

PIER Fiscal Year 2011 – 2012 Initiatives
June 21, 23, 24, and July 26, 2011
Workshop Details

August 2011

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INTRODUCTION

The California Energy Commission's (Energy Commission) Public Interest Energy Research (PIER) program, an Investor Owned Utility (IOU) ratepayer funded program was established by legislation in 1997. The purpose of PIER is to fund public interest energy research that is not provided by the competitive or regulated markets; advance energy science and technology to the benefit of California ratepayers; and provide environmentally sound, safe, reliable and affordable energy services and products. Research is funded in the following areas:

- Energy Efficiency and Demand Response
- Renewable Energy and Advanced Electricity Generation
- Transmission and Distribution
- Energy- related Environmental and Climate Science
- Transportation

Senate Bill (SB) 1250 requires the formation of an Advisory Board consisting of key members, legislative members, energy companies, environmental groups, academics, and others. The Board provides strategic advice on research and development (R&D) priorities and makes programmatic level recommendations on future program directions to the Energy Commission's Research and Development (R&D) Policy Committee. The Board meets two to three times per year.

At the March 30, 2011 Advisory Board meeting, the Board approved a PIER staff recommendation to augment the Advisory Board structure by forming three subcommittees, called PIER Advisory Groups (PAGs). PAG's will provide advice and input to PIER staff on research initiatives, ensure research is not duplicative, identify possible collaborative opportunities, and assist in effective transfer and use of research results and products. PIER staff held three PAG workshops in June 2011 which focused on the following research topics:

- Energy Efficiency
- Renewable Energy
- Smart Infrastructure

A follow-up workshop with the PAG members for the three groups and the public was held July 26, 2011 to review meeting summaries, PAG recommendations, and integration opportunities. This report provides summaries of all four Workshops.

Energy Efficiency Advisory Group Workshop

Highlights of PIER Advisory Board Input Building Energy Efficiency - June 24, 2011

Summary of Workshop Comments

HVAC

- Solutions should be simple and reliable
- In retrofits, a whole building approach should be taken including synergies with other improvements
- Evaporative cooling, demand response and grid impacts should be included
- Consumer preferences must also be factored in
- Smart building controls need to be designed so that an information layer helps provide ongoing monitoring, diagnostics and real time commissioning

LIGHTING

- Day-lighting, dimming and controls integration and specifications need R&D
- Behavior, usability and customer acceptance and preferences should be studied
- Market transformation activities should be done in coordination with utilities
- PIER should be looking farther ahead than the utility programs

WHOLE BUILDING PERFORMANCE

- Need better design and energy simulation as well as measurement and evaluation tools
- Passive house, passive solar and other specification should be considered in California context
- Arboreal as well as movable shading should be investigated
- Indoor air quality, including sources as well as ventilation should be investigated.
- Energy savings potential of telecommuting should be investigated. Home vs. office.

CONSUMER ELECTRONICS AND PLUG LOADS

- PIER should help provide consistent data on television, computer and game console, and wireless network energy use and effects on power quality.
- Behavior and use patterns are important to understand.

ZERO-NET-ENERGY BUILDING DEMONSTRATIONS

- PIER research should affect and drive policy. Focus on synergistic opportunities. Getting more buildings to slightly improve may be more practical than a few to vastly improve.
- Sustainability and maintenance of performance is important.
- Selection criteria for demo projects, both new and renovation, should be designed to pull more market actors into process

- Projects at beginning, middle, and end of processes are all important. For example, design, finance, construction, operation and behavior are all important at different phases
- New ZNE construction may be more practical to facilitate. Standard packages may be useful for renovations. Developers need must be considered.
- Utility collaboration is essential
- Timing and funding levels are important considerations.
- Energy storage, including thermal energy storage, is important.
- Programs such as LEED should be considered—the program has gained owner participation through elite recognition.
- ZNE focus needs to be on all types of buildings—residential, commercial and old and new and government buildings
- Need to assess which types of community sub-areas, by geography, age of building stock, demographic/economic data would generate the biggest bang for the buck for retrofits

BEHAVIOR RESEARCH

- Appropriate in conjunction with technology development. People from different sciences should be supported to communicate at an early phase.
- Need to investigate how to increase awareness, concern and action.
- Need to know: Why are occupants and operators doing what they're doing?
- Investigate the basis for success of certain programs and technologies.
- Usability and user interface interactions are important to improve: user friendliness.

OTHER COMMENTS

- Need to consider energy efficiency research for laboratories, such as biotech, pharma, chemistry materials science and IT
- Need training programs for electricians and HVAC technicians who understand advanced sensors and software
- Centers such as CBE, WCEC and CLTC have been valuable.
- Continue focus on developing more efficient technologies including software—especially the sophistication to pinpoint problems
- Need research to understand and overcome barriers with input from stakeholders
- Need improved outreach to designers on energy saving strategies for new/remodeled buildings
- Need to involve financial decision makers and other trade organizations, such as SMACNA and the other trades, on the benefits and results of of PIER funded research such as on-going commissioning and improved operations
- Need better feedback on how technologies are performing and how the market reacts to them and what to do next
- Need to consider DC power distribution in buildings
- Need research to demonstrate effects of regulatory processes and how to identify ways to minimize and streamline
- Need research on how well modeled savings track actual changes in energy consumption in a home or other building, including consumer behavior.
- Need for integration of renewable energy into Buildings —emphasizing applied side and assessments of renewable energy in the context of buildings is essential

Highlights of PIER Advisory Board Input Industrial, Agriculture and Water Energy Efficiency - June 24, 2011

Summary of Workshop Comments

REDUCING RISK

- Make it easier for dairies (*or other industries*) to participate in the program. Suggest PIER provide funds to bridge the needs of the early adopters.
- Need to address permitting hurdle for dairies (or other industries). Length of time and costs are prohibitive
- Support to the end user is very important.
- IAW is more difficult because of different processes. Transferability of the research is on everyone's mind. Look at ease for transferring project to end user from demonstration stage.
- Need to reduce the risk to the owner/operator and put the risk elsewhere.
- Suggest setting up centers similar to lighting and HVAC –this can help implement IAW efforts.
- Create stakeholder meetings at corporate level and look for the right economic metrics (payback, life cycle cost, etc.).

AREAS OF RESEARCH

- Need for intensive training for high tech solutions and support infrastructure—should consider including in solicitations. There are problems with automation (SCADA) systems and water districts—implementation of technology can be challenging.
- There was a suggestion to tap into industrial audits conducted by university students. However, another participant indicated that we should be cautious about using students to evaluate. Procedures need to be standardized and ensure they are industry appropriate. Need to be sure the evaluators understand the process given the complex nature of the industry. CalPoly has a good program but requires training.
- Help simplify protocols for carbon offset process.
- Look at using combined messages to advance more than one technology and demonstrate the benefit to the end user, such as waste water treatment, energy savings and more.
- Need new approaches for motors and pump designs, especially for the small pumps. We have good motor efficiencies (about 95%) and pump impeller/bowl efficiencies (about 85%) for big pumps. Cut those in half for the thousands for small water pumps. .
- Technologies with Potential
 - Improved fertigation (nutrition and water) of crops—need for simple fertigation controllers and better knowledge organization/synthesis regarding proper fertilization
 - Pumping energy audits for municipalities –we could develop meaningful audits and analysis similar to the sewage and water treatment plants
 - New techniques for real-time irrigation scheduling of agricultural irrigation, using multiple band spectral analysis in conjunction with LandSAT images to compute evapotranspiration on large areas of land.

- Life cycle analysis: Need to determine GHG/energy savings of different energy-saving technologies for the entire life cycle of a product. It might be helpful to take a more comprehensive approach to comparatively assess more energy efficient products with their less energy efficient counterparts, to determine whether these efficiencies are realized throughout the product life cycle.
- Need for integration of renewable energy into IAW - emphasizing applied side and assessments of renewable energy in the context of IAW is essential
- Need to avoid duplication/repetition research when developing roadmaps
- Need to establish an industrial energy center –across different sectors such as academia, utilities, industries and government.

California Energy Commission
CEC Staff Workshop on FY 2011/12 Public Interest Energy Research Initiatives
Energy Efficiency Research
June 24, 2011—Meeting Summary

Advisory Group Members in Attendance

[Note: This list is based on sign-in sheets and may not be complete.]

Name, Title, Agency

Ayat Osman, CPUC
Carrie Temple, Commissioning Agents
Dave Mehl, ARB
Don Frey, Light Louver (via telephone)
Dr. Emily Young, The San Diego Foundation (via telephone)
Gregg Ander, SCE
Jerry Mix, Watt Stopper
John Holmes, SDG&E (via telephone)
Noah Horowitz, NRDC
Obadiah Bartholomy, SMUD
Peter Turnbull, PG&E
Taylor Honrath, Clean Tech Orange County (via telephone)
Dr. Wendell Brase, UC Irvine (via telephone)
Invited Researchers
Dr. Charles Burt, Cal Poly San Luis Obispo (via telephone)
Dr. Zhongli Pan, UC Davis and USDA
Don Fisher, Consultant
Peggy Jenkins, ARB (via telephone)
Danielle Wilson, Note-taker, ICF International

Agency Acronyms

ARB = California Air Resources Board
CEC = California Energy Commission
CPUC = California Public Utilities Commission
NRDC = Natural Resources Defense Council
PG&E = The Pacific Gas and Electric Company
SCE = Southern California Edison
SDG&E = San Diego Gas and Electric
SMUD = Sacramento Municipal Utilities District
UC = University of California
USDA = U.S. Department of Agriculture

Welcome, Overview and Introductions (Virginia Lew, CEC)

See PowerPoint Presentation (Presentation:

http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/)

Virginia Lew, CEC staff opened the meeting. third in a series of workshops this week on the research initiatives.

Program Overview

PIER program launched in 1997 to fund public interest energy research, advances sciences and technology, and provide environmentally sound safe, reliable and affordable energy services and products. Approximate \$86.5 million annual budget.

- IOU Ratepayer Funded Program launched in 1997
- Purpose:

Fund public interest energy research that is not provided by the competitive or regulated markets, advances energy science and technology to the benefit of California ratepayers and will provide environmentally sound, safe, reliable and affordable energy services and products. Research areas:

- Energy Efficiency and Demand Response
- Renewable Energy and Advanced Electricity Generation
- Transmission and Distribution
- Climate and Environment
- Transportation
- Approximate \$86.5 Million Annual Budget
 - \$62.5 million electric
 - \$24 million natural gas

Energy Efficiency Policy Targets

- Integrated Energy Policy Reports (IEPR)
 - Adopt statewide energy efficiency targets
 - Collaborate with publicly owned utilities
 - Enact stronger California appliance and building efficiency standards and combine with on-site generation
 - Investigate market-based incentives for energy efficiency
 - Increase energy efficiency through electricity and natural gas research and development
 - Conduct research to better understand the interaction of water and energy and identify new technologies for achieving energy savings.

The program is guided by legislation AB 32, AB 758, AB 1109, and AB 2021 as well as SB 1250. Also includes Governor Brown's Clean Energy Job Plan, and the California Energy Efficiency Strategic Plan with the CPUC.

- Legislation
 - AB 32: Reduce greenhouse gas emissions to 1990 levels by 2020
 - AB 758: Achieve savings in residential and commercial buildings
 - AB 1109: Reduce energy indoor/outdoor lighting energy use
 - AB 2021: Establish statewide energy efficiency goals
 - SB 1250: Develop and bring to market energy technologies that increase environmental benefits and system reliability, lower system cost and that provide tangible benefits to electric utility customers
- Governor Brown's Clean Energy Job Plan
 - Zero net energy buildings; maximize energy efficiency; water efficiency/recycling, DG and combined heat and power
- California Energy Efficiency Strategic Plan
 - Energy efficiency and zero net energy building goals
 - Heating, Ventilation and Air Conditioning (HVAC) to be transformed to ensure energy performance is optimal for California's climate

Role of Advisory Board

The PIER Advisory Board was created as part of SB 1250 to provide strategic advice, provide research priorities and foster collaboration. The membership is comprised of governmental, non-governmental, consumer, environmental agencies, utilities, end users, public representatives, academia and industry consultants and public representatives.

- **PIER Advisory Board** (PRC Section 25620.11):
 - Make programmatic recommendations and priorities
 - Provide strategic advice on R&D priorities
 - Foster collaborations
 - Facilitate commercial introduction of new PIER funded technologies
- Membership - composed of key stakeholders and research organizations
 - Approx 22 members including representatives from governmental and non-governmental agencies, consumer/environmental organizations, academia, electrical corporations and members of the senate and assembly
- March 2011 Board meeting
 - 3 advisory subgroups created: Smart Infrastructure, Renewable Energy, Energy Efficiency
 - Purpose: to allow for more technical review and input on research initiatives

- Introduction of Advisory Group members present.

Role of Advisory Group and Public

- PIER Advisory Group:
 - Provide technical advice and input on research initiatives
 - Share information on RD&D activities and identify synergies and opportunities for collaboration
 - Facilitate technical transfer of PIER funded technologies
 - Approx 20 members including governmental agencies, nongovernmental organizations, manufacturers, end users, public representatives, academia, consumer/environmental organizations, electrical corporations, industry consultants and public representatives
- Researchers/Public
 - Provide technical feedback on research initiatives
 - Share information on RD&D activities and identify synergies and opportunities for collaboration

Energy Efficiency Advisory Group Workshop

- Objective: Structure future public interest research efforts that maximizes electricity ratepayer benefits and eliminates duplication of efforts
- Receive comment on the proposed PIER research initiatives for fiscal year 2011/12 by having the Advisory Group and public:
 - Provide advice on the initiatives
 - Share information on other RD&D activities and identify possible duplications and synergies
 - Identify opportunities for collaboration
 - Assist in effective transfer and use of research results in the marketplace

Feedback

Research Initiatives draft report will be revised to include feedback from these workshops. We will finalize the report and circulate to our Board and the public for feedback.

Today's Agenda

Chris Scruton, CEC staff will lead this morning's discussion on building end use efficiency.

In the afternoon, **Beth Chambers**, CEC staff will provide a presentation on industrial, agriculture and water.

Building End-Use Energy Efficiency Presentation (Chris Scruton, CEC)

See PowerPoint Presentation (Presentation: http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/)

Overview, Policy Drivers, Who We Are, What We're Targeting

Chris Scruton provided an overview of the staff and the building program targets. The top four energy using areas are large offices (over 30,000 square feet), restaurants, food stores and hospital/health care facilities.

Example Solicitation Documents

Most of the projects under this program are developed through competitive solicitations. **Chris** reviewed the required contents of the proposal and the selection criteria.

- Typical Proposal Sections:
 - Problem Statement
 - Goal of the proposed project
 - Objectives of the project
 - Benefits to California ratepayers
 - Narrative Scope of Work with deliverables
 - Related Research
 - Team
 - Cost estimate
 - Schedule
 - Market connections, partners, and cost share
- Selection Criteria:
 - Does proposal address an important energy-related issue?
 - Is the issue not adequately addressed by competitive or regulated markets or by existing research?
 - Could the proposal significantly impact the issue?
 - Are the team members well qualified to carry out the proposed research and to follow through to marketplace? (commercialization, regulatory and rule making, etc)
 - Are the budget and schedule appropriate for the project?
 - Are market connections adequate?
 - Is there cost share at an appropriate level?

