Silver 2009 Award for Design Excellence (ADEX) to Full Spectrum Solutions for the Berkeley Lamp II. The ADEX award recipients are recognized for superior product design. The energy-efficient Berkeley Lamp II was developed for PIER by Full Spectrum in partnership with the California Lighting Technology Center at UC Davis. The Berkeley Lamp II provides both downward

(direct task) and upward (indirect ambient) lighting with independently-dimmable fluorescent lamps. *Design Journal* is the international trade publication for interior designers, architects, and facility managers. The annual ADEX award program is the largest and most prestigious awards program for product design of furniture, fixtures, and finishes marked to the design trade.

- ***Chicago Innovation Award*** – Gas Technology Institute was awarded a Chicago Innovation Award for its Transport Membrane Condenser (TMC) advanced heat recovery technology. This technology allows the capture of waste heat and water vapor from exhaust/flue gas for reuse which can increase operating efficiency and lower overall energy costs. It could be applied to a wide variety of industrial, commercial, and residential equipment, and is currently being developed as the key element in the Super Boiler technology. Applied to industrial and commercial boilers, the Transport Membrane Condenser is the cornerstone of an advanced recovery system that can provide an increase in fuel-to-steam efficiency of as much as 10% to 15% (up to 95% fuel-to-steam efficiency), and up to 20% fresh water savings.

  The technology was developed under a U.S. Department of Energy (DOE) contract with support from a number of partners including the California Energy Commission, the California Air Resources Board, South Coast Air Quality Management District, and Southern California Gas (a Sempra Energy Company). Other natural gas utilities provided funding through Utilization Technology Development, NFP, (UTD) and GTI's Sustaining Membership Program. Cleaver Brooks, a leading boiler manufacturer, along with Super Boiler field test sites at Specification Rubber Products in Alabama and Clement-Pappas & Company, a juice bottler in California, have also contributed to the development.

State Partnership Energy Efficient Demonstration Program Sites



Reports

- *"In order to best analyze climate change risks, the 2009 California Climate Adaptation Strategy draws on years of state-specific science and impacts research, largely funded through the California Energy Commission's Public Interest Energy Research (PIER) Program and an engaged research community. The research provides for an understanding of the climate-related risks California will face and has significantly contributed to greater public awareness of climate change. As data continues to be developed and collected, the state's adaptation strategy will beupdated to reflect current findings."*

  Source: 2009 California Climate Adaptation Strategy. A report to the Governor of the State of California in Response to Executive Order S-13-2008. California Natural Resources Agency

- *"California is unique in the United States as a state that has examined possible effects of climate change on its energy production and use in some detail. Led by the California Energy Commission…, the state is developing a knowledge base on this subject that could be a model for other states and regions (as well as the nation as a whole)."*

  Source: Effects of Climate Change on Energy Production and Use in the United States. A Report by the U.S. Climate Change Science Program and the subcommittee on Global change Research. Thomas J. Wilbanks,, Vatsal Bhatt, Daniel E. Bilello, Stanley R. Bull, James Ekmann, William C. Horak, Y. Joe Huang, Mark D. Levine, Michael J. Sale, David K. Schmalzer, and Michael J. Scott). Department of Energy, Office of Biological & Environmental Research, Washington, DC., USA, 160 pp (2007).

- *"The quality of research contained in the scenario analysis performed by PIER far exceeded our expectations. The findings of the report contributed greatly to our understanding of the effects of climate change emissions in California. These findings were the basis of the scientific evidence reflected in the March 2006 Climate Action Team report and in AB 32, the California Global Warming Solutions Act of 2006." Eileen Wenger Tutt. California Environmental Protection Agency Assistant Secretary for Climate Change Activities"*

  Source: In the Public Interest Developing Affordable, Clean, and Smart Energy For 21st Century California. Staff Report. California Energy Commission. CEC-500-2007-020

TendersInfo

March 15, 2010 Monday

LENGTH: 442 words
HEADLINE: United States : Wind farm installs Beacon Power flywheels
BYLINE: prashant03

BODY:

Beacon Power Corp. said that it has shipped, installed, and successfully connected one of its Smart Energy flywheel energy storage systems at a California wind farm. Tyngsborough-based Beacon Power specializes in making massive flywheels that store power like giant alkaline batteries.

The Beacon Power flywheel system just installed in Tehachapi, Calif., is part of a wind power/flywheel demonstration project being carried out for the California Energy Commission, Beacon Power said in a Beacon Power Corporation (BCON), a leading provider of advanced products and services to support a more stable, reliable and efficient electricity grid, today announced that it has shipped, installed and successfully connected a Smart Energy 25 (Gen 4) flywheel energy storage system at a wind farm in Tehachapi, California. The system is part of a wind power/flywheel demonstration project being carried out for the California Energy Commission.

The primary goal of the project is to demonstrate that advanced control technology with energy storage can help expand the delivery of wind energy by effectively increasing the capacity of constrained

transmission facilities in the area. Tehachapi, California, is a high-potential wind resource area where, according to a report from the California ISO, up to 4,200 megawatts of wind power may be added in the coming years.
Successfully integrating renewable energy onto the grid is one of California s top energy priorities. As California builds the infrastructure to achieve 33 percent renewable energy resources by 2020, this research will be important in operating the transmission grid with more renewables in the future, said Energy Commissioner Jeffrey Byron.

In collaboration with the Commission s Public Interest Energy Research (PIER) program, California ISO, and PG&E, Beacon Power completed a successful research project and field demonstration on the value of energy storage for maintaining reliability on the grid. It helped us better understand the communications and system control issues associated with integrating energy storage onto California s electrical grid, said Byron.
This is the first Gen 4 flywheel that we've shipped, installed and operated outside of Beacon's facility, and it went very smoothly, said Bill Capp, Beacon president and CEO. It's also the first of our systems intended to show how energy storage can help optimize the output of a wind farm. We're pleased with the continuing good relationship we have with the California Energy Commission and the California ISO as they address the challenges of deploying intermittent renewable energy resources.

Ltd.

March 18, 2010 Thursday 11:55 AM EST

LENGTH: 308 words

HEADLINE: ENERGY EFFICIENT LIGHTING TAKES TOP PRIZE

BODY:

SACRAMENTO, Calif., March 17 -- The California Energy Commission issued the following news release:

Energy efficient lighting took the top prize in the 2010 "best-in-class" awards at the Strategies in Light conference and expo at the Santa Clara Convention Center. The Finelite CURVE task luminaire, a market-ready product resulting from a research project funded by the Energy Commission's Public Interest Energy Research (PIER) program, received one of the expo's top awards.

"Finelite's success shows why California public-private sponsored research and demonstration programs are so important," said Energy Commission Vice Chairman Jim Boyd. "This win exemplifies what the PIER program is all about. It provides opportunities to research, develop, and demonstrate ideas that can be turned into energy efficient products for consumers. These technological breakthroughs will positively impact a host of concerns for Californians - energy consumption, cost of electricity, and greenhouse gas emissions," he added.

Other best-in-class winners included Spilighting, Inc., for its Stile Styk wall washing luminaire, GE Lighting Solutions for its Evolve LED R150 Roadway luminaire for streets and roadways, and Wide-Lite (a Philips group brand) for its VizorLED for parking garages.

This year, 47 commercial LED (light emitting diode) lighting products were recognized for excellence, out of 126 entries, and 43 were considered market-ready. A panel of 12 judges from the architectural lighting design community evaluated the entries based on performance, appearance, construction, and illuminating power.

The conference was supported by nearly 90 sponsors and exhibitors, ranging from equipment and materials suppliers to LED and lighting fixture manufacturers.For more information please contact: Sarabjit Jagirdar, Email: htsyndication@hindustantimes.com

Appendix D: Collaboratives

Appendix D contains the following collaborative membership lists:

1) California Commissioning Collaborative
2) California Biomass Collaborative – CBC
3) California Geothermal Energy Collaborative – CGEC
4) California Solar Energy Collaborative – CSEC
5) California Wind Energy Collaborative – CWEC

1) **California Commissioning Collaborative – Governing Board and Members**

Governing Board Members

Name	Organization
Gregg Ander, FAIA	Chief Architect, Southern California Edison
Don Frey	Architectural Energy Corporation
Greydon Hicks	Pacific Gas and Electric
Jim Parks	Sacramento Municipal Utility District
Chuck Poindexter	San Diego Gas and Electric
Glenda Towns	Southern California Gas Company
Phil Welker	Portland Energy Conservation Incorporated

Advisory Council

Name	Organization
James Bryan	Arden Realty, Incorporated
Tav Commins	California Energy Commission
Greg Cunningham	Enovity, Incorporated
Keith Foreman	Pacific Gas and Electric
Don Frey	Architectural Energy Corporation
Richard Greco	California Data Center Design Group
Phillip Haves	Lawrence Berkeley National Laboratory
Randall Higa	Southern California Gas (now with Southern California Edison)
Ed Jerome	EnerNOC, Inc.
David Jump	Quantum Energy Services and Technologies, Inc.
Michael Lo	Southern California Edison
Alfred McKelvy	Berding and Well LLP
Clifford Moriyama	Capitol Dynamics, LLC
Tony Pierce	Facility Dynamics, Engineering
Jim Rosier	Equal Air Balance Company
Reinhard Seidl	Taylor Engineering
Shane Schroeder	Target
Mark Walter	Keithly Barber Associates
John Wimer	National Center for Energy Management and Building Technologies

California Biomass Collaborative – Current and Alternative Advisory Board Members

Current Board Members

Name	Organization
Trip Allen	Sierra Club
Fernando Berton	Environmental Alternatives Consulting
Linda G. Blevins	US Department of Energy
Kevin Chen	Southern California Edison
Cynthia Cory	California Farm Bureau Federation
Allen Dusault	Sustainable Conservation
Jose I. Faria	Department of Water Resources
John Ferrell	US Department of Energy
Robert Fletcher	California Air Resources Board
Robert S. Glass	LLNL
Bruce Goines	US Forest Service
Rahul Iyer	Primafuel, Inc.
Bryan Jenkins	UC Davis
Stephen Kaffka	UC Davis
Kim Kristoff	Gemtek Products
Hal LaFlash	PG&E
Kay Martin	BioEnergy Producers Association
Gary Matteson	Matteson and Associates
John Menke	State Water Resources Control Board
Gregory Morris	Future Resources Associates
William J. Orts	USDA-Ag Research Station
Ralph P. Overend	Consultant-Ottawa, Canada
Phil Reese	Colmac Energy
Prab Sethi	CEC
Steve Shaffer	Environmental Consulting for Agriculture
John Shears	Center for Energy Efficiency and Renewable Technologies
John Shelly	UC Richmond Field Station
George Simons	Itron
Pat Sullivan	SCS Engineers
Necy Sumait	BlueFire Ethanol
Toni Symonds	Assembly Committee on Jobs, Economic Development and the Economy
Valentino Tiangco	SMUD

Name	Organization
Frederick A. Tornatore	TSS Consultants, Inc.
Chick White	Waste Management, Inc.
Doug Wickizer	California Department of Forestry and Fire Protection
Clark Williams	California Department of Resources Recycling and Recovery

Alternate Board Members

Name	Organization
Kitty Howard	CARB
Mike Tollstrup	CARB
Mike Leaon	CEC

California Geothermal Energy Collaborative – Current Advisory Board Members and Steering Committee

Board Members

Name	Organization
Charlene Wardlow	Ormat Nevada Inc.
Paul Brophy	EGS Inc.
Elaine Sison-Lebrilla	SMUD
Mack Kennedy	LBNL
Karl Gawell	Geothermal Energy Association
Jay Nathwani	DOE Geothermal Technology Program

Steering Committee Members

Name	Organization
Charlene Wardlow	Ormat Nevada Inc.
Paul Brophy	EGS Inc.
Elaine Sison-Lebrilla	SMUD
Hal LaFlash	PG&E
Steve Yatsko	SDGE
David Olsen	Consultant
Daniel Schocet	Ram Power Inc.
Jonathan Weisgall	MidAmerican Energy Holdings Co.
Mack Kennedy	LBNL
Colin Williams	USGS Western Region
Marshall Reed	USGS Western Region
Carol Bruton	Simbol Mining Corporation
Jim Lovekin	GeothermEX, Inc.
Elizabeth Johnson	California Division of Oil, Gas and Geothermal
Karl Gawell	Geothermal Energy Association
Jay Nathwani	DOE Geothermal Technology Program
Marilyn Nemzer	Geothermal Education office
Curtis Framel	US Department of Energy
Connie Reitman	Inter-Tribal Council of California
John White	CEERT
Laurie Hietter	MHA/RMT Inc.

Name	Organization
Paula Blaydes	Western GeoPower, Inc.
Daniel Dudak	California State Lands Commission
Richard Grabowski	BLM – California Office
Sean Haggerty	BLM – California Office
John McCaull	GEA Western States Representative
Danielle Seperas	Calpine Corporation
Larry Grogan	County of Imperial
Dale Merrick	Merrick Consulting
Dennis Murphy	Potter Drilling, LLC
Rick Phelps	High Sierra Energy Foundation
Lisa Meline	Meline Engineering Corporation
Johanna Partin	Department of the Environment – SF
Curt Robinson	Geothermal Resources Council
William Glassley	UC Davis
Judy Fischette	UC Davis

2) **California Solar Energy Collaborative – Current Advisory Board Members**

Name	Organization
Meg Arnold	SARTA
Bryan Banke	Solar Power Partners
Jim Blatchford	California Independent System Operator
Greg Brownell	SMUD
Sue Carter	UC Santa Cruz
Stephen W. Frantz	SMUD
Eric Hafter	Solar Power, Inc.
Oleg Kaganovici	DFJ Aurora
Sue Kateley	CALSEIA
David McFeely	Solar Tech
William Torre	SDGE
Roland Winston	UC Merced
Andrew Yip	PG&E
Prab Sethi	CEC
Pieter Stroeve	UC Davis
Joseph Ford	UC San Diego

Attachment 5

3) **California Wind Energy Collaborative – Current Advisory Board Members**

Name	Organization
Charles Bennett	Environmental Science Associates
Michael Bergey	Bergey Windpower Company
Gerald Braun	UC Davis
Craig Christenson	Clipper Windpower, Inc.
Ron Davis	BEW Engineering, Inc.
Edgar DeMeo	Renewable Consulting Services, Inc.
Jeffrey Ghilardi	GE Wind Energy, LLC
Dave Hawkins	California ISO
Kevin Jackson	Dynamic Design Engineering, Inc
Michael Kane	CEC
Mather Kearney	California Business Investment Services
Mike Marelli	Southern California Edison
Hugh Merriam	PG&E
Emil Moroz	DeWind Inc.
Dora Yen Nakafuji	Hawaiian Electric Company
Brent Reardon	Garrad Hassan America, Inc.
Hal Ramonowitz	Oak Creek Energy Systems, Inc.
Brian Smith	National Wind Technology Center
C.P. van Dam	UC Davis
Bruce White	UC Davis

