

PIER Advisory Group

2011 – 2012 Budget Year Initiatives Report

Draft Version

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EXECUTIVE SUMMARY

Summary of public input and combined AG feedback.

INTRODUCTION

The California Energy Commission (Commission) established a Public Interest Energy Research (PIER) Advisory Board as required by statute. During a PIER Advisory Board meeting held on March 30, 2011, PIER staff presented a recommendation to augment the Advisory Board structure by forming three subcommittees, called Advisory Groups, which would focus on the following research topics:

- Energy Efficiency (including related environmental research)
- Renewables (including related environmental research)
- Smart Infrastructure (transmission and distribution, demand response, smart grid, transportation, environmental and climate change)

The recommendation was endorsed by the Advisory Board. The purpose of the PIER Advisory Groups (PAGs) is to provide advice and input to program staff on research initiatives. In providing their advice, the PAGs will interface between Program staff, external stakeholders and the PIER Advisory Board. The Advisory Groups will share their knowledge of public interest energy research to:

- Provide advice on the initiatives to Energy Commission staff,
- Alert Energy Commission staff to possible duplication of efforts,
- Advise Energy Commission staff on opportunities to gain synergies in research efforts, and
- Assist effective transfer and use of research results.

Policy Drivers

In response to legislative direction, the PIER Program funds research in energy efficiency and demand response, renewable energy resources, advanced electricity generation, transmission and distribution, energy-related transportation, and energy-related environmental research. This public interest energy research helps achieve state energy policy goals by conducting research that is not adequately provided by competitive and regulated markets. Legislative direction is used to guide the program's support of state energy policy.

Integrated Energy Policy Reports (IEPR)

The 2009 IEPR articulates state energy policy and informs the Commission's PIER Program portfolio. IEPR recommendations concerning PIER include:

- Increase energy efficiency and demand response.
- Integrate renewable energy resources and distributed generation resources, including energy storage and Smart Grid.
- Advance clean generation technologies and improving the state's transmission

- infrastructure.
- Reduce the environmental impacts from energy generation, transmission, distribution and end-use.
 - Advance transportation technologies and alternative fuels to reduce air pollution and greenhouse gases emissions.
 - Continue to support and conduct carbon capture and sequestration research to demonstrate technology performance and facilitate interagency coordination to develop the technical data and analytical capabilities necessary for establishing a legal and regulatory framework for this technology in California.
 - Continue to research storage technologies to reduce cost and determine the best placement and sizing of new facilities to maximize electric system value.
 - Develop tools to forecast operational performance of solar energy generation facilities.
 - Target and support research efforts in new and emerging energy efficiency technologies and techniques as well as building maintenance and commissioning.
 - Continue Research on technologies that mitigate or resolve intermittency of renewable resources, as well as research on bidirectional power flows and power quality issues resulting from increased use of renewable resources.
 - Provide grants focusing on projects that capitalize on the synergies of co-locating electricity generation from biomass with the production of biofuel for use in the transportation sector.
 - Develop a web-based database to provide location, volume, quality, and seasonality of biodegradable waste suitable for co-digestion at wastewater treatment plants.

Energy efficiency and demand response research projects address the following state policies and goals – the CPUC Energy Efficiency Strategic Plan and *IEPR 2009* (sets zero net energy goals for residential buildings by 2020 and commercial buildings by 2030), Governor Brown’s Clean Energy Job Plan, SB 1250 (develop and bring to market energy technologies), AB 1109 (reduce average statewide electrical energy consumption for indoor and outdoor lighting), AB 2021 (establishment of statewide energy efficiency goals) and AB 32 (reduce green house gas production). Energy efficiency and demand response are considered the best options for meeting additional demand, and utilities are instructed to give them highest priority by the CPUC.