What PIER Buildings Has Funded

Highlights of PIER projects were presented.

Chris started with a discussion of HVAC systems and why air conditioning is important. Projects examined included:

- Hot dry optimized air conditioner that would reduce dehumidification be efficient at high temperatures, and be optimized fan and air flow, etc.
- Radiant heating and cooling systems.
 - eliminates most fan energy
 - utilizes large floor/ceiling area
 - reduced temperature differentials
 - large thermal mass
 - Title 24 standards proposals
- HVAC field investigations, automated diagnostics and training

Learn HVAC:

- Visual training tool
- Developed PIER and NSF
- Uses building simulation
- Available free to schools
- <http://www.learnhvac.org/>
- Western Cooling Efficiency Center
 - Reduce cooling system electrical demand and energy consumption in the Western United States
 - Partnering with stakeholders
 - Identifying technologies
 - Conducting research and demonstrations
 - Disseminating information
 - Implementing programs

Proposed initiatives...HVAC

- Improved diagnostics for small systems?
- Improved efficiency of conventional gas furnaces?
- Improved fan efficiency? Reduced air flow resistance?
- Training for technicians and inspectors?
- More field study?

Lighting

- California Lighting Technology Center
 - Work with manufacturers
 - Practical designs developed
 - Coordinate incentive programs
 - Training next generation
- Integrated Office Lighting System
 - Finelite
 - 3, 6, 9W LED fixtures
 - Custom configuration
 - Occupancy sensor
- Dual-loop photo sensor dimming
 - WattStopper
 - Open- and closed-loop
 - self-commissioning
 - ends over-dimming
- Advanced Plasma Lighting
 - Topanga
 - High-output
 - More efficient than LED, fluorescent, HID
 - Luminaire developed
- Other
 - Daylight integration?
 - Advanced occupant awareness?
 - Develop advanced lighting sources? Fixtures?
 - Performance appraisal of lamps and fixtures?

Envelope and Design

- HEED (Home Energy Efficient Design)
- Murray Milne UCLA : Early phase design iteration
- Heat Island Group: Cool Roofs
- Windows
- Center for the Built Environment: Whole Building Performance

- LBNL: Indoor Air Quality
- ASHRAE 62

Proposed Initiatives: Whole Building Design and Performance

- Develop quick measurement for envelope ratings?
- Cost effective envelope retrofits? Construction techniques?
- Better IAQ/IEQ test methods? Design tools?
- Passive house spec (or equivalent) for California climate?
- IAQ and energy benefits from Cool Community measures?

Consumer Electronics

- New Energy Efficient Computer Designs help to transform market
 - PIER developed efficient computer prototypes that greatly exceed ENERGY STAR requirements
 - The market has made dramatic advances
 - MAC Mini idles 13 W better than PIER hybrid 19 W
- PIER Research Forms Data Cornerstone for Title 20 TV standard
 - PIER TV research integral part of the basis for developing a new Title 20 TV standard
- Similar Technology Now Available Commercially: Laptops with Solid State Hard Drives and Super Efficient Chipsets
 - MacBook Air: 5.7 watts idle; Lenovo X301: 10 watts idle
 - Both products employ LED-backlit LCD screens as well to achieve maximum battery life and minimal weight
 - Set Top Boxes Drawing Nearly Constant Power
- Active Power Research
 - Improve efficiency of power supplies, battery chargers, displays, TVs, computers, TiVo players, Wi-Fi, 3D TVs
- Low Power Mode Research
 - Improve enabling features of equipment, power management software, improved power strips, set top boxes, gaming consoles, and inter-device control.
- Building Networks
 - Improve efficiency of routers, switches, Ethernet, Android technology for control of equipment, wireless controls, VOIP.

- UC Irvine now funded to work on plug-load energy efficiency
- EPRI, Ecos, LBNL and others continue excellent work in this area.

First New idea-Game Changer:

- ZNE Building Demonstration
 - **Background:** Utilities and others have programs to develop high efficiency/zero net energy buildings but there may be gaps, or funding may be limited.
 - **Goal:** Fund transformational demonstrations that will help accelerate the development of ZNE buildings and communities.
 - **Objective:** Assist in deployment of advanced designs and energy efficient technology to leverage efforts of utilities and others in development of zero-net or very high efficiency buildings.
- **Proposed initiative:**
 - Demonstrations of ZNE/high efficiency buildings/ communities
 - Integration of suite of advanced energy efficiency, renewable energy and other technologies
 - Leverage efforts of utilities and others in development of zero-net or very high efficiency buildings/communities
 - Demonstrations for planned buildings and renovations, residential/multi-family and low income and/or community scale
 - Should the focus be existing or new construction? Commercial or residential?
 - What are suggestions for involving low income housing and other under-served markets into the demonstrations?
 - Though the desire is to integrate as many advanced technologies, what should be the priority emphasis?
 - How would you measure success in a demonstration?
 - Are there opportunities to collaborate or synergize? If so, with whom?

Behavior Research

- **Background:** Attitudes towards energy use can have a huge impact on consumption and efficiency.
- **Goal:** improve energy efficiency by changing outlook on consumption and energy use.
- **Objective:** Discover through research effective techniques to promote energy efficiency awareness and concern.

Are there ways we can improve the program? Are there other things we should be working on?

Advisory Group Feedback on HVAC

Gregg Ander, SCE—How do you know what success look likes?

Reliability and simplicity. Really cool products that is too complicated to install and determine if they actually work. From a lighting and controls standpoint ... has this come up before? Are you looking at reliability, controllability, and/or simplicity?

Obadiah Bartholomy, SMUD—For retrofits, need to look at appropriate synergies. Look at appropriate sizing of existing HVAC systems to improve efficiency. Need to look at how to reduce size (i.e. additional benchmark work) of existing systems. Need to look at demonstration efforts.

Chris responded that this is a challenge. Contractors do like to sell oversized units to increase profit and reliability.

Don Fisher, Consultant—Evaporative cooling seems to be missing from your presentation.

Chris responded that this was a focus of the cooling challenge at the Western Cooling Energy Efficiency Center.

Jerry Mix, Watt Stopper—Are you looking at demand response?

Chris responded absolutely.

Peter Turnbull, PG&E—Increase emphasis on consumer demand. Work with utilities to identify the needs

Gregg Ander, SCE—Stay abreast of all policies. Focus on increased efficiencies. Focus on transparency to encourage participation. Look at this holistically. Not only efficiencies but also impact on the grid.

Work on Lighting Programs

Chris Presented the Program's Work on Lighting Programs

What else should we be doing in terms of lighting?

Advisory Group Feedback

Gary Fernstrom, PG&E—Air conditioning and lighting should get appropriate valuation from the CPUC. The evidence of savings doesn't seem to be there from maintenance programs per the CPUC.

Gregg Ander, SCE—Lighting is a real critical element of the program. One of the shining stars of the PIER program is the lighting efforts.

Michael Short, MC2—Add to the solicitation a mandatory utility connection or at least encourage it. It is being done informally or at a secondary level. Need to formalize or be explicit in the proposal the role of the utilities in the outcome of the proposal.

Jerry Mix, Watt Stopper—Pushing it past the point of being a PIER science. Need to fund adoption or implementation. The market place has early adopters but there is a gap. PIER sometimes bridges that gap to help good ideas and good projects get past that gap.

Gregg Ander, SCE—The building industry is highly dysfunctional. Need to get these technologies put into the market; encourage development. Need to provide right guidance in solicitations.

Obadiah Bartholomy, SMUD—Need day lighting integration technology is very important. Need controls that interact with these types of new technologies.

Noah Horowitz, NRDC (add to adv. Group list above)—Better dimming functionality. Need to make dimmer specs that work with standard lights that match current low load bulbs. Develop specifications that can into standards. Currently very poor interaction.

What can we encourage in the next generation?

Owen Howlett HMG—I believe that the research community should not be looking at dimmers. The manufacturers should be doing this. They will make a product that works with their existing products.

The programs don't have the dollars to look at the behavior and applications that need to be done. Look at what people do in practice and to understand if this stuff really works and what we need to be doing in the future.

Utilities should be strong partners with PIER and provide role of emerging technologies. manufacturers can make products that work.

Jerry Mix, Watt Stopper—The adoption of the technologies and the products in the market place. There is no guarantee that consumers will purchase and install these types of products.

Ayat Osman, CPUC—Need this continuum to address gap of research and the market. Need some innovative advancement in technologies to help achieve the zero net goals of the CPUC. The market transformation and long term energy efficiency goals are the issue. We see the utilities focusing on the short term goals. PIER needs to play a role in providing a way for the next big wave of new products. There is plenty of funding in utilities program for research. The input from this group is very important.

Whole Building Area Program Efforts

Chris Presented on the highlights of the whole building area program efforts at the performance of a whole building.

What should we be looking at? Better IAQ/IEQ test methods and design tools?

Is Passive house spec suitable for California climate?

Advisory Group Feedback

Gregg Ander, SCE—Need more granular tools that can allow more holistic evaluations. Need design tools that take it all the way through to installation and beyond. Need to look at measurement and evaluation tools.

Ayat Osman, CPUC— Need tools for compliance, energy modeling and thermal modeling of buildings

Obadiah Bartholomy, SMUD—Align model outputs with actual reality of energy outputs. Improve existing tools and fund energy modeling to demonstrate anticipated real outputs. Are you taking tree shading into account? Don't have a good tool to evaluate balance between shading and need for solar energy. Help contractors and architects determine the balance. Is the research focused on electricity or does it also include natural gas?

Jerry Mix, Watt Stopper—Is the passive house the same as Net Zero?

Chris responded by giving an example of a house with virtually no leakage over the 3,000 square feet located in Menlo Park. Is it appropriate to use this type of technology to be focused in California given the moderate climate? The group nodded in consensus.

Bruce Baccei (SMUD)—One could add passive solar that would add night time cooling and shading. Need to examine moveable shading.

Peggy Jenkins, (ARB) (via telephone)—In the last round of code revisions you went with code violations in new homes; further research in this area is needed. Ideally there would be some research that would look at all systems including energy use and indoor air. More research needed on mechanical ventilation in homes—need to look at systems and protection of indoor air.

A system like the bathroom exhaust that brings in outdoor air that brings in unfiltered air into the house is bad—results in increased outdoor air pollutants.

Market acceptance from the perspective of the lighting market is very important—make sure new technology works for persons with eye disease, aging users, etc.

The PIER should work with ARB on emissions of office equipment and other indoor sources of pollution. Would like to see a reduction of indoor emissions. Insulation materials should be low emitting and safe.

Dr. Emily Young, San Diego Foundation (by phone)—More accessible research to look at telecommuting and compare the cost and energy savings associated with that. Look at where workers are located at, how efficient their homes are compared to the office and the savings from not commuting vs. home energy costs realized from working at home.

PIER Initiatives Work on Consumer Electronics and Lower Power Research

Chris presented on the PIER initiatives work on consumer electronics and lower power research that include active power research, low power mode research and commercial building networks.

Are these the areas we should be looking?

Advisory Group Feedback

Noah Horowitz, NRDC—Better job with outreach. Real scarcity of data of TV. use, taking advantage of power savings on computer, electronic games, etc. Need in home usage monitor to determine how many hours per day, what modes—all of these will help to inform the standards.

High-speed internet equipment adds up (6W for the modem and 6W for the router—all running 24/7). Need equipment that responds to repetitive response to allow equipment to power down and power up with little or no delay to the user.

Obadiah Bartholomy, SMUD—Study data needs in California is very important.

The NW Energy Alliance did a monitoring study down to the millisecond level—data collected plug load usage in homes at varying time increments.

Gary Fernstrom, PG&E—Important to keep an eye on power quality. Total harmonic distortion –cost of correcting power factor is small but it adds up. Economic value relative to cost of fixing issues.

Owen Lowlett—Ability to gather more data than ever before. The manufacturer of these systems has their own ways of doing this. PIER can look at linking together data sets and implement consistencies in how data is gathered.

John Holmes, SDG&E—Importance of supportive research to facilitate the ease of day to day use by the consumer. A large piece of energy pie is the awareness of how to use these systems—this will raise awareness.

ZNE Building Demonstrations

Chris presented to the group the idea of a game changer. The proposal is ZNE building demonstrations that leverages utility activities. Should PIER focus on new buildings, existing construction? A need for commercial or residential or both? Low income housing or other underserved markets?

Advisory Group Feedback

Gregg Ander, SCE—The need to look at ZNE is important for both existing and new. Need to help effect and drive policy. Need to focus on synergistic opportunities at both the local building level and at the systems level.

Ayat Osman, CPUC—One of the most important thing when talking about collaboration and synergies, need to include selection criteria to identify what strategies to follow and input of market actions. What strategies to follow in the near term and ensure sustainability of technology and maintenance of systems exist? What is missing is collaboration and use of new technologies and renovations of existing buildings. . Also to insure sustainability systems are in place. Need to look at renovation of existing buildings. Need to pull more of the market actors into the process. Having selection criteria will achieve that. **Chris** asked “have experts come up with the selection criteria to address the questions?” The information available is segregated.

Jerry Mix, Watt Stopper—Which one has the highest likelihood of success? Experience is that retrofits follow new construction. Get the model right for new construction, and then you will get retrofits to follow including tenant improvements.

Obadiah Bartholomy, SMUD—Existing buildings is a much larger challenge than focusing on new construction. SMUD has a lot of challenges to have consumers change out existing equipment with different more efficient equipment. Need more demonstration projects to educate. Need to know packages that are working for standardized approach and not customized challenge.

Jerry Mix, Watt Stopper—Market share is driven by home builders not consumers.

Peter Turnbull, PG&E—Collaboration with utilities is a very important part of this. Need to know what level of magnitude of dollars is available. How do we come to terms with timeframes and agreements that span over time? Can we make commitments on collaboration over a long period of time? Need a working group to look at this.

John Holmes, SDG&E (via telephone)—Energy storage will be a key component of performance. Adoption of AB 2514 integration with renewable portfolio strategy is also an opportunity for further investigation. There is a \$50 M research project with Itron as part of CSI/CPUC –need to leverage and coordinate—see Frank Goodman.

Michael Siminovich (UCD)—May be more important to have more buildings half the way there rather than a few buildings that are all of the way to ZNE—when considering program goals and objectives.

Martha Krebs—Engage at the beginning of the project with utilities and understand market issues and tools and engage at operational phase and understand user behavior—include mix of projects at the beginning, middle and end. . Learn something about financing, market drivers, etc. The other approach is to engage at the end to better understand user behavior.

Noah Horowitz, NRDC—PIER could facilitate a process that shows the goals and visions or targets for the program (such as whole house will use less than 10 watts and what we need to do to reduce lighting by 0.5 watts/sf. Identify the roadmaps that demonstrate the tools to achieve the goals. Fund the things we really need that build together to achieve a greater outcome.

Bruce Baccei (SMUD)—No wrong solution. Just what is different and or more challenging? The other element we should consider is geothermal.