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		159	3DGeo Development, Inc.	Petrophysical Interpretation of Fractures and Fluids in Geothermal Fields for Improved Energy Generation	Jan-2005	$75,000	Yes
500-04-017	0		ADI Thermal Power Corporation	Proof of Concept and Test Validation of a 25kW Dual Shell Stirling Engine	Jan-2005	$600,000	Yes
500-98-014		167	Advanced Conservation Technologies, Inc.	Non-Restrictive Pressure Relief Heat Trap	Oct-2005	$75,000	Yes
UC BOA-082	0		Advanced Energy Inc.	Achieving More with Less: Efficiency and Economics of Motor Decision Tools	Aug-2004	$112,000	Yes
500-98-014		169	Advanced Engine Technologies Corporation	Ion Sense Based Air-Fuel Ratio Control in Stationary IC Engines	Aug-2005	$74,011	Yes
PIR-08-033	0		Advanced Power and Energy Program - UC Irvine	Piloting The Integration and Utilization of Renewables to Achieve a Flexible and secure energy Infrastructure	Jul-2009	$948,903	In progress
500-98-014		292	Aegis Technology Inc.	High-efficiency, Compact Silicon-Carbide-based Solar Inverter	Nov-2009	$95,000	In progress
500-00-016	1		Alternative Energy Systems Consulting, Inc.	Demonstration of Intelligent Software Agents for Control &Scheduling of Distributed Generation	Mar-2004	$345,000	Yes
500-07-020	0		Alternative Energy Systems Consulting, Inc.	Agents for the Integration of Storage and Renewables	Dec-2007	$1,150,000	In progress
SAIC-06-012-P-S	0		Alternative Energy Systems Consulting, Inc.	Biofuels RD&D Proposal Reviews for the 2006-07 Biofuels Grant Solicitation	Jan-2007	$10,709	Yes
SAIC-06-017-P-R	0		Alternative Energy Systems Consulting, Inc.	I-PLACE3S Energy Module-Distributed Generation and DEER Baseline Buildings and Energy Efficiency	Mar-2007	$40,000	In progress
SAIC-06-028-P-S	0		Alternative Energy Systems Consulting, Inc.	Technical Review of CCHP Proposals	Dec-2007	$6,841	Yes
500-98-014		184	Altex Technologies Corporation	Small Efficient Turbine System (SETS) for DEG and CHP Applications	Jan-2006	$74,796	In progress
500-08-007	0		Altostratus, Inc.	MultiEpisodic and Seasonal Impacts of and Emissions Credits from Heat Island Mitigation Strategies	Sep-2008	$200,000	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
PIR-08-030	0		Altostratus, Inc.	Ranking and Priortizing the Deployment of Community-Scale Energy Technologies Based on Their Indirect Effects in California Climate Zones	Jun-2009	$120,492	In progress
500-03-040	0		Alzeta Corporation	High Efficiency Ultra-Low NOx Supplemental Firing Burner	Apr-2004	$1,521,321	Yes
500-98-014		216	Alzeta Corporation	Ultra Low NOx Duct Burner for Small High Efficiency CCHP Systems	Jan-2007	$94,880	In progress
07-205.01-021	0		American Council for an Energy Efficient Economy	Co-Sponsorship of the Behavior, Energy and Climate Change Conference	Oct-2007	$4,995	Yes
500-03-029	0		American Council for an Energy Efficient Economy	2004 ACEEE Summer Study on Energy Efficiency in Buildings Co-Sponsorship	Mar-2004	$15,000	Yes
500-04-007	0		American Council for an Energy Efficient Economy	2004 Emerging Technologies Conference	Oct-2004	$20,000	Yes
500-06-009	0		American Council for an Energy Efficient Economy	2006 ACEEE Summer Study on Energy Efficiency in Buildings	Aug-2006	$20,000	Yes
500-06-021	0		American Council for an Energy Efficient Economy	Emerging Technology Summit 2006	Oct-2006	$25,000	Yes
500-08-004	0		American Council for an Energy Efficient Economy	ACEEE Buildings Summer Study 2008	Jul-2008	$50,000	Yes
UC BOA-070	0		American Council for an Energy Efficient Economy	Demand Response and Energy Efficiency	Feb-2004	$39,200	Yes
500-03-023	0		American Council on Renewable Energy (ACRE)	Membership in American Council on Renewable Energy	Jan-2004	$74,999	Yes
06-205.00-012	0		American Society of Mechanical Engineers	ASME Internal Combustion Engine Division (ICED) 2006 Fall Technical Conference	Sep-2008	$4,500	Yes
500-03-025	0		American Water Works Association Research Foundation	Energy Efficiency Projects for Water Treatment	Mar-2004	$1,000,000	Yes
500-98-014		145	Amonix, Inc.	Innovative Injection-Molded Plastic Package For High-Concentration PV Cells	Apr-2004	$75,000	Yes
500-98-014		212	Angela Chuang	Electric Service Reliability Analysis Tool	Nov-2007	$50,000	In progress
500-98-014		202	Appa Renewable Energy Systems, Inc.	Passively Pitchable Smart Blades for Improving Efficiency of Small Wind Turbines	Oct-2006	$95,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC MR-037	0		Applied Geosolutions, LLC	Developing and Applying Process-based Models for Estimating GHG and Air Emissions from California Dairies	Mar-2005	$492,582	In progress
500-98-014		289	Applied Lighting Solutions	High Efficiency LED Luminaires using Low Cost Compact Cooling Technology	Nov-2009	$95,000	In progress
500-03-030	0		Architectural Energy Corporation	Phase Last Projects	Mar-2004	$2,935,240	In progress
500-04-016	0		Architectural Energy Corporation	Integrating Building Commissioning into the State Building Construction Process	Jan-2005	$543,800	Yes
500-04-024	0		Architectural Energy Corporation	Utility-Focused Market Model for Zero Energy New Homes	Mar-2005	$2,904,938	No
500-06-035	0		Architectural Energy Corporation	Lighting California's Future	Mar-2007	$2,502,779	In progress
SAIC-06-014-P-R	0		Asset Reliance International, LLC	Wind Monitoring Equipment Valuation	Feb-2007	$1,926	Yes
500-07-022	0		Association of California Water Agencies	California Time of Use Water Meter Case Study	Dec-2007	$399,286	In progress
05-223.00-047	0		Association of State Energy Research and Technology Transfer Institutions (ASERTTI)	ASERTTI Digester Protocols Initiative	May-2006	$4,995	Yes
500-04-003	0		Association of State Energy Research and Technology Transfer Institutions (ASERTTI)	Membership in ASERTTI	Jul-2004	$54,000	Yes
500-07-029	0		Association of State Energy Research and Technology Transfer Institutions (ASERTTI)	Membership in ASERTTI	Jan-2008	$36,000	In progress
500-06-024	0		AWS Truewind, LLC	Expanded Sodar Monitoring	Jan-2007	$250,000	In progress
500-04-009	0		Beacon Matrix Services	Flywheel Energy Storage System (FESS) for Grid Frequency Regulation	Dec-2004	$1,232,854	Yes
PIR-08-011	0		Becker Engineering Company	Green Guide for Sustainable Energy Efficient Refrigerated Warehouses	Jun-2009	$106,750	In progress
PIR-08-016	0		Benningfield Group	Demonstration of Field Effectiveness of Classroom Single Zone VAV Units	Jul-2009	$178,370	In progress
PIR-08-020	0		BETA Lighting	Networked LED Streetlights with Intelligent Controls	Jun-2009	$300,000	In progress
PIR-08-018	0		Bevilacqua-Knight, Inc.	Technology and Strategies for AB32 Compliance in the Exisitng Homes Sector	Jun-2009	$199,972	In progress
UC BOA-080	0		Bevilacqua-Knight, Inc.	Fire, Climate, and Air Quality: Proposal Preparation for US EPA Funding Opportunity	May-2004	$22,356	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-116	0		Bevilacqua-Knight, Inc.	Clean Coal Technology Workshop	Apr-2005	$68,877	Yes
UC BOA-117	0		Bevilacqua-Knight, Inc.	West Coast Regional Carbon Sequestration Partnership (WESTCARB): Phase II Start-up and Planning Activities	Jun-2005	$63,050	Yes
UC BOA-117	1		Bevilacqua-Knight, Inc.	West Coast Regional Carbon Sequestration Partnership (WESTCARB): Phase II Start-up and Planning Activities	Jun-2005	$455,875	Yes
500-98-014		266	BioEnergy Solutions, LLC	Low-Cost Hydrogen Sulfide Reduction in Biogas Energy Systems	Feb-2009	$93,896	In progress
ICF-06-015-P-S	0		Black & Veatch Corporation	Review of Biopower Proposals	Nov-2007	$13,271	Yes
UC BOA-111	0		Blaydes and Associates	California Geothermal Energy Collaboration: Expanding CA's Confirmed Geothermal Resources Base	May-2005	$59,580	Yes
500-98-014		162	Boston University	Advanced Cathode Materials for Solid Oxide Electrolyzers	Jan-2005	$75,000	In progress
500-98-014		172	Brayton Energy, LLC	Solar CAT Critical Technology Demonstration	Sep-2005	$75,000	In progress
PIR-07-004	0		Brayton Energy, LLC	400 kW Intercooled-Recuperated Microturbine	Jun-2008	$808,000	In progress
MRA-02-078	0		Bren School of Environmental Science & Management - UC Santa Barbara	Biofuels and Biodiversity in California	Oct-2008	$397,000	In progress
PIR-04-005	0		Brookhaven National Laboratory	Demonstration of Engineering-Based Cement Evaluation Method for Geothermal Wells	Jun-2005	$90,000	No
500-98-014		293	Broome & Associates	Verification Test Undershot Impulse-Jet Hydro-Turbine at Turlock Irrigation Districts Drop-MD6	Nov-2009	$95,000	In progress
500-04-006	0		Bruce Wilcox	2008 Building Efficiency Standards Research	Oct-2004	$965,053	Yes
PIR-08-019	0		Bruce Wilcox	Energy Efficiency Characteristics of New California Homes	Jul-2009	$197,667	In progress
SAIC-06-043-P-R	0		Bruce Wilcox	Research to Support Improvements in Residential Compliance Tools	Jan-2009	$103,314	In progress
400-00-037	1		Building Industry Institute	Profitability, Quality and Risk Reduction Through Energy Efficiency	Jan-2005	-$479,264	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		248	C/e- Solutions, Inc.	Novel energy generation process for wastewater treatment plant operations	Jan-2008	$94,817	In progress
500-06-040	0		Cal Poly Corporation	Agricultural Water and Energy Efficiency	May-2007	$1,600,000	In progress
500-02-023	1		California Air Resources Board	Indoor Environmental Quality Characterization	Jan-2006	$1,600,000	In progress
500-03-027	0		California Air Resources Board	Haagen-Smit Symposium on Climate Change Co-Sponsorship Agreement	Apr-2004	$25,000	Yes
500-05-013	0		California Air Resources Board	Environmental Justice	Jun-2006	$345,961	In progress
500-06-042	0		California Air Resources Board	Haagen-Smit Symposium 2007	Apr-2007	$50,000	Yes
500-05-008	0		California Alliance For Distributed Energy Resources, Inc.	The 6th Annual International Symposium on Distributed Energy Resources	Aug-2005	$10,000	Yes
PIR-04-008	0		California Climate Action Registry	2004 Registry Software Upgrading, Hosting and Maintenance, Sequestration of Protocols	Dec-2004	$200,000	Yes
UC BOA-128	0		California Climate Change Center - UC Berkeley	CA Climate Change Center Project Analyst	Jun-2005	$330,909	Yes
500-05-035	0		California Commissioning Collaborative	Commercial Building Commissioning R&D	Apr-2006	$400,000	Yes
500-08-039	0		California Commissioning Collaborative	Building Commissioning: Strategies and Technologies for Energy Efficiency	Apr-2009	$1,796,630	In progress
500-08-045	0		California Council on Science and Technology	California's Energy Future: Assessing our Technical Capacity to meet 2050 Climate and Energy Goals	May-2009	$50,000	In progress
500-05-028	0		California Department of Conservation	West Coast Regional Carbon Sequestration Partnership, Phase II	Feb-2006	$150,000	In progress
500-08-021	0		California Department of Conservation	West Coast Regional Carbon Sequestration - - Phase II Geological Characterization	Nov-2008	$274,067	In progress
500-06-060	0		California Department of Corrections & Rehabilitation	Demonstration of a Dual-Function Thermodynamic Cycle for Increasing Turbine Efficiency.	Jun-2007	$450,000	In progress
500-08-010	0		California Department of Fish and Game	Validation of an Environmental Anaylsis Tool (PACT) for Renewable Energy Siting	Sep-2008	$2,997,955	In progress
500-04-004	0		California Department of Forestry & Fire Protection	Strategic Value Analysis: GIS Development #2	Jul-2004	$650,000	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-05-029	0		California Department of Forestry & Fire Protection	West Coast Regional Carbon Sequestration Partnership, Phase II	Feb-2006	$200,000	In progress
500-09-016	0		California Department of Water Resources	Adaptation Initiatives for Sea Level Rise in California	Dec-2009	$95,000	In progress
500-98-014		173	California Institute of Technology	Silicon Nanorod Solar Cells	Sep-2005	$75,000	In progress
BOA-99-199-P	0		California Lighting Technology Center - UC Davis	Partnership for Energy Efficient Lighting	Nov-2008	$369,715	In progress
UC BOA-074	0		California Lighting Technology Center - UC Davis	Berkeley Lamp Applications Study	May-2004	$89,971	Yes
500-98-014		200	California State Polytechnic University, Pomona	Computer Controlled LED Array Power Supply and Controller	Sep-2006	$74,026	In progress
200-96-010	3		California State University Sacramento Foundation	Standard Agreement with CSUS Foundation for Student Services	May-2004	$100,583	Yes
200-96-010	3		California State University Sacramento Foundation	Standard Agreement with CSUS Foundation for Student Services	May-2004	$160,000	Yes
200-96-010	6		California State University Sacramento Foundation	Standard Agreement with CSUS Foundation for Student Services	Jun-2005	$182,803	Yes
200-96-010	7		California State University Sacramento Foundation	Standard Agreement with CSUS Foundation for Student Services	Sep-2006	$60,000	Yes
200-96-010	8		California State University Sacramento Foundation	Standard Agreement with CSUS Foundation for Student Services	May-2009	$15,000	In progress
200-96-010	8		California State University Sacramento Foundation	Standard Agreement with CSUS Foundation for Student Services	May-2009	$114,979	In progress
500-08-027	0		California State University, Sacramento	SmartGrid Information Assurance and Security Technology Assessment	Feb-2009	$200,000	In progress
PIR-08-028	0		California Wind Energy Association (CALWEA)	Improving Methods to Assess and Mitigate Impacts of Wind Energy Development on Birds and Bats in California: Synthesizing and Analyzing a Database to Empirically Evaluate Key Issues, and Validating Fatality Estimation Methods	Jul-2009	$442,078	In progress
500-09-019	0		CALSTART, Inc.	The California Hybrid, Efficient and Advanced Truck (CalHEAT) Research Center	Dec-2009	$3,000,000	In progress
500-09-013	0		Cambria Solutions	PIER Administrative Polices and Procedures Manual	Oct-2009	$179,762	In progress
06-433.01-003	0		Capitol Advantage LLC	Capitol Advantage LLC	2006	$2,000	Yes
BOA-99-237-R	0		CE-CERT	PIER AFRR Gaps Analysis and Research	Sep-2009	$400,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC MR-061	0		Center for Aquatic Biology and Aquaculture - UC Davis	Research on Instream Flow Determinations for Hydropower Applications in California	Jan-2007	$1,000,000	In progress
500-04-019	0		Center for Clean Air Policy	Center for Clean Air Policy	Feb-2005	$15,000	Yes
500-06-026	0		Center for Clean Air Policy	Center for Clean Air Policy	Feb-2007	$60,000	Yes
500-05-005	0		Center for Energy Efficiency and Renewable Technologies	Imperial Valley and Tehachapi Implementation Groups	Aug-2005	$799,758	In progress
500-06-048	0		Center for Energy Efficiency and Renewable Technologies	Renewable Resource/Transmission Development Scenarios	May-2007	$999,714	In progress
500-06-049	0		Center for the Built Environment - UC Berkeley	Efficient Commercial Comfort Systems	Sep-2007	$600,000	In progress
500-07-018	0		Center for the Built Environment - UC Berkeley	UC Berkeley CBE Membership	Nov-2007	$30,000	Yes
500-08-044	0		Center for the Built Environment - UC Berkeley	Advanced Building Systems Technology Development	May-2009	$2,100,000	In progress
BOA-99-185-P	0		Center for the Built Environment - UC Berkeley	Title 24 Compliance Model for Under Floor Air Distribution	Dec-2007	$162,400	In progress
BOA-99-200-P	0		Center for the Built Environment - UC Berkeley	Advanced Systems Technology Development	Oct-2008	$250,000	In progress
BOA-99-210-P	0		Center for the Built Environment - UC Berkeley	Advanced Integrated Systems Development	Jan-2009	$200,000	In progress
BOA-99-214-P	0		Center for the Built Environment - UC Berkeley	Cool-colored cars to reduce air-conditioning energy use and reduce CO2 emissions	Feb-2009	$250,000	In progress
BOA-99-225-P	0		Center for the Built Environment - UC Berkeley	Integrated Systems Tools Development and Performance Testing	Jul-2009	$280,000	In progress
BOA-99-244-R	0		Center for the Built Environment - UC Berkeley	Energy and comfort effects of reducing the minimum diffuser flow rate in existing VAV systems	Dec-2009	$150,000	In progress
500-98-014		251	CHA Corporation	Microwave-Induced Destruction of NOx and H2S in Dairy Digester Reciprocating Engines	Jul-2008	$95,000	In progress
500-98-014		140	Choson Research Corp.	A New Physical Water Treatment Technology for Energy-Efficient Water-Cooled Air Conditioning Systems	Apr-2004	$74,290	Yes
500-98-014		209	Clarkson University	Use of Plasma Actuators to Increase Wind Energy Extraction	Dec-2006	$95,000	In progress
500-05-036	0		Clean Energy States Alliance	Clean Energy States Alliance National Wind Siting/Wildlife Collaborative	May-2006	$25,000	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-01-013	1		Clean Energy Systems, Inc.	A 500 kW Zero-Emission Gas-Fired Power Plant	Mar-2004	$2,000,000	Yes
500-98-014		168	Clean Energy Systems, Inc.	Alternative Synthetic Fuels Injector Tests	Sep-2005	$75,000	In progress
500-98-014		249	CleanEngen Group LLC	Air Independent Internal Oxidation Steam Generator	Mar-2008	$95,000	In progress
500-98-014		226	Clever Fellows Innovation Consortium (CFIC), Inc.	The Next Wave in Air-conditioning: Acoustic-Stirling Commercial Rooftop Units	Jun-2007	$86,762	In progress
500-98-014		230	Clustered Systems	Fanless Cooling System for Servers and Storage Systems	Aug-2007	$95,000	In progress
500-03-037	0		CMC-Engineering	Power Generation Integrated in Burners for Packaged Industrial/Commercial Boilers	Apr-2004	$1,505,827	In progress
PIR-07-003	0		CMC-Engineering	Microturbine-Based Efficient Heat and Power Systems (EHPS)	Jun-2008	$1,499,733	In progress
PIR-07-005	0		CMC-Engineering	Packaged Microturbine / Boiler CHP System	Jun-2008	$535,954	In progress
PIR-07-007	0		CMC-Engineering	Microturbine-Based CHP for Thermal Oxidizers	Jun-2008	$733,905	In progress
500-98-014		131	Cobalt Energy	Flywheel System for Bulk Energy Storage	Jan-2004	$75,000	In progress
04-433.00-415	0		Coders Online, Inc.	Visual Basic for Applications Programmer	Apr-2005	$180,403	Yes
04-433.00-415	1		Coders Online, Inc.	Visual Basic for Applications Programmer	Apr-2005	$69,064	Yes
500-98-014		223	Columbia University	Determining the Feasibility of a High Temperature CO2 Separation Membrane	Sep-2007	$73,865	In progress
500-04-015	0		Competitive Energy Insight Inc.	Evaluation of Policy Impacts on the Economic Viability from a Project Owners Perspective of California Based Distributed Generation/Combined Heat and Power	Dec-2004	$128,621	Yes
06-432.01-008	0		ComponentOne, LLC	Component One Software Renewal for PIMS	2006	$1,200	Yes
UC MR-024	0		Conservation International	Dynamic Ecosystem Modeling for California	Mar-2004	$596,778	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
PIR-08-021	0		ConSol	Strategies to Eliminate Peak Air Conditioning Loads	Jul-2009	$292,173	In progress
500-07-005	0		Consortium For Energy Efficiency	Lighting for Tomorrow 2007-2008	Sep-2007	$36,000	Yes
500-09-001	0		Consortium For Energy Efficiency	Lighting for Tomorrow 2009	Jul-2009	$18,000	In progress
UC BOA-101	0		Consortium For Energy Efficiency	Lighting for Tomorrow	Feb-2005	$21,000	Yes
UC BOA-167	0		Consortium For Energy Efficiency	Lighting for Tomorrow-Light Fixture Competition using Compact Flourescent and Light Emitting Diode Lamps	Nov-2006	$21,000	Yes
PIR-08-039	0		County of Alameda	CERTS Smart Grid Demonstration with Renewables and large-Scale Energy Storage Integrated at Santa Rita Jail, Alameda County, California	Jul-2009	$1,983,555	In progress
500-06-056	0		County of Kern Planning Department	Tehachapi Wind Resource Area Expansion Study	Jun-2007	$500,000	In progress
05-433.00-504	0		Creatus, Inc.	MSA	Nov-2005	$207,459	Yes
05-433.00-505	0		Creatus, Inc.	MSA	Nov-2005	$240,064	Yes
05-433.00-506	0		Creatus, Inc.	MSA	Nov-2005	$172,906	Yes
500-08-036	0		CTG Energetics, Inc.	Energy and Greenhouse Gas Assessment Protocols for Built Environments	Mar-2009	$684,667	In progress
500-98-014		139	Davis Energy Group, Inc.	Covell Village - A Model for Sustainable Communities	Apr-2004	$74,965	Yes
UC BOA-115	0		Davis Power Consultants	California Geothermal Energy Collaboration: Assistance with Renewables Portfolio Standard Process	May-2005	$41,493	Yes
500-03-038	0		DE Solutions, Inc.	Engine CHP Integrated Cooling and Heating Module Development	Apr-2004	$1,173,536	Yes
500-98-014		232	Desert Research Institute	Utility Monitoring System Hardware Development	Aug-2007	$94,859	Yes
PIR-08-010	0		Desert Research Institute	Investigation of Methods of Potential Value to Monitor Groundwater Recharge in the Mountains of California	Dec-2008	$399,990	In progress
UC MR-027	0		Desert Research Institute	Enhanced Climate and Hydrological Monitoring for California	Apr-2004	$399,918	In progress
UC BOA-091	0		Design & Engineering Services	Demand Response Evaluation Methodology and PCF CASE Inititative Activities	Jun-2005	$280,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-03-034	0		Distributed Utility Associates	DUIT-Distributed Utility Integration Test	Mar-2004	$2,976,437	Yes
500-98-014		146	Donald Taylor	Biomass-to-Syngas, Novel Low-Cost Counter-Current Process	Apr-2004	$74,908	Yes
500-03-005	1		E Source Companies LLC	PIER Buildings Program Technology Dissemination Initiative	Oct-2005	$260,000	In progress
500-05-038	0		E Source Companies LLC	E Source Technology Assessment Service (formerly called Core Membership)	May-2006	$16,200	Yes
500-08-016	0		E Source Companies LLC	E Source Technology Assessment Service	Oct-2008	$17,900	In progress
500-09-018	0		E Source Companies LLC	E Source Technology Assessment Service (TAS)	Dec-2009	$17,900	In progress
500-04-021	0		EcoInteractive, Inc.	Development of an Energy Module for the I-PLACE3S Planning Tool	Apr-2005	$405,254	Yes
500-04-030	0		Ecos Consulting Inc.	Battery Charger and Power Supply Standards Evaluation	Jun-2005	$688,833	In progress
500-06-007	0		Ecos Consulting Inc.	Energy Savings in Electronics	Jul-2006	$1,299,616	In progress
PIR-08-026	0		EDM International, Inc.	Evaluating the Effectiveness of Avian Interaction Mitigating Measures and Processes	Jul-2009	$165,516	In progress
500-98-014		170	Ekster & Associates	Development of Optimization Software for an Activated Sludge System	Sep-2005	$75,000	In progress
UC MR-072	0		Ekster & Associates	Automation of Sludge Thickening Process	Aug-2007	$75,000	In progress
PIR-08-040	0		El Dorado Irrigation District	El Dorado County Water Systems Energy Generation, Storage, Efficiency, Demand Management & grid Support Project	Jul-2009	$197,950	In progress
500-08-048	0		Electric Power Group	Demonstration of Advanced Synchrophasor Technology for the Integration of Renewables on the California Grid	Jun-2009	$1,699,149	In progress
UC BOA-105	0		Electric Power Group	Assessmnet of Reliability and Operational Issues for Integration of Renewables, Phase 2	Apr-2005	$325,650	Yes
UC BOA-142	0		Electric Power Group	California Transmission Congestion Assessment	Mar-2006	$224,000	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-02-014	2		Electric Power Research Institute (EPRI)	Research and Collaborative Projects	Jun-2005	$139,098	Yes
500-02-028	1		Electric Power Research Institute (EPRI)	EPRI Memberships	Apr-2005	$756,622	Yes
500-06-052	0		Electric Power Research Institute (EPRI)	EPRI Collaborative Research Portfolio Membership Agreement	Jun-2007	$1,179,660	In progress
500-06-052	1		Electric Power Research Institute (EPRI)	EPRI Collaborative Research Portfolio Membership Agreement	Dec-2008	$1,225,602	In progress
500-09-014	0		Electric Power Research Institute (EPRI)	California Utility Vision and Roadmap for the Smart Grid of Year 2020.	Nov-2009	$458,457	In progress
PIR-07-010	0		Electric Power Research Institute (EPRI)	Metrics-Based Evaluation of Storage at Wind Interconnection Points in California	Jun-2008	$481,657	In progress
UC BOA-140	0		Electric Power Research Institute (EPRI)	Critical Operating Constraints Forecasting for CA Independent System Operators-Planning Phase	Feb-2006	$55,225	Yes
UC MR-050	0		Electric Power Research Institute (EPRI)	Critical Operating Constraint Forecaster (COCF)	Jul-2006	$300,000	In progress
UC MR-052	0		Electric Power Research Institute (EPRI)	Probabilistic Transmission Congestion Forecasting	Jul-2006	$250,000	In progress
500-05-014	0		Electricity Storage Association	Electrical Storage Association 2005 Conference (EESAT 2005)	Oct-2005	$10,000	Yes
500-98-014		135	EnefTech Corporation	Development of a Modular Scroll-Turbine-Based Organic-Ranking Cycle (ORC)	Jan-2004	$75,000	Yes
500-06-051	0		Energetics Incorporated	4th Annual Advanced Stationary Reciprocating Engines Conference	Jun-2007	$20,000	Yes
KEMA-06-018-P-R	0		Energetics Incorporated	RD & D roadmap for improving energy efficiency in California's food processing industry	Oct-2008	$47,300	In progress
05-205.00-034	0		Energetics, Inc	CO-SPONSORSHIP OF THE USDOE AND THE CALIFORNIA ENERGY COMMISSION ORGANIZED 3RD ANNUAL ADVANCED STATIONARY RECIPROCATING ENGINE CONFERENCE	2005	$4,999	Yes
ICF-06-025-P-R	0		Energy & Environmental Economics, Inc.	Carbon Calculator for California Buildings using Electricity Sector Marginal Emissions Profile	May-2008	$44,752	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
ICF-06-031-P-R	0		Energy & Environmental Economics, Inc.	Carbon Calculator for California Buildings Electricity Sector Emission Profile - Phase 2	Dec-2008	$17,762	Yes
500-05-024	0		Energy Center of Wisconsin	Performance Testing Protocols and a Database for Distributed Generation Systems (Phase II)	Feb-2006	$338,000	In progress
500-05-033	0		Energy Concepts Company	Demonstration and Monitoring of ThermoSorber	Apr-2006	$40,000	Yes
500-98-014		265	Energy Concepts Company	Charge Air Chiller	Feb-2009	$95,000	In progress
06-205.00-016	0		Energy Policy Initiatives Center, USD School of Law	San Diego Smart Grid Summit Co-Sponsorship	Nov-2006	$2,475	Yes
500-05-003	0		EnergySoft, LLC	Development of Recommendations to Integrate Emerging Technologies into the 2008 Nonresidential Standards	Jul-2005	$123,788	Yes
SAIC-06-006-P-R	0		EnergySoft, LLC	Support of Recommendations to Integrate Emerging Technologies into the 2008 Nonresidential Standards	Dec-2006	$46,311	Yes
UC BOA-089	0		EnerNex Corporation	R&D Demonstration Process for DR information Exchange	Nov-2004	$109,020	Yes
UC BOA-089	1		EnerNex Corporation	R&D Demonstration Process for DR information Exchange	Nov-2004	$88,518	Yes
UC BOA-172	0		EnerNex Corporation	R&D Demonstration Process for Demand Response Consumer Portal Information Exchange	Feb-2007	$49,464	Yes
500-98-014		235	Engsysco, Inc.	Feasibility Analysis of Cleanroom Airflow Reduction Based on Establishment of Theoretical Basis and Required Validation	Sep-2007	$95,000	In progress
06-226.00-002	0		Ensci Corporation	Interface Boards	2006	$24,510	Yes
500-98-014		234	EPB Consulting Group	Residential Integrated Ventilation Energy Controller	Dec-2007	$89,856	In progress
500-98-014		252	Evan Hughes	Pomace and Woody Biomass for Renewable Biomass Power: Technical and Economic Feasibility	Aug-2008	$95,000	In progress
500-98-014		263	Exergy Controls, LLC	Demand Response Load Shedding System for Lighting	Feb-2009	$94,895	In progress
500-08-030	0		Facet Decision Systems, Inc	Environmental Siting Model and Renewable Scenario Support	Mar-2009	$510,100	In progress
500-98-014		190	Federspiel Controls	Constant-Volume to Conversion Technology	Feb-2006	$75,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		180	Fiberstars, Inc	Distributed Optical Fiber Luminaires to Replace Fluorescent Freezer Case Lighting for Dramatic energy Savings in California	Apr-2006	$75,000	In progress
05-223.01-524	0		Frost & Sullivan	Technical Insights	2005	$4,995	Yes
500-98-014		217	Gaia Power Technologies	Time Shifting of PV Generation Using Dispatchable Distributed Energy Storage	Feb-2007	$76,731	In progress
500-04-026	0		Gas Technology Institute	Technical Support for California Sustainable Urban Energy Planning (Modeling Support)	Apr-2005	$199,872	Yes
500-06-038	0		Gas Technology Institute	331 kWe High Efficiency and Low Emission Engine Using Thermochemical Fuel Reforming	Apr-2007	$1,960,654	In progress
500-06-054	0		Gas Technology Institute	Sequestration of CO2 Emissions through Biocatalytic Mineralization	Jun-2007	$105,000	In progress
500-08-051	0		Gas Technology Institute	Advanced Radiant Hvac Systems for California Homes	Jun-2009	$902,820	In progress
500-98-014		225	Gas Technology Institute	Feasibility Evaluation of a Direct Carbon Fuel Cell (DCFC) Operating on Petroleum Coke Using a Molten Carbonate Electrolyte	Jun-2007	$94,906	In progress
500-98-014		237	GC Environmental, Inc.	UV-Photodecomposition of Siloxane	Jun-2008	$95,000	In progress
500-98-014		260	Georgia Institute of Technology	A New Approach to Carbon Dioxide Capture	Feb-2009	$88,972	In progress
UC BOA-075	0		Geothermal Energy Association	CA Geothermal Energy Collaborative: Start-up and Planning Phase 0	Nov-2004	$33,799	Yes
UC BOA-120	0		Geothermal Energy Association	CA Geothermal Energy Collaboration: Assessment of CA's Geothermal Resources Base	Jun-2005	$11,200	Yes
06-205.00-027	0		Geothermal Resources Council	Geothermal Resource Council Membership	Dec-2006	$2,500	Yes
08-205.01-017	0		Geothermal Resources Council	Membership of Geothermal Resources Council for calendar 2009 and 2010	Jan-2009	$4,999	In progress
UC BOA-112	0		Geothermal Resources Council	California Geothermal Energy Collaboration: Outreach and Education	May-2005	$2,810	Yes
UC BOA-099	0		Global Energy	Exploring How to Improve the Representation of the Electricity System in the BEAR Model	Mar-2005	$72,425	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-088	0		Global Environment & Technology Foundation	The Effects of Alternative Fuel Pathways on Electricity and Emissions in California: An Exploratory Study	Sep-2004	$33,600	Yes
500-04-023	0		Global Green USA	Affordable Multi-Family ZENH Project	Mar-2005	$732,000	In progress
500-04-020	0		Green Building Studio, Inc.	Green Building Studio Enhancement	Mar-2005	$270,000	Yes
500-98-014		296	Green Reactions LLC	Osprey: Ultra efficient mass microalgae culturing and harvesting device	Nov-2009	$95,000	In progress
PIR-07-011	0		Green Volts, Inc.	Low Cost Installation of Concentrating PV	Jun-2008	$250,000	In progress
500-98-014		203	Greenvolts, Inc.	Economical Two-Axis Carousel Tracker for Concentrated PV Power Plants	Sep-2006	$94,958	In progress
PIR-07-001	0		Growpro Inc.	Develop and Operate a Wood Gasification System in a Commercial Environment in Northern California	Apr-2008	$199,500	In progress
SAIC-06-020-P-R	0		H. Jaeger Associates	Syn Gas Fired Advaned Gas Turbine Analysis	Sep-2007	$19,999	In progress
PIR-08-027	0		H.T. Harvey and Associates	Radar, Acoustic and Observational Study to Assess Bat and Bird Movements and Mortality Relative to Old and New Wind Tower Structures	Jul-2009	$732,411	In progress
500-98-014		183	Heliocentric	High Energy Density Capacitors for Photovoltaic Systems	Jan-2006	$75,000	In progress
500-06-039	0		Heschong Mahone Group	Optimizing Human Factors in the Lighting Efficiency Equation	Mar-2007	$975,740	In progress
UC BOA-166	0		Heschong Mahone Group	Assessment, Review and Recommendation on the Implementation of Demand Response New and Emerging Technologies	Nov-2006	$33,600	Yes
500-98-014		155	Hi-Q Products, Inc.	The Mamikon Spinner	Nov-2004	$75,000	Yes
500-98-014		264	Hydrogen Solutions International, Inc.	Rice Straw as a Renewable Hydrogen Source	Feb-2009	$95,000	In progress
500-07-013	0		Hydrologic Research Center (HRC)	Performance of the Northern California Water System Under Climate Change: INFORM as an adaptation tool	Oct-2007	$199,600	In progress
500-08-033	0		Hydrologic Research Center (HRC)	INFORM II	Mar-2009	$1,000,000	In progress
UC BOA-147	0		Ibis Environmental Inc	Review and Analysis of Existing Methods and Metrics for Wind Siting Process	Mar-2006	$22,400	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
PIR-07-006	0		ICF International	Dehumidification/Heating Combined Heat and Power System	Jun-2008	$460,062	In progress
06-205.00-038	0		ICF Resources, LLC	Gladstein, Neandross & Associates, LLC	Sep-2007	$4,950	Yes
ICF-06-001-P-S	0		ICF Resources, LLC	Contract Administration and Management Task 1	Oct-2006	$120,000	In progress
ICF-06-012-P-S	0		ICF Resources, LLC	Technical and Outreach Support for the PIER Climate Change Research Program	Apr-2007	$138,238	In progress
ICF-06-019-P-S	0		ICF Resources, LLC	Contract Administration and Management Task 1	Nov-2007	$74,700	In progress
ICF-06-020-P-R	0		ICF Resources, LLC	Contract Administration and Management Task 1	Nov-2007	$80,340	In progress
ICF-06-021-P-R	0		ICF Resources, LLC	Climate Change Research Plan Update	Apr-2008	$124,705	In progress
ICF-06-024-P-R	0		ICF Resources, LLC	RD&D Analysis and Targets for EPAG	Feb-2008	$99,998	Yes
ICF-06-024-P-R	2		ICF Resources, LLC	RD&D Analysis and Targets for EPAG	Dec-2008	$70,000	Yes
ICF-06-027-P-R	0		ICF Resources, LLC	Economic Analyses of Sectoral Impacts of Climate Change	Sep-2008	$78,532	In progress
ICF-06-028-P-R	0		ICF Resources, LLC	Task 1 - Contract Administration and Management	Oct-2008	$29,760	In progress
ICF-06-029-P-S	0		ICF Resources, LLC	Task 1 - Contract Administration and Management	Oct-2008	$48,000	In progress
ICF-06-032-P-R	0		ICF Resources, LLC	Combined Heat and Power Technical and Market Assessment	Feb-2009	$149,990	Yes
ICF-06-032-P-R	2		ICF Resources, LLC	Combined Heat and Power Technical and Market Assessment	Sep-2009	$24,945	Yes
ICF-06-033-P-S	0		ICF Resources, LLC	PIER Advisory Board Meetings Support	Apr-2009	$185,505	In progress
ICF-06-035-P-S	0		ICF Resources, LLC	Climate Change Center Brochure	Aug-2009	$15,761	In progress
PIR-04-006	0		Imageair, Inc.	Geothermal Exploration in Eastern California Using ASTER TIR Data	Jun-2005	$338,331	In progress
500-98-014		191	Infoscitex Corporation	Development of Microencapsulated Phase Change Materials for Chilled Water Systems	Mar-2006	$74,656	In progress
500-98-014		204	Institute of Transportation Studies - UC Davis	Hydrogen Enrichment of Landfill Gas for Enhanced Combustion	Apr-2007	$95,000	In progress
UC MR-060	0		Institute of Transportation Studies - UC Davis	Plug-in Electric Hybrid Vehicle Research Center	Dec-2006	$3,000,000	In progress
500-08-003	0		International Building Performance Simulation Association-USA	Cosponsorship of SimBuild 2008 Conference in Berkeley, California	Jul-2008	$15,000	In progress
500-98-014		185	InterPhases Research	Flexible Hybrid Solar Cell	Jan-2006	$75,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		143	Intertec Advanced Materials, Inc.	High Efficiency Lanthanide Doped Ceria-Zirconia Layered Hybrid Electrode for SOFC Generators	Apr-2004	$74,936	In progress
500-98-014		218	Iowa State University	Wheat Straw Utilization to Produce Syngas/Hydrogen Fuel for Power Generation	Jul-2007	$95,000	In progress
500-98-014		284	Iowa State University	Innovative biogas hydrogen sulfide removal technology	Oct-2009	$95,000	In progress
500-98-014		295	Iowa State University, Dept of Mechanical Engineering	Development of High-Efficiency and Cost-effective Micro Wind Turbines	Nov-2009	$94,868	In progress
UC MR-034	0		Iowa State University, Iowa Energy Center	National Building Control Information Program	Nov-2004	$400,000	Yes
500-98-014		215	ITN Energy Systems, Inc.	Development of an Ordered Thin-Film Palladium Alloy Membrane for Hydrogen Separation	Feb-2007	$94,949	In progress
ICF-06-010-P-S	0		Itron, Inc.	California Commercial End Use Survey (CEUS) Technical Support	Feb-2007	$64,300	In progress
500-98-014		165	J. Schripsema & Associates, LLC	Low-level Concentrating Photovoltaic System	Jan-2005	$75,000	In progress
500-07-003	0		John Maulbetsch	Field Testing and CFD Modeling of Wind Effects on ACC Performance	Aug-2007	$540,000	In progress
500-98-014		182	JX Crystals, Inc.	Efficient Solar Photovoltaic Mirror Modules for Half the Cost of Today's Planar Modules	Dec-2005	$75,000	In progress
500-98-014		171	Kebaili Corporation	Hydrogen Micro-Sensor for Real Time Diagnostic of Transformer Oil	Sep-2005	$75,000	In progress
KEMA-06-001-P-S	0		KEMA, Inc.	Contract Administration and Management Task 1	Oct-2006	$105,000	In progress
KEMA-06-001-P-S	1		KEMA, Inc.	Contract Administration and Management Task 1	Mar-2007	$15,000	In progress
KEMA-06-005-P-S	0		KEMA, Inc.	Proposal Review for RD&D Projects Focused on Reducing Emissions and Improving Efficiency of ARICE for DG and CHP	Dec-2006	$440	Yes
KEMA-06-006-P-R	0		KEMA, Inc.	Cybersecurity Technical Assistance	Feb-2007	$17,353	Yes
KEMA-06-007-P-S	0		KEMA, Inc.	Cyber Security Technical Assistance - Phase 2	Apr-2008	$92,105	In progress
KEMA-06-011-P-S	0		KEMA, Inc.	Contract Administration and Management Task 1	Nov-2007	$36,294	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
KEMA-06-011-P-S	1		KEMA, Inc.	Contract Administration and Management Task 1	Oct-2008	$6,906	In progress
KEMA-06-012-P-R	0		KEMA, Inc.	Contract Administration and Management Task 1	Nov-2007	$73,920	In progress
KEMA-06-013-P-R	0		KEMA, Inc.	2008 Research, Development and Demonstration Evaluation Methodology	Apr-2008	$541,969	In progress
KEMA-06-013-P-R	2		KEMA, Inc.	2008 Research, Development and Demonstration Evaluation Methodology	Aug-2008	$0	In progress
KEMA-06-014-P-S	0		KEMA, Inc.	New baseline requirements for the project information management system - Lawrence Kinser	Oct-2008	$11,543	Yes
KEMA-06-015-P-R	0		KEMA, Inc.	Task 1 - Contract Administration and Management	Oct-2008	$62,880	In progress
KEMA-06-016-P-S	0		KEMA, Inc.	Task 1 - Contact Adminstration and Management	Oct-2008	$48,000	In progress
KEMA-06-019-P-R	0		KEMA, Inc.	ESI Market Assessments and Technology Information on Smart Grid and Renewables Integration	Dec-2008	$110,278	In progress
KEMA-06-020-P-R	0		KEMA, Inc.	Renewable Energy Cost of Generation Update	Jan-2009	$188,420	In progress
KEMA-06-021-P-R	0		KEMA, Inc.	Assessment of Advanced Storage Impact on Demand Side Services	Feb-2009	$72,129	Yes
KEMA-06-022-P-R	0		KEMA, Inc.	Impacts of Alternative Fuels on Air Quality: A Research Roadmap	Mar-2009	$80,820	In progress
KEMA-06-023-P-R	0		KEMA, Inc.	Research to Evalute the Impact of Wind Generation, Storage, and Demand Response on the California Grid	May-2009	$93,793	In progress
KEMA-06-024-P-S	0		KEMA, Inc.	Facilitiation of the Results Gained from the Research Evaluation of Wind Generation, Storage Impact, and Demand Response on the CA Grid	May-2009	$53,237	In progress
KEMA-06-025-P-R	0		KEMA, Inc.	Customer-Side Energy Storage for Demand Response & Realiability.	Aug-2009	$26,441	In progress
UC BOA-130	0		KEMA, Inc.	A Business Case Study on Applying Phasor Measurement Technology and Applications in the WECC	Jan-2006	$257,533	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		164	Kennedy/Jenks Consultants, Inc.	Evaluation of Molybdenum Removal from Power Plant Waste Streams Using Innovative Nanoparticle Media	Jan-2005	$74,837	Yes
PIR-08-025	0		Kenneth Shawn Smallwood	Comparing Utilization Data for Siting New Wind Power Generation	Jun-2009	$181,800	In progress
SAIC-06-005-P-S	0		Kessler and Associates, LLC for SAIC	Water-Energy Project Support	Dec-2006	$58,075	Yes
500-98-014		151	Konarka Technologies, Inc.	Printed Photovoltaic Images for Roofing	Dec-2004	$74,482	Yes
500-08-035	0		L Monte Information Services	Building Energy Standards Modeler Demonstration Program	Apr-2009	$1,826,761	In progress
ICF-06-026-P-R	0		L Monte Information Services	Requirements Engineering Services for the PIER Buildings Program Area	Sep-2008	$49,959	In progress
ICF-06-036-P-R	0		L Monte Information Services	Requirements Engineering Services for the PIER Buildings Program Area	Sep-2009	$17,745	In progress
UC BOA-174	1		L Monte Information Services	Requirements Engineering Services for the PIER Buildings Program Area	Oct-2007	$93,531	In progress
UC BOA-127	0		Larsen Communications	Assistance to PIER Energy Efficiency Office	Jan-2006	$99,390	Yes
UC BOA-127	2		Larsen Communications	Assistance to PIER Energy Efficiency Office	Dec-2007	$20,000	Yes
500-03-022	1		Lawrence Berkeley National Laboratory	Final Phase Research - High Performance Commercial Building Systems (HPCBS) Program	Jun-2006	$675,000	In progress
500-03-024	0		Lawrence Berkeley National Laboratory	CERTS-Microgrid Laboratory Test Bed	Feb-2004	$2,955,000	Yes
500-03-024	2		Lawrence Berkeley National Laboratory	CERTS-Microgrid Laboratory Test Bed	Oct-2005	$673,000	Yes
500-03-026	0		Lawrence Berkeley National Laboratory	Demand Response Research Center	Feb-2004	$7,999,970	In progress
500-03-026	1		Lawrence Berkeley National Laboratory	Demand Response Research Center	Jun-2007	$5,000,000	In progress
500-03-041	0		Lawrence Berkeley National Laboratory	Classroom HVAC: Improving Ventilation and Saving Energy	Apr-2004	$744,000	In progress
500-04-005	0		Lawrence Berkeley National Laboratory	Residential Ventilation Standards Research	Oct-2004	$600,000	Yes
500-04-014	0		Lawrence Berkeley National Laboratory	Phase 3 Research into Low Power Modes: Statewide Survey	Dec-2004	$472,000	In progress
500-05-001	0		Lawrence Berkeley National Laboratory	Demand Response as a System Reliability Resource	Jun-2005	$486,925	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-05-001	1		Lawrence Berkeley National Laboratory	Demand Response as a System Reliability Resource	Jun-2006	$613,000	In progress
500-05-001	2		Lawrence Berkeley National Laboratory	Demand Response as a System Reliability Resource	Aug-2007	$250,000	In progress
500-05-001	3		Lawrence Berkeley National Laboratory	Demand Response as a System Reliability Resource	Apr-2009	$550,000	In progress
500-05-006	0		Lawrence Berkeley National Laboratory	2008 Title 24 Codes & Standards Enhancement for Residential Cool Roofs	Aug-2005	$250,000	Yes
500-05-034	0		Lawrence Berkeley National Laboratory	Market Deployment of Colored Cool Roof Materials	Apr-2006	$1,253,000	In progress
500-06-022	0		Lawrence Berkeley National Laboratory	Energy Efficient Digital Networks	Nov-2006	$1,299,000	In progress
500-06-041	0		Lawrence Berkeley National Laboratory	High Performance Building Façade Solutions	Apr-2007	$500,000	In progress
500-06-046	0		Lawrence Berkeley National Laboratory	Automated Rooftop Air Conditioning Fault Detection at Target Stores and Extension of HVAC ePrimer	May-2007	$260,000	In progress
500-06-053	0		Lawrence Berkeley National Laboratory	Energy Efficient High-tech Buildings	Jun-2007	$1,100,000	In progress
500-06-058	0		Lawrence Berkeley National Laboratory	Develop Benchmarking and Energy & Water Savings Tool (BEST) for California Dairy Processing Industry	Jun-2007	$275,000	In progress
500-07-001	0		Lawrence Berkeley National Laboratory	Estimating the Global Climate Impact of Urban Albedo	Aug-2007	$150,000	In progress
500-07-006	0		Lawrence Berkeley National Laboratory	Residential Forced Air System Cabinet Leakage and Blower Efficiency	Sep-2007	$250,000	In progress
500-07-008	0		Lawrence Berkeley National Laboratory	EnergyPlus Enhancements for Title-24 Standards	Sep-2007	$400,000	In progress
500-07-043	0		Lawrence Berkeley National Laboratory	Greenhouse Gas Abatement and Climate Change Impact Adaptation in California: Advanced Methods and Applied Research	Jun-2008	$504,000	In progress
500-07-046	0		Lawrence Berkeley National Laboratory	Demand Controlled Ventilation: Research for Improving the Specifications in Title 24	Jun-2008	$870,000	In progress
500-08-001	0		Lawrence Berkeley National Laboratory	Co-Sponsorship to Organize the 2nd International Conference on Countermeasures to Urban heat Islands	Jul-2008	$10,000	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-08-052	0		Lawrence Berkeley National Laboratory	Development of Diagnostic and Measurement and Verification Tools for Commercial Buildings	Jun-2009	$1,959,879	In progress
500-08-054	0		Lawrence Berkeley National Laboratory	Synchrophasors for the Integration of Renewables	Jun-2009	$550,000	In progress
500-08-059R	0		Lawrence Berkeley National Laboratory	Cool Communities	Jun-2009	$435,000	In progress
500-08-061	0		Lawrence Berkeley National Laboratory	Residential Energy Savings from Air-tightness and Ventilation Excellence	Jun-2009	$1,688,155	In progress
500-09-002	0		Lawrence Berkeley National Laboratory	Data Center Energy Efficiency and Demonstration Projects	Jul-2009	$865,000	In progress
500-09-003	0		Lawrence Berkeley National Laboratory	Action-oriented Benchmarking - EnergyIQ Tool Enhancements and Service Extension Upgrades	Jul-2009	$636,000	In progress
500-09-010	0		Lawrence Berkeley National Laboratory	Development of a Design GUI for EnergyPlus	Sep-2009	$900,000	In progress
500-09-017	0		Lawrence Berkeley National Laboratory	Linking Water and Energy for the American River System	Dec-2009	$500,000	In progress
BOA-99-170-P	0		Lawrence Berkeley National Laboratory	High-Performance Healthcare Buildings	Dec-2007	$112,000	Yes
BOA-99-187-P	0		Lawrence Berkeley National Laboratory	Cool Communities Early Action Research	Feb-2008	$22,400	Yes
BOA-99-194-P	0		Lawrence Berkeley National Laboratory	Recommendations for energy benchmarking programs and opportunities to meet California goals	May-2008	$112,000	Yes
BOA-99-196-P	0		Lawrence Berkeley National Laboratory	Integrate Data Interoperability Research into ASHRAE Guideline Document	Jul-2008	$56,000	In progress
BOA-99-201-P	0		Lawrence Berkeley National Laboratory	Action-oriented Benchmarking Tools - Improved Functionality & End-user Feedback	Nov-2008	$112,000	Yes
BOA-99-201-P	1		Lawrence Berkeley National Laboratory	Action-oriented Benchmarking Tools - Improved Functionality & End-user Feedback	Jul-2009	$84,000	Yes
BOA-99-203-P	0		Lawrence Berkeley National Laboratory	Title 24 Technical Support for Residential HVAC	Dec-2008	$56,000	Yes
BOA-99-204-P	0		Lawrence Berkeley National Laboratory	UC Merced: Measured Performance Validation	Nov-2008	$33,600	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
BOA-99-205-P	0		Lawrence Berkeley National Laboratory	Research Opportunities in Emerging and Under-Utilized Energy-Efficient Industrial Technologies	Dec-2008	$84,000	In progress
BOA-99-206-P	0		Lawrence Berkeley National Laboratory	Phasors	Nov-2008	$235,200	Yes
BOA-99-211-P	0		Lawrence Berkeley National Laboratory	Domain Expert Workshops - HVAC Graphical User Interface for EnergyPlus	Jan-2009	$111,897	Yes
BOA-99-221-P-R	0		Lawrence Berkeley National Laboratory	Climate Change and Californias Energy Infrastructure: Phase I	May-2009	$400,000	In progress
BOA-99-222-P	0		Lawrence Berkeley National Laboratory	Continued Greenhouse gas Measurements and Analysis at Walnut Grove	Apr-2009	$30,229	No
BOA-99-229-P	0		Lawrence Berkeley National Laboratory	ASHRAE 62.1 study in retail buildings	Jul-2009	$275,000	In progress
BOA-99-230-P	0		Lawrence Berkeley National Laboratory	California GHG Targets and CHP Incentives	Aug-2009	$50,000	In progress
BOA-99-232-R	0		Lawrence Berkeley National Laboratory	Energy Efficiency Research for California Hospitals	Sep-2009	$350,000	In progress
BOA-99-239-R	0		Lawrence Berkeley National Laboratory	Development of LearnHVAC Teaching Tool	Nov-2009	$350,000	In progress
IJA-150-02	0		Lawrence Berkeley National Laboratory	Tech Assistance - ESI	Aug-2004	$125,681	Yes
IJA-50-001	0		Lawrence Berkeley National Laboratory	Tech Assistance - Bldg	Apr-2005	$175,435	Yes
IJE-05-001	0		Lawrence Berkeley National Laboratory	Tech Assistance - EA	Oct-2005	$1,103,576	In progress
IJE-05-005	0		Lawrence Berkeley National Laboratory	Consultant	Apr-2006	$111,008	Yes
MRA-02-079	0		Lawrence Berkeley National Laboratory	California Energy Balances Phase II	Dec-2008	$250,000	In progress
MRA-02-081	0		Lawrence Berkeley National Laboratory	IAW Storage Viability and Optimization Site	Feb-2009	$180,000	In progress
PIR-04-002	0		Lawrence Berkeley National Laboratory	Development of Fluid Injection Strategies for Optimizing Steam Production at The Geysers, California	Aug-2005	$998,606	In progress
PIR-04-004	0		Lawrence Berkeley National Laboratory	Structure of Salton Sea Geothermal Field from Passive Seismic Measurements	Aug-2005	$813,276	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
PIR-08-009	0		Lawrence Berkeley National Laboratory	California's Carbon Challenge: An Integrated Modeling Framework to Reduce GHG Emissions in California by 2050	Jun-2009	$400,000	In progress
PIR-08-013	0		Lawrence Berkeley National Laboratory	Lighting Control User Interface Standards	Jun-2009	$168,000	In progress
PIR-08-014	0		Lawrence Berkeley National Laboratory	Energy Implications of In-Line Filtration in California Residences	Aug-2009	$172,000	In progress
UC BOA-078	0		Lawrence Berkeley National Laboratory	Duct Leakage Modeling in Energy Plus: Max Sherman/LBNL; Craig Wray/LBNL	Sep-2004	$44,800	Yes
UC BOA-078	3		Lawrence Berkeley National Laboratory	Duct Leakage Modeling in Energy Plus: Max Sherman/LBNL; Craig Wray/LBNL	Sep-2004	$56,000	Yes
UC BOA-079	0		Lawrence Berkeley National Laboratory	New Housing Technology Demonstration	Jun-2004	$196,000	Yes
UC BOA-079	3		Lawrence Berkeley National Laboratory	New Housing Technology Demonstration	Jun-2004	$28,000	Yes
UC BOA-084	0		Lawrence Berkeley National Laboratory	Preliminary Report on Applicability of Residential Ventilation Standards in CA	Sep-2004	$55,936	Yes
UC BOA-092	0		Lawrence Berkeley National Laboratory	Improving SEER for Hot, Dry Climates	Jan-2005	$88,144	Yes
UC BOA-098	0		Lawrence Berkeley National Laboratory	Quantifying Tree Cover Over Typical Residential Areas in CA	Jun-2005	$491,680	Yes
UC BOA-104	0		Lawrence Berkeley National Laboratory	Evaluating the Use of Energy Plus for 2008 Nonresidential Standards Development	Mar-2005	$414,400	Yes
UC BOA-106	0		Lawrence Berkeley National Laboratory	Economic Evaluation and Peak Load Savings of Residential Central Air Conditioner Designs for Hot and Dry Climates	Mar-2005	$28,000	Yes
UC BOA-139	0		Lawrence Berkeley National Laboratory	Energy Efficient Digital Networks (EEDN)	Jun-2006	$56,000	Yes
UC BOA-143	0		Lawrence Berkeley National Laboratory	Preliminary Evaluation of Exterior Operable Window Shading Systems for Residential Buildings	Apr-2006	$5,600	Yes
UC BOA-145	0		Lawrence Berkeley National Laboratory	An Assessment of Research Needs Regarding the Interation of Energy and Water within California	Apr-2006	$134,400	Yes
UC BOA-154	0		Lawrence Berkeley National Laboratory	Technology Transfer for IBECS	Jun-2006	$84,000	Yes