Renewable energy research is driven by a number of renewable energy generation and greenhouse gas reduction goals, including AB 32. Additionally, California’s Renewable Portfolio Standard (as mandated by SB 1078 and SB 107) is one of the most aggressive in the United States. The goals of this standard were expanded by SBX1-2 which establishes California's Renewable Portfolio Standard (RPS) that codifies 33 percent of electricity in the grid to come from renewable sources by 2020. Governor Brown’s progressive energy plan will advance the state’s renewable energy goals even further by requiring 20,000 MW of electricity to be generated from renewable resources by 2020 - 12,000 MW of localized electricity generation, and 8,000 MW of large scale renewables - and increasing combined heat and power production by 6,500 megawatts.

Advanced generation, transmission, distribution, and Smart Grid research projects address the requirements of SB 1250 (enhance the capabilities of the transmission and distribution system), AB 32 (advanced generation to reduce greenhouse gas emissions), and SB 17 (Smart Grid planning and implementation).

Energy-related environmental research falls into four main categories: Air Quality, Water Resources, Terrestrial Resources, and Climate Science. All research is tied to energy policies, such as SB 1078 (Renewable Portfolio Standard), SB 1250 (reduce or eliminate consumption of finite resources), AB 32 (greenhouse gas reduction), SB X1 2 (33% renewable requirement) and numerous *Integrated Energy Policy Report* (IEPR) recommendations.

PIER energy-related transportation research addresses policy goals for deploying sustainable fuels and improving vehicle efficiency as stipulated in SB 1250, SB 76, and the State Alternative Fuels Plan. PIER energy-related transportation research also addresses statutory goals as stated in SB 375 for sustainable communities.

Strategic Plan

The Energy Commission has begun producing a strategic research plan for the PIER program. Development of this plan will coincide with new legislation that will define the research program's scope and budget beyond the 2011/12 fiscal year, if the program is re-authorized. Public vetting of research initiatives and budgets for fiscal years beyond 2011/12 will comport with new legislated processes.

RESEARCH INITIATIVES FOR FY 2011/12

A research initiative is comprised of one or more research projects each of which is designed to resolve issues associated with a technology or area of science. PIER's budget process allocates funding to approved initiatives which are subsequently acted up by developing specific projects mainly through competitive solicitations. The research initiatives in this report are organized within the technical areas of energy efficiency, renewable energy and smart infrastructure.

ENERGY EFFICIENCY RESEARCH INITIATIVES

Using energy efficient buildings and equipment to decrease California's per capita electricity consumption reduces the state's need for new power plants and the associated environmental impacts. These measures also reduce the state's dependence on natural gas, thereby increasing the reliability of the electricity system.

In light of the energy challenges facing the state, efficiency programs provide a means to allow current supply to better meet demand without costly and polluting additional investments in generation capacity. For budget year 2011/2012, the PIER program is proposing energy efficiency research initiatives that are focused on commercial and residential buildings, and the industrial, agriculture and water sectors. A "game changer initiative has been proposed to demonstrate advanced energy efficiency technologies and strategies to accelerate the state's zero net energy (ZNE) buildings goals.

The "loading order" identifies energy efficiency as California's top priority resource. Energy efficiency has flattened the state's per capital electricity use and has been the keystone of

California's energy strategy. As a result, approximately one third of the PIER funding has historically been allocated for energy efficiency and related environmental research.

In addition to energy efficiency, the PIER program also addresses environmental and water challenges associated with energy use in the buildings, industrial, and agricultural sectors.

Buildings Energy End-Use Efficiency

I. Goals

Reduce Energy Use in Buildings and Communities

- Advance efficient technologies, healthy indoor air quality, design tools, and operations.
- Demonstrate affordable, comfortable, energy-efficient buildings.
- Find co-benefits such as water and energy savings
- Improve information resources for sharing research results.

II. General Approach

Major Considerations When Planning New Research

- Policy Connection-Does the research address state policy goals
- Research gaps analysis – Is there a significant gap in knowledge/products? Will further information make a difference?
 - Identified through meetings with stakeholders, utilities, and industry.
 - Near-term research to address market barriers.
 - Longer-term research for more challenging, high-potential technologies.
- Energy – Are probable energy savings impacts significant?
 - Market and energy savings potential analysis.
- Public Health - are energy efficiency measures impacting public health
- Market – Is there a market connection for new technologies?
 - Engage commercial partners and end-users at an early stage of research.
 - Won't the private and regulated markets address it?