David Cellini, ACCO engineer systems—Look at LEED program. Many programs would need to be put together a system—implement and design to put many technologies together—lighting, controls, etc. If the overall system is inefficient or doesn't produce can be an issue. Something that puts together broader systems would be of benefit.

Dr. Wendell Brase, UCI—A bigger role for thermal energy storage. Proven inexpensive type of storage. Will buffer effects of intermittent energy. Energy storage not only opportunity here.

Behavior Research

Chris then presented the second idea which is to look at behavior research. We want to look to see if messaging can have a different role in the market place and can it demonstrate other types of behavior.

Advisory Group Feedback

Martha Krebs (UCD)—Appropriate research topic for PIER in conjunction with technology development. The real key for PIER is that when you invest in the social science that you put it in the context and require the other researchers to participate. Need to pay for people to talk to each other at the early phase of project design.

Gary Fernstrom, PG&E—Great idea. Similar to FLEX Your Power program several years ago. Need to identify how to increase awareness and raise concerns. Need to make readily available information on energy efficiency and performance or use. What do occupants do and how to interact with buildings?

Owen Howlett—Message research is very exciting. Need to better understand the why or how of consumers and facility managers as it relates to function or perform certain usage actions.

Obadiah Bartholomy, SMUD—It's a challenge to get people to pay attention to energy. Get the public to modify behaviors and interactions through better understanding how their actions impact their use.

Jerry Mix, Watt Stopper—Behavior research to find out why certain things are successful, especially in lighting.

Gregg Ander, SCE—All of the soft science is important. Market research and intel we need more info.

Ayat Osman, CPUC—Consumer input and output is very important. Get consumers to participate.

Dr. Wendell Brase, UCI—User interface with appliances and devices is important. All devices have features that have energy saving components. Need to make it more user friendly to the consumer to educate how to use the features without forcing users to read complicated manuals, information, etc.

Break for lunch.

Industrial, Agricultural and Water (IAW) Efficiency Program (Beth Chambers, CEC)

See PowerPoint Presentation (http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/)

Beth Chambers, CEC staff lead for industrial, agricultural and water (IAW) efficiency program.

Dr. Zhongli Pan, a researcher with UCD and USDA joined us this afternoon for the presentation and discussion.

Michael Short with MC squared via telephone also joined the afternoon session.

Beth presented the agenda for the presentation and discussion.

Goals

The goals for the IAW are to reduce energy use and costs; increase energy efficiency; develop measures to meet environmental challenges; energy demand and reliability issues; advance energy technologies; and maintain productivity.

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 & reliability issues
- Advance energy 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.

General Approach

Primary method of implementation is through solicitations or RFP's.

- Candidate research topics/technologies identified through:
 - Road maps (9 prepared since inception of PIER)
 - Focus groups meetings with industries and trade associations
 - Discussions with utilities, governmental agencies and stakeholders
- Alignment with state policy and program goals and comments from the PIER Advisory Board and Group
- Primary implementation method is through competitive solicitations such as Request for Proposals or Program Opportunity Notices.

Priority Research Areas-Sector End Use

Water sectors use a lot of energy. Water is not just for industrial processes. Water treatment plants, water supply and transportation systems, drinking, and irrigation.

2005-2010 Funded Research

Involved in over 100 projects totaling \$21,578,370. These include:

1. Federal controls for data centers that demonstrate cooling control technology integrated with wireless network sensors to control data center cooling, combined with best practices at CA datacenters.
2. Super Boiler project that advances boiler heat recovery leads to 12 percent energy efficiency improvement.
3. Napa-based Wine Secrets Selective Tartrate Removal System to eliminate tartrates through electrodialysis to remove sediment. Takes 1 to 3 kilowatts of electricity to produce 1 barrel of wine.
4. CO₂ laundry using liquid/supercritical CO₂ industrial and commercial laundry machines. This project demonstrates the use of a carbon dioxide-based laundry system for industrial/commercial laundry facilities that will reduce water consumption and significantly reduce energy usage associated with drying.
5. Food processing project using large energy user Frio-Lay to demonstrate a solar technology to provide high-temperature solar process heat steam for making potato ships.
6. Waste water treatment plants that improve methane production. Cascade Clean Energy will install a pilot scale bio-reactor to use existing wastewater.
7. Agricultural irrigation water energy efficient to address peak energy demands.
8. Co-digestion of dairy and other waste products to use with an existing anaerobic digestion power general system to see how it will react.
9. Time-of-use water meter impacts on customer water use to study water use patterns and provide incentives on water and energy conservation.

Proposed Funding Initiatives for FY11/12

Beth then presented regarding the Emerging Technologies Demonstration Grant Program that will incorporate energy efficiency technologies, tools, benchmarking and diagnostics.

The other initiative is to update the most current technologies by updating selected roadmaps to identify future research ideas.

Emerging Technologies Demonstration Grant Program

Demonstrations to help the industrial sector meet the following objectives:

- 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.
- Develop program/projects aligned with the State's energy policy goals; collaborate with utilities through the Emerging Technologies Coordinating Council.
- Explore ways to reduce the energy intensity of the water use cycle and better manage the energy demands of the water system.
- Maximize the use of alternative & renewable energy sources at industrial facilities to reduce natural gas use and greenhouse gas emissions.

Roadmap

- Update selected roadmaps to identify future research initiatives and industry needs
- Done in conjunction with input from utilities and affected industries
- Includes public workshops to get input

Technology Targets

Emerging Technologies Demonstration Research Areas:

- Water and wastewater-process optimization, water and energy conservation, renewable resource integration
- Data center: innovative cooling options, equipment improvements
- Energy storage: customer side load management/demand response, renewable energy integration
- Industrial energy efficiency: process/equipment improvements, renewable energy integration, CHP/DG

Questions

- The main technologies focused in the last Emerging Technologies Demonstration solicitation were industrial processes, water/wastewater, and energy storage on the customer-side of the meter and data centers.
 - Are there other areas that you would recommend?
 - Any suggestions on priorities?

- Besides demonstrations, what are some of the other ways to reach out to this diverse sector? How do we measure the success of these other options?
- Are there opportunities to collaborate or synergize? If so, with whom?
- How would you recommend maximizing market penetration of technologies in this sector?

Beth requested feedback from the Advisory Group.

Advisory Group Feedback

Carrie Temple, Consultant—How is market transfer handled? How do you reach the smaller dairies? Do you collaborate with the utilities?

Beth responded they utilize the website and try to do meetings and outreach as much as possible given the travel restrictions. Yes we do collaborate with the utilities.

Obadiah Bartholomy, SMUD—The dairy owners are not experts in operating and maintaining the digester or other components of the systems. There is a need for technical assistance and on-going support for the smaller dairies. PIER should look at the technical needs for supporting ongoing operations. You got to have the right guy for the project. And broader markets—maybe not sustainable.. Need for support function and business models to help owners operate projects/facilities.

Michael Lozano, CEC Staff person—indicated that it depends if CEC is a driver or a follower. In this particular industry we sometimes have an individual that was willing to push the technology so PIER was able to follow. Sometimes we have to be opportunistic.

Obadiah Bartholomy, SMUD—Need to try to make it attractive for dairies to participate. We don't want them to share with their neighbors that it is difficult to participate. Suggest PIER provide funds to bridge the needs of the early adopters.

Jerry Mix—You need middle men or facilitators. You need someone to take the risk away from the owner/operator and from the provider. This industry is risk adverse-need to put the risk with someone else.

Susan Patterson, Gas Research Institute—2008 Dairyman Association—nobody building due to permitting process. Need to address permitting hurdle for the dairies to allow digesters to be installed. The length of time and costs was prohibitive.

Martha Krebs—The policies and regulations make it really difficult for the dairies to participate in these types of programs. Clear policy was needed and a mechanism to keep talking to one another about these challenges. CEC needs to be at that table.

Charles Burt, CalPoly San Luis Obispo—Problems with automation (SCADA and water districts). Moving to implementation of technology can be challenging “devil is in the details”. Need to do intensive training for high-tech solutions. Need to have support infrastructures in place and include it in solicitations.

Peter Turnbull, PG&E—IAW is more difficult because of different processes. Transferability of the research is on everyone's mind. Look at ease for transferring project to end user from demonstration stage. Also consider the regulatory barriers for the end user—huge barrier.

Dr. Zhongli Pan, UCD/USDA—Support to the end user is very important. Need companies that can monitor the sensors that regulate performance of equipment.

Obadiah Bartholomy, SMUD—DOE funded universities to do industrial audits resulted in evaluation teams of well-trained individuals to look at industries and matching technologies. PIER can look at this and see whether can tap into these audits—match low cost audits and implementation.

Michael Short—Drag reducing agents in pipelines. Finding that pipeline companies are not eager to get involved in the various investigations. Does anyone have ideas on how to encourage them to get involved?

Jerry Mix—Are there centers similar to lighting and HVAC in this industry that can help implement these efforts?

Terry ?, UCD—UCD is putting together a state water use efficiency center that will look at ag-related water demands and where it is most efficient to invest. It is currently housed in the Western Cooling Efficiency Center.

Charles Burt, CalPoly SLO—Caution to use students to evaluate. Procedures need to be standardized and ensure they are industry appropriate. Need to be sure the evaluators understand the process given the complex nature of the industry. CalPoly has a good program but requires training.

Obadiah Bartholomy, SMUD—Carbon offset market have significant costs related to the accounting and verification and technology. It makes sense to drive projects that look at the off-sets of the carbon market for the smaller dairies that are based on rigorous standards of larger dairies. PIER could help simplify protocols for carbon offset process.

Jerry Mix, Watt Stopper—Eliminate risk and barriers results in better market penetration.

Fred Bauman, PG&E—Create stakeholder meeting at corporate level and look at payback period versus life cycle cost—select the right metric.

Jerry Mix, Watt Stopper—PIER needs to look at policies to create tax incentives for participation in the programs.

Ayat Osman, CPUC—Look at using combined messages to further more than one technology to work together to demonstrate the benefit to the end user. Such as waste water treatment, energy savings and more.—solve more than one problem—save water, save energy, etc.

Charles Burt, CalPoly SLO—Encourage incentives for modernization or upgrade to new technologies vs. refabrication of old things. For instance, pumping is very simple (rehabilitation and modernization and incentivize for additional improvements).

Dr. Zhongli Pan—PIER needs to encourage use of new technologies.

Conclusion of workshop and invitation for comments by end of next week (July 1) presented by **Virginia Lew**. Final initiatives report expected by the end of the month to present to the Board. Workshop concluded

The following were the comments that were part of the Webinar email chat or were received by email after the meeting:

Webinar chat comments:

Dr. Wendell Brase - A building-type missing from your list is laboratories. I don't mean academic labs, only, but the thousands of labs in CA in the biotech, pharma, chemistry, materials science, and IT industry. In terms of energy-intensity, labs are up there in the range of hospitals.

"Smart" building controls need to be designed so that an "information layer" helps provide ongoing monitoring, diagnostics, and real-time commissioning. That is, the complexity that can be a curse needs to be harnessed into a strength of smart building systems.

In terms of training, we increasingly need electricians and HVAC techs who understand advanced sensors and software -- not more solar panel installers, which is typically the image evoked by the term "green workers."

Peggy Jenkins - Need to keep vision issues in mind for market acceptance...we have an aging population, increased vision conditions such as macular degeneration, diabetic eye issues, etc. Some new lighting has not worked for these folks.

John Holmes SDG&E - I echo the value of CBE's activities. SDG&E is a member. We also support research at WCEC and CLTC. I have a few comments on the topic of "intelligent" system integration.

David Cellini- When considering existing buildings and retrofit, we might research the LEED program. The program has gained owner participation through elite recognition.

Dan Burgoyne - I think that the ZNE focus needs to be on all of the above. New construction is easier to integrate, while the bulk of our building portfolio is existing buildings. We need to include housing as well as commercial buildings. While several good examples are in California, we should apply to several government pilot buildings.

Comments Received by Email by July 1

Charles Burt:

I was somewhat surprised, initially, by the fact that many demonstrations are in fact demonstrations of what won't work. It may not be the technology itself as much as it may be the support that researchers don't consider in their proposals. I equate it to purchasing a copy machine without considering the cost/need of a maintenance contract, the cost of electricity, and paper.

Thanks to considerable support from DWR, CEC, and PIER over the last 20 years, ITRC has made many forms of irrigation district and pump automation successful and widely accepted. But we recognized early on that if we just knew the algorithms (equivalent to understanding the biochemical and biological processes in anaerobic digesters), the automation would fail. We needed to understand how the automation would properly fit into the system, we had to know all the details of the hardware, sensors, radios, etc, and we needed to have proper commissioning of the automation and follow-up service. The devil is

absolutely in the details with new technologies, and it just doesn't cut it to only understand part of the process. As automation became more common in irrigation districts, what we call "integrators" stepped up to the plate to handle things like proper commissioning and maintenance agreements, and we stepped back from the actual implementation of those details.

We are now focused on improving the overall PROCESS of automation even more – using new programming languages that can be used on any major brand of field computer, for example. And making control code modular so that there are less programming errors for new installations. And more clearly defining the line between control folks and integrators. A big item in this subject is our improved ability to perform unsteady canal flow modeling – modeling not only the canal hydraulics themselves, but also the influence of our control algorithms.

Bottom line: You can't just take a new technology with lots of potential, stick it in the field, and hope it will work after the contract runs out.

I'm not sure how familiar you are with ITRC, but a quick glance at the reports and papers on our web site (www.itrc.org) will show you the tremendous range of water/energy research and implementation we have done. I mention this because one of the agenda items was to prevent duplication of efforts. I heard one person in the room state that they would like to become a water/energy testing center. We already have an excellent testing center that has been developed largely with funds from the electric utilities and CEC/PIER. We currently have contracts with SCE to test things like sand wear on pump impellers. We have the expertise, personnel and instrumentation to measure a wide range of water/energy variables. As an example, we have an NIST-traceable weighing tank so we can know precisely what flow rates we are testing. Our flow rate capacity for testing varies from 0-15,000 Gallons/minute. We can develop pressures up to about 200 psi with our pumps. Plus, we have efficient testing setups so that we can quickly and properly insert items into hydraulic systems to test them. There is no other comparable facility in California, and obviously if you are considering supporting a water/energy center I would hope we could have you visit ITRC and see what we already have, and what our proven capabilities are. Enhancing your existing investment in us is undoubtedly a prudent move, rather than striking out in a new direction. I should also add that we are extremely well known in the irrigation arena – by farmers, irrigation districts, irrigation dealers, manufacturers, etc.

During the meeting we did not discuss many specific technologies which I think have potential, and which we will be interested in submitting proposals on. A quick description:

1. Improved fertigation of crops. Believe it or not, CEC sponsored our FERTIGATION (applying fertilizer through irrigation water) book perhaps 20 years ago, and it's extremely well accepted.....but now 20 years old. I could go into great detail about why this important, and about the details that aren't commonly understood. But in the end, the fact is that with better nutrition (timing, amounts, ratios), we can greatly improve the crop/drop (of water and energy) ratio. Furthermore, judicious use of nitrogen fertilizer saves considerable energy directly (albeit derived from natural gas). There are two areas of need: (1) simple fertigation controllers that farmers can use to spoon-feed their crops, and (2) better knowledge organization/synthesis regarding proper fertilization...put into a format that is

understandable. You can imagine that the chemistry thing about fertilizers pretty well blows most farmers away.