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UC BOA-160	0		Lawrence Berkeley National Laboratory	Maintaining and Improving Energy Tariffs In the Home Energy Saver (HES) Web Site	Jul-2006	$56,000	Yes
UC BOA-165	0		Lawrence Berkeley National Laboratory	Scoping Study of Cold Seawater Source Cooling Systems for California	Oct-2006	$39,200	Yes
UC BOA-173	0		Lawrence Berkeley National Laboratory	Scoping Study: Greenhouse Gases Emissions and Combined Heat and Power in California	Mar-2007	$25,000	Yes
UC MR-030	0		Lawrence Berkeley National Laboratory	Cool Ducts	Apr-2004	$346,563	Yes
UC MR-033	0		Lawrence Berkeley National Laboratory	Energy Efficient Arsenic Removal from California Drinking Waters	Sep-2004	$254,000	Yes
UC MR-036	0		Lawrence Berkeley National Laboratory	Technology for Real Time Transmission System Operation	Feb-2005	$1,600,000	Yes
UC MR-040	0		Lawrence Berkeley National Laboratory	Development and Application of a California Basin Water and Energy Model	Sep-2005	$500,000	Yes
UC MR-041	0		Lawrence Berkeley National Laboratory	Technology for Real Time Transmission System Operation	Nov-2005	$2,500,000	In progress
UC MR-046	0		Lawrence Berkeley National Laboratory	Regional Climate Model Enhancement and Baseline Climate Inter-comparison	May-2006	$930,000	In progress
UC MR-047	0		Lawrence Berkeley National Laboratory	Research and Monitoring of Reliability and Operations Issues for Integration of Renewable Resources	Jun-2006	$303,000	Yes
UC MR-049	0		Lawrence Berkeley National Laboratory	WECC Load Modeling Transmission Research Project	Jul-2006	$1,158,430	In progress
UC MR-051	0		Lawrence Berkeley National Laboratory	Transmission Cost Allocation Methodologies	Jul-2006	$455,000	In progress
500-06-017	0		Lawrence Livermore National Laboratory	Renewable Energy GIS Capability	Sep-2006	$350,000	In progress
500-06-017	1		Lawrence Livermore National Laboratory	Renewable Energy GIS Capability	May-2007	$550,000	In progress
500-06-033	0		Lawrence Livermore National Laboratory	California Geothermal Energy Collaborative	Feb-2007	$450,000	No
500-06-044	0		Lawrence Livermore National Laboratory	Effect of Climate Change Impacts on Future Renewable Energy Generation	Apr-2007	$450,000	In progress
500-09-005	0		Lawrence Livermore National Laboratory	AB 1925 Report for 2010	Jul-2009	$400,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-160	0		Lawrence Berkeley National Laboratory	Maintaining and Improving Energy Tariffs in the Home Energy Saver (HES) Web Site	Jul-2006	$56,000	Yes
UC BOA-165	0		Lawrence Berkeley National Laboratory	Scoping Study of Cold Seawater Source Cooling Systems for California	Oct-2006	$39,200	Yes
UC BOA-173	0		Lawrence Berkeley National Laboratory	Scoping Study: Greenhouse Gases Emissions and Combined Heat and Power in California	Mar-2007	$25,000	Yes
UC MR-030	0		Lawrence Berkeley National Laboratory	Cool Ducts	Apr-2004	$346,563	Yes
UC MR-033	0		Lawrence Berkeley National Laboratory	Energy Efficient Arsenic Removal from California Drinking Waters	Sep-2004	$254,000	Yes
UC MR-036	0		Lawrence Berkeley National Laboratory	Technology for Real Time Transmission System Operation	Feb-2005	$1,600,000	Yes
UC MR-040	0		Lawrence Berkeley National Laboratory	Development and Application of a California Basin Water and Energy Model	Sep-2005	$500,000	Yes
UC MR-041	0		Lawrence Berkeley National Laboratory	Technology for Real Time Transmission System Operation	Nov-2005	$2,500,000	In progress
UC MR-046	0		Lawrence Berkeley National Laboratory	Regional Climate Model Enhancement and Baseline Climate Inter-comparison	May-2006	$930,000	In progress
UC MR-047	0		Lawrence Berkeley National Laboratory	Research and Monitoring of Reliability and Operations Issues for Integration of Renewable Resources	Jun-2006	$303,000	Yes
UC MR-049	0		Lawrence Berkeley National Laboratory	WECC Load Modeling Transmission Research Project	Jul-2006	$1,158,430	In progress
UC MR-051	0		Lawrence Berkeley National Laboratory	Transmission Cost Allocation Methodologies	Jul-2006	$455,000	In progress
500-06-017	0		Lawrence Livermore National Laboratory	Renewable Energy GIS Capability	Sep-2006	$350,000	In progress
500-06-017	1		Lawrence Livermore National Laboratory	Renewable Energy GIS Capability	May-2007	$550,000	In progress
500-06-033	0		Lawrence Livermore National Laboratory	California Geothermal Energy Collaborative	Feb-2007	$450,000	No
500-06-044	0		Lawrence Livermore National Laboratory	Effect of Climate Change Impacts on Future Renewable Energy Generation	Apr-2007	$450,000	In progress
500-09-005	0		Lawrence Livermore National Laboratory	AB 1925 Report for 2010	Jul-2009	$400,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
IEE-04-001	0		Lawrence Livermore National Laboratory	Tech Assistance - Renew	Jan-2005	$240,125	In progress
IIA-54-001	1		Lawrence Livermore National Laboratory	IIA - For Renewables	Aug-2004	$54,146	Yes
IIE-05-003	0		Lawrence Livermore National Laboratory	Consultant -Robert Glass	2005	$59,469	Yes
PIR-04-003	0		Lawrence Livermore National Laboratory	Pilot-Scale Geothermal Silica Recovery at Mammoth Lakes	Nov-2005	$737,213	Yes
UC BOA-072	0		Lawrence Livermore National Laboratory	Satellite Imagery and Geographical Information System (GIS) Analysis	Apr-2004	$140,000	Yes
UC BOA-169	0		Lawrence Livermore National Laboratory	PIER Shared Renewables Integration and Variable Resources Support	Oct-2006	$58,081	Yes
UC BOA-169	1		Lawrence Livermore National Laboratory	PIER Shared Renewables Integration and Variable Resources Support	Oct-2006	$58,081	Yes
UC BOA-169	2		Lawrence Livermore National Laboratory	PIER Shared Renewables Integration and Variable Resources Support	Oct-2006	$147,995	Yes
UC BOA-179	0		Lawrence Livermore National Laboratory	Report to Legislature accelerating Carbon Sequestration Strategies	Jun-2007	$100,000	Yes
UC MR-023	0		Lawrence Livermore National Laboratory	Protocol for the Intercomparison of Regional Climate Models for California	Mar-2004	$100,000	Yes
UC MR-073	0		Lawrence Livermore National Laboratory	Research Activities for the AB1925 Report to the Legislature on Accelerating Geologic Carbon Sequestration Strategies	Aug-2007	$150,000	In progress
UC BOA-093	0		Levy Associates	Assistance for Demand Response Technology and Policy	Dec-2004	$68,821	Yes
500-98-014		153	Lieberman Research Associates	Test and Evaluation of Heat Transfer Parameters for CAES Tank System	Nov-2004	$75,000	Yes
600-07-009	0		Life Cycle Associates	Technical Assistance for Full Fuel Cycle Analysis - Environmental and Emissions Emphasis	Jun-2008	$699,760	In progress
PIR-08-015	0		Lighting Research Center - Rensselaer Polytechnic Institute	A Platform for Innovation in Solid-State Lighting	Jun-2009	$294,942	In progress
500-03-004	1		Local Government Commission (LGC)	Community Choice Aggregation Pilot Project	May-2005	$475,974	Yes
PIR-08-032	0		Local Power Inc	San Luis Obispo RESCO	Jun-2009	$198,167	In progress
PIR-08-031	0		Los Angeles Community College District	Energy Demand Optimization Program for L.A. Trade Tech's F Building	Jun-2009	$2,000,000	In progress
500-98-014		189	M4 Engineering, Inc.	Lightweight Carbon Fiber Truss Windmill Blade Demonstrator	Mar-2006	$74,867	In progress