III. Proposed Initiatives for FY 11/12

- A. Technology Innovations: The objective of the initiatives are to reduce building energy consumption by supporting the development or improvement of energy efficient technologies, strategies, tools and building performance evaluation methods. These improvements must be consistent with state policies and market needs and can motivate greater market demand for energy efficiency. Tentative targeted research areas include:

- HVAC: Develop diagnostics and tools for improving energy efficiency of HVAC equipment and systems; improve efficiency of conventional gas furnaces, especially heat exchanger and air handler improvements
 - Develop low emission and high efficiency combustion equipment for HVAC and service water heaters; develop and evaluate low cost solar water and space heating systems
 - Lighting: Develop advanced lighting and controls, integration with daylighting, “smart controls”
 - Building envelope: Measure and evaluate the performance of building envelopes; develop cost effective improvements to envelopes to increase building energy efficiency, especially in retrofits; develop, evaluate and publicize the benefit of better construction techniques; consideration of passive house specifications for California climates.
 - Evaluate direct and indirect electricity savings from water conservation
 - Food service: evaluate and demonstrate for improving energy efficiency of food service equipment, such as dishwashers, range tops, restaurant specific refrigeration heat recovery systems and tankless and high efficiency water heating systems
 - Plug loads: measure and evaluate the performance and make recommendations for reducing energy use associated with consumer electronics, computers and display electronics, such as set top boxes, gaming equipment
 - Assess ventilation needs to achieve healthy indoor air quality in net-zero energy commercial buildings (on-going project)
 - Conduct field study on air quality and energy benefits from implementing cool community measures
 - Develop roadmap to identify future research initiatives for buildings, especially on research needed to meet zero net energy building goals
- B. Game Changer: This initiative focuses on funding transformational demonstrations that will emphasize an integrated suite of advanced energy efficiency, renewable energy and other technologies. The goal for new construction is zero net energy for both electric and natural gas and for renovations the goal is at least 50 percent reduction in facility energy use. The objective is to have designs and demonstrations of new construction and renovated spaces that are cost effective (least cost per square foot and most energy savings per square foot compared to conventional designs), uses low emissions materials, improves indoor air quality and can be replicated by others. When possible, the demonstration will be coordinated with electric/natural gas utility programs with contribution and commitment from multiple stakeholders. The demonstrations can include integration of the following technologies:
- Building envelope
 - Lighting
 - HVAC, fans, motors, pumps,
 - Controls

- Water heating and water conservation
- Plug Loads
- Cool roofs
- Renewable energy integration with storage

IV. Questions

- What are your comments on the initiatives?
- Is our research duplicative? Are there synergies or collaborative opportunities with other programs?
- Should the game changer focus on both building and/or community scale?

Industrial, Agricultural, and Water Efficiency

I. Goals

Conduct Research, Development and Demonstration Projects to Help the Industrial, Agriculture, and Water Sectors

- Reduce energy use and costs
- Increase energy efficiency
- Develop measures to meet environmental challenges while maintaining or enhancing energy efficiency
- Enhance ability to cope effectively with energy demand and reliability issues
- Advance electricity technologies that reduce or eliminate consumption of water or other finite resources or increase use of renewable energy
- Maintain or increase productivity while reducing energy consumption and emissions

II. General Approach

- Possible research topics/technologies identified through:
 - Road maps (9 prepared since inception of PIER for various sectors)
 - Focus groups meetings with industry and trade associations
 - Discussions with utilities, governmental agencies and stakeholders
 - Primary implementation method is through competitive solicitations such as Request for Proposals or Program Opportunity Notices
- Enhance resource and administrative efficiency through collaboration with other PIER programs and outside agencies.