2. New technologies for small pumps. This is the story: We have good motor efficiencies (about 95%) and pump impeller/bowl efficiencies (about 85%) for big pumps. Cut those in half for the thousands for small water pumps. We need new approaches for motors and pump designs, especially for the small pumps.
3. Pumping energy audits for municipalities – not just to help out the individual municipalities themselves, but more to benchmark the conditions. Where are the inefficiencies? What are the solutions? With proper benchmarking (we have done this very successfully for DWR and USBR and The World Bank in irrigation district water distribution and with on-farm irrigation efficiency and with landscape irrigation)) we can properly target interventions that will be practical, economical, and successful in reducing energy consumption. With the sewage and water treatment plants, I know we could develop meaningful audits and analysis.
4. New techniques for real-time irrigation scheduling of agricultural irrigation, using multiple band spectral analysis. This is a long story, and I don't know for a fact right now that it would be accepted. But we know the technology (we use it with LandSAT images to compute evapotranspiration on large areas of land) and we know on-farm irrigation and all the problems with current soil moisture sensors, infrared sensors, leaf bombs, etc. I'll have to think this out a bit more.

Dr. Emily Young

I thought there were many good points raised during the call.

Somehow, the phone cut off during the last 10 minutes, so I am not sure what you heard of my comments on prioritizing retrofits over new buildings and commercial retrofits as the highest priority.

Another area of potential research is that assessing which types of community sub-areas, by geography, age of building stock, demographic/economic data, etc would generate the biggest bang for your buck in terms of retrofits. There seem to be a number of programs (at least here in San Diego County), which are designed to provide rebates or outright grants based on a first come, first serve basis (sometimes with an additional household income requirement for residential retrofits). I am not sure if these programs generate more impact than would more targeted funding toward a group of the least energy efficient homes/businesses in particular neighborhoods.

Finally, another policy question that I had was to that of the extent of GHG/energy savings of different energy-saving technologies for the entire life cycle of a product. It might be helpful to take a more comprehensive approach to comparatively assess more energy efficient products with their less energy efficient counterparts, to determine whether these efficiencies are realized throughout the product life cycle.

Don Frey

Thank you for inviting me to participate in the PIER Advisory Group Workshop last week. I had a very difficult time hearing what was being said, so the flow was hard to follow. If I know when the next meeting is, I will try to attend in person.

I have been involved in the PIER program for many years. I'm not sure when we started the first PIER project at Architectural Energy Corporation, but would guess that it was in

1998 or 1999. I have participated in many meetings and was surprised to hear little that I have not heard before. The difference is that it is almost a whole new group of people participating and making comments. Gregg Ander has been involved in PIER as long, if not longer, than I have.

As I said before the meeting, the real challenge is to create successful net-zero energy buildings. I always like to figure out what topic areas elements of discussions fit into. For me, that is the only way to put structure around issues so that they can be further investigated and used to achieve the high-level goals, like net-zero energy. The subjects discussed in the meeting seem to fit into the following topic areas.

- Policy and Background
- Technologies
- Utility Involvement
- Market Acceptance
- Design
- Construction and Commissioning
- Operations and On-going Commissioning
- Feedback

I will say a little bit about each of these to elaborate on what I think fits into topic area.

Policy and Background

I include codes and standards, like Title 24, and other government mandates into this category. These are typically the drivers for major changes. I also include background information like time histories of end-use loads, such as the CBECS database. These tell policy makers and utilities what it causing loads at every hour of the year and also point to what solutions are needed to reduce loads. This category might also include further constraints on permissible technologies and solutions, such as health standards. We got deeply into this category a few years ago on a PIER project that dealt with indoor environmental quality.

Technologies

Technologies are all the new developments that have come into the marketplace as a result of PIER funding. Some of these were discussed in the meeting. Many others have resulted from the PIER program. UC and CSU campuses have been test beds for many of them. The information that is developed under Policy and Background is used to understand the gaps and to place priorities on new technologies to meet the high-level goals. For instance, California's summer climates are mainly hot and dry. Evaporative cooling strategies are likely to be more and more important as dates to achieve net-zero energy come closer. Water will be an issue that gets a great deal of scrutiny and any projects funded to look at this will be done under Policy and Background. On the surface evaporative cooling looks like it will increase water use, but in actuality water use may go down, since water is used to cool equipment that generates electricity.

More efficient technologies are needed for most all the major end-use categories. In most cases these will be hardware, but some will be software, such as better algorithms for lighting controls or more robust diagnostic and control strategies. Energy

management systems that diagnose and fix problems are possible. A lot of what appears to be fault detection and diagnostic software coming onto the market lacks the sophistication to pinpoint problems.

Better technologies will continue to be a focus of PIER funding, as it should be. Better collaborations with industry to get technologies into the market quickly will continue to be a challenge.

Utility Involvement

The utilities have a key place in the PIER program for planning, implementation, and evaluation of technology development projects. Through the Emerging Technologies Coordinating Council they can share information among themselves and develop incentive programs that encourage the adoption of technologies and help to bridge the “valley of death,” as was mentioned in the meeting.

Except for Southern California Edison, the corporate memory of what has been done in the past is pretty short. The PIER program should establish contacts as high as possible in the utilities and encourage long-term continuity of personnel involved in PIER.

Market Acceptance

Customers need to accept technologies for them to be successful in the marketplace. Work needs to be done to understand barriers. Barriers will be different depending on the type of technology. For instance, customers know they need light bulbs and are aware that incandescent lamps are being phased out and will be replaced with CFLs. This is a known technology being replaced by an advanced technology. A completely different situation for developing market acceptance occurs when a completely unknown or unfamiliar technology, like products that project daylight into buildings (think LightLouver) are introduced to the market. The process of gaining market acceptance is much more difficult, but the rewards are great.

Design

The design community is very poor at helping to promote new technologies or design strategies. One of the people in the meeting commented on design practices to implement passive cooling, window shading, daylighting, etc. He didn't mention anything that hasn't been known for decades, but is still not taken up by the design community. Significant outreach is needed with designers to get energy-saving strategies into new and remodeled buildings.

Construction and Commissioning

The construction trades are keys to getting new technologies properly installed and operating in buildings. Contractors and subcontractors need education about emerging technologies and about working with commissioning agents. Even though acceptance test procedures are not in Title 24, enforcement is not guaranteed, and is a source of concern. Not all jurisdictions will handle enforcement the same way. The PIER program should bring trade organizations, such as SMACNA, to the table to either provide advice or to develop strategies to work with the trades. Some utility companies, like SCE, are doing this but more can be done through the Big Bold Initiatives.

Operations and On-going Commissioning

Lots of work has been funded under the PIER program to develop systems for improved operations and on-going commissioning. The problem is that very few building operators take action in response to the information. Somehow the financial decision makers in corporations and other organizations need to be an audience for the benefits of PIER-funded fault detection and diagnostic projects. In other words, the people who can make improvements happen are often not aware that cost-effective opportunities to save money and improve building performance even exist.

Feedback

Finally, the PIER program needs better feedback on how technologies are performing, how the market reacts to them, and what to do next. Some of my comments reflect experiences of managing PIER Programs and Projects. Others come from testing PIER-funded products and observing reactions by customers and operators. More of this needs to be done to develop policy to help guide the PIER program.

Tim T. Xu

Thanks for having me in the workshop webinar. I think you have presented a great deal of information that is very helpful and provides a solid foundation for expansion in future rounds of new work.

As a matter of fact, after reviewing the draft report - I initially had an preliminary impression that IAW area was given less weight compared to other areas such as renewable (i.e., much more bullet points for possible initiatives FY11-12). Therefore, I sit in part of renewable workshop, of which the online participation was disappointingly far less than EE. Such a high degree of unbalance between possible bullet points (potentially funding) and participants clearly indicate something that the commission might want to carefully review and deliberate.

I have a few specific comments concerning the draft report on the RE/EE's initiatives:
1) there is a need for integration of RE into IWA (and Buildings as well) - emphasizing applied side and assessments of RE in the context of IAW/Bldg is essential.

2) in IWA - there is a mention of possible update of roadmaps. Not knowing what exactly these are meant, cautions of duplication/repetition should be emphasized. How do we know the significance of a pre-selected sector(s), should we look to new sector, or across sector?

3) there was success in data center work initialized by CEC - now more and more orgs (DOE/EPA) are funding such work.

Finally, if we have any provoking thoughts to offer, I would recommend that there is a need to establish an industrial energy center (across different sectors) to be headed by a non-profit institute, which can effectively serve as a conduit to industries (enduse, manufacturers, AND utilities), academia, and governments (CEC/CPUC, federal), policy makers. This is very important especially in the context of providing non-bias RD&D and nimbleness in tech transfer (demonstration). To pitch this idea further, we

in the national lab are very well poised (or adapt if at all) to this and to collaborate with the Commission more closely to make better things happen. From my a decade long experience with PIER projects (bldg/IAW)- it's clear that being able to lump projects of limited scales would helped both CEC and us to improve efficiency (i.e., project fund allocation and management).

Bob Knight

Hi, Chris...I regret I wasn't able to join your workshop yesterday. Lots of good presentations, and I suppose you got a lot more from the participants.

I was struck by two important omissions that I hope will make it into your planning.

1. One technology of great long-term potential but little R&D effort: DC power distribution within buildings. More and more buildings are going to have PV, which incurs losses through its DC-to-AC conversion for building uses...and then more energy is lost in the AC to DC(or different frequency)conversion that lots of devices require (computers, printers, TV, many other plug loads, fluorescent lighting, etc.). That latter conversion is done within current end-use devices but could be eliminated eventually if DC power were available. Karl Johnson is a big proponent of DC buildings. PIER could seed a public-private venture to do a demo and collect some real data as well as generate broader interest by potential private stakeholders and investors.

2. Overall incentive and regulatory processes for introducing new technologies and practices(my top priority topic):For example, in our home retrofit programs under EUC(utility and DOE-ARRA funding—a huge experiment in California that my company is right in the middle of)we are finding that existing technologies can do most of what is needed to get to zero...and that even with more economically viable retrofits (25-40% savings, \$10,000-25,000) the biggest obstacle is the welter of regulations and requirements that the contractors and customers are forced to endure. You need more research to demonstrate this negative effect more solidly and to identify ways to minimize it through process refinements at every level...from legislation, implementing regulations, legal obstacles (real or imagined), and outmoded codes and difficult updating to over-conservative utility implementation rules, lack of understanding of what contractors need in program support, ineffective and misguided marketing, lack of understanding of contractor and consumer motivational triggers and selling strategies(behavioral tendencies and potential counter-influences), and ineffective program designs and training regimes to maximize market entry and actual energy savings. On top of those many things, we also do not have adequate knowledge of many other things susceptible to research—including not really knowing how well modeled savings track actual changes in energy consumption in a home or other building, how much consumer behavior influences such discrepancies, how it might be changed, and what new models of energy efficiency program designs might do a better job with less cost. And of course things like the California Standard Practice Manual and its improper requirement, definition, and specific choices and requirements of cost-effectiveness metrics like the TRC. All these things are appropriate and essential topics for research to advance the effectiveness of energy reduction programs.

New technology development is of course needed, particularly to do things like bringing down the cost of LED lighting, creating more convenient and effective ways to stem vampire and standby loads, new ways to condition spaces and heat water, and overall

energy management in both new and existing buildings. But I urge you to also focus on the nontechnical things that are currently killing even the most lavishly funded and advanced programs like EUC. These are not getting better and won't if we don't put some research effort into them. This is totally outside the interest and ability of private industry and also of the utility implementation programs, which always have limited budgets and too much to do to keep the programs moving. So PIER and other research groups constitute the needed providers. One possibility is to assemble several of the research organizations that are most active in EE, such as several of the national labs, FSEC, DOE-HQ, ARPA-E, etc., and develop a roadmap including co-funding and topic-allocation agreements to get some of these obstacles out of the way. Otherwise technology R&D is not going to be able to get the traction needed to overcome the challenges of climate, jobs, and trade that are going to become imperative.

Our little PIER project is going to try to include calling attention to some of these kinds of nontechnical barriers, as they apply to home retrofits, but you will need a lot more breadth and effort than that. I hope I can be involved in that. And I hope this volley of words is useful to your program planning. Let me know if I can help.

Renewable Energy Advisory Group Workshop

Highlights of Advisory Group June 23, 2011 Workshop on FY 2011/12 Public Interest Energy Research Initiatives – Renewable Energy Research

Energy Commission staff has summarized the comments from the PIER Advisory Group (PAG) members on renewable energy research initiatives for Fiscal Year 11/12 and has categorized the recommendations into 11 major themes. In summary, the major recommendations of the Advisory Group are being addressed by past, current, and proposed research initiatives (Table 1).

Major Research Themes Recommended by the PAG

- Emphasize pilot demonstration projects
 - Engage utilities
 - Community level
 - Integration/interconnection
- Increase focus on biomass
 - Biogas to pipeline
 - Dairy digester
 - Gasification
 - Forest and agriculture biomass
 - Quantify greenhouse gas (GHG) benefits
 - Consider water and soil conservation requirements
- Forecasting – solar, wind
- Resource assessment
 - Regional solar
 - Offshore and onshore wind
- Energy storage
- New technology development and existing technology improvement
 - Combined Heat and Power (CHP)/ Distributed Generation (DG)/Solar thermal and PV
 - Efficiency
 - Cost/Value
- Leverage federal dollars
- Environmental performance/compatibility/mitigation

Non-research Items

- Permitting
- Education/workforce training

**California Energy Commission (CEC)
Staff Workshop on FY 2011/12 Public Interest Energy Research Initiatives
Renewable Energy Research**

June 23, 2011—Meeting Summary

Attendees: Name, Agency

Advisory Group Members in Attendance

Andrew Michael, Bay Area Council
Cathy Bleier, California Department of Forestry and Fire Prevention (CalFire)
Craig Stowers, California Department of Fish and Game (DFG)
Dave Mehl, California Air Resources Board (ARB)
Elaine Sison-Lebrilla, Sacramento Municipal Utility District (SMUD)
Frank Goodman, San Diego Gas and Electric (SDG&E)
George Simons, Itron
Jan McFarland, Center for Energy Efficiency and Renewable Technologies (CEERT)
Jeanne Merrill, California Climate and Agriculture Network (CalCAN)
Jim Blatchford, California Independent System Operator (CAISO)
Jose Perez, Southern California Edison (SCE)
Karl Gawell, Geothermal Energy Association
Kate Meis, Local Government Commission
Matt Miyasato, South Coast Air Quality Management District (SCAQMD) (via WebEx)
Michelle Passero, The Nature Conservancy
Noah Long, Natural Resources Defense Council (NRDC)
Ron Kent, Southern California Gas Company (SoCalGas)
Valerie Winn, Pacific Gas and Electric (PG&E)

Interested Parties

Bryan Jenkins, University of California (UC), Davis/California Renewable Energy Center
Roland Winston, UC Merced
Valentino Tiangco, SMUD
Cherif Youssef, Sempra Energy Utilities
Kevin Wolf, Wind Harvest International