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Agreement#	Amd #	Pri #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
06-432.01-011	0		MadCap Software, Inc.	MadCap Flare, Bronze Maintenance Plan - 15 Months	2006	$1,129	Yes
PIR-08-042	0		Makel Engineering Inc.	Biogas Fuelled HCCI Power Generation System for Distributed Generation	Jul-2009	$300,000	In progress
500-98-014		192	Mansell, Steven	Validation of Guthrie Lead Separation Process (GLSP)	Apr-2006	$75,000	In progress
500-98-014		294	Mark Convery	Closed-loop Tracking for Solar Thermal Heliostats	Nov-2009	$89,000	In progress
UC BOA-144	0		Mark Z. Jacobson	Scoping Study on the Effects of Black Carbon on the Reflectivity of Snow and Agriculture Irrigation on Surface Temperatures	Apr-2006	$28,000	Yes
500-98-014		144	Markron Technologies	Innovative Wheel Concept to Increase Gas Turbine Efficiency	Apr-2004	$75,000	Yes
500-98-014		134	Material Methods, LLC	End-Use Efficient, Environmentally Friendly Water Softening Device	Jan-2004	$74,996	Yes
500-98-014		290	Materials and Systems Research, Inc.	Development of a Petcoke-fueled SOFC Power Generator for on-site Application	Nov-2009	$94,931	In progress
08-205.01-025	0		McClellan Technology Incubator	CleanStart's Venture Expo	Dec-2008	$4,999	In progress
09-409.00-015	0		Metavista Consulting Group	PIMS Application Support	Aug-2009	$120,000	In progress
500-98-014		259	Miami University - Ohio	Novel Heat Exchanger Fin Surface Design for Improved Condensate Management	Feb-2009	$77,993	In progress
500-98-014		175	Michigan State University	Performance Enhancement of Microturbines by Using Wave Rotor Technology	Dec-2005	$75,000	Yes
500-98-014		227	Michigan State University	Woven turbo wheel as key technology for economical compact and high-efficient R718 chiller that uses only water as refrigerant	Jul-2007	$95,000	In progress
UC BOA-141	0		Michigan State University	Feasibility Analysis for the PIER Biological Impacts of Climate Change in CA (BICCCA) Fellowships	Mar-2006	$29,975	Yes
500-98-014		297	Missouri Science & Technology	Module-level Power Converters for Parallel-Connected Photovoltaic Arrays	Nov-2009	$94,998	In progress
500-98-014		207	Nanotron	Low Cost Laser Process for Fabricating Multi-Junction Solar Cells	Feb-2007	$95,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		286	Nanotron	Nanowire thermoelectrics for industrial waste heat recovery	Oct-2009	$95,000	In progress
UC MR-071	0		National Center for Atmospheric Research	Validation of lateral boundary conditions for regional climate models applied to the California region	Jun-2007	$150,000	In progress
500-05-042	0		National Center for Energy Management and Building Technology	Best HVAC Practices for Residential and Small Commercial Systems	May-2006	$250,211	Yes
500-08-047	0		National Energy Technology Laboratory	Automotive Thermoelectric HVAC Development and Demonstration Project	May-2009	$2,000,000	In progress
500-98-014		178	National Fuel Cell Research Center - UC Irvine	Feasibility Study for Ceramic Proton Conductor-Based Reversible Solid Oxide Fuel Cells	Jul-2006	$74,977	In progress
UC MR-068	0		National Fuel Cell Research Center - UC Irvine	Research, Development, and Demonstration Plan for Fuel Cells	Apr-2007	$225,905	In progress
08-205.00-009	0		National Renewable Energy Laboratory	NREL's 21st Industry Growth Forum	Oct-2008	$4,999	In progress
500-05-027	0		National Renewable Energy Laboratory	Advanced Power Electronic Interface (APEI) Initiative	Feb-2006	$2,500,000	In progress
500-05-027	1		National Renewable Energy Laboratory	Advanced Power Electronic Interface (APEI) Initiative	Jan-2008	$651,296	In progress
500-05-027	2		National Renewable Energy Laboratory	Advanced Power Electronic Interface (APEI) Initiative	Jun-2009	$3,000,000	In progress
500-06-020	0		National Renewable Energy Laboratory	19 th NREL Industry Growth Forum Co-sponsorship	Oct-2006	$35,000	Yes
500-06-028	0		National Renewable Energy Laboratory	Advanced Community Scale Solar Home Design Tools	Jan-2007	$450,000	In progress
500-07-034	0		National Renewable Energy Laboratory	Software Tools for Standards Development & Compliance	Mar-2008	$1,000,000	In progress
UC MR-065	0		National Renewable Energy Laboratory	WECC Wind Generation Modeling	Mar-2007	$573,764	In progress
500-06-008	0		Navigant Consulting, Inc.	Program Planning and Evaluation for PIER Energy Systems Integration Program	Jul-2006	$949,778	In progress
NCI-06-001-P-S	0		Navigant Consulting, Inc.	Contract Administration and Management Task 1	Oct-2006	$105,000	In progress
NCI-06-001-P-S	1		Navigant Consulting, Inc.	Contract Administration and Management Task 1	Mar-2007	$9,300	In progress
NCI-06-002-P-R	0		Navigant Consulting, Inc.	Continue Development of PIER Solar PV Research Plan	Oct-2006	$34,373	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
NCI-06-003-P-R	0		Navigant Consulting, Inc.	Final Report Preparation of PIER Renewables Solar PV Market Assessment	Nov-2006	$41,288	In progress
NCI-06-003-P-R	1		Navigant Consulting, Inc.	Final Report Preparation of PIER Renewables Solar PV Market Assessment	Mar-2007	$3,529	In progress
NCI-06-003-P-R	1		Navigant Consulting, Inc.	Final Report Preparation of PIER Renewables Solar PV Market Assessment	Mar-2007	$4,382	In progress
NCI-06-004-P-R	0		Navigant Consulting, Inc.	Wave Energy Reports Review and Refinement	Nov-2006	$69,266	Yes
NCI-06-005-P-R	0		Navigant Consulting, Inc.	Support Development of PIER Industrial End-Use Energy Efficiency RD&D Pland and Implementation Plan	Nov-2006	$201,971	In progress
NCI-06-006-P-S	0		Navigant Consulting, Inc.	RD&D Projects Focused on Reducing Emissions and Improving Efficiency of ARICE for DG and CHP Applications	Dec-2006	$6,831	Yes
NCI-06-007-P-R	0		Navigant Consulting, Inc.	Transportation Program Area R&D Framework Development	Dec-2006	$123,868	In progress
NCI-06-009-P-R	0		Navigant Consulting, Inc.	Support Development of PIER Water-Energy Five Year Strategic Plan and Roadmap	Mar-2007	$127,846	In progress
NCI-06-009-P-R	1		Navigant Consulting, Inc.	Support Development of PIER Water-Energy Five Year Strategic Plan and Roadmap	Apr-2007	$82,154	In progress
NCI-06-010-P-R	0		Navigant Consulting, Inc.	Renewables Cost Data Collection and Analysis	Jan-2007	$84,955	In progress
NCI-06-013-P-S	0		Navigant Consulting, Inc.	PIER Buildings Program RFP Support	May-2007	$57,449	In progress
NCI-06-014-P-S	0		Navigant Consulting, Inc.	PIER Buildings Program RFP Support	Nov-2007	$24,977	In progress
NCI-06-015-P-S	0		Navigant Consulting, Inc.	Contract Administration and Management Task 1	Nov-2007	$9,210	In progress
NCI-06-016-P-R	0		Navigant Consulting, Inc.	Contract Administration and Management Task 1	Nov-2007	$232,710	In progress
NCI-06-017-P-R	0		Navigant Consulting, Inc.	Analysis and Implications of the CPUC Zero Energy Building (ZEB) Initiative	Dec-2007	$249,709	In progress
NCI-06-018-P-R	0		Navigant Consulting, Inc.	Identification of Transportation RD&D Opportunities	Dec-2007	$199,568	In progress
NCI-06-019-P-R	0		Navigant Consulting, Inc.	Smart Grid Research Alliance	Dec-2007	$185,333	In progress