III. Proposed Initiatives for FY 11/12

A. Emerging Technologies Demonstration Program: The objective of this initiative is to fund demonstrations of technologies that can help the industrial sector meet the following objectives:

- Aligned with State's energy saving policy and goals and the California Public Utilities Commission Energy Efficiency Strategic Plan, and complement projects

funded by the Emerging Technologies Coordinating Council members and others.

- Help industrial customers incorporate energy efficiency technologies, understand how to control energy use and demand by providing tools and technologies to facilitate demand response, load shifting/management, benchmarking, and diagnostics.
- Reduce the energy intensity of the water use cycle and better manage the energy demands of the water system.
- Maximize the use of alternative and renewable energy sources at industrial facilities to reduce natural gas use and greenhouse gas emissions.

The demonstrations provide the data needed to verify energy savings and project benefits and provide the basis for future utility rebates. This program uses monitoring and verification protocols that are consistent with the investor owned utilities. Potential research topics:

- industrial processes
- water/wastewater
- energy storage on the customer-side of the meter, and data centers
- renewable energy integration with storage.

B. Road map: This initiative will result in updating roadmaps to identify future research initiatives for various industrial sectors.

IV. Questions

- The main technologies focused on the last solicitation were industrial processes, water/wastewater, energy storage on the customer-side of the meter, and data centers. Are there other areas that you would recommend?
- Is our research duplicative? Are there synergies or collaborative opportunities with other programs?

RENEWABLE ENERGY

Renewable energy research focuses on deployment and integration projects targeted at several key market scales: utility scale, community scale, and building scale. By focusing on the different market scales, the Energy Commission can close the gap in research for the deployment of renewable energy technologies and accelerate system integration. Research also focuses on resolving current environmental issues associated with planning and permitting renewable generation and on developing future scenarios to help predict and proactively resolve potential future issues. The goal is to increase reliable access to renewable energy, reduce technology integration barriers, improve renewable energy forecasting and storage, reduce the cost of renewable energy, and optimize the use of infrastructure. This strategy also allows the Energy Commission to coordinate and collaborate on infrastructure requirements, resource allocations, and end user needs, and could ultimately accelerate commercialization of renewable energy to meet California's 33 percent Renewable Portfolio Standard (RPS) mandate for 2020 and beyond.

A “game changer” that has been identified for the renewable energy program is to conduct an advanced community-based energy systems (ACES) demonstration. The goal of this game changer is to demonstrate the technical and economic feasibility of community-based energy systems, including design, new technologies, implementation and monitoring. ACES demonstration projects will require broad stakeholder support and utility involvement.

Renewable Energy Technologies

I. Goals

- Demonstrate integration of renewable energy at the utility, community, and building scales.
- Reduce technology integration barriers, and increase reliable access to renewable energy.
- Increase renewable storage options.
- Improve renewable energy forecasting, and water forecasting for large hydro
- Resolve current environmental issues with renewable developments
- Produce plausible scenarios of future development and create proactive strategies for addressing potential environmental issues.
- Advance the science, technology, and market availability of grid-connected combined heat and power (CHP).
- Develop advanced generation technologies that focus on increasing reliability, efficiency, and affordability, and reducing emissions.
- Develop and demonstrate diversified applications of advanced generation technologies that use renewable energy resources and integrate storage options.
- Investigate the role of renewables in achieving GHG emission targets/goals using an whole energy system perspective

II. General Approach

- Focus research on three market scales *utility, community, building* to build the market connectedness of renewable technologies with grid integration, storage, efficiency, and to lower the cost of renewable energy.
- Maximize resources, infrastructure, coordination, and collaboration, and advance renewable science and technology.
- Take a more proactive approach to resolving environmental issues and seek co-benefits
- Increase the penetration of renewables at all three market scales.
- Provide research, development and demonstration projects
- Develop and demonstrate DG/CHP systems with hybrid generation and fuel flexible (HG/FF) capability that would help increase efficiency and reliability while reducing overall costs and emissions. Such systems combine, integrate, and demonstrate different power generation technologies(e.g. gas turbine combined with

fuel cell generation) including storage, and/or has the ability to use more types of fuels including alternative and renewable fuels.