CEC Staff Presenters/Facilitators

Joe O'Hagan, Energy Commission Specialist II
Rizaldo Aldas, Energy Commission Specialist II
Linda Spiegel, Office Manager II, Energy Generation Research Office
Laurie ten Hope, Deputy Director, Research and Development Division
Sandra Fromm/Burns, Energy Commission Supervisor II

Notetaker

Danielle Wilson, ICF International

Acronyms

AB = Assembly Bill
ACES = Advanced Community-Based Energy Systems
ARB = California Air Resources Board
ARPA-E = Advanced Research Projects Agency - Energy
ARRA = American Recovery and Reinvestment Act of 2009
BLM = Bureau of Land Management
CAISO = California Independent System Operator
CalFire = California Department of Forestry and Fire Prevention
CalCAN = California Climate and Agriculture Network
CCHP = combined cooling, heating and power
CEC = California Energy Commission
CEERT = Center for Energy Efficiency and Renewable Technologies
CHP = combined heat and power
CO₂ = carbon dioxide
CPUC = California Public Utilities Commission
CREC = California Renewable Energy Research Center
DFG = California Department of Fish and Game
DG = distributed generation
DOE = United States Department of Energy
DRECP = Desert Renewable Energy Conservation Plan
EAP = Energy Action Plan
GHG = greenhouse gas
GWh = gigawatt hour
GRDA = Geothermal Resources Development Account
IEC = International Electrotechnical Commission
IEPR = Integrated Energy Policy Report
IOU = Investor Owned Utility
MW = megawatts
NOPA = Notice of Proposed Award
NRDC = Natural Resources Defense Council
O&M = operation and maintenance
PACE = Property Assessed Clean Energy
PAG = PIER Advisory Group
PG&E = Pacific Gas and Electric Company
PIER = Public Interest Energy Research Program
PV = photovoltaic(s)
R&D = research and development
RD&D = Research, Development, and Demonstration
RE = renewable energy

RESCO = Renewable Energy Secure Community
RESCO II = Community Scale Renewable Energy
RETI = Renewable Energy Transmission Initiative
RFP = Request for Proposal
RP₃ = Reliable Public Power Provider
RPS = Renewable Portfolio Standard
SB = Senate Bill
SCAQMD = South Coast Air Quality Management District
SCE = Southern California Edison
SDG&E = San Diego Gas and Electric
SMUD = Sacramento Municipal Utility District
SoCalGas = Southern California Gas Company
UC = University of California
USDA = United States Department of Agriculture
USFWS = United States Fish and Wildlife Service
USRE = Utility-Scale Renewable Energy

I. Welcome, Overview and Introductions (Linda Spiegel, CEC)

See PowerPoint Presentation at: http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/RE_Adv_Group_Intro_Slides.pdf and workshop notice at: http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/2011-06-21-23-24_Notice.pdf

Linda Spiegel, Energy Generation Research Office Manager II, opened the meeting.

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

- ✓ Energy Efficiency
- ✓ Renewables
- ✓ Smart Infrastructure (smart grid, transportation, and climate change)

The purpose of the PIER Advisory Groups (PAGs) is to assist PIER program staff in producing a Budget Year Research Initiatives Report which will be incorporated into the PIER Budget Year Research Plan to be presented to the Research, Development and Demonstration (RD&D) Committee for final approval. The PAGs will interface between program staff, external stakeholders, and the PIER Advisory Board for research initiative development and effective technology transfer of research results. PAGs will provide advice and input to program staff on research initiatives.

This is the second in a series of three workshops that were planned to solicit input from the Advisory Groups on the PIER fiscal year 2011/12 research initiatives. The first workshop was held on June 21 and addressed Smart Infrastructure. Tomorrow is the final workshop on Energy Efficiency. Tomorrow's workshop will also include environmental research

related to energy efficiency. The workshop started with introductions of the Advisory Board Members and invited researchers/guests.

A. Overview – Public Interest Energy Research (PIER) Program

- Investor Owned Utility (IOU) ratepayer funded program launched in 1997.
- **Purpose:** Fund public interest energy research that is not provided by the competitive or regulated markets; advance energy science and technology to the benefit of California ratepayers; and provide environmentally sound, safe, reliable and affordable energy services and products. Research areas:
 - Energy Efficiency and Demand Response
 - Renewable Energy and Advanced Electricity Generation
 - Transmission and Distribution
 - Climate and Environment
 - Transportation
- Approximate budget of \$62.5 million Electricity funds. We also receive \$24 million of natural gas funds. This workshop will focus on the electricity funding.
- Provides strategic advice on research and development (R&D) priorities and make programmatic level recommendations to future program directions to R&D Policy Committee
- Senate Bill (SB) 1250 requires an advisory board of key members, legislative members, energy companies, environmental groups, academics, etc. The role of the board is to advise the R&D Policy Committee.

B. Role of Participants

The feedback today will inform the research initiatives report that will be provided to the PIER Advisory Board and the Energy Commission R&D Committee. The roles of participants are as follows:

- R&D Committee – Decision Makers
- PIER Advisory Board: Provide policy guidance on the PIER program
- PIER Advisory Group: Provide advice, and input on research initiatives and interfaces with the board.
- Invited Researchers/Public: Provide technical feedback, public input on research initiatives

C. Workshop

- Today's objective is to present the initiatives for fiscal year 2011/12. Goal : Structure future public interest research efforts that maximizes electricity ratepayer benefits and eliminates duplication of efforts

- Receive comment on the proposed PIER research initiatives for fiscal year 2011/12 by having the Advisory Group, Researchers and public:
 - Provide advice on the initiatives
 - Identify possible duplicative efforts
 - Identify collaborative opportunities to gain synergies and leverage research dollars
 - Assist in effective transfer and use of research results

D. Renewable & Environmental Energy Policies

The research imitative portfolio of each program area is driven by energy policy. For the renewable program area, these policies include:

- Integrated Energy Policy Report (IEPR) – biannual report
- SB1250 – Authorizes PIER, sets program direction
- Renewable Portfolio Standard (RPS)
- Governor’s 20,000 megawatts (MW) of Renewable by 2020
 - 12,000 MW of localized generations
 - 8,000 MW large scale utilities
 - 6,500 MW combined heat and power (CHP)
- Global Warming Solutions Act

E. Renewable & Environmental Program Goals

Renewable Energy

- Utility, community and building scales
- Reduce technology barriers
- Increase storage options
- Improve forecasting

Advanced Generation

- Science, technology, market availability of grid-connected CHP
- Technologies to increase reliability, efficiency, and reduce costs , emissions
- Develop/Demonstrate diversified applications of technologies that use renewable resources and integrate storage options

Energy-Related Environmental Area

- Resolve issues to increase deployment of renewable energy
- Forecast plausible scenarios of future energy sources and proactively evaluate and research information gaps

F. Renewable Area Program Budget- Electricity Funds

- Renewable and Advanced Generation - \$13.9 million
- Renewable-related Environmental - \$1.5 million

II. Renewable Energy 2011/12 Research Initiatives Presentation (Rizaldo Aldas and Joe O'Hagan, CEC)

A. Renewable Energy Research Program

See PowerPoint Presentation at: http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/AdGroupWorkshop_Renewables_fy11_12Initiatives.pdf

Rizaldo Aldas, Energy Commission Specialist II, presented the Renewable Energy Research Program

Policy Drivers

- Governor Brown's Clean Energy Jobs Plan
- Assembly Bill (AB) 32
- Accelerated RPS [SB1x 2 / SB 1078/ IEPR / Energy Action Plan (EAP)]
- SB-1 and California Solar Initiative
- 2007 IEPR
- State Bioenergy Goal (S-06-06)

Goals

Renewable Energy

- 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

Advanced Generation

- Advance the science, technology, and market availability of grid-connected combined heat and power
- Develop advanced generation technologies that focus on increasing reliability, efficiency, and affordability, and reducing emissions
- Demonstrate diversified applications of advanced generation technologies that use renewable energy resources and integrate storage options

General Approach

Renewable Energy

- Focus on research, development and demonstration (RD&D) that builds the market connectedness of renewable technologies with grid integration, storage, efficiency, and to lower the cost of renewable energy
- Research and development activities that maximize resources, infrastructure, coordination, and collaboration, and advance renewable science and technology
- Goal is to increase the penetration of renewables at all three market scales
- Each market scale presents a unique set of issues for the deployment and integration of renewable energy and other emerging energy technologies

Advanced Generation

- Develop and demonstrate distributed generation (DG)/CHP systems with hybrid generation and fuel flexible capability that would help increase efficiency and reliability while reducing overall costs and emissions.
 - 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 alternative and renewable fuels.

Current Research Initiatives

- Renewable Energy Secure Community (RESCO)
 - Communities that secure their energy supply (electricity and fuel) through indigenous renewable energy (RE) resources
 - Use of locally-available renewable resources to meet 100% of communities' energy needs
 - 11 projects from 2009 solicitation
 - Integration projects (8)
 - ❖ Exploratory Stage
 - ❖ Pilot Stage
 - ❖ Implementation Stage
 - Collateral projects (3)
 - Example RESCO: UC Davis West Village
 - Project Objective: Provide compact, mixed-use housing for:
 - ❖ ~2,000 students
 - ❖ 340 homes
 - ❖ an education center
 - ❖ a ten-acre recreation field complex

- ❖ a village square with neighborhood-serving retail uses.
- Planned technologies include:
 - ❖ Energy efficiency (passive & active)
 - ❖ Demand response
 - ❖ Distributed Solar, Photovoltaic
 - ❖ Distributed Solar Thermal
 - ❖ Biogas digester
 - ❖ Fuel Cells
 - ❖ Advanced energy storage
 - ❖ Smart Grid technologies
 - ❖ Bio-methane upgrade system
 - ❖ Bio-fuels for transportation
- Santa Rita Jail RESCO
 - Integrating energy generation capabilities:
 - ❖ 1.2 megawatts of *already existing* solar photovoltaics
 - ❖ an *existing* 1.0 megawatt fuel cell cogeneration system
 - ❖ 11.5 kilowatts of *new* wind turbines
 - ❖ backup diesel emergency generation system) [*already existing*]
- PIER Renewable American Recovery and Reinvestment Act of 2009 (ARRA) Cost Share Projects
 - Research Areas:
 - Community Renewable Energy Deployment
 - Advanced Geothermal Technologies
 - High Solar Penetration Tools and Techniques
 - Advanced Combined Heat and Power Technologies
- California Renewable Energy Research Center (CREC)
 - Brought together broad stakeholders that address research and development on various renewable energy resources
 - Conducted research into sustainable resource management and assessment, technology development, system integration, and other aspects of renewable energy
 - Resource inventory and generation assessment , standards and roadmaps, and clearing house for renewable facilities performance and environmental data
 - Products generated information needed in support of strategic planning, public policy and government regulations and standards for increasing use of renewable energy.

- **RECENTLY COMPLETED SOLICITATIONS**

- Utility Scale Renewable Energy
 - Fund initiatives that will help meet RD&D needs related to more rapid and environmentally responsible deployment of Utility-Scale Renewable Energy (USRE) to the California electricity grid.
 - Solicitation released on Nov. 2, 2010 and Notice of Proposed Award (NOPA) released on March 21, 2011
 - Funding 8 projects out of 27 proposals covering 4 topic areas:
 - ❖ Renewable Hybrid Generation and Energy Storage Integration Demonstration
 - ❖ Monitoring and Forecasting Analysis
 - ❖ Thermal Energy Storage Modeling
 - ❖ Environmental Mitigation for Utility-Scale Solar Energy Technology
- Geothermal Solicitation
 - Funding opportunity through its Geothermal Resources Development Account (GRDA) Program
 - Overall purpose is to promote the development of geothermal resources and technologies.
 - Project categories: Resource Development Projects, Planning Projects, and Mitigation Projects.
 - Funding 4 projects out of 13 proposals

- **PLANNED SOLICITATIONS UNDER FY 2010/11**

- Community Scale Renewable Energy (RESCO II)
 - Integration strategy for one or more renewable energy generation and enabling technology at the community scale
 - Potential for advancing exploratory projects into the next phase
 - Broaden the definition of community from the previous
 - Exploratory and Demonstration
 - Build on feedback from RESCO workshops held in UC Davis
- Advanced Generation/Combined Heat and Power (CHP)
 - Develop and integrate emerging multiple DG/CHP technology, including energy storage, in diversified applications
 - Advance the science, technology and market availability of grid-connected CHP in California
 - Focus on hybrid generation and fuel flexible DG/CHP

Proposed Research Initiatives for FY 2011/12 –

1. Game Changer: Advanced Community-Based Energy Systems (ACES)

- PIER-wide solicitation in coordination with the Energy Efficiency and Energy Technology and Systems Integration Programs
- 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
- This initiative will develop data, tools, and methods to address information gaps for the economically-viable community-scale deployment of DG, CHP, and other emerging energy technologies.
- Potential applications include:
 - Commercial business parks
 - Industrial business parks
 - Urban neighborhoods
 - Suburban neighborhoods
 - Shopping centers
 - Rural Communities
 - Military Complexes
 - Institutional/Municipal Facilities

Mixed-Use Applications (Residential and/or Retail)

- Maximized penetration of DG (rooftop, parking lots, etc.)
- CHP/ combined cooling, heating and power (CCHP) with possible district energy
- Efficiency measures
- Smart Grid Management Systems
- Smart EV charging stations.
- Home and/or community second-life battery storage applications.

Industrial or Commercial Business Park Applications

- DG and smart grid technologies
- CHP/ CCHP systems
- Electric and/or thermal storage

- Onsite EV charging
- Co-production of fuel for fleet operation
- Efficiency measures

Demonstration Projects will Attempt to Fill Knowledge Gaps

- What are the life-cycle impacts of DG projects versus centralized generation?
- What DG, smart grid, and distributed energy storage implementation strategies can reduce grid impacts of electric vehicles?
- How can intermittent DG resources be best integrated into communities to provide baseload generation?
- What role can advanced community energy systems play in providing grid support services?
 - How feasible is using automotive-grade li-ion batteries in second-life storage applications?
 - What emerging technologies can be deployed to complement existing energy systems and provide ancillary services?
- How effective are alternative ownership and management strategies?

2. 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

3. Advancement of Renewable Energy Generation Technology

Help advance the science and technology and market readiness; develop new technologies; help facilitate further development and demonstration of successful prior PIER projects to help move to next level.

- Provide balance to RD&D portfolio through research that will help achieve demonstration-readiness of 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

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?

B. Energy-Related Environmental Research

See PowerPoint Presentation at: http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/Joe_O_EA_Infrastructure.pdf

Joe O'Hagan, Energy Commission Specialist II, spoke regarding energy-related environmental research.

Goals and Approach

Goals

- **Develop** cost-effective approaches to evaluating and resolving environmental effects of energy production, delivery and use in California; and explore how new energy applications and products can solve/mitigate environmental problems.
- **Complement** national and international energy research efforts by producing California specific products that also inform policy formulation.

Approach

- **Collaborate** with other California Energy Commission Divisions, sister agencies, and all stakeholders to produce long-term research plans to identify and address energy-related environmental impacts.
- **Implementation** through solicitations and interagency agreements.