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Agreement#	Amd #	Pri #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
NCI-06-020-P-R	0		Navigant Consulting, Inc.	Support Development of PIER Water-Energy, Five Year Strategic Plan and Roadmap - Continuation and Completion of WA 009	Dec-2007	$81,111	In progress
NCI-06-021-P-R	0		Navigant Consulting, Inc.	Update of PIER Renewables R&D Targets for 2008 Budget Process	Dec-2007	$55,782	In progress
NCI-06-022-P-R	0		Navigant Consulting, Inc.	Analysis of Transportation Vehicle Technology RD&D Opportunities	Mar-2008	$80,092	In progress
NCI-06-023-P-S	0		Navigant Consulting, Inc.	Task 1 - Contract Administration and Management	Oct-2008	$29,280	In progress
NCI-06-026-P-R	0		Navigant Consulting, Inc.	Analysis and Implications of Existing Home Energy Efficiency Goals in the California Energy Efficiency Strategic Plan	Mar-2009	$149,757	In progress
NCI-06-027-P-R	0		Navigant Consulting, Inc.	PIER Advanced Generation Program Roadmap	Apr-2009	$189,907	In progress
NCI-06-028-P-R	0		Navigant Consulting, Inc.	Utility-Scale Renewable Energy Roadmap	Apr-2009	$149,991	In progress
NCI-06-029-P-R	0		Navigant Consulting, Inc.	Renewable Energy Secure Buildings Roadmap	Apr-2009	$150,000	In progress
NCI-06-031-P-S	0		Navigant Consulting, Inc.	Distributed Renewable Energy Input Coordination and Assessment	May-2009	$74,923	In progress
NCI-06-032-P-R	0		Navigant Consulting, Inc.	Identify RD&D Targets for PIER Industrial, Agricultural and Water Energy Efficiency Program	Jun-2009	$99,986	In progress
500-05-037	0		New Buildings Institute, Inc.	Leading Edge Student Design Competition	May-2006	$20,000	Yes
500-07-023	0		New Buildings Institute, Inc.	Leading Edge Student Design Competition	Dec-2007	$25,000	Yes
500-08-049	0		New Buildings Institute, Inc.	Evidence-Based Design & Operations: Improving the Real World Performance of High-Performance Buildings	May-2009	$1,971,152	In progress
UC BOA-107	0		New Buildings Institute, Inc.	Leading Edge Student Design Competition	May-2005	$28,000	Yes
500-98-014		250	New Mexico State University	Fault Location in Power Distribution System with Penetration of Distributed Energy Resources	Oct-2008	$50,000	In progress
500-04-008	0		New Power Technologies	Verification of Optimal Methodology	Oct-2004	$5,427,726	In progress

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500-98-014		231	Nexajoule, Inc.	Residential Sub-Wetbulb Evaporative Chiller System	Oct-2007	$95,000	In progress
ICF-06-023-P-S	0		Nexant, Inc.	Technical Reviewers for Wind Storage Solicitation 2007	Feb-2008	$19,990	In progress
PIR-04-001	0		Northern California Power Agency	Integrated Geothermal Systems Simulator to Enhance Power Generation at the Geysers	Jun-2005	$316,642	In progress
PIR-04-007	0		Northern California Power Agency	Reinjection Well Down Hole Power Generation at The Geysers	Jun-2004	$669,334	In progress
500-98-014		246	Northwestern University	Novel Solid Oxide Fuel Cell Anodes for Use with Coal- and Biomass-Derived Syngas	Jan-2008	$94,993	In progress
500-98-014		132	Nove Technologies	Development of Magnesium Diboride-Based Superconductor/Metal Matrix Composite Wire for use in Superconducting Transformers	Jan-2004	$72,060	Yes
500-98-014		213	Nove Technologies	Development of High-Performance Magnesium Diboride-based Superconductor/Metal Matrix Composite Components for use in Superconducting Fault Current Limiters	Jan-2007	$95,000	In progress
500-98-014		197	Nrgtix, Inc.	Low Cost Seawater Desalination	Jul-2006	$73,100	In progress
UC BOA-113	0		NumaGroup	California Geothermal Energy Collaboration: Native American Stakeholders	May-2005	$8,960	No
500-05-016	0		Oak Ridge National Laboratory	Building Energy Performance Benchmarking Development	May-2006	$200,000	In progress
500-05-016	1		Oak Ridge National Laboratory	Building Energy Performance Benchmarking Development	Jun-2008	$50,000	In progress
500-98-014		199	One Cycle Control, Inc.	A Three-Phase Grid-Tied Inverter That Suppresses Harmonics and Reactives	Jun-2006	$75,000	In progress
UC MR-075	0		One Cycle Control, Inc.	Field Demonstration of One-Cycle Control Active Power Filter (OCC-APF)	Sep-2007	$334,204	In progress
500-98-014		281	Pacific Consolidated Industries,LLC	Renewable energy through purification of low-BTU landfill gas	Oct-2009	$95,000	In progress
500-06-037	0		Pacific Gas and Electric Company	Regional Integration of Renewables-Northern California Transmission Integration	Mar-2007	$800,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-08-013	0		Pacific Northwest National Laboratory	Integrated Climate Technology Analysis for California	Oct-2008	$228,337	In progress
UC MR-031	0		Pacific Northwest National Laboratory	Advanced Energy Technology Options for California Within the Context of National and Global Systems	Mar-2004	$750,000	Yes
UC MR-076	0		Pacific Northwest National Laboratory	Extreme Event Research	Dec-2007	$1,160,000	In progress
500-04-011	0		Palmdale Water District	Energy Storage Enabled Renewable MicroGrid Power Network	Dec-2004	$979,047	In progress
500-98-014		262	Pennsylvania State University	High G-Load Combustor for Microturbines	Feb-2009	$95,000	In progress
500-04-001	0		Portland Energy Conservation, Inc.	Building Commissioning - Innovation to Practice	Jun-2004	$799,000	Yes
500-07-041	0		Portland Energy Conservation, Inc.	2008 National Conference on Building Commissioning Cosponsorship	Apr-2008	$10,000	Yes
500-03-035	0		Powerlight Corporation	Tracking the Sun for High Value Grid Electricity	Mar-2004	$1,214,389	In progress
UC MR-074	0		PRBO Conservation Science	Biological Impacts of Climate Change in California (BICCCA)	Sep-2007	$500,000	In progress
500-98-014		210	Primus Power	Prototype Energy Cell	Dec-2006	$95,000	In progress
SAIC-06-019-P-R	0		Princeton Energy Resources International, LLC	Focused Economic Study of Bio-Energy Production	Apr-2007	$49,978	Yes
500-98-014		219	Priyam Inc.	Cost Reduction in Solar Cell Electricity	Jun-2007	$95,000	In progress
500-98-014		194	Proctor Engineering Group	Advanced Onboard Diagnostics (AOD) for Air Conditioners and Heat Pumps	Feb-2006	$74,778	In progress
500-98-014		268	Proctor Engineering Group	Proportional Time Delay for Air Conditioner Latent Capacity Recovery	Apr-2009	$91,470	In progress
500-98-014		160	Proton Power, Inc.	Direct Ethanol Solid Acid Fuel Cells	Jan-2005	$74,600	In progress
07-409.00-012A	0		Public Sector Consultants, Inc.	CMAS Agreement to Support PIMS	Jan-2008	$249,196	Yes
07-409.00-013	0		Public Sector Consultants, Inc.	CMAS Program/Project Manager Agreement for PIER	Jan-2008	$186,969	Yes
08-409.00-004	0		Public Sector Consultants, Inc.	PIMS Support	Oct-2008	$437,400	Yes
ICF-06-002-P-S	0		Public Sector Consultants, Inc.	Contract Development Expertise	Oct-2006	$155,091	Yes
ICF-06-003-P-S	0		Public Sector Consultants, Inc.	Technology Transfer Expert	Oct-2006	$117,629	Yes
ICF-06-016-P-S	0		Public Sector Consultants, Inc.	Contract Business Process Support	Oct-2007	$106,995	Yes
ICF-06-017-P-S	0		Public Sector Consultants, Inc.	Support to PIER 2007 Annual Report and PIMS	Oct-2007	$84,075	Yes
KEMA-06-002-P-S	0		Public Sector Consultants, Inc.	Information Management Expertise	Oct-2006	$199,022	Yes
KEMA-06-003-P-S	0		Public Sector Consultants, Inc.	Information Management Expertise	Oct-2006	$160,394	Yes
KEMA-06-004-P-S	0		Public Sector Consultants, Inc.	Information Management Expertise	Oct-2006	$254,255	Yes

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KEMA-06-008-P-S	0		Public Sector Consultants, Inc.	Software Engineer and Database Administrator for PIMS.	Oct-2007	$50,209	Yes
KEMA-06-009-P-S	0		Public Sector Consultants, Inc.	Software Engineer and Database Analyst for PIMS	Oct-2007	$41,002	Yes
KEMA-06-010-P-S	0		Public Sector Consultants, Inc.	Information Technology Project Management for PIMS	Oct-2007	$58,703	Yes
500-98-014		206	Purdue University	Increasing the Energy Efficiency of Vapor Compression Systems by Using "Smart" and Cost Effective Compressors	Oct-2006	$95,000	In progress
PIR-08-017	0		Purdue University Herrick Lab	Optimizing Refrigerant Distribution in Evaporators	Jun-2009	$249,729	In progress
500-98-014		201	Q1 Nano Systems	Nanostructure Array for Solar Cell Applications	Jun-2006	$75,000	In progress
PIR-08-002	0		Rand Corporation	Developing Flexible and Robust Water Management Climate Change Adaptation Strategies in the Sierra Nevada	Mar-2009	$199,491	In progress
PIR-08-034	0		Redwood Coast Energy Authority	Planning for Renewable-based Energy Security and Prosperity in Humboldt County	Jun-2009	$199,988	In progress
500-03-012	1		Reflective Energies	Forging a Consensus on Utility Systems Interconnection-Rule 21 Interconnection Streamlining	Sep-2006	$225,000	Yes
PIR-06-002	0		Renewable Energy Institute International, Inc.	Demonstration of an Integrated Biofuels and Energy Production System	Apr-2007	$996,093	In progress
500-04-010	0		Rensselaer Polytechnic Institute	Three Year Collaborative Research with Lighting Research Center	Dec-2004	$150,000	In progress
500-05-018	0		Rensselaer Polytechnic Institute	National Lighting Product Information Program	Nov-2005	$125,000	Yes
500-08-040	0		Rensselaer Polytechnic Institute	Lighting Research Center Partnership	Apr-2009	$60,000	In progress
500-98-014		142	Rensselaer Polytechnic Institute	The DaySwitch	Apr-2004	$75,000	In progress
500-98-014		186	Rensselaer Polytechnic Institute	Development of an energy-Efficient, Ultra-Thin LED Luminaire	Dec-2005	$75,000	In progress
500-98-014		228	Rensselaer Polytechnic Institute	High-Efficiency and Low-Cost Single-Phase PFC Converters	Jul-2007	$94,210	In progress
SAIC-06-003-P-R	0		Resolve, Inc.	PIER Research Program on Avian and Bat Assessments at Wind Facilities Workshop Facilitation	Nov-2006	$6,856	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
SAIC-06-010-P-R	0		Rick Chitwood Associates	PIER Buildings Efficiency Project Design Review and Quality Assurance	Jan-2007	$46,534	Yes
500-98-014		148	Rutgers University	New Membranes Based on Ionic Liquids for High Temperature PEM Fuel Cells	Apr-2004	$75,000	Yes
500-98-014		181	Rutgers University	Laminated Polymer Dye Sensitized Solar Cell	Apr-2006	$75,000	In progress
500-98-014		269	Rutgers University	Flexible Zinc and Copper Based Solar Cells	Apr-2009	$95,000	In progress
500-06-055	0		Sacramento Municipal Utility District	Demonstration of the Benefits of Applying Electric Energy Storage for Light Rail Trackside Support	Jun-2007	$400,000	In progress
500-06-059	0		Sacramento Municipal Utility District	Vanadium Redox Battery Demonstration for Industrial Load Management	Jun-2007	$100,000	In progress
500-08-009	0		Sacramento Municipal Utility District	SMUD Micro-Grid Demonstration	Sep-2008	$1,586,290	In progress
500-08-025	0		San Diego Gas & Electric Company	SDG&E Sustainable Community Smart Grid Demonstration	Feb-2009	$2,808,488	In progress
500-06-004	0		San Diego State University Research Foundation	Energy Efficient Community Development Research Project	Jul-2006	$380,000	In progress
PIR-06-001	0		San Francisco PUC	Brown Grease Recovery and Biofuel Production Demonstration	Apr-2007	$995,791	In progress
UC BOA-159	0		San Francisco State University	Support for Field Demonstration of Emerging Industrial Technologies	Oct-2006	$79,053	In progress
UC BOA-094	0		San Jose State University	Identifying Research Needs and Priorities Addressing the Ecological Effects Once-Through Colling Technology	Jan-2005	$29,053	Yes
500-04-025	0		San Jose State University Foundation	Environmental Effects of Cooling Water Intake Structures	Apr-2005	$1,499,800	In progress
500-07-009	0		San Jose State University Foundation	Environmental Business Cluster Business Assistance Program for PIER Companies	Sep-2007	$220,000	In progress
UC BOA-083	0		San Jose State University Foundation	Needs Assessment of a Clean Energy Business Incubator fo the Davis/Sacramento/Vacaville Area	Sep-2004	$141,097	Yes
500-98-014		205	Santa Clara University	Phase Change Material (PCM) Solar Thermal Storage System	Dec-2006	$94,363	In progress
500-06-050	0		Science Applications International Corporation (SAIC)	Advanced Distributed Sensor Networks for Electric Utilities	Jun-2007	$691,841	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
SAIC-06-001-P-S	0		Science Applications International Corporation (SAIC)	Contract Administration and Management Task 1	Oct-2006	$105,000	In progress
SAIC-06-001-P-S	2		Science Applications International Corporation (SAIC)	Contract Administration and Management Task 1	Feb-2007	$5,760	In progress
SAIC-06-009-P-S	0		Science Applications International Corporation (SAIC)	PIER Reports/Research Plans Writing and Editing	Dec-2006	$111,915	In progress
SAIC-06-011-P-S	0		Science Applications International Corporation (SAIC)	2006 PIER Annual Report Preparation	Jan-2007	$27,829	Yes
SAIC-06-013-P-S	0		Science Applications International Corporation (SAIC)	2007 California Global Climate Change Conference Expenses	Feb-2007	$93,396	Yes
SAIC-06-023-P-S	0		Science Applications International Corporation (SAIC)	2007 Annaul Report - Design and editor support.	Dec-2007	$7,432	Yes
SAIC-06-025-P-S	0		Science Applications International Corporation (SAIC)	Contract Administration and Management Task 1	Nov-2007	$9,210	In progress
SAIC-06-026-P-R	0		Science Applications International Corporation (SAIC)	Contract Administration and Management Task 1	Nov-2007	$145,110	In progress
SAIC-06-030-P-R	0		Science Applications International Corporation (SAIC)	Climate Change RD&D Target Identification: Adaptation	May-2008	$191,360	In progress
SAIC-06-031-P-R	0		Science Applications International Corporation (SAIC)	RD&D Support for Climate Change Adaptation	Mar-2008	$31,983	In progress
SAIC-06-031-P-R	1		Science Applications International Corporation (SAIC)	RD&D Support for Climate Change Adaptation	Jun-2008	$21,778	In progress
SAIC-06-032-P-R	0		Science Applications International Corporation (SAIC)	Planning Meeting Suport for the 2009/10 CalWater Energy, Water and Regional Climate	Aug-2008	$11,788	Yes
SAIC-06-033-P-R	0		Science Applications International Corporation (SAIC)	5th Annual California Climate Change Conference	Aug-2008	$84,799	Yes
SAIC-06-034-P-S	0		Science Applications International Corporation (SAIC)	Support for the 5th California Climate Change Conference	Aug-2008	$22,818	Yes
SAIC-06-035-P-R	0		Science Applications International Corporation (SAIC)	Climate Adaptation Planning in California using Google Earth/weADAPT: a Pilot Study	Aug-2008	$140,099	In progress
SAIC-06-036-P-R	0		Science Applications International Corporation (SAIC)	Preparation of a high-level research plan for California	Aug-2008	$31,840	Yes
SAIC-06-037-P-R	0		Science Applications International Corporation (SAIC)	5th Climate Change Conference Speakers	Sep-2008	$11,080	Yes
SAIC-06-038-P-S	0		Science Applications International Corporation (SAIC)	Task 1 - Contract Administration and Management	Oct-2008	$8,880	In progress
SAIC-06-044-P-R	0		Science Applications International Corporation (SAIC)	RD&D Activities for the 6th Annual California Climate Change Symposium	Jan-2009	$74,954	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
SAIC-06-044-P-R	1		Science Applications International Corporation (SAIC)	RD&D Activities for the 6th Annual California Climate Change Symposium	Sep-2009	$10,005	In progress
SAIC-06-045-P-S	0		Science Applications International Corporation (SAIC)	Support Activities for the 6th Annual California Climate Change Conference	Jan-2009	$56,480	In progress
SAIC-06-046-P-S	0		Science Applications International Corporation (SAIC)	Brochure Development and Printing for the 2009 Impacts Studies Report	Aug-2009	$24,950	In progress
SAIC-06-047-P-R	0		Science Applications International Corporation (SAIC)	Climate Adaptation Planning in California using Google Earth®/weADAPT®: Data Transfer	Sep-2009	$6,932	In progress
500-98-014		224	Scott Larwood	Dynamic Analysis Tool Development for Advanced-Geometry Wind Turbine Blades	Jun-2007	$67,250	In progress
500-07-017	0		Scripps Institution of Oceanography - UC San Diego	Climate Monitoring, Modeling, and Analyses: Phase III and 2008 Scenarios Impact and Adaptation Study	Dec-2007	$2,289,016	In progress
500-07-042	0		Scripps Institution of Oceanography - UC San Diego	Development of Probabilistic Climate Projections for California	Jun-2008	$1,200,000	In progress
500-08-046	0		Scripps Institution of Oceanography - UC San Diego	Joint Cloud Condensation Nuclei - Micro-channel Capillary Electrophoresis device for measuring droplet chemistry of cloud active aerosols: Phase I	May-2009	$199,077	In progress
BOA-99-212-P	0		Scripps Institution of Oceanography - UC San Diego	Climate Change Center Research Analyst	Feb-2009	$130,000	In progress
BOA-99-216-P	0		Scripps Institution of Oceanography - UC San Diego	CEC-NOAA Study: Winter 2009	Feb-2009	$140,000	In progress
UC MR-025	0		Scripps Institution of Oceanography - UC San Diego	Continuing Climatic Data Collection, Analyses, and Modeling	Mar-2004	$3,526,732	Yes
UC MR-039	0		Scripps Institution of Oceanography - UC San Diego	Evaluation of Potential for Improved Co-Management of California and Pacific Northwest Water and Hydropower Resources	Jun-2005	$200,000	Yes
ICF-06-004-P-S	0		SDV-SCC, Inc.	Events Coordinator/Administrative Assistant Support	Oct-2006	$50,906	Yes
ICF-06-004-P-S	1		SDV-SCC, Inc.	Events Coordinator/Administrative Assistant Support	Apr-2007	$21,790	Yes
ICF-06-005-P-S	0		SDV-SCC, Inc.	2006 PIER Annual Report	Nov-2006	$45,161	Yes
ICF-06-005-P-S	1		SDV-SCC, Inc.	2006 PIER Annual Report	Feb-2007	$16,380	Yes
ICF-06-007-P-S	0		SDV-SCC, Inc.	Events Coordinator/Administrative Assistant Support	Nov-2006	$46,637	Yes