III. Proposed Initiatives for FY 11/12

- Advanced Community Energy Systems (ACES) – Game Changer
 - Demonstration of high-penetration deployment of DG, CHP, and other emerging energy technologies, in partnership with utilities, to supplement power needs of community
 - Targets mixed-use multifamily residential communities, industrial and commercial parks, and brownfield sites development
 - Emphasis on renewable energy systems, retrofits, shovel-ready projects and zero net energy communities
- California Renewable Energy Research Center (CREC)
 - Regional/local renewable resource assessments
 - Help communities determine generation potentials, what renewables to access and where to site
 - Assessment of renewable energy technologies
 - Technical, economic, environmental, and other barriers by technologies aimed at providing baseline for further advancing the science and technology of renewable enabling technology
 - Determine potential new environmental issues based on scenarios of future renewable energy profiles
 - Integrated energy management tools that incorporate forecasting to handle intermittency of Renewables (ISO, utilities).
 - Improve forecasts for CA water futures from climate change
- Advancement of renewable energy generation technology
 - Help advance the science and technology and market readiness of renewable energy generation and enabling technology
 - Develop new technologies that will address near term issues and/or help solve renewable energy integration issues
 - Help facilitate further development and demonstration of successful PIER prior projects on renewable and advanced generation technologies

IV. Questions

- How should we balance supporting pilot and full-scale demonstrations of renewable penetration projects with technology development?
- What kind of support should be provided for local/regional resources assessments to pave the way for future demonstration projects?
- How much should research focus on technologies with a near term potential for commercialization compared to emerging technologies.
- Should the game changer be focused on specific end users (e.g. industrial, commercial, residential) and on specific technologies in order to contribute most to increased DG penetration?
- What is the role of utilities in promoting DG in general and in implementing the proposed game changer in particular?

SMART INFRASTRUCTURE

California's electric system is increasingly integrated and will require implementation of smart grid technologies and tools in order to achieve far-reaching policy goals that include renewable energy, demand response, electrified transportation and greenhouse gas reductions. To meet energy infrastructure challenges, the PIER smart infrastructure program integrates several key research and development areas, including smart grid, climate change, transportation, demand response, and transmission and distribution (T&D). The goal of this integrated program is to help create a smart energy infrastructure that provides low system costs, safe delivery, reliable service, improved customer service options and environmental benefits.

The smart infrastructure program supports the development of sustainable energy systems. Sustainable energy systems will enable California communities to use geographically convenient renewable energy resources, and efficiently use other energy resources to provide reliable energy services, increased options on how to meet the individual customer's energy demand and minimize greenhouse gas emissions. Sustainable energy systems allow for the integration of energy efficiency strategies and programs, demand response programs, renewable energy, energy storage, and clean advanced generation. Additionally, they enable sustainable transportation systems and fuels, minimize adverse land impacts, and ensure the preservation of clean air and water in California. Sustainable energy systems move California down the path of achieving zero net energy status and minimizing the production of greenhouse gasses.

Transmission, Distribution and Smart Grid (Energy Systems Research Office—Energy Technology Systems Integration)

I. Goals

Lower overall system costs, increase system reliability, and provide ratepayer benefits.

- Enable integration of renewables, distributed generation, demand response, and storage.
- Improve capacity, utilization, and performance of transmission and distribution systems.
- Improve security and reliability of the electricity system.
- Empower ratepayers by enabling distributed renewables, electric vehicles, and providing energy use information.