Policy Drivers

The Energy policy drivers were presented earlier. All environmental initiatives also must address environmental policies and regulations affecting energy.

Energy

- Governor Brown's Clean Energy Jobs Plan
- 33% Renewable Portfolio Standard
- California Global Warming Solutions Act

Environmental

- Clean Air Act
- Clean Water Act
- Porter-Cologne Water Quality Act
- California Endangered Species Act

Energy-Related Environmental Research

Four areas of research:

- Climate Change Science for the Energy Sector
 - Climate monitoring, analysis, and modeling at scales specific for California
 - Investigating cost-effective options to reduce greenhouse gas (GHG) emissions; and
 - Impact and adaptation studies for the energy sector
- Air Quality and Energy
 - Building efficiency and indoor environmental quality; and
 - Outdoor air quality implications of new technologies, controls and fuels
- Aquatic Resources and Energy
 - Energy generation effects on aquatic species, water quality and water supply; and
 - Energy and water management
- Terrestrial Resource and Energy
 - Environmental barriers to renewable energy development; and
 - Tools and best management practices to facilitate siting energy facilities
- Integrate our projects into three areas:
 - Smart Infrastructure
 - Energy Efficiency,
 - Renewable Energy

Proposed Portfolio 2011–2012

- Smart Energy Infrastructure
 - Evaluate in-basin air quality impacts of electrification
 - Identify potential sources of GHG offsets/allowances for utilities

- Investigate beneficial uses of carbon dioxide for the production of chemicals, chemical feed stocks, working fluids, and building materials
- Estimate potential climate changes impacts and adaptation options for the energy sector
- Improve regional climate models
- Energy Efficiency
 - Healthy indoor air quality for net zero energy buildings
 - Validation of the air quality and energy benefits of cool communities
 - Energy benefits from water conservation
- Renewable Energy
 - Removing environmental barriers to the deployment of renewable energy facilities
 - Addressing water temperature effects from hydropower on aquatic organisms
 - Assessing air quality barriers to utilization of biomass sources, such as municipal waste

Recent & Current Portfolio

To provide background to the proposed renewable energy related environmental research initiatives, some current and recent research efforts were presented. These include projects addressing specific energy technologies as well as ones addressing a variety of technologies on a statewide basis.

Facilitate Renewable Energy

- Research addressing solar energy
 - Use of Habitat Suitability Models and Head-start Techniques to Minimize Conflicts between Energy Development and Desert Tortoises
 - Cumulative Biological Impacts Framework for Solar Energy Projects in the California Desert
- Research addressing wind energy and power lines
 - Evaluating the Effectiveness of Avian Interaction Mitigating Measures and Processes
 - Radar, Acoustic and Observational Study to Assess Bat and Bird movements and Mortality Relative to Old and New Wind Tower Structures
- Research addressing both forest and agricultural biomass/biofuel sources and production
 - Analysis of Forest Biomass Removal on Biodiversity
 - Environmental Impacts of Using Forest Biomass for Energy Production
- Research addressing climate change effects on renewable energy sources
 - Climate Change Impacts on the Operation of Two High-Elevation Hydropower Systems in California

- Projected Effects of Climate Change Induced Changes in Vegetation on Future Hydrologic Energy Generation in California
- Research addressing forecasting, management and impact analysis for hydropower operations
 - Integrated Forecasting and Reservoir Management
 - Research on Instream Flow Determinations for Hydropower Applications in California
- Research addressing the air quality ramifications of the renewable portfolio standard
 - Life Cycle Assessment of Existing and Emerging Distributed Generation Technologies in California
 - Methodology to Estimate Air Emissions Reductions Through Energy and Peak Load Reductions and Renewable Generation
- Energy Scenarios
 - Potential Energy Scenarios for California and Their Environmental Consequences
Second phase-environmental evaluations

Upcoming Activities

- Workshop on PIER research on wildlife impacts of energy infrastructure – tentatively set for July 20, 2011
- Workshop on PIER research related to Indoor Air Quality and Energy Efficiency - July 28, 2011
- Solicitation on multiple PIER Energy-Related Environmental Research topics released ~August 2011

Research Initiatives Related to Renewable Energy

Addressing Environmental Barriers to Renewable Energy Permitting

- Conduct research on environmental issues that will facilitate the deployment and permitting of solar, wind, biomass and other renewable energy sources while ensuring environmental protection. Research will focus on developing tools and methodologies to assist decision makers in balancing environmental protection and the state's renewable energy goals.

Improving water temperature objectives and criteria for Hydropower

- Improving the scientific basis for ecological based water temperature criteria California. Research would focus biological responses to natural fluctuations in water temperature to develop improved water temperature objectives/criteria. Ratepayer benefits include greater environmental protection while avoiding the unnecessary curtailment of inexpensive hydropower generation.

Addressing Air Quality and Biomass

- Scoping study to identify air quality barriers to the utilization of potential biomass sources. For example, municipal solid waste has the potential to produce 13,000

gigawatt hours (GWh) of electricity by 2020. However, combustion of municipal solid waste is prohibited because of potential air toxic contaminants. Study would evaluate technologies and regulatory constraints and identify research needs to address these concerns.

Questions

- How much should PIER focus on addressing environmental barriers to deploying existing or near ready 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?

III. Advisory Group Feedback

Ron Kent, SoCalGas

Emphasize more pilot and pre-commercial demonstration type projects versus paper studies. Can see results much sooner which is important given the renewable energy goals. Biomass is an under-utilized resource that should be considered. Currently there are no waste water treatment plants or landfills injecting gas into the pipeline. Water and agriculture is important in the state and we would like to see energy projects that touch on all of these three issues.

Off-shore wind: we have interesting opportunities in California and should consider and leverage opportunities to deploy on existing off-shore oil rigs

Karl Gawell, Geothermal Energy Association

Advanced community-based systems can include geothermal. There is a bill in the United States Senate sponsored by Senator Tester (S. 1142) that is a new federal initiative addressing geothermal heat pump demonstration projects in this area. Need to look at what smaller geothermal systems can do in California.

Geothermal resource identification is a big area and there is opportunity for synergies and further development. Look at federal government ARRA solicitations and dollars available for California (e.g., resource identification). We are excited about some of the technology opportunities and power output profiles that provide synergies.

Transmission is important.

The White House announced a new initiative to help move projects along faster and we need to seize this opportunity to take advantage of real synergies.

Take advantage of Desert Renewable Energy Conservation Plan (DRECP) and other programs that are moving things forward while not compromising environmental issues at the same time.

Dave Mehl, California Air Resource Board

No comments at this time. Research is very important due to AB 32 implications.

Frank Goodman, SDG&E

Thank you for putting this forum together and for inviting SDG&E to attend.

We do not see solar thermal electric systems presented. There is going to be a need for storage for renewables and solar thermal provides that option. Should consider including it in what you encourage for pilot projects.

Operation and Maintenance (O&M)— There are four solar producers producing prototype projects that we are helping to move forward. Key issues on these are O&M because investors want O&M to be zero, but that is not going to happen. Need to know what the O&M cost is because the levelized cost of energy will depend on capital costs, O&M, and the resource. For one project, we now have 10 months of run time and have history of O&M, as well as an O&M manual. Large pilot projects should include O&M.

Wind—Test small wind turbine on Harbor Island to determine viability. When you move away from mountains to off-shore wind speeds are much lower. Quantifying wind resource off-shore should be step 1 or step 0 to find out viability of off-shore resource.

Connecting community projects and projects at consumer level is more attainable at community level than residential level.

Jose Perez, SCE

No specific comments at this time.

Valerie Winn, PG&E

So many of these initiatives are going to be important to meeting state goals. How can we introduce new technologies and keep moving into the future? How do we make sure we are ready to operate system with new technologies?

Storage, integration issues are very important to use.

Forecasting is key; need to improve forecasting techniques.

Permitting initiatives-how do we help developers understand what the challenges are going to be to develop in these areas, such as in the desert? Need a better understanding of the environmental issues and addressing them up front to help us as we try to meet goals and to help developers as they try do business in California. Developers need help to better understand when and how to get their projects on-line.

Jim Blatchford, CAISO

Offshore wind needs to be looked at. However, the Pacific Ocean bottom is very different from the East Coast, so not sure about viability.

Need to look at storage and balance the grid with storage and renewables.

What is being done with water.

Most concerned about resource/electricity viability and forecasting. Need to know the future and need viable 1 hour, 8 hours 24 hours forecasting.

Ron Kent, SoCalGas

One reason gasification is important is that it is one way to avoid using landfills. It makes more sense to intercept energy before disposal.

Carbon dioxide (CO₂) capture with anaerobic digesters, because the volume of CO₂ generated is relatively small, you should consider capture of CO₂ for use with agriculture instead of sequestration. Anaerobic digesters do not scale well compared with gasifier or other thermochemical systems.

Consider using closed-loop systems and producing hydro during off-peak hours.

Don't use new land-use already disturbed land when locating and siting projects.

Elaine Sison-Lebrilla, SMUD

Biogas is a priority in resource planning and Biogas injection into the pipeline is important. SMUD is currently buying biogas from out of state. We need to develop biogas in state and locally and use biogas to inject into co-generation plants. Increase digester capacity to be able to inject biogas.

Support on-shore wind.

Encourage environmental scrutiny into the known and potentially new areas identified through the Renewable Energy Transmission Initiative (RETI) process and 20,000 megawatts of renewables proposed by governor. What is staff doing to take RETI process to next level?

The real issue will be trying to integrate the targeted 20,000 MW of renewable energy at transmission and distribution levels locally and throughout state. This was not seen in presentation.

Support solar research and echo comments that Karl has provided.

Matt Miyasato, SCAQMD (on-line)

How is funding going to be divided up?

When are these initiatives being released?

SCAQMD has a request for proposal (RFP) closing on July 1 and would like to work with CEC staff to integrate funding efforts.

Response from **Rizaldo Aldas**, CEC—Working on budget and will make funding recommendations available at Policy Committee meeting.

Cathy Bleier, Cal Fire

Interested in potential use of forest biomass for energy. Use materials to underwrite activities to reduce fuel and to be resilient to challenges such as climate change. Suggests looking for opportunities for co-benefits. Forest management practices that are out there can provide benefits. Need to investigate different scales of use in plants in different locations and how biomass facilities can help achieve forest management objectives.

Suggests conducting environmental assessments along with larger economical models on how these issues may change long-term forest management and the synergies between other programs.

Kate Meis, Local Government Commission

Important to look at education and policy changes. Financing is going to be a huge piece of this at the building and community scales.

Property Assessed Clean Energy (PACE) pilot programs are tasked to look at best practices and federal barriers. Hope lessons learned from those programs are applied. Need to work at a local level to encourage cities and counties to work at regional level.

Streamline and standardize permitting processes across the regions and lower fees. Consider Reliable Public Power Provider (RP₃) program integration.

Mapping of solar potential: Information to help target solar resources would be very helpful. Local government faces a lot of opposition; provide tools to help educate on local level.

Craig Stowers, DFG

Most concerned with environmental permitting stemming from differing state and fed permitting, mitigation, and regulatory processes. No federal representatives in the room. Need to get them involved [i.e., Bureau of Land Management (BLM), United States Fish and Wildlife Service (USFWS)]. Can't streamline permitting processes without the federal agencies.

Noah Long, NRDC

Thank you for involving us in this process.

You are doing a lot of work to defuse risk of research investment. Not all research will pan out to solutions that are attractive to investors and staff is doing a good job to address risk. Not clear from material how the risk is being defused at the local level. Really important for planning to have multi-year planning on how risk is being addressed and how change is being planned for.

Sees the following four areas as important:

1. New technology development and/or existing technology improvement.
2. Interconnection: process is too slow and processes can be improved. Closely related to integration.
3. Integration: can overlap to technology improvement. Some of the community-scaled focus needs to be done on how interconnection occurs at the grid level.
4. Provide appropriate siting and reduction of impacts at sites to help improve ability to site. Address permitting limitations and technological limitations. Large-scale siting efforts with mapping and prioritizing needs to continue. Minimization of impacts from those projects is a great area for focus to help make these projects a reality.

Jeanne Merrill, CalCAN

Use of biomass for small scale energy projects and see lots of opportunity for agricultural biomass projects (i.e., almond shells, etc.).

Need to investigate environmental impacts from biomass such as from food process waste to fuel projects, and potential inappropriate uses of biomass such as removing crop. Need to look at soil and water conservation requirements and impacts from removal of soil and water when considering biomass in agriculture.

A successful program would include outreach and demonstration. As much as possible that outreach and demonstration work should include other agencies, like UC Cooperative Extension, and ideally would have some funding available to them to provide for that

outreach and extension piece. We need to build upon existing networks so that model renewable energy initiatives can have the greatest reach possible.

Valentino Tiangco, SMUD

Applaud team for building on other CEC programs to avoid research duplication. Suggest that CEC effectively transfer output of program to out of state by writing papers, reviewing biomass program at the United States Department of Energy (DOE), and preparing factsheets for distribution at conferences.

Look at biomass generation and pipeline injection – need to demonstrate technologies to clean landfill gas (mainly to remove vinyl chloride) for injection into pipeline and for gasification of biomass for use in pipeline injection.

Emphasize assessment of what is economically available of biomass transmission.

George Simons, Itron

Focusing on game changer is a good follow-up.

I see three goals—Meet RPS, clean-up GHG emissions, and move renewables into main stream without incentives. What a great time to be challenged to be innovative. Embrace that.

Must partner with utilities on what they need to put these technologies on the grid. How do you put these projects into alignment of what CAISO needs? Look at communication and capabilities. How do you forecast what the facilities will provide. Need to have metering and communication.

Storage and solar thermal electric has a role to play. Policy perspective has to occur that will address how the utilities can implement those policies. Need to make utilities neutral or so that they can benefit.

Photovoltaics (PV) going into the grid are going to quadruple, which will cause reliability issues. Utilities will need help. What kind of tools do we need to develop to address these demands and so they can streamline processes? Provide different levels of incentives and different level of net metering.

Focus on pilot projects, partner with utilities, open up to PV project developers, and get all to work together to show where areas in the grid are weak and the tools needed. Wind—Don't have to go very far off-shore to get good wind resources. Need to be sure that we are actually putting wind in the grid where we need it. Visual impacts and permitting are huge issues. At urban interface, there are good resources at 100 meters, so we don't have to go offshore.

Biomass is underutilized. Currently we do not factor in benefits of fire suppression. Currently driving dairies out of California due to dairy digester issues but there is a potential huge reduction in GHG through dairy digesters. Even though not much MW potential, we can achieve huge GHG reductions while avoiding waste disposal.

The game changer is perfect. You need to integrate. You can't locate at local level on rooftops; need larger areas. You get a lot of export with PV mid day. Locate PV at commercial center due to cars located at work mid-day. Can incorporate combined heat and power to meet distribution needs at high peak. CHP with PV at community centers makes a lot of sense.

CHP-- continue that work on how to push into market place.

Michelle Passero, the Nature Conservancy

Need to identify best approaches and best management practices for forest systems with biomass. Need additional research on understanding GHG benefits and impacts on bio-forest impacts. We are actively looking at biomass for energy and fuels and there are gaps in understanding accountings of bio-forest impacts.