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
ICF-06-008-P-S	0		SDV-SCC, Inc.	Events Coordinator/Administrative Assistant Support	Nov-2006	$10,188	Yes
ICF-06-011-P-R	0		SDV-SCC, Inc.	Summary of Partnership for a New Generation of Vehicles (PNGV) Results	Mar-2007	$8,600	Yes
ICF-06-013-P-S	0		SDV-SCC, Inc.	Events Coordinator/Administrative Assistant Support	Apr-2007	$4,540	Yes
ICF-06-014-P-S	0		SDV-SCC, Inc.	Electricity Journal Article	Sep-2007	$2,594	Yes
ICF-06-018-P-S	0		SDV-SCC, Inc.	Serve as technical editor and writer for the 2007 RD&D Annual report	Oct-2007	$28,549	In progress
ICF-06-018-P-S	1		SDV-SCC, Inc.	Serve as technical editor and writer for the 2007 RD&D Annual report	Jan-2008	$7,987	In progress
ICF-06-034-P-S	0		SDV-SCC, Inc.	LNG Infrastructure Research	Jul-2009	$23,731	In progress
500-08-050	0		Sensus MI	Enterprise Plug n Play Diagnostics and Optimization for Smart Buildings	May-2009	$1,262,252	In progress
PIR-07-012	0		Silicon Valley Leadership Group	Enabling Photovoltaic Markets in California Through Building Integration, Standardization and Metering in the Carbon Economy	Jun-2008	$747,253	In progress
500-98-014		166	Smith & Sun	High-Efficiency Air-Conditioner on Single-Phase Electricity	Jan-2005	$75,000	In progress
500-98-014		137	SOAR Technologies, Inc.	Pressure Reducing Valve Turbine	Jan-2004	$75,000	In progress
500-98-014		221	Solarec, Inc.	Clean and Dispatchable Renewable Electricity through Solar Reduction of Carbon	Jul-2007	$95,000	In progress
500-98-014		150	Sonipulse, Inc.	Pulsed Ultrasound Water Treatment	Oct-2004	$74,610	Yes
500-98-014		198	Sonlight, Inc.	Small Wind Turbine Generator for Low Wind Speed/Low Noise Turbines	Jun-2006	$75,000	In progress
PIR-08-038	0		Sonoma County Water Agency	Renewable Energy Secure Sonoma County	Jun-2009	$1,000,000	In progress
UC BOA-157	0		Sonoma State University	Electric Distribution and Requirements Engineering Workshops	Jun-2006	$28,214	Yes
500-04-029	0		Southern California Edison	Planning Alternative Corridors for Transmission	Jun-2005	$1,519,916	Yes
500-05-012	0		Southern California Edison	Improvements to Refrigerated Display Case Efficiency	Oct-2005	$250,000	In progress
500-08-008	0		Southern California Edison	Self-Audit Of Wastewater Treatment Processes To Achieve Energy Optimization, Phase 1	Nov-2008	$300,000	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
PIR-08-037	0		Southern California Edison	Proposed Deployment Study of a high Penetration of Renewable Energy on Santa Catalina Island	Jun-2009	$200,000	In progress
500-08-015	0		Southern California Gas Company	Cosponsorship of Emerging Technologies Summit	Sep-2008	$25,000	Yes
PIR-07-008	0		Southern California Gas Company	Ultra-Low Emission Integrated CHP Technology Development	Jun-2008	$1,484,179	In progress
500-98-014		276	Spark Technologies	Evaluation of Porosity Additives in Lithium Ion Batteries	Apr-2009	$84,550	In progress
UC BOA-081	0		Squab Producers of California Inc.	Optimization of a Gas Driven Heat Pump Installation at Squab Producers of CA Plant	Sep-2004	$22,400	Yes
500-08-038	0		Stanford University	Energy Modeling Forum	Mar-2009	$15,000	In progress
500-98-014		136	Starburst Foundation	Construction and Testing of a High-Efficiency Solar Water Still	Jan-2004	$74,998	In progress
500-07-036	0		State Coastal Conservancy	Ocean Energy Environmental Knowledge Gaps	Apr-2008	$100,000	Yes
200-98-012	2		State Controller's Office	PIER Audit Program	Sep-2004	$299,830	Yes
200-98-012	3		State Controller's Office	PIER Audit Program	Aug-2007	$300,000	In progress
500-08-028	0		State Water Project Contractors Authority	Analysis and Optimization of Water and Energy Balances for Storage and Conveyance Systems	Feb-2009	$400,000	In progress
ICF-06-006-P-S	0		Steven Eisner	Expert Control Assistance	Nov-2006	$1,617	Yes
500-98-014		211	Steven Winter Associates, Inc.	A Building Integated Damper to Improve Comfort with Evaporative Cooling	Oct-2006	$94,896	In progress
500-98-014		195	Strategic Development Advisors	Solar Panel Modulation Technology: A Feasibility Study for Solar Assisted HVAC	Sep-2006	$74,800	In progress
UC BOA-153	0		Stuart Consulting	Scoping Study of Intelligent Grid Protection Systems	May-2006	$57,260	Yes
500-04-022	0		SunPower Corporation	Commercializing Zero Energy Home New Communities	Mar-2005	$2,730,261	In progress
500-98-014		147	SunPower Corporation	Flat-Plate Micro-Dish Photovoltaic Concentrator Module	Apr-2004	$74,985	Yes
500-98-014		278	Sunprint Inc.	Printing Low Cost Solar Cell with Ultrasonic Ejection	Oct-2009	$93,350	In progress
SAIC-06-021-P-R	0		Susan Sanders Biological Consulting	PIER Research Roadmap for Bird and Bat Collisions with Wind Turbines	Nov-2007	$42,018	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
SAIC-06-022-P-S	0		Susan Sanders Biological Consulting	PIER Solicitation and Proposal Review Support for Bird and Bat Collisions with Wind Turbines	Nov-2007	$8,326	No
SAIC-06-041-P-S	0		Susan Sanders Biological Consulting	RFP Solicitation and Proposal Review Support for PIER Research on Bird and Bat Collisions with Wind Turbines in California	Dec-2008	$8,326	In progress
SAIC-06-042-P-R	0		Susan Sanders Biological Consulting	Bird and Bat Collisions with Wind Turbines Bibliography	Dec-2008	$4,646	In progress
SAIC-06-042-P-R	1		Susan Sanders Biological Consulting	Bird and Bat Collisions with Wind Turbines Bibliography	Jan-2009	$42,234	In progress
500-03-039	0		Tecogen, Inc.	Premium Power for Small CHP Systems	Apr-2004	$941,199	Yes
PIR-08-022	0		Tecogen, Inc.	New Engine Technology for California's Combined Heat and Power Market	Jun-2009	$999,824	In progress
500-98-014		245	Texas Engineering Experiment Station	Novel heat transfer fluid for heating, ventilating, and air conditioning (HVAC), and microelectronics applications	Apr-2008	$93,906	In progress
06-205.00-014	0		The JG Press, Inc	6th Annual BioCycle Conference On Renewable Energy From Organics Recycling	Sep-2006	$4,995	Yes
08-205.01-024	0		The JG Press, Inc	BioCycle International Conference 2009 Celebrating BioCycle's 50th Anniversary	Mar-2009	$4,995	Yes
500-06-027	0		The Regents of the University of California - Sponsored Projects Office	Co-sponsorship of Workshop on Combined Heat and Power and Energy Efficiency Opportunities for California's Agricultural Sector"	Jan-2007	$15,000	Yes
500-01-043	1		The Regents of the University of California, - CIEE	Enabling Technologies Development	Mar-2004	$2,500,000	In progress
500-01-043	2		The Regents of the University of California, - CIEE	Enabling Technologies Development	Jul-2005	$3,500,000	In progress
500-01-043	3		The Regents of the University of California, - CIEE	Enabling Technologies Development	Dec-2007	$2,405,863	In progress
500-01-043	4		The Regents of the University of California, - CIEE	Enabling Technologies Development	May-2009	$1,900,000	In progress
500-06-034	0		The Regents of the University of California, - CIEE	PIER Program Manager	Feb-2007	$492,660	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-07-037	0		The Regents of the University of California, - CIEE	UC/CIEE research to improve transmission of renewable energy.	May-2008	$5,850,866	In progress
500-08-006	0		The Regents of the University of California, - CIEE	Funding for UC Energy Institute to operate the Center for the Study of Energy Markets	Oct-2008	$1,894,375	In progress
BOA-99-181-P	0		The Regents of the University of California, - CIEE	Requirements Engineering for Advance Metering	Oct-2007	$25,200	Yes
BOA-99-181-P	1		The Regents of the University of California, - CIEE	Requirements Engineering for Advance Metering	Feb-2008	$9,856	Yes
BOA-99-182-P	0		The Regents of the University of California, - CIEE	Programmatic Renewable Energy Strategic Plan and Multi-Year Technologies RD&D Program Plans	Nov-2007	$221,844	In progress
BOA-99-183-P	0		The Regents of the University of California, - CIEE	RD & D for PIER Bldgs - Lighting Research Program (LRP)	Nov-2007	$80,621	In progress
BOA-99-184-P	0		The Regents of the University of California, - CIEE	Development of Smart Grid Implementation Plans Associated with Legacy Distribution Automation Equipment Upgrades, Demand Response Infrastructure, and the PCT Reference Design	Nov-2007	$373,071	In progress
BOA-99-184-P	0		The Regents of the University of California, - CIEE	Development of Smart Grid Implementation Plans Associated with Legacy Distribution Automation Equipment Upgrades, Demand Response Infrastructure, and the PCT Reference Design	Nov-2007	$44,769	In progress
BOA-99-186-P	0		The Regents of the University of California, - CIEE	2008 Scenarios Project Supplementation	Feb-2008	$44,800	In progress
BOA-99-190-S	0		The Regents of the University of California, - CIEE	To provide continued leadership in targeting areas of renewable energy research for RD&D support which would bring the greatest benefit to CA., and in the evaluation of benefits associated with RD&D programs and projects to improve CA's energy supply	Mar-2008	$108,086	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
BOA-99-190-S	0		The Regents of the University of California, - CIEE	To provide continued leadership in targeting areas of renewable energy research for RD&D support which would bring the greatest benefit to CA., and in the evaluation of benefits associated with RD&D programs and projects to improve CA's energy supply	Mar-2008	$138,000	Yes
BOA-99-192-P	0		The Regents of the University of California, - CIEE	Transmission Technologies for Renewable Integration Research	May-2008	$202,847	Yes
BOA-99-195-P	0		The Regents of the University of California, - CIEE	Tire Rating System Analysis	Jun-2008	$150,000	Yes
BOA-99-197-P	0		The Regents of the University of California, - CIEE	Funding for UC Energy Institute to operate the Center for the Study of Energy Markets	Sep-2008	$252,659	Yes
BOA-99-202-P	0		The Regents of the University of California, - CIEE	Development of an HVAC Load Model for Aggregates of Homes	Nov-2008	$130,770	In progress
BOA-99-208-P	0		The Regents of the University of California, - CIEE	WECC Load Modeling	Feb-2009	$160,349	In progress
BOA-99-209-P	0		The Regents of the University of California, - CIEE	Strategic Planning Research for integration of Renewable Energy Collaboratives	Jan-2009	$119,996	In progress
BOA-99-213-P	0		The Regents of the University of California, - CIEE	Solicitation Support for the Plug-in Hybrid Electric Vehicle Research Center	Feb-2009	$56,000	In progress
BOA-99-215-P	0		The Regents of the University of California, - CIEE	Clean Energy Supply Technology Program Scoping	Mar-2009	$384,202	In progress
BOA-99-217-P	0		The Regents of the University of California, - CIEE	Funding for UC Energy Institute to operate the Center for the Study of Energy Markets	Feb-2009	$383,562	In progress
BOA-99-217-P	1		The Regents of the University of California, - CIEE	Funding for UC Energy Institute to operate the Center for the Study of Energy Markets	Dec-2009	-$154,700	In progress
BOA-99-218-P	0		The Regents of the University of California, - CIEE	Establishing RD&D Foundation and Roadmap for Smart Grid Center	Apr-2009	$150,000	In progress
BOA-99-227-P	0		The Regents of the University of California, - CIEE	Climate Change and Energy: IEPR Discussion Papers	Jun-2009	$16,800	In progress
BOA-99-233-S	0		The Regents of the University of California, - CIEE	PIER Science Advisor	Jul-2009	$191,169	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
BOA-99-235-R	0		The Regents of the University of California, - CIEE	Regional Technology Implementation Plan - West Carb, Phase II	Sep-2009	$499,221	In progress
BOA-99-236-R	0		The Regents of the University of California, - CIEE	Quantification of Black Carbon Emissions from Cookstoves	Aug-2009	$99,999	In progress
BOA-99-243-S	0		The Regents of the University of California, - CIEE	Statistician for Avian Research Project Review	Dec-2009	$40,857	In progress
BOA-99-245-R	0		The Regents of the University of California, - CIEE	CCS Blue Ribbon Panel	Dec-2009	$267,589	In progress
IJE-04-002	0		The Regents of the University of California, - CIEE	Tech Assistance	2004	$516,650	In progress
PIR-04-009	0		The Regents of the University of California, - CIEE	Center for the Study of Electricity Markets	May-2005	$2,298,427	In progress
UC BOA-069	0		The Regents of the University of California, - CIEE	Global Climate Change Center Research Assistant	Jan-2004	$25,255	Yes
UC BOA-097	0		The Regents of the University of California, - CIEE	Science and Technology Activities for PIER: Martha Krebbs	Jan-2005	$52,640	Yes
UC BOA-097	1		The Regents of the University of California, - CIEE	Science and Technology Activities for PIER: Martha Krebbs	Jan-2005	$3,073	Yes
UC BOA-103	0		The Regents of the University of California, - CIEE	Assistance to PIER Environmental Area	Feb-2005	$181,091	Yes
UC BOA-103	3		The Regents of the University of California, - CIEE	Assistance to PIER Environmental Area	Feb-2005	$225,306	Yes
UC BOA-109	0		The Regents of the University of California, - CIEE	Managing a Solicitation for the PIER Refrigerated Warehouse Efficiency RD&D Initiative	Nov-2005	$30,788	Yes
UC BOA-110	0		The Regents of the University of California, - CIEE	California Geothermal Energy Collaboration: Establishment and Administration	May-2005	$178,080	Yes
UC BOA-110	1		The Regents of the University of California, - CIEE	California Geothermal Energy Collaboration: Establishment and Administration	Jun-2006	$34,440	Yes
UC BOA-110	3		The Regents of the University of California, - CIEE	California Geothermal Energy Collaboration: Establishment and Administration	Sep-2007	$20,107	Yes
UC BOA-110	4		The Regents of the University of California, - CIEE	California Geothermal Energy Collaboration: Establishment and Administration	May-2005	$125,000	Yes
UC BOA-114	0		The Regents of the University of California, - CIEE	California Geothermal Energy Collaboration: Transmission Access & Development Activites	May-2005	$22,170	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-118	0		The Regents of the University of California, - CIEE	Climate Change Impacts: Potential Impact of Hight Temperatures and Air Pollution on Public Health	Aug-2005	$72,800	Yes
UC BOA-119	0		The Regents of the University of California, - CIEE	Assessing Potential Impacts of Climate Change on California	Aug-2005	$480,000	In progress
UC BOA-135	0		The Regents of the University of California, - CIEE	UC Research Program Assistance to the PIER Environmental Area	Mar-2006	$144,727	Yes
UC BOA-135	1		The Regents of the University of California, - CIEE	UC Research Program Assistance to the PIER Environmental Area	Mar-2006	$20,000	Yes
UC BOA-137	0		The Regents of the University of California, - CIEE	UC Technical Expertise for PIER Buildings Area Lighting Research Program	Feb-2006	$107,526	Yes
UC BOA-137	2		The Regents of the University of California, - CIEE	UC Technical Expertise for PIER Buildings Area Lighting Research Program	Feb-2006	$37,500	Yes
UC BOA-138	0		The Regents of the University of California, - CIEE	PIER Transmission Research Program Administration	Jan-2006	$1,161,145	Yes
UC BOA-138	1		The Regents of the University of California, - CIEE	PIER Transmission Research Program Administration	Jan-2006	$723,510	Yes
UC BOA-138	3		The Regents of the University of California, - CIEE	PIER Transmission Research Program Administration	Dec-2007	$94,971	Yes
UC BOA-138	4		The Regents of the University of California, - CIEE	PIER Transmission Research Program Administration	Feb-2008	$70,000	Yes
UC BOA-146	0		The Regents of the University of California, - CIEE	PIER Technical Assistance, CIEE Sacramento	Mar-2006	$76,581	Yes
UC BOA-146	1		The Regents of the University of California, - CIEE	PIER Technical Assistance, CIEE Sacramento	Mar-2006	$76,581	Yes
UC BOA-151	0		The Regents of the University of California, - CIEE	Support to the Demand Response Enabling Technologies Development Program	Apr-2006	$145,600	Yes
UC BOA-151	1		The Regents of the University of California, - CIEE	Support to the Demand Response Enabling Technologies Development Program	Apr-2006	$55,000	Yes
UC BOA-155	0		The Regents of the University of California, - CIEE	Avian Mortality Study Peer Review	Mar-2006	$48,549	Yes
UC BOA-163	0		The Regents of the University of California, - CIEE	Management of the PIER Food Prcessing Technology Program	Sep-2006	$125,000	Yes
UC BOA-163	1		The Regents of the University of California, - CIEE	Management of the PIER Food Prcessing Technology Program	Sep-2006	$53,608	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-168	0		The Regents of the University of California, - CIEE	Air Quality Research Program Management	Oct-2006	$284,565	Yes
UC BOA-175	0		The Regents of the University of California, - CIEE	UC Assistance for the PIER Renewable Area	Mar-2007	$109,886	Yes
UC BOA-176	0		The Regents of the University of California, - CIEE	PIER Renewable Energy Research Program Management	Mar-2007	$292,796	Yes
UC MR-001	2		The Regents of the University of California, - CIEE	WA #MR-001 UC Research Agreement Administration	May-2004	$3,545,455	In progress
UC MR-001	3		The Regents of the University of California, - CIEE	WA #MR-001 UC Research Agreement Administration	Dec-2007	$2,702,164	In progress
UC MR-022	0		The Regents of the University of California, - CIEE	State Partnership for Energy Efficient Demonstrations	Mar-2004	$3,000,000	In progress
UC MR-022	1		The Regents of the University of California, - CIEE	State Partnership for Energy Efficient Demonstrations	Jan-2007	$3,564,987	In progress
UC MR-035	0		The Regents of the University of California, - CIEE	Environmental Exploratory Grant Program 2004	Nov-2004	$366,201	Yes
UC MR-038	0		The Regents of the University of California, - CIEE	Evaluating the Effects of Advanced Energy System Pathways on Energy Flows and Emissions in California	Apr-2005	$1,999,846	In progress
UC MR-038	1		The Regents of the University of California, - CIEE	Evaluating the Effects of Advanced Energy System Pathways on Energy Flows and Emissions in California	Dec-2005	$271,900	In progress
UC MR-043	0		The Regents of the University of California, - CIEE	PIER-EA 2005 Environmental Exploratory Grant Program	Jan-2006	$670,183	Yes
UC MR-044	0		The Regents of the University of California, - CIEE	Lighting Research Program Final Phase	Feb-2006	$560,000	In progress
UC MR-045	0		The Regents of the University of California, - CIEE	West Coast Regional Carbon Sequestration Partnership, Phase II	Feb-2006	$724,364	In progress
UC MR-048	0		The Regents of the University of California, - CIEE	Life-cycle Energy Assessment of Alternative Water Supply Systems in California	Jul-2006	$534,788	In progress
UC MR-053	0		The Regents of the University of California, - CIEE	Enhancement of Transmission State Estimation Results Using Real Time Phasor Measurement Data	Aug-2006	$395,000	In progress
UC MR-064	0		The Regents of the University of California, - CIEE	Development of Fault Current Controller Technology	Mar-2007	$1,175,000	In progress
UC MR-066	0		The Regents of the University of California, - CIEE	Develop new technology for Refrigerated Warehouses using Blast freezer fan modulation	Apr-2007	$180,055	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC MR-069	0		The Regents of the University of California, - CIEE	Environmental Exploratory Grant Program 2006	May-2007	$599,992	In progress
500-98-014		285	The Regents of the University of California, Davis	Improving high-solids biomass conversion efficiency using spray-dried enzymes	Oct-2009	$93,019	In progress
BOA-99-228-P	0		The Regents of the University of California, Davis	Determining and Valuing the Effects of Temperature and Heat Waves on Mortality and Morbidity in California	Jul-2009	$224,161	In progress
500-98-014		270	The Regents of the University of California, San Diego	Micro-Optic Slab Concentrators for Low-Cost Solar Panels	Apr-2009	$95,000	In progress
500-98-014		272	The Regents of the University of California, San Diego	Semiconductor Quantum Dot Based Heterostructures for High-Efficiency Photovoltaics	Apr-2009	$95,000	In progress
500-98-014		282	The Regents of the University of California, San Diego	Nitric oxide reduction using oxy-combustion in stationary power engines	Oct-2009	$95,000	In progress
BOA-99-240-P-R	0		The Regents of the University of California, San Diego	Deployment of Ground-based Aerosol Time of Flight Mass Spectrometer	Nov-2009	$416,000	In progress
PIR-07-002	0		The Regents of the University of California, San Diego	Power Generation Using Advanced Thermochemical Gasification of Biomass	Apr-2008	$499,857	In progress
PIR-08-043	0		The Regents of the University of California, San Diego	Enabling Renewable Energy, Energy Storage, Demand Response and Energy Efficiency with a Community Based Master Controller-Optimizer	Jun-2009	$444,879	In progress
UC BOA-077	0		The Valley Group, Inc.	Integration of Real-Time Transmission Line Data with Utility and CAISO Operations	May-2004	$95,200	Yes
UC BOA-077	1		The Valley Group, Inc.	Integration of Real-Time Transmission Line Data with Utility and CAISO Operations	May-2004	$41,330	Yes
UC BOA-121	0		The Valley Group, Inc.	Multi-Area Real-Time Transmission Line Rating (RTR) Study	Jul-2005	$130,418	Yes
500-98-014		279	ThermAvant Technologies, LLC	Heat-Activated cooler with two-stage, multi-fluid ejector and novel mixing chamber	Oct-2009	$95,000	In progress
600-07-008	0		TIAX LLC	Technical Assistance for Full Fuel Cycle Analysis - Sustainability Emphasis	Jun-2008	$149,220	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-085	0		TIAX LLC	Advanced Energy System Pathways Evaluation Program Plan Development	Sep-2004	$11,150	Yes
PIR-07-013	0		Tilt Solar LLC	Demonstration of a Novel, Low-Cost Two Axis Solar Tracking System	Jun-2008	$246,816	No
500-98-014		298	Torrey Hills Technologies, LLC	Low Cost Dye Sensitized Solar Cells	Nov-2009	$95,000	In progress
500-05-032	0		Trustees of the California State University - San Diego	PIER Buildings R&D Grant Program	Mar-2006	$2,416,897	In progress
500-98-014		229	Trustees of the California State University - San Diego	Feasibility Study of a Flexible Symmetrical Turbine Blade for Wind Energy Conversion	Sep-2007	$94,856	In progress
500-09-020	0		U.S. Geological Survey, Southwest Biological Science Center	Assessing the Long-term Survival and Reproductive Output of Desert Tortoises at a Wind Energy Facility Near Palm Springs, California.	Dec-2009	$319,936	In progress
500-01-035	1		UC Berkeley	Modeling for Under Floor Air Distribution (UFAD)	Apr-2005	$100,000	Yes
500-08-031	0		UC Berkeley	Research on Hydropower Effects on an Amphibian Species of Special Concern II	Feb-2009	$299,992	In progress
500-98-014		149	UC Berkeley	Efficient Lighting by Sensing and Actuating with MEMS Smart Dust Motes	Oct-2004	$74,009	Yes
500-98-014		161	UC Berkeley	Ceramic Electrolyte Production on Pre-Formed ITSOFC Substrates	Jan-2005	$74,626	In progress
500-98-014		152	UC Berkeley	Development of a Wireless Lighting Control Network	Jan-2005	$74,915	In progress
500-98-014		254	UC Berkeley	Novel Adaptation of 3-Way Catalyst for NOx Reduction in Exhaust of Landfill Gas Engines	Jul-2008	$92,500	In progress
BOA-99-191-P	0		UC Berkeley	Potential Benefits of Transportation Electric Fuel Implementation in California	Apr-2008	$83,608	Yes
BOA-99-219-P	0		UC Berkeley	Underground cable research	May-2009	$787,042	In progress
BOA-99-223-P	0		UC Berkeley	Center for Resource Efficient Communities (CREC)	Jun-2009	$450,000	In progress
BOA-99-231-P	0		UC Berkeley	Modeling, the Development of Load Control Strategies and the Integration of Electric Generators Driven by Renewable Resources.	Aug-2009	$425,600	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
BOA-99-234-R	0		UC Berkeley	Building to Grid Cory Hall Testbed, Phase 1	Sep-2009	$535,000	In progress
MRA-02-080	0		UC Berkeley	Grinnell Resurvey Project	Dec-2008	$124,747	In progress
PIR-08-001	0		UC Berkeley	Assessing Long-term Dynamics of Bird Distributions in Relation to Climate Change: From Grinnell to Present	Dec-2008	$199,999	In progress
UC BOA-100	0		UC Berkeley	Market Research for Healthy Air HVAC System	Mar-2005	$84,000	Yes
UC BOA-132	0		UC Berkeley	Programmable Communicating Thermostat (PCT): Prototype Development for Title 24	Dec-2005	$179,225	Yes
UC BOA-132	1		UC Berkeley	Programmable Communicating Thermostat (PCT): Prototype Development for Title 24	Dec-2005	$28,896	Yes
UC BOA-132	2		UC Berkeley	Programmable Communicating Thermostat (PCT): Prototype Development for Title 24	Dec-2005	$243,885	Yes
UC BOA-161	0		UC Berkeley	Underground Cable Fault Analysis: Scoping Study	Aug-2006	$50,000	Yes
UC BOA-161	1		UC Berkeley	Underground Cable Fault Analysis: Scoping Study	Aug-2006	$95,000	Yes
UC MR-006	1		UC Berkeley	Preliminary Economic Analyses of Climate Change Impacts and Adaptation, and GHG Mitigation	Jul-2004	$1,943,107	Yes
UC MR-063	0		UC Berkeley	Water, Energy and Climate Change	Feb-2007	$456,644	In progress
UC MR-070	0		UC Berkeley	Fault Analysis in Underground Cables	May-2007	$1,050,000	In progress
UC MR-070	1		UC Berkeley	Fault Analysis in Underground Cables	Dec-2007	$450,000	In progress
MRA-02-083	0		UC Berkeley, Global Metropolitan Studies Center	Assess New Transportation and Land -use Patterns in a Carbon-constrained Future	May-2009	$250,000	In progress
500-01-016	1		UC Davis	California Biomass Collaborative	Dec-2005	$232,872	In progress
500-01-016	2		UC Davis	California Biomass Collaborative	Jan-2007	$398,115	In progress
500-01-044	1		UC Davis	Ecological Impacts of Pulsed Flows from Hydroelectric Facilities	Jul-2004	$1,000,000	Yes
500-06-047	0		UC Davis	Eleventh Biennial Asilomar Conference	May-2007	$15,000	Yes
500-07-004	0		UC Davis	Dynamics of Sierra Nevada Conifer Loss Under Climate Change	Aug-2007	$114,996	In progress
500-07-045	0		UC Davis	Particulate Matter Characterization in Airmass Transport	May-2008	$120,000	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-08-005	0		UC Davis	Modeling Integrated Adaptation to Climate Change for Californias Water Supply and Hydropower Systems	Oct-2008	$300,000	In progress
500-08-017	0		UC Davis	California Renewable Energy Collaborative - Research Program Plan for Renewable Energy	Mar-2009	$2,589,727	In progress
500-08-053	0		UC Davis	Realizing Energy Efficient Lighting in California	May-2009	$3,200,000	In progress
500-98-014		157	UC Davis	High-Performance, Nanostructured Cathode for Li-ion Rechargeable Battery	Dec-2004	$75,000	In progress
500-98-014		193	UC Davis	Energy Efficient Processing Methods for Drying Fruits and Vegetables	Apr-2006	$74,785	In progress
500-98-014		208	UC Davis	Nanoparticle-Based Catalysts for Solar Hydrogen Generation	Oct-2006	$95,000	In progress
500-98-014		253	UC Davis	Wind Turbine Load Limiting Algorithm Verification Testing	Oct-2008	$94,815	In progress
500-98-014		261	UC Davis	Tandem Organic Solar Cell Using CNT and Mixed Quantum Dots	Feb-2009	$81,463	In progress
500-98-014		267	UC Davis	Feasibility Study of a Novel Biochemical Route for Ethanol Production	Apr-2009	$95,000	In progress
MRA-02-077	0		UC Davis	California Wind Energy Collaborative	Dec-2007	$402,269	In progress
PIR-08-004	0		UC Davis	N2O Emissions from the Application of Fertilizers in Agricultural Soils	Dec-2008	$499,960	In progress
PIR-08-006	0		UC Davis	Systematic Terrestrial Vegetation Data Development for Climate Change Studies	Dec-2008	$199,997	In progress
PIR-08-007	0		UC Davis	Reducing Greenhouse Gas Emissions Through Local Government Action: Case Studies of Five California Cities	Jan-2009	$262,323	In progress
PIR-08-035	0		UC Davis	West Village Renewable-Based Energy Secure Community	Jul-2009	$1,994,322	In progress
UC BOA-087	0		UC Davis	California Biomass Collaborative Forum Planning and BFRS Update	Oct-2004	$30,127	Yes
UC BOA-087	1		UC Davis	California Biomass Collaborative Forum Planning and BFRS Update	Oct-2004	$88,310	Yes
UC BOA-087	2		UC Davis	California Biomass Collaborative Forum Planning and BFRS Update	Oct-2004	$145,433	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-108	0		UC Davis	Producing and Marketing Sustainable and Energy-Saving Light Products	Apr-2005	$61,230	Yes
UC BOA-149	0		UC Davis	Renewables GIS Analysis and Support - with Link to State GIS Infrastructure	Aug-2006	$115,517	Yes
UC MR-017	1		UC Davis	California Wind Energy Collaborative	Dec-2004	$2,294,777	Yes
UC MR-017	3		UC Davis	California Wind Energy Collaborative	Feb-2007	$176,687	Yes
UC MR-018	1		UC Davis	Establish and operate the California Lighting Technology Center	Sep-2006	$395,577	In progress
UC MR-029	0		UC Davis	Development and Demonstration of A Distributed Biogas Energy System Utilizing Organic Solid Wastes	Mar-2004	$995,763	In progress
UC MR-067	0		UC Davis	Assessment of Central Valley Agricultural Carbon Sequestration Potential	Apr-2007	$50,000	Yes
500-08-018	0		UC Davis Center for Watershed Sciences	Research on Hydropower Effects on an Amphibian Species of Special Concern	Nov-2008	$285,650	In progress
BOA-99-226-P	0		UC Davis Center for Watershed Sciences	Foothill Yellow-legged Frog (Rana boylii) Tadpole Lateral Movement Study	Jun-2009	$18,000	In progress
05-205.00-037	0		UC Irvine	2nd Annual Waste Heat to Power Workshop Sponsorship	Feb-2006	$1,500	Yes
500-00-020	2		UC Irvine	Integrated Gas Handling System for Renewable Fuel Simulation	Sep-2005	-$591,904	Yes
500-09-015	0		UC Irvine	Fuel Flexible Turbine System	Dec-2009	$300,000	In progress
500-98-014		174	UC Irvine	Metallic Interconnects for SOFC Systems: Surface Engineering for Improved Durability and Reduced Contact Resistance	Sep-2005	$75,000	Yes
500-98-014		187	UC Irvine	A Simple and Reliable FACTS Element for Distributed Generation	Dec-2005	$75,000	Yes
500-98-014		188	UC Irvine	Feasibility of Producing Bio-Hydrogen at Municipal Wastewater Facilities Using Molecular Studies to Optimize Production via the Anaerobic Digestion Process	Mar-2006	$75,000	Yes
BOA-99-189-P	0		UC Irvine	Laboratory Validation of Novel Greenhouse Gas Monitoring Techniques	Feb-2008	$81,670	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
BOA-99-241-P-R	0		UC Irvine	Roadmap for Consumer and Offices Electronics and Appliance Efficiency Center at University California Irvine	Dec-2009	$149,990	In progress
MRA-02-082	0		UC Irvine	Energy Reduction in Membrane Filtration Processes through Optimization of Nanosuspended Particles Removal	Aug-2009	$124,985	In progress
PIR-08-005	0		UC Irvine	Reductions in urban outdoor water use as an adaptation to rising temperatures and declining water supplies in Southern California	Dec-2008	$199,737	In progress
500-08-029	0		UC Los Angeles	Getting to 2020	Mar-2009	$708,245	In progress
500-98-014		130	UC Los Angeles	Application of Stochastic Filtering and Control Methodology to the Optimization of Wind Turbine Control Design	Jan-2004	$74,993	In progress
500-98-014		158	UC Los Angeles	Biosolar Conversion of Carbon Dioxide into Hydrogen Via Bacteria Embedded in Colloidal Gas Aphrons	Nov-2004	$74,948	Yes
500-98-014		163	UC Los Angeles	Atmospheric Plasma Deposition of N-type Zinc Oxide for Thin Film Photovoltaics	Jan-2005	$75,000	In progress
BOA-99-207-P	0		UC Los Angeles	Potential Targets and Benefits of Integrated Energy Smart Communities Research in the PIER program	Nov-2008	$64,029	Yes
BOA-99-238-R	0		UC Los Angeles	Development of a Research Roadmap for Energy in Sustainable Communities	Oct-2009	$300,000	In progress
500-98-014		176	UC Merced	Concentrating Triple-Junction PV Systems for Distributed Power Generation	Sep-2005	$75,000	Yes
PIR-07-016	0		UC Merced	Development and Demonstration of a Concentrating PV System for Commercial Applications with Integrated Active Micro-inverters and an Optional Daylighting Subsystem	Jun-2008	$258,115	In progress
PIR-08-036	0		UC Merced	Piloting a Integrated a Renewable Energy Portfolio for the UC Merced Community	Jul-2009	$1,000,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC MR-062	0		UC Merced	Liquid Desiccant Based Integrated Hybrid Refrigeration Technology for Energy Efficient Refrigerated Warehouses	Mar-2007	$242,999	In progress
500-08-055	0		UC Riverside	Improving Understanding of Regional and Near-source Air Quality Impacts of Distributed Generation Sources	Jun-2009	$650,000	In progress
500-98-014		129	UC Riverside	Nanostructured Electrodes for PEM Fuel Cells	Jan-2004	$75,000	Yes
500-98-014		277	UC Riverside	Metallic Nanotubes as Low-Cost and Durable Fuel Cell Catalysts	Apr-2009	$95,000	In progress
BOA-99-188-P	0		UC Riverside	White Paper on Hydrogasification	Mar-2008	$50,000	Yes
UC MR-026	0		UC Riverside	Air Quality Research Program	Mar-2004	$3,512,279	In progress
UC MR-026	1		UC Riverside	Air Quality Research Program	Oct-2006	$1,200,000	In progress
UC MR-026	2		UC Riverside	Air Quality Research Program	Aug-2007	$1,142,408	In progress
500-98-014		283	UC San Diego	Novel energy saving light bulb	Oct-2009	$94,909	In progress
500-08-020	0		UC Santa Barbara	Advanced modeling of the biological effects of climate change in California	Dec-2008	$300,000	In progress
UC BOA-096	0		UC Santa Barbara	A Statewide Assessment of Energy Use Associated with California Water Use	Jan-2005	$134,363	Yes
UC BOA-122	0		UC Santa Barbara	Power of the Sun	Feb-2005	$190,400	Yes
500-01-032	1		UC Santa Cruz	Avian-Transmission System Mitigation Program	Mar-2004	$1,999,949	Yes
500-98-014		179	UC Santa Cruz	High Efficiency Planar Luminescent Solar Concentrators	Jan-2006	$74,636	In progress
500-98-014		233	UC Santa Cruz	Evaluation of a CO2 Mitigation Option for California Coastal Power Plants	Oct-2007	$95,000	In progress
500-98-014		288	UC Santa Cruz	Fully printed all inorganic nanoparticle-based solar cells	Nov-2009	$95,000	In progress
PIR-08-003	0		UC Santa Cruz	Informing Climate Change Models with Stand Level Ecological Data: Valley Oak Woodlands in California	Jan-2009	$68,725	In progress
500-09-011	0		United Innovations, Inc.	Production of an Operating Photovoltaic Sub-Module for Integration into a High-Efficiency Power Conversion Unit	Oct-2009	$226,961	In progress