II. General Approach

Technology Elements, Technology Integration, Smart Grid

3 Phase Approach

1. Develop & Improve Devices
2. Integration of Devices into Microgrids
3. Utility Scale Demonstrations

Benefits

- Grid more reliable, efficient, & secure
- Empower ratepayers through home area networks (HANs)
- Ensure there is an adequate workforce to power the Green Economy
- Strive for an up to 20 to 1 investment ratio on PIER supported projects

Focus

- Renewables integration, Electric Storage, efficient grid operation and PEV Integration

III. Proposed Initiatives for FY 11/12

Build One Smart Grid for All of California

- Develop smart grid equipment
 - Protection relays that self configure to accommodate renewables
- Renewable Integration
 - Greater use of electric energy storage
 - Demand Response for load shifting
 - Distribution system monitoring to provide safe and reliable distribution

system operation, improved system visibility and transparency for CAISO, refined DG specifications and interconnection standards, and information toward needs for strategic upgrades in distribution systems.

- Automated Demand Response for load shifting and grid ancillary services
 - Residential and Commercial & Industrial consumer behavior
- Accommodate Electric Vehicles
 - Simulator to provide data for distribution system models
 - Structure smart grid research to coordinate with and inform the Plug in Hybrid and Electric Vehicle Center (PH & EV Center)
 - Integrate work with other ongoing **California utility**, DOE and ARRA funded projects.

IV. Questions

- How broad should the Smart Grid research umbrella cover?
- Are there more effective ways for ETSI to engage with IOU's and CAISO for future research needs?
- How do we better communicate the benefits of Smart Grid to California Ratepayers?

Carbon Capture and Sequestration (CCS) (Energy Systems Research Office—WESTCARB Program)

I. Goals

The West Coast Regional Carbon Sequestration Partnership (WESTCARB) is one of seven regional carbon sequestration partnerships created by the United States Department of Energy (DOE).

WESTCARB is exploring opportunities in seven western states and one Canadian province for removing carbon dioxide (CO₂) from the atmosphere by (1) terrestrial sequestration—enhancing natural processes that store CO₂ in biomass and soil, and (2) carbon dioxide capture and storage (CCS)—modifying industrial facilities to remove CO₂ from process or exhaust gases for injection into secure geologic formations.

Results obtained from these efforts will provide the foundation for CCS technology commercialization throughout the United States.

II. General Approach

Within its territory, WESTCARB is identifying the major stationary sources of CO₂ such as power plants, oil refineries, and cement plants; assessing CO₂ separation or “capture” technologies that could be used at these facilities; determining the potential for storing CO₂ in geologic formations; and assessing the costs of transporting CO₂ via pipelines from major CO₂ sources to storage sites.

DOE combines WESTCARB's findings with those of the other partnerships to create the interactive National Carbon Sequestration Database and Geographic Information System (NATCARB) to understand how regional sequestration can help the United States and Canada reduce CO₂ emissions and mitigate climate change impacts.

III. Proposed Initiatives for FY 11/12

- Work with ARRA-funded projects
 - Porifera, Inc.
 - Terralog Technologies, Inc.
 - Hydrogen Energy California
- Build pilot-scale CO₂ capture demonstration in a natural gas combined-cycle plant in California
- Continued state and site characterizations to further refine CO₂ geological storage capacity and resource estimates

IV. Questions

- Is carbon capture and sequestration economically and politically feasible in California with some defined carbon tax or a cap and trade environment?
- Are there more effective ways for Westcarb to engage with CCS partners for future research?
- What role will this technology play with power producers over the long term?
- How can the Westcarb team best share the information gained and leverage the lessons learned from the national partnerships to advance CCS policy in California.
- How do we acquire California projects? What will that take? Any ideas on potential partners?

Transportation Research Area

I. Goals

- Reduce carbon emissions
- Decrease use of fossil fuels
- Improve infrastructure capacity, reliability, and sustainability
- Improve air quality
- Increase the use of alternative and renewable fuels
- Reduce the need for vehicle travel

II. General Approach

National and state transportation research policy identifies three main components: vehicles (making vehicles more efficient), fuels (lowering the fossil carbon content and environmental impact of fuels), and vehicle miles traveled (reducing the use of personal vehicles). The PIER

Transportation research area also uses these components in its framework under the focus areas of **Vehicle Technologies, Alternative Fuels, and Transportation Systems**. These three focus areas will fund research that reduces petroleum consumption and greenhouse gas emissions while assisting economic development within California.