Andrew Michael, Bay Area Council

Streamline permit processes, for example, solar projects, and bring together state and federal-level parties to avoid multiple layers of bureaucracy for permit process. Use pilot projects to unknot permit process.

Support game changer pilot projects to promote renewables.

Map out transmission capabilities to better connect a smart grid capability.

Jan McFarland, CEERT

One of the biggest Game Changers to look at is how California has made decisions on energy technologies in the state. We have not integrated gas technologies yet. The whole regulatory framework needs to work toward making integrated decisions. Regulatory silos need to be assessed. Use GHG technologies for space heating and energy.

Need to look at solar and fuels cells. Need to increase the percentage of renewable energy portfolios, given the demand. Focus on community-based renewables.

Distributed generation is not fully understood. It is really important to evaluate the data and determine the true value of distributed generation and provide incentives where there are benefits. Determine efficiencies and retrofit market to incorporate efficiencies of DG to make it more cost effective.

Need to pay attention to balance between soil and water conservation and efficiency. Demonstration is also an important and valuable effort.

Bryan Jenkins, UC Davis and California Renewable Energy Center

In the future, renewables will go well beyond 33%. Need to understand how to manage risk around research--one ways you can address risk is to involve a large number of stakeholders.

Suggests building research program on statewide efforts out of CREC which has substantial expertise that can be brought to the table to inform how to advance the renewable programs we are talking about.

Substantial infrastructure issues are being addressed through the CREC. Going to need to be able to track the temporal development within the industry. Technology demonstration is important. Good data on O&M will be necessary. Coordination with federal programs is important to achieve the environmental benefits of the goals that are developed. Modeling interaction different between energy sectors and agencies. Model demand of power decreases once efficiencies are realized. Benefits of new developments need to be modeled; no idea of benefits that will be achieved long-term and impact across the grid.

Need to be cognizant of environmental performance of new technologies. Ground energy system integration to demonstrate benefits, infrastructure adaption, and technology needs. Funding research at greater level will be necessary. Need to look at federal level for funds.

Education for next generation of professionals that will take us where we need to go is very important to go forward.

Roland Winston, UC Merced/UC Solar Group

There is enormous opportunity in solar energy. On average every square meter has about 4 kilowatt hours of solar energy. Second law of thermodynamics governs solar potential. Efficiency to use solar is very high. The main point is that the abundance of solar and availability is so high that we need to ask ourselves how we use it appropriately. By the time we write down how we utilize it, the technology is obsolete. Need to balance planning with implementation.

PV technology is almost half way to using the percentage of solar energy possible, so that technology is doing well. PIER should look at other uses of solar. Solar thermal is not being explored as much as it should be. Solar thermal proposals are stuck back in antiquity. Try to simplify and look at solar thermal that doesn't track. Try to balance between having well-defined programs with ways to bring things up to date.

The PIER program has enabled UC Merced to do research projects that are moving forward successfully.

IV. Public Comment

Cherif Youssef, Sempra Energy Utilities

Coordinate with DOE on federal initiatives. DOE's Advanced Research Projects Agency – Energy (ARPA-E) is doing DG projects.

Kevin Wolf, Wind Harvest International

Invest in companies that need assistance in getting through certification process due to costs.

Capacity improvement could be accomplished adding near ground turbines to existing wind farms, so near ground resources should be offered as part of the initiatives..

Writing grants is very time consuming. Parameters of our program for grant applications are too narrowly written. Allow applicants apply at any time, without specific parameters.

V. Comments from PIER Deputy Director, Laurie ten Hope

RETI is on hiatus. Our program is not funding RETI. However, our program is supporting DRECP.

Focus today is on electricity. Natural gas side is under a separate program that is not profiled today.

What I am hearing today is less paper projects and more demonstration projects. We are very interested in doing demonstration projects, but they are very expensive, especially at the different demonstration levels.

What level of funding should we provide given that the amount of funding would be much larger than what we have offered in the past?

Laurie offered two questions to the group: What does success look like and at what levels do we measure success for demonstration projects?

VI. Advisory Group Response

1) What would a successful demonstration project look like?

Frank Goodwin, SDG&E

It should be a flexible project with the core at a community level that is simple and has other projects that will piggy back off of it. Perhaps a community solar system that would have a storage system with it. Utility needs to have the ability to dispatch either solar or storage.

Partner with utilities and system integrator

Full interoperability with multiple technology types demonstrated at different levels. Take advantage of capital investment over a longer period of time.

Community power size ranges from hundreds of kilowatts but not greater than a megawatt. . Would want the demonstration project to conform the system to the current standards [i.e., International Electrotechnical Commission (IEC)] that would allow for a plug and play system that would ultimately be international.

Jose Perez, SCE

Try new areas for systems and demonstrate permitting process. Construct a project in an area that would push limits and provide challenges to test system limits and figure out how to integrate, and demonstrate permitting policies.

Valerie Winn, PG&E

Utilities are challenged due to lack of research funds, so participation in demonstration projects is a challenge and requires an application to California Public Utilities Commission (CPUC). Need to create synergies to allow utilities to partner without CPUC intervention.

Need to get started sooner.

Jim Blatchford, CAISO

Need a well defined goal that will benefit the industry -- the project cannot be a commercial for an individual product.

Need to have multiple parties involved, including vendors and utilities, to help integrate into the market and into the grid. Funding for research is not available but ISO can provide in-kind services.

Ron Kent, SoCalGas

Needs to be collaborative. Needs to have a utility in charge and perhaps hire an engineer to help move project forward.

Project needs to be self-funding and cover the long term operating costs. Manage risks by having a phased project. The Natural Gas Program is a good example that involved a utility

company and allowed for a phased self-funded project that had measurable successes along the way.

Elaine Sison-Lebrilla, SMUD

Should be small, doable in measured timeframe, applicable to other areas or communities, implemented at an affordable cost, have a stakeholder process, address barriers to wide-scale deployment, and have metrics for success and/or failure.

Karl Gawell, Geothermal Energy Association

Need to use dollars carefully, produce well-defined information in an understandable third party manner, have measurable goals, well-defined roles, understand risks, have a third party profile, and identify the end user.

Valentino Tiango, SMUD

Need to continue to demonstrate low-temperature geothermal projects, capitalize on community or individual biomass digesters, and fuel cells with biomass.

Support biomass gasification and technologies that use municipal solid waste, aerobic digestion of food waste and provide a good collection system for food waste.

PIER has to leverage other funds like from DOE to provide the level of funding necessary for these projects. Important for CEC staff to attend DOE conferences to leverage funding and to get information and ideas.

Noah Long, NRDC

Valentino's list is admirable but with the limited budget available makes it difficult for the staff to prioritize these types of projects. PIER does need to leverage funding from other sources, like DOE. Next week DOE will be reviewing the entire biomass program, but PIER is not represented in that review.

George Simons, Itron

R&D always takes awhile. Demonstrations also take awhile. Demonstrations should be looking longer term vs. near term. The metric for the demonstration is understanding what will be the operation of the system. Need to have measurable goals that make sense.

Go to the utilities and have them inform you on what will work and how it can be measured. Identify specific items that have to be addressed in the system.

Well defined projects that work for California will stimulate other interests from states and feds because they will recognize it can be replicated across the country. Metric of demonstration project should be the operating criteria for future use.

Jeanne Merrill, CalCAN

Interconnection issues should be included. Deal with biomass from food processing waste and other food products.

Cathy Bleier, Cal Fire

Use of forestry biomass at a local level with stakeholders that can inform sustainability. A demonstration project should look at social issues and how to move the project forward. Local efforts can often move through process more readily.

2) What are the measures of success?

Frank Goodman, SDG&E

Need high value while keeping cost down. Project needs readily measurable parameters that identify quantifiers and have clear timelines.

Ron Kent, SoCalGas

The ultimate measures of success are did it get commercialized or lead to another demonstration or multiple smaller demonstration projects, or build on an existing project or prior steps.

Elaine Sison-Lebrilla, SMUD

Goals/success metrics need to be quantifiable, specific and measurable.

Noah Long, NRDC

Information should include or produce policy and technology change needs. Interconnectivity is a good example of this.

Valentino Tiangco, SMUD

Establish targets such as costs, schedules and technology transfer for the project.

Roland Winston, UC Merced

A useful, quantifiable, replicable investment. Return on investment can be a metric.

Bryan Jenkins, UC Davis

Ground truthing, direct and specific metrics that guide development. System analyses will hopefully provide models that can provide metrics.

VII. Closing Comments

Frank Goodman, SDG&E

Important to coordinate internally within the CEC and with other agencies, among staff and projects.

Jim Blatchford, CAISO

Coordinate to ensure staff knows what other ongoing efforts are occurring. Be transparent.

Elaine Sison-Lebrilla, SMUD

Information dissemination is very important. RETI produced a lot of good information that needs to be made more available. Communicate project specific information as well as program successes.

George Simons, Itron

Look at policy implications that come from work but also look at policy implications that could be a detriment or would conflict with existing policies. Don't add to an already complicated policy arena. As you conceive projects, keep in mind/know possible policy barriers.

Valentino Tiangco, SMUD

Demonstration projects must be connected to the grid to demonstrate how they would be successful. PIER staff that cannot attend DOE program review should attend remotely. This will help support nation-wide participation.

Cherif Youssef, Sempra Energy Utilities

Collaborate between gas and electric programs.

Roland Winston, UC Merced

Create something exciting to create momentum around the greatest solar provider.

Jeanne Merrill, CalCAN

Emphasize the importance of stakeholder process to encourage buy-in and support. On-farm renewable energy projects are of interest to the agricultural community.

Karl Gawell, Geothermal Energy Association

It is not clear who is going to keep things operating in the area of distributed generation. Things are going to break so an institutional group to keep policies and systems running and healthy is important.

VIII. Workshop Close – Laurie ten Hope, CEC

Thank you. We are encouraged by this start of conversation. Please feel free to pick up the phone and reach out to the program leads and share thoughts and ideas on research that is or is not occurring.

Please submit any specific comments on the initiatives within the next week so that staff can finalize the report.

IX. Comments Received After Workshop

1. Follow-up comments received from Karl Gawell, Geothermal Energy Association, dated July 5, 2011.

First, I appreciated being invited to the PIER Advisory Group meeting June 23. At that meeting, we were invited to follow-up with written comments. I would like to pass along some brief comments for your consideration.

Comments on the three PIER initiatives:

Advanced Community Energy Systems:

Small low-temperature geothermal power technology is opening new areas for community energy systems based upon geothermal resources. Surprise Valley, for example, is working towards such a system, as well Mammoth Lakes. However, these are just two of the many communities that over the years have been supported by the California GRDA account, and could be the basis for a significant new initiative using today's technology.

California Renewable Energy Research Center:

This appears to be an important new development building upon the prior work of PIER, and initiatives such as the California Geothermal Energy Collaborative. We hope this will build upon the work done in the technology areas, and be a center for fundamental information needed both for communities and the state. For example, for geothermal energy activities such as the Geothermal Permitting Guide have been widely cited as beneficial to a broad audience. Also, initiatives to build a new capacity for resource identification and assessment, particularly those linked to graduate and undergraduate student programs, are very exciting new developments.

Advancements of renewable energy generation technology:

For geothermal energy, the subsurface technologies needed to find, manage and otherwise produce the resource are important to include. As I noted at the meeting, the US DOE has significant new initiatives in this area, and I would hope PIER's efforts could be collaborative with theirs. Also, there are new developments in power plants, like the recent announcement of hybrid geothermal-solar power projects, which could be important for renewable technologies.

Additional Comments:

The group briefly discussed the issue of transmission, and one panelist expressed concern that the RETI effort has ended with no continued effort in the transmission area. I believe it was said that PIER/CEC instead are focusing on the DRECP initiative.

Transmission is a critical issue/barrier for all renewables, and the integration and stability of the grid in a heavier distributed generation environment also needs careful examination. I would urge the program to re-examine its work to continue constructive engagement in transmission.

Also, regarding DRCEP, I believe it would be useful to have an effort underway that is parallel to but independent of DRECP to determine its benefits to renewable developers. It is difficult for many developers to see whether and how the DRECP process is, in fact, expediting project development. An independent assessment of this question done on a contemporary basis would be very valuable.

Further, the question was raised but not seriously discussed whether efforts should focus on emerging technologies or more conventional technologies. This is a difficult question to answer because the definition of "emerging technology" is too often simply a list of specific technologies instead of a clear and cross-cutting characterization. So, first, a non-technology specific definition would be useful. Also, the question should be "Do we need new technology to achieve California's goals, or do we need to expand the use of renewable resources already available?" My view would be that probably some of each is needed, and the answer is, thus, not an "either/or" proposition.

Conclusion

Thank you for this opportunity to provide comments. I hope they are helpful to your efforts.

Table 1. Matrix to map major themes recommended by the PAG to PIER Renewable Energy Research Initiatives.

Advisory Group Major Research Themes	Examples of Past and Current Initiatives that address research theme	11/12 Initiatives that address the research theme
Emphasize pilot demonstration projects	<p>5 projects demonstrating integration of multiple renewables and enabling technology aimed at renewable energy secured communities;</p> <p>8 projects demonstrating specific technology advancement in bioenergy and combined heat and power (CHP).</p>	<p>Demonstration of renewable and advanced energy systems at diverse communities;</p> <p>Demonstration of high-penetration DG, CHP and other emerging technologies in partnership with utilities.</p>
Increase focus on biomass	<p>21 projects addressing various energy conversion issues on biomass resources such forest and agricultural biomass, municipal and food processing wastewater, and animal/dairy wastes, and on anaerobic digestion and thermochemical conversion technologies;</p> <p>Total of 7 projects on dairy digester (new model to estimate GHG emissions from dairy farms), forest and agricultural biomass (e.g., environmental evaluations), and quantification of GHG benefits (e.g., carbon sequestration).</p>	<p>Bioenergy demonstration included in the advanced community energy system project;</p> <p>Advanced bioenergy technologies under new technology and prior research initiative;</p> <p>Biomass technology assessment and barriers analysis through the renewable energy center;</p> <p>Carbon accounting of energy related forestry projects.</p>
Forecasting – solar, wind	<p>6 projects on solar forecasting, analysis and modeling, wind energy forecasting system, and on energy resource forecasting and integration analysis.</p>	<p>Integrated energy management tools that incorporate forecasting to handle intermittency, and scenarios of future renewable energy profiles through the renewable energy center.</p>
Resource assessment	<p>11 projects (including four under the renewable energy center), on assessment of solar, wind, biomass, and geothermal resource assessment, including resource modeling, GIS compatibility, and resource development scenarios.</p>	<p>Regional and local renewable resource assessments through the renewable energy center;</p> <p>Community level resource assessment in support of advanced energy systems;</p> <p>Studies on potential environmental issues associated with wave energy and offshore wind.</p>
Energy storage	<p>11 projects on energy storage for renewable generation including rooftop PV, stand-alone utility PV, concentrated PV, and wind, and on</p>	<p>Integration and demonstration of electric and/or thermal storage at the industrial or</p>

Advisory Group Major Research Themes	Examples of Past and Current Initiatives that address research theme	11/12 Initiatives that address the research theme
	fast energy storage demonstration and integration.	commercial business applications under the community-based energy systems initiative.
New technology development and existing technology improvement	<p>16 projects on CHP and combined cooling heating and power (CCHP) systems tied with technologies such as microturbines, fuel cell, reciprocating engines including PV-CHP system;</p> <p>8 projects on (solar thermal and PV technologies) development and low cost installation of concentrating PV, solar thermal heat pump/chiller development, PV generation with direct current applications, cost reduction of solar cell, integration of PV and storage and on enabling PV markets through building Integration, standardization and metering;</p> <p>Study of the potential of micro CHP units in buildings and their associated GHG emissions, and on realistic applications and air quality implications of DG and CHP;</p> <p>Life cycle assessment and studies on air quality impacts of DG;</p> <p>Total of 6 studies on the environmental impacts of solar thermal and PV technologies and how to minimize them.</p>	<p>DG/CHP, solar technology and other renewable improvement through the advanced community energy system project;</p> <p>Advanced DG/CHP, and renewable energy technologies under new technology and prior research initiative;</p> <p>New studies on how to mitigate the impacts of these technologies in the Mojave desert.</p>
Leverage federal dollars	10 projects under the ARRA and regular DOE co-funding on renewable energy deployment, high solar penetration, advanced geothermal technologies, and advanced DG/CHP technologies.	Potential cost-share projects with DOE through the advanced renewable energy technology solicitation and community-based energy systems demonstration.
Environmental performance, compatibility, mitigation	<p>7 projects on engine emissions control technology, emissions reduction strategies in DG/CHP/CCHP and biogas-fueled generator, and climate change impacts on future renewable energy generation;</p> <p>Total of 8 projects on air quality benefits of renewable energy, hydropower impacts on aquatic ecosystems, and the role of renewables on future energy systems.</p>	About 4 new projects looking at the environmental impacts of renewable (e.g., air quality effects of biomass facilities) and development of tools that could be used for future licensing of energy facilities.