PIER Electric Agreements: 2004 - 2009 Calendar Years (Sorted Alpha on Company)

Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		156	United Innovations, Inc.	A Unique Dielectric Light Injector for Ultra Efficient Photovoltaic Cavity Converters: A Novel Approach for Advanced Solar Concentrators and Directed Laser Power Beam Applications	Oct-2004	$75,000	Yes
500-98-014		274	University of Alaska, Fairbanks	Optimized SHEV Control Strategies for Reduced Fuel Consumption and Emissions	Apr-2009	$95,000	In progress
500-98-014		133	University of Arizona	Development of Low Cost High Efficiency Heterojunction Organic Solar Cell Using Inkjet and Screen Printing Techniques	Jan-2004	$75,000	Yes
500-98-014		247	University of Arkansas Division of Agricultural-Cooperative Extension Services	Thermochemical Processes Platforms to Utilize Crude Glycerin for Hydrogen Production and Electricity Generation	Jan-2008	$95,000	In progress
PIR-08-029	0		University of California, Davis, Wildlife, Fish & Consevation Biology Department	Research on Hydropower Effects on a Fish Species of Special Concern	Jun-2009	$441,797	In progress
500-98-014		287	University of California, Irvine	Transient operation and control of fuel cell temperature variations	Oct-2009	$50,000	In progress
500-98-014		280	University of California, San Diego	Developing ultrahigh-efficiency thermal-to-electric energy conversion technique	Oct-2009	$95,000	In progress
500-98-014		291	University of California, San Diego	Direct Solid Oxide Fuel Cells	Nov-2009	$95,000	In progress
UC BOA-102	0		University of Central Florida	Fabrication of a High Performance Fan for a High Efficiency Hot Arid Climate Air Conditioner	Feb-2005	$18,818	Yes
500-98-014		271	University of Florida	Biomimetic Antireflection Coatings for Highly Efficient Solar Cells	Apr-2009	$95,000	In progress
500-98-014		141	University of Illinois, Electrical & Computer Engineering	A Zero Current Ripple, Energy Efficiency and Reliable Low Cost Residential and Commercial Zero Emission Direct Power-Conversion System	Apr-2004	$74,999	In progress
UC BOA-158	0		University of Illinois, Electrical & Computer Engineering	Benefits Assessment of the PIER Program - Phase I	Sep-2006	$118,710	Yes

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-98-014		154	University of Kansas	Phase-Change Frame Walls (PCFWs) for Peak Demand Reduction, Load Shifting, and Energy Conservation in California	Jan-2005	$74,596	In progress
500-98-014		222	University of Miami	Hybrid DC- and AC-Linked Microgrids	Jul-2007	$50,000	In progress
500-98-014		196	University of Nevada, Reno	Municipal Sludge Drying and Conversion for Electricity Production	Sep-2006	$74,996	In progress
500-05-020	0		University of Southern California	Vulnerability Assessment and Security Analysis of Electric Power System	Nov-2005	$100,000	Yes
500-07-030	0		University of Southern California	Strategies to Minimize All Hazards Impact on the Southern California Electrical Power Grid	Feb-2008	$500,000	In progress
500-98-014		236	University of Southern California	Carbon Molecular Sieve Membranes with Tunable Properties	Sep-2007	$95,000	In progress
UC BOA-133	0		US Department of the Interior, Bureau of Reclamation	White Paper for Cloud Seeding Optimization in California	Dec-2005	$15,485	Yes
PIR-08-024	0		US Forest Service Pacific Southwest Research Station	Improving the Accuracy and Cost-effectiveness of Pre-Construction and Operations Monitoring Efforts for Bats and Birds at Wind Energy Facilities in California	Jul-2009	$550,948	In progress
500-09-012	0		US Geological Survey	Carbon sequestration and GHG emissions in intentionally flooded corn fields in the Delta	Oct-2009	$449,145	In progress
UC BOA-095	0		USDA-FSA Aerial Photography Field Office	Aerial Imagery Program for the State of California	Feb-2005	$280,000	Yes
500-05-031	0		Utility Energy Forum	Utility Energy Forum	Mar-2006	$6,000	Yes
06-205.00-029	0		Utility Wind Integration Group	Utility Wind Integration Group (UWIG)	Jan-2007	$500	In progress
UC BOA-073	0		Utility Wind Interest Group, Inc.	Distributed Wind Impacts	Apr-2004	$56,000	Yes
UC MR-054	0		Virginia Polytechnic Institute and State University	Advanced Protection Systems using Wide Area Measurements	Sep-2006	$599,467	In progress
UC MR-054	1		Virginia Polytechnic Institute and State University	Advanced Protection Systems using Wide Area Measurements	Nov-2007	$10,000	In progress
500-98-014		220	Washington State University	Innovative Design of High Solids Digestion Plants for Economic and Renewable Energy Production	Aug-2007	$93,595	In progress
500-07-038	0		WateReuse Foundation	Energy Efficiency for Reclaimed Water and Water Reuse Projects	Apr-2008	$650,000	In progress
500-04-028	0		West Basin Municipal Water District	Demonstration of a Low Energy Seawater Desalination Process	Jun-2005	$50,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
500-07-011	0		Western Cooling Efficiency Center - UC Davis	Advancing Efficient Cooling in California	Oct-2007	$200,000	In progress
500-08-042	0		Western Cooling Efficiency Center - UC Davis	Western Cooling Efficiency Center Research	May-2009	$2,100,000	In progress
BOA-99-198-P	0		Western Cooling Efficiency Center - UC Davis	Advancement of Western Cooling Efficiency	Oct-2008	$224,000	In progress
BOA-99-224-P	0		Western Cooling Efficiency Center - UC Davis	WCEC Retrofit Strategies for Retail Buildings	Jun-2009	$175,000	In progress
06-205.00-033	0		WestStart-CALSTART	Weststart Calstart	Feb-2007	$4,950	Yes
500-07-033	0		White Box Technologies, Inc.	Update of Certified Energy Commission California Weather Data and Weather File Creation Methodologies	Jun-2008	$300,000	In progress
PIR-04-012	0		Wind Tower Systems LLC	Composite Taller Towers for Low to Moderate Wind Shear	Dec-2004	$1,511,916	In progress
PIR-08-008	0		Winrock International	Deforestation in California: A poorly understood GHG emission source and emission reduction opportunity	Dec-2008	$299,424	In progress
UC BOA-090	0		Woodley Weather Consultants	The Use of a Cloud Physics Aircraft for the Mapping of Pollution Aerosols Detremental to Winter Orographic Precipitation	Jan-2005	$252,955	Yes
UC MR-032	0		Woodley Weather Consultants	Physical/Statistical and Modeling Documentation of the Effects of Urban and Industrial Effects of Urban and Industrial Air Pollution in California	Jul-2004	$298,576	Yes
UC MR-042	0		Woodley Weather Consultants	Suppression of Precipitation (SUPRECIP-2) Experiment	Dec-2005	$615,000	Yes
500-98-014		275	Worcester Polytechic Institute	Flywheel Hybrid with Switch-Mode Continuously Variable Transmission Concept Validation	Apr-2009	$87,027	In progress
SAIC-06-008-P-R	0		Xanthus Consulting International	Value of Distribution Automation, Phase 1	Dec-2006	$119,025	Yes
SAIC-06-024-P-R	0		Xanthus Consulting International	Proof of Concept for Interoperable Communication Standards for Smart Renewable Community Network used in Community Choice Aggregation	Dec-2007	$102,235	Yes
500-98-014		214	Xtreme Energetics, Inc.	Solid-State Electro-Fluidic Solar Tracker	Feb-2007	$95,000	In progress