III. Proposed Initiatives for FY 11/12

- **Electric Fuel (Recommended initiatives from PHEV Research Roadmap)**

- *Standardized PEV Battery Systems*

Standardizing aspects of the battery systems can reduce costs of PEV ownership. This initiative begins the development of standardized PEV battery modules.

- *Advanced PEV Battery Recycling*

Develop advanced technologies for material extraction and determine economic trade-offs

- **Transportation Energy for Sustainable Communities**

- *California PECAS Model Calibration*

This model is currently operating at UC Davis. The model requires calibration in order to fulfill its capacity but once calibrated it is ready to serve the policy and investment exploration needs of a wide variety of stakeholders.

- *Exploration of Future Transportation Patterns in California*

VMT Variation in Scenarios Involving Transportation and Land Use Modifications using the California Statewide Travel Demand Model as a Complementary Analysis Tool in CALCARS (\$500,000).

IV. Questions

- Are there additional opportunities to coordinate PEV integration with smart grid research in ESI?
- What additional research may be needed to develop synergies between PEV battery production and the general need for DES?

Environmental and Climate Change Research

I. Goals

- Find co-beneficial and economic uses of CO₂ to prevent releases in the atmosphere
- Reduce air, water, and land impacts from energy generation, delivery and use
- Produce and monitor CA-scale climate change scenarios
- Protect the energy infrastructure from climate change impacts
- Identify low cost GHG offsets/allowance options that utilities could use to reduce their

AB32 compliance cost for the benefit of their ratepayers

- Inform the development of an energy system in California that achieves GHG emission reduction targets and goals while at the same time avoids or minimize environmental impacts on water, air, ocean, and other natural resources.

II. General Approach

- Reduce GHG and consumption of finite resources due to energy systems
- Develop science to determine climate change impacts
- Generate the information that would be needed to identify low cost offsets/allowances
- Produce tools, models, information, data, and new scientific findings that will assist in the determination on how the energy system in California should evolve from a micro (e.g., siting of power plants) to a macro perspectives.

III. Proposed Initiatives for FY 11/12

- Evaluate net in basin air quality impacts of electrification for on- and off-road mobile sources.
- Green house gas offsets/allowances for utilities and beneficial uses of CO₂ such as the use of CO₂ to produce chemicals, chemical feed stocks, working fluids for energy-related technologies, and building materials.
- Climate Change impact and adaptation of the energy sector such as more detailed studies about the potential effects of sea level rise on coastal power plants.
- Investigate the reasons for the divergent modeling results from existing regional climate models even when driven by the same global climate model to produce improved climate scenarios for California in the future.

IV. Questions:

- Should PIER be involved in the identification of potential sources of criteria pollutant and greenhouse gas offsets/allowances?
- Should PIER address the issue of habitat and species range shifts resulting from climate change to better evaluate energy development impacts, mitigation and habitat compensation required under CEQA assessments? Currently permitting is subject to challenge because CEQA evaluations of large energy facilities do not take climate change into account due to lack of readily available information.
- How much should PIER focus on addressing environmental barriers to deploying existing or near renewable energy technologies compared to the environmental effects of emerging technologies, potentially ten years or more away from commercial deployment?
- Are there synergies or collaborative opportunities with other programs?
- How can we better communicate the benefits to California ratepayers?

SUMMARY OF PUBLIC COMMENTS

Energy Efficiency Advisory Group Workshop

Renewable Energy Advisory Group Workshop

Smart Infrastructure Advisory Group Workshop

SUMMARY OF ADVICE AND COMMENT

Energy Efficiency Advisory Group

Renewable Energy Advisory Group

Smart Infrastructure Advisory Group

INTEGRATION OF ADVISORY GROUP FEEDBACK

CONCLUSIONS