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Agreement#	Amd #	Prj #	Company	Title/Purpose	Awarded	Encumb $	Goals Met?
UC BOA-131	0		Zaininger Engineering Company	Scoping Study of Real Time Tools for Forecasting Dynamic Operating Margins on Key CA Transmission Paths	Dec-2005	$94,808	Yes
500-03-031	0		ZBB Energy Corporation	Demonstration of ZBB Energy Storage Systems	Mar-2004	$1,873,133	Yes

APPENDIX F

Salary Expenditures by Job – 2009/2010

Classification	Salary Range
CEA III	$8,594.00 - $9,476.00
Office Manager II	$7,110.00 - $7,838.00
Senior Mechanical Engineer	$8,115.00 - $9,859.00
Senior Electrical Engineer	$8,115.00 - $9,859.00
Engineering Geologist	$6,897.00 - $8,379.00
Associate Automotive Equipment Standards Engineer	$6,898.00 - $8,378.00
Associate Electrical Engineer	$6,898.00 - $8,378.00
Associate Mechanical Engineer	$6,898.00 - $8,378.00
Electric Generation Systems Specialist I	$6,379.00 - $7,663.00
Mechanical Engineer	$4,608.00 - $8,379.00
Energy Commission Supervisor II	$5,312.00 - $6,409.00
Energy Commission Specialist III	$5,831.00 - $7,042.00
Energy Commission Specialist II	$5,309.00 - $6,404.00
Energy Commission Specialist I	$4,833.00 - $5,831.00
Associate Energy Specialist	$4,400.00 - $5,309.00
Associate Governmental Program Analyst	$4,400.00 - $5,348.00
Energy Analyst	$2,817.00 - $4,400.00
Staff Services Analyst	$2,817.00 - $4,446.00
Office Technician (Typing)	$2,686.00 - $3,264.00

PIER Names and Position Titles, Authorized Positions

PROGRAM	LAST NAME	FIRST NAME	PY	TITLE
MEDIA	GREENWOOD	CAROL	1	ASSOC INFO SYS ANALYST (SP)
DIV	VACANT		1	OFFICE TECHNICIAN (T)
DIV	YAMAMOTO	DORIS	1	ASSOC GOVERNMNTAL PROG ANALYS
DIV	KELLY	JOEL	1	CEA 3
BA	VACANT		1	ASSOC. ENERGY SP. (TED)
BA	KRITLOW	VANESSA	1	ASSOC. ENERGY SP. (TED)
ESRO	CHAMPLION	RITA	1	ENERGY COMM. SUP. II (TED)
BA	PINA	FERNANDO	1	ENERGY COMM. SUP. II (TED)
BA	ROSALES	JESSELYN	1	ENERGY COMM. SP. I (TED)
BA	MOHNEY	LEAH	1	ENERGY COMM. SP. II (TED)
BA	WORSTER	BRADLEY	1	STAFF SERVICES ANALYST (GEN)
BA	CUSHMAN	SANDRA	1	STAFF SERVICES ANALYST (GEN)
BA	ORTIZ	RETA	1	STAFF SERVICES ANALYST (GEN)
BA	FRANKS	JANNA	1	ASSOC GOVERNMNTAL PROG ANALYS
BA	TURNER	CATHY	1	ASSOC GOVERNMNTAL PROG ANALYS
BA	HAMBY	MICHELLE	1	ASSOC GOVERNMNTAL PROG ANALYS
ESRO	VACANT		1	OFFICE TECHNICIAN (T)
ESRO	GRAVELY	MICHAEL	1	OFFICE MANAGER II CEC
ETSI	BINING	AVTAR	1	ASSOC MECHANICAL ENGINEER
ETSI	LEE	BRYAN	1	MECHANICAL ENGINEER, RG C
ETSI	JANES	CLARENCE	1	MECHANICAL ENGINEER, RG C

PROGRAM	LAST NAME	FIRST NAME	PY	TITLE
ETSI	PATTERSON	JAMES	1	SENIOR ELECTRICAL ENGINEER
ETSI	SICHON	CONSUELO	1	SENIOR ELECTRICAL ENGINEER
ETSI	CHAMBERS	DAVID	1	ASSOC ELECTRICAL ENGINEER
ETSI	VACANT		1	ASSOC ELECTRICAL ENGINEER
ETSI	GHADIRI	STEVE	1	ASSOC ELECTRICAL ENGINEER
ETSI	CLOSSON	CHERYL	1	ENGINEERING. GEOLOGIST
ETSI	VACANT		1	ASSOC. ENERGY SP. (TED)
ETSI	GOMEZ	PEDRO	1	ENERGY COMM. SUP II (TED)
ETSI	COLDWELL	MATTHEW	1	ENERGY COMM. SP. I (TED)
ETSI	ALDAS	RIZALDO	1	ENERGY COMM. SP. I (TED)
ETSI	VACANT		1	ENERGY COMM. SP. II (TED)
ETSI	CHEW	KRISTEN	1	ENERGY COMM. SP. II (TED)
ETSI	VACANT		1	ENERGY COMM. SP. II (TED)
ETSI	BIRKINSHAW	KELLY	1	ENERGY COMM. SP. III (TED)
ETSI	VACANT		1	ELEC GEN SYS PR SP I
ETSI	VACANT		1	ENERGY ANALYST
ETSI	KELLER	ELIZABETH	1	ENERGY ANALYST
EA	FRANCO	GUIDO	1	SENIOR MECHANICAL ENGINEER
EA	MUELLER	MARLA	1	SENIOR MECHANICAL ENGINEER
EA	PITTIGLIO	SARAH	1	ASSOC. ENERGY SP. (TED)
EA	MATHIS	JOHN	1	ENERGY COMM. SP. I (TED)
EA	REED	JOHN	1	ENERGY COMM. SP. I (TED)
EA	MILLIRON	MISA	1	ENERGY COMM. SP. II (TED)
EA	OHAGEN	JOSEPH	1	ENERGY COMM. SP. II (TED)
EA	SPIEGEL	LINDA	1	ENERGY COMM. SP. III (TED)
EGRO	LAYTON	ANGELA	1	OFFICE TECHNICIAN (T)
EGRO	KOYOMA	KENNETH	1	OFFICE MANAGER II CEC
ETSI	VACANT		1	MECHANICAL ENGINEER, RG C
RENW	SETHI	PRABHJOT	1	SENIOR MECHANICAL ENGINEER
RENW	GUTIERREZ	PABLO	1	ASSOC MECHANICAL ENGINEER
RENW	MOHAMMED	HASSAN	1	MECHANICAL ENGINEER, RG C
RENW	KANE	MICHAEL	1	MECHANICAL ENGINEER, RG D
RENW	BARONAS	JEAN	1	ASSOC. ENERGY SP. (TED)
RENW	FROMM-BURNS	SANDRA	1	ENERGY COMM. SUP. II (TED)
RENW	HINGTGEN	JOHN	1	ENERGY COMM. SP. I (TED)
RENW	ZHANG	ZHIQIN	1	ENERGY COMM. SP. II (TED)
RENW	EDALATI-SARYANI	ABOLGHASEM	1	ENERGY COMM. SP. II (TED)
RENW	WIGGETT	GAIL	1	ELEC GEN SYS SP I
RENW	SOKOL	MICHAEL	1	ENERGY ANALYST
TRANS	MIRCHEVA	DIANA	1	ENERGY ANALYST
TRANS	GONZALES	REYNALDO	1	ASSOC AUTO EQUIP STANDARDS EN
TRANS	TULLY	DEAN	1	ENERGY COMM. SUP II (TED)
TRANS	STOKES	ERIC	1	ENERGY COMM. SP. I (TED)
TRANS	VACANT		1	ENERGY COMM. SP. I (TED)
TRANS	GALLAGHER	DANIEL	1	ENERGY COMM. SP. II (TED)
TRANS	EFFROSS	DAVID	1	ENERGY COMM. SP. II (TED)
TRANS	MISEMER	PHILIP	1	ENERGY COMM. SP. III (TED)

PIER Names and Position Titles, Authorized Positions…Continued

PROGRAM	LAST NAME	FIRST NAME	PY	TITLE
BLDGS	MEISTER	BRADLEY	1	SENIOR MECHANICAL ENGINEER
BLDGS	KAZAMA	DONALD	1	SENIOR MECHANICAL ENGINEER
BLDGS	KIBRYA	GOLAM	1	SENIOR MECHANICAL ENGINEER
BLDGS	SCRUTON	CHRISTOPHER	1	MECHANICAL ENGINEER, RG C
BLDGS	FLESHMAN	JOSEPH	1	MECHANICAL ENGINEER, RG A
BLDGS	DAVIS	DUSTIN	1	ASSOC. ENERGY SP. (TED)
BLDGS	WEIGHTMAN	DAVID	1	ENERGY COMM. SP. I (TED)
BLDGS	HEBERT	ELAINE	1	ENERGY COMM. SP. II (TED)
BLDGS	VACANT		1	ENERGY COMM. SPEC. II (EFF)
BLDGS	VACANT		1	ENERGY COMM. SP. III (EFF)
EERO	CASS	CAROLYN	1	OFFICE TECHNICIAN (T)
EERO	LEW	VIRGINIA	1	OFFICE MANAGER II CEC
IAW	LOZANO	MICHAEL	1	SENIOR MECHANICAL ENGINEER
IAW	ROGGENSACK	PAUL	1	MECHANICAL ENGINEER, RG D
IAW	KAPOOR	RAJESH	1	MECHANICAL ENGINEER, RG C
IAW	GAUTAM	ANISH	1	MECHANICAL ENGINEER, RG
IAW	SAPUDAR	RICHARD	1	ENERGY COMM. SP. II (TED)
IAW	CHAMBERS	ELIZABETH	1	ENERGY COMM. SUP. II (EFF)
IAW	PRATT	KIEL	1	ENERGY ANALYST

APPENDIX F

Public Interest Energy Research (PIER) Audit and Response Matrix

	Audit Recommendation	DOF pg.	PIER pg.	PIER Audit Response/Action *Two primary actions: (1) Work with DGS to create PIER policies and contracting procedures (2) Develop PIER Contract Manual and manual training*	PIER Primary Actions: 1. DGS partnership – Policy & Procedures Creation	PIER Primary Actions: 2. PIER Manual Project – PIER Manual Creation	Process Updates *Status*	Action Validated with PIER	Existing Documentation
1	**Observation 1: Update PIER Contracting/ Subcontracting Policy**								
2	***Award issuance policy:*** Work with DGS to develop a flexible and expedient policy with written approval of policy from DGS.	4,5	25	Work with DGS to develop and implement improved contracting process	X		Proposed	Developing compliance with DGS, then update documentation in PIER Manual.	1. Contract Mngr Manual-Section 5 Contract Approval Process 2. Grants and Loans Manual, p.10 3. Sparkey BoK
3	***Org. structures:*** Update to reflect PIER's current org. structure			Update organizational structure		X	Existing	Org structures updated and posted to shared drive and energynet	1. G:\Organizational Chart\ERD&D Org Chart.pdf 2. G:\5000 Energy Research & Development\HR-Personnel\Org Charts
4	***Contracting/Sub-Contracting policies***: Update to promote a clear, open and competitive contracting process with transparency and accountability			Work with DGS to develop and implement improved contracting process	X		Proposed	Work with DGS to document, then update documentation in PIER Manual.	1. Contract Mngr Manual 2. Grants and Loans Manual 3. Sparkey BoK
5	**Observation 2: Contracts and Work Authorizations**								
6	***Contract terms & conditions***: Ensure consistency	6	25	None	X		Existing	Completed Observation 2 recommendations by removing streamlined invoice process.	PIER_TCs_2-07-06.pdf
7	***Amendment process***: Comply with state requirements and provide amendment documentation in contract file			None	X		Proposed	Confirmed	RG: 1) Commission Contract Manager's Manual - Section 6, Amending a Contract 2) Some clarification has been added to the terms and conditions regarding changes requiring formal amendment like Budget Reallocation
8	***Work Authorizations***: Link to one prime contract and document exceptions			Directive to Commission's Legal Office to review all work authorizations		X	Proposed	Confirmed	* There is no documentation in Legal office, yet In PIMS Help there is language that states Legal must to review all WAs. * Contract Manager Manual, section 6.4B
9	***Award issuance policy***: Strengthen controls for contracts and work authorization			Directive to Commission's Legal Office to review all work authorizations		X	Proposed	Confirmed	* There is no documentation in Legal office, yet In PIMS Help there is language that states Legal must to review all WAs. * Contract Manager Manual, section 6.4B
10	***New and Amended Contract***: Enhance the Commission's Checklist to include verification provisions			Directive to Commission's Legal Office to review all work authorizations		X	Proposed	Staff not sure what "verification of required provision" means, so Checklist has not been updated.	1. Checklist for New and Amended Contract Packages
11	**Observation 3: Collect Intellectual Property Payments**								
12	***Royalties (monitoring completed projects)***: Process for reviewing projects for potential royalties and follow up post closeout	6,7	25,26	Expand current procedures and add to PIER contract manual	X	X	In Progress	Need to expand current documentation that is currently placeholder for the PIER Manual.	1. Intellectual Properties list 6-30-04 Boilerplate 2. Contract Manager Manual section 6.14 - Closeout 3. Closeout Document draft (PIER specific)
13	**Observation 4: Reclassification of Authorized Positions**								
14	***Reclassifications:*** Implement policy to ensure reclassifications will not cause deficiencies	7	26	Review reclassification policy to ensure staff has clear guidelines		X	In Progress	Waiting for HR contact info from Doris	
15	***Staff duties with BCP authorizations:*** Periodically review and reconcile. Research and justify variances			Establishing a tracking system for BCP positions		X	In Progress	Doris and Jesse are working on this currently.	
16	**Observation 5: Personnel Management Liaison Memos (PLM)**								
17	***PLMs***: Review contracts for applicability with the PMLs and send documentation to union representatives	7,8	26	Formal process to ensure union representatives receive appropriate contract documents when using bargaining unit services		X	Existing	Contracts office has implemented updates (documentation on Contracts shared drive)	Documentation on Contracts shared drive
18	**Observation 6: Written Policies and Procedures**								
19	***Convene a multi-disciplinary team to assist with developing and implementing currently non-documented policies and procedures that are PRC compliant***	8,9	26	Develop contracting manual specifically for PIER program	X	X	In Progress	(1) Admin Support Manual team; (2) PIER Manual project prompting PIER staff to create updated/new documentation	
20	***Create PIER-specific documentation that is easily accessible to all PIER staff (can augment the Commission-wide policies and procedures)***				X	X		Post PIER Manual on EnergyNet. Live, easy to locate manual with links to all contract documents	

Public Interest Energy Research (PIER) Audit and Response Matrix

					1. DGS partnership	2. PIER Manual Project			
	Audit Recommendation	DOF pg.	PIER pg.	**PIER Audit Response/Action** *Two primary actions: (1) Work with DGS to create PIER policies and contracting procedures (2) Develop PIER Contract Manual and manual training*	Policy & Procedures Creation	PIER Manual Creation	**Process Updates *Status***	**Action Validated with PIER**	**Existing Documentation**
21	**Observation 7: Program Support Contracting Methodology**								
22	***Government Codes***: Adopt certain Government Code provisions with respect to program support contracting methodologies and policies	9,10	26,27	Legal Office attorneys ensure compliance with GCS 19130 and include in PIER Manual		X	Existing	Complete	1) Section 2 B of the Contract Manual covers this information 2) Policy and Regulation Documents
				Staff training on current approval process for program support contractors		X	Existing	Contract Manager training occurs at different times throughout the year depending on need.	The Contract Manual Chapter 5 covers the contract approval process but not a process to approve contractors.
24	***PIER program staff skills/abilities and workload***: Maintain and utilize a log of all PIER program staff skills and abilities and a spreadsheet outlining the workload of each contract manager			None		X	Proposed	General functions as opposed to duty statement information.	Functional Experts List (EnergyNet)
25	**Observation 8: Grant Terms and Conditions**								
26	***Grant Funding***: Require boilerplate funding source paragraph to be used in all grant documents	10	27				Existing	G&L office provide links to documents that will be included in the PIER Manual	
27	***Standardized formats***: Require grantees to submit invoices, progress reports, and final reports in a standardized format			A standard grant invoice form			Existing	G&L office provide links to documents that will be included in the PIER Manual	
28	**Observations 9-11: Questionable Prime Contracts and Admin Costs**								
29	Encourage an ***open and competitive contracting process***	10,11	27	CEC Legal Office reviews all work authorizations		X	Existing	Confirmed	There is no documentation in Legal office, yet in "PIMS Help" there is language that states Legal must to review all WAs.
				Current contracting and approval processes will be addressed			In Progress	Looking for updated documentation	
31	Establish and maintain ***one UC prime contract*** (two if functionally different)	11,12	27, 28	Negotiate terms for a new prime contract with UC which combines functions of current MRA and BOA into one agreement		X	Proposed	RG: Negotiations with UC for new Terms and Conditions halted. DGS is currently negotiating some Terms and Conditions with UC for use by all State Entities.	
				Lower overhead rates negotiated			Existing	RG: Overhead rates have not been re-negotiated.	
				Practice of issuing work authorization to Non-UC entities stopped			Existing	Confirmed. RG: This practice was halted in the current MRA	
				Training staff to better identify and prevent multiple overheads in agreements			Existing	Confirmed. RG: Contract Mngr Training is several times a year since 2008. More is planned for July-Sept	
35	**Observation 12: Project Management Practices**								
36	***Evaluating and monitoring projects:*** Develop best practices for progress reporting and invoicing practices	13	28	Update the contracting process documentation for evaluating, monitoring, invoicing projects and include it in the PIER Manual	X	X	Existing	Many documents currently exist for this topic. Some even updated recently. Include links to documents in PIER Manual.	Contract Manager Manual, section 6.6 and p.9 Progress Report Template_Std ExA-2 Grants and Loans Manual, p.18-19 Contract Manager Manual, section 6.7-6.12 PIMS: Approve an Invoice with Adjustments PIMS: Dispute an Invoice Resulting in a Cancellation PIMS: Dispute and Invoice Resulting in a Resolution PIMS: Invoice_Process PIMS: Invoice_Process_MRABOA PIMS: Invoice_Process_TechSupport
				Require the CEC103 form always be used for progress reporting		X	In Progress	Form exists, mandating it's use is not documented.	CEC103 is not on Energynet FORMS, it is listed in PIMS though. Only CEC84 is listed for the progress eval. Contract Manual says to use CEC84, PIMS says CEC84Contracts, CEC103Grants
38	**Observation 13: Flawed Invoice Process**								
39	***Invoice template:*** Require all contractors to use a "suggested format" invoice maintained on the Commission's web-site	14,15	29	Discontinue streamlined invoice process		X	Existing	All existing except 2nd review and authorization for large dollar invoices	Invoicing template on CEC website
40	***Invoicing documentation***: Require supporting documentation be submitted with all invoices								
41	***Invoicing***: Require 2nd review and authorization for large dollar invoices								
42	***Audits***: Increase the frequency and number of audits								
43	**Observation 14: Reconciliation between CALSTARS and PIMS**								
44	***Data reconciliation***: Perform and document a reconciliation between Calstars and PIMS, at least quarterly	15	29	Develop and implement a plan to automate information reconciliation between CALSTARS and PIMS		X	In Progress	Manual reconcilitation. Leah working with Frank T. to create this documentation	None