Smart Infrastructure Advisory Group Workshop

Highlights of Advisory Group June 21, 2011 Workshop on FY 2011/12 Public Interest Energy Research Initiatives – Smart Infrastructure

The Smart Infrastructure Advisory Group (SIAG) is composed of three functional areas that met together to discuss and address California Grid infrastructure issues. These areas are (1) Systems Integration (T&D, DR, and Smart Grid), (2) Energy Related Environmental and Climate Change, and (3) Transportation Energy. The session began with a joint session where Mike Gravely gave an overview presentation and discussed the roles and mission of the SIAG. He pointed out that in addition to the SIAG, there were two other PIER Advisor Groups meeting to discuss technical issues on the priorities and activities of the PIER program going forward. Those other two groups are (1) Energy Efficiency and (2) Renewables.

The purpose of the day's meetings was to review the proposed PIER research Initiatives and to determine if (1) did the research initiatives address the correct priorities, (2) were there areas where potentially the PIER research was duplicative of other ongoing or planned research and (3) are there other potential funding sources that present opportunities for PIER to leverage for a better result.

After the overview session, the three groups met independently on the three separate topic areas. The attached notes provide comments and information on the topics of discussions and recommendations that came from each of the separate working group meetings.

After the independent meetings, the three groups joined together to review their activities and to discuss cross cutting activities. The following were the major conclusions from the discussions:

1. The utilities are very interested in actively participating in these research initiatives.
2. Where continued research on the transmission system issues is important, with the emerging issues of integration of electric vehicles, PV, and other systems on the distribution system, more research attention is needed to solve the challenges on the distribution system. With Governor Brown's directive to install 12,000 addition megawatts of distributed renewables, this research is even more time critical.
3. Special attention needs to be given to leveraging the billions of dollars being spent in California as part of the ARRA efforts. We need to find ways determine lessons learned and work to continue research on the best ARRA successes.
4. The new PIER Game Changers need to be coordinated with the CPUC IOU funded efforts.
5. Transportation Energy
 - Implement research on impacts of human behavior on vehicle technology acceptance.

- Facilitate information/data sharing between PIER and private entities working on advanced transportation technologies.
 - Sustainable communities research is needed and encouraged.
 - Integrate research outcomes across the three transportation focus areas.
 - Pursue opportunities for second life/ EV recycling research.
 - Develop research projects for monitoring and measuring electricity as fuel.
6. Climate Monitoring, Analysis, and Modeling
- Research products in this area of research are very useful. This work must be continued.
 - There is a need to continue improving regional climate models and hydrological models at different scales to support actions at the local levels
7. GHG Inventory Methods
- It is unfortunate that PIER does not plan to support projects in this area of research in fiscal year 2011-2012.
 - We need to understand what is being emitted before we can estimate cost-effective mitigation efforts including the identification of potential offset sources for energy utilities.
8. Options to Reduce GHG Emissions
- It is an excellent idea to start looking at potential beneficial uses of CO₂ and expanding traditional carbon capture and sequestration to try to find ways to make useful products from CO₂ (e.g., construction materials).
 - Try to work with the U.S. Geological Survey on carbon sequestration in the Delta region.
 - It is a good idea to work on the identification of potential sources of offsets and allowances that would be available to energy utilities.
9. Impacts and Adaptation for the Energy System
- The research should be much broader than just looking at potential impacts and adaptation options to the energy system.
 - Past PIER research has been extremely useful and should be continued.
 - Studies on ecological impacts should be supported because it will provide important information for the environmental evaluations and siting of future energy facilities
 - Studies on renewable sources of energy and climate change should be supported.
 - DRECP is starting research on species in the desert. This work should be coordinated with climate change studies
 - Support on research on sea-level-rise and how our shoreline would change should continue because important energy infrastructure would be affected.
 - PIER should continue supporting studies on climate change and water supply because there is a strong nexus between water and energy and hydropower generation in particular.

**California Energy Commission (CEC)
Energy Systems Research Office FY 2011/12 Proposed Research Initiatives
Smart Infrastructure Advisory Group Workshop**

June 21, 2011—Meeting Summary

Advisory Group Members in Attendance

(Note: This list is based on sign-in sheets and may not be complete.)

Name, Title, Agency

PIER Advisory Group Members and Invited Researchers

<p>Barry Haaser, Managing Director, Open ADR Alliance</p> <p>Brett Williams, Researcher, UC Berkeley</p> <p>Brian Galey, GIS Analyst, UC Berkeley</p> <p>Cathy Bleier, Climate Action Program, Cal Fire</p> <p>Charles Powars, Principal, St. Croix Research EPA Region 9</p> <p>Jim McIntosh, Director, Executive Advisor, CAISO</p> <p>Jim Parks, Program Manager, SMUD</p> <p>Jim Thorne, Researcher, UC Davis</p> <p>John Holmes</p> <p>Julia Lave Johnston, Director of Land Use and Environmental Planning, UC Davis Extension</p> <p>Kevin Dasso, Director of Smart Grid, PG&E</p> <p>Kevin Koy, Manager, UC Berkeley</p> <p>Kevin Tucker, Transportation Planner, Caltrans</p> <p>Kurt Malchow, Climate Adaptation Coordinator, CNRA</p>	<p>Lorrie Flint, Research Hydrologist, USGS</p> <p>Louis Blumberg, Director, The Nature Conservancy</p> <p>Mark Wenzel, Climate Action Advisor, Cal-EPA</p> <p>Pearl Kan, Energy Program, EDF</p> <p>Peter Klauer, Lead Smart Grid Specialist, CAISO</p> <p>Robert Sherick, Advanced Technology, Smart Grid Department Deployment Plan, SCE</p> <p>Ryan McCarthy, Science and Technical Advisor, ARB</p> <p>Susan Fisher, Air Resources Engineer, Research Planning, ARB</p> <p>Tiffany Meyer, Research Program Specialist, Cal Fire</p> <p>Todd Litman, UC Berkeley</p> <p>Tom Turrentine, Director, Plug-in Hybrid Electric Vehicle Research Center, UC Davis</p> <p>Tom Wenzel, Research Scientist, UC Berkeley</p> <p>Whitney Albright, Climate Change Associate, CDFG</p> <p>William Torre, Chief Engineer, SDG&E</p>
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Energy Commission Staff

<p>Connie Sichon, Senior Electrical Engineer, CEC</p> <p>Elizabeth Keller</p> <p>Jerry Wiens, CEC retiree</p> <p>Joe O'Hagan, ECS II, CEC</p>	<p>Leah Mohney, ECS II, CEC</p> <p>Marla Mueller, CEC</p> <p>Martha Krebs, Executive Director for Energy and Environment Research Development, UC Davis</p> <p>Steve Ghadiri, Electrical Engineer, CEC</p>
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ICF International Note-takers

<p>Danielle Williams, Note-taker, ICF International</p> <p>Ingrid Norgaard, Note-taker, ICF International</p>	<p>Jennifer Rogers, Note-taker, ICF International</p>
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Acronyms

ADR = Automation of Demand Response.	CNRA = California Natural Resources Agency.
ARB = California Air Resources Board.	EDF = Environmental Defense Fund.
CAISO = California Independent System Operator.	EPA = U.S. Environmental Protection Agency.
Cal-EPA = California Environmental Protection Agency.	PG&E = The Pacific Gas and Electric Company.
Cal Fire = California Department of Forestry and Fire Protection.	SCE = Southern California Edison.
Caltrans = California Department of Transportation.	SDG&E = San Diego Gas and Electric.
CDFG = California Department of Fish and Game.	SMUD = Sacramento Municipal Utilities District.
CEC = California Energy Commission.	UC = University of California.
	USGS = U.S. Geological Survey.

I. Welcome, Overview and Introductions (Mike Gravely, CEC)

See PowerPoint Presentation (http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/Smart_Infrastructure_Intro.pdf)

The Advisory Committee met in March and formed these three sub groups:

- Systems Integration (T&D, DR, Energy Storage, Smart Grid),
- Environmental and Climate Change, and
- Transportation Energy.

PIER has a legislatively directed -board (PIER Advisory Board) that meets several times a year. The purpose is to have more detailed discussions on the issues they are facing and to provide strategic advice to the PIER management team. PIER is in the process of being re-authorized by the legislature this year. Decisions are currently underway on how PIER will be moving forward in the coming year.

A. Public Interest Energy Research (PIER) Program Overview

- IOU Ratepayer Funded Program launched in 1997
- Purpose
- Total PIER funding (1997–2010): \$757.9 Million
- Approximate \$86.5 Million Annual Budget

B. Smart Infrastructure Policy Targets

- Integrated Energy Policy Report (IEPR)
- Renewable Portfolio Standard
- Governor's goal is 20,000 MW of Renewables by 2020?
- Global Warming Solutions Act (AB 32)
- State Alternative Fuels Plan (AB 1007)
- Sustainable Communities and Climate Protection Act (SB 375)
- AB 1925/SB 1368—Westcarb/accelerate CCS industrial Use of CO₂

C. Role of Today's Workshop Participants

Provide input to research managers and members of the PIER Advisory Board (PAB). There are close to 30 advisory group members for the Smart Infrastructure Advisory Group. PIER is inviting researchers and other industry officials to provide feedback to this group.

Budget discussions for this meeting will be at the initiative level and not at the project-by-project level.

Today's breakout sessions are meant to provide feedback, identify duplication of efforts and provide overall comments.

Three sessions will include (1) Systems Integration, (2) Environmental and Climate Change, and (3) Transportation of Energy. Advisory group members will attend sessions to ensure equal representation at all sessions. All sessions are available on Webex. After the lunch break, representatives from each session will report back to the entire group. At the end of the session there will be time for public comment. Also, want to hear on how effective this format is for going forward.

Again the goal of today's discussions is to provide advice to PIER advisory Board in July or August and recommendations on how to best manage this group going forward to ensure it is effective.

- Send any feedback or suggestions to **Mike Gravely**.

II. Overview of Breakout Sessions and Update on Status of Report (See Report for More Details)

CEC staff person, **Philip Misemer** reported that the Smart Infrastructure Advisory Group is focused on the three topic areas covered in our sessions today.

Pill will be leading the breakout session I focusing on the transportation energy 2011/12 research initiatives. The specific topics we will cover are research duplication and synergy opportunities, technology transfer and end user opportunities, and what advice and comments we can provide to the EEnergy Commission staff.

Guido Franco will be leading the Environmental and Climate Change breakout session. Guido reported that environmental issues will inform development of energy infrastructure in California. Climate Change must be a part of this discussion. The discussions will touch on things we are missing, things we are emphasizing on our research and possible links, as well as any advice or comments we can provide to the staff.

Pedro Gomez will be leading the Systems Integration breakout session.

III. Concurrent Breakout Session 1: Systems Integration (T&D, DR, Smart Grid)

See PowerPoint Presentation (http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/ETSI_Breakout.pdf)

A. Goals

Lower overall system cost; enabling integration; improving capacity, utilization and performance of transmission; ensure smart grid security; and develop knowledge for future decisions, policy, etc.

Technology such as telephones, electric vehicles, entertainment have all advanced and changed. Electric transmission has not. The number of electrical appliances in our home has increased significantly.

B. General Approach

Outline three phases on the general approach slides: technology elements, technology integration, and smart grid.

- Technology Elements
Research focus on developing and improving devices. 2:1 investment ratio.
- Technology Integration
Research focus on integration of devices into a grid system. 2:1 investment ratio.
- Smart Grid
Research focus on entire grid system. 20:1 investment ratio.

C. Benefits

Work on this initiation will provide consumers more knowledge on energy use, will reduce carbon footprint, and will stimulate economy.

D. On-Going Research

On-going research includes storage, automated demand response, distribution impacts, and forecasting to help support the California Independent System Operator (CAISO) and the California grid.

Change will not happen overnight. One of the things the initiatives are looking at is microgrid visibility to CAISO. UC Davis campus has a microgrid that this initiative is looking at how it functions.

Electric vehicle integration; distributed electric storage system; PVC clustering are key issues currently being researched.

E. Proposed Initiative

Distribution Research to Meet Goal of 20,000 MW

Goals for the coming year include distribution research to meet the goal of 20,000 MW.

Research activities includes: characterization of sample feeders; local DG impact assessment; information sharing / build partnerships; coordinated data analysis; feeder modeling for future DG and EV impact predictions; implementation of broader feeder monitoring where indicated; distributed resource behavior specifications; distribution system research road map.

Distribution Research Benefits

Safe and reliable distribution system operation with increasing presence of distributed generation and EVs; Visibility for transmission operators beyond the substation; informing DG specification and interconnection standards; informing needs for strategic upgrades.

PIER Wide Solicitation

PIER is developing a solicitation to fund one or more major integrated projects. Example projects include building upon existing research efforts such as RESCO or Microgrid projects; demonstration projects to promote PIER funded technologies, a zero net-energy building demonstration; and linking of multiple microgrids—all with goals of providing innovative solutions and partnerships.

- Would like feedback on what PIER is proposing with this solicitation. See presentation for questions.

Integrating Demand Response & Energy Storage

Major efforts that we are working to integrate demand response and energy storage include work with the Demand Response Research Center (DRRC); a project with Lawrence Livermore National Lab; and energy storage activities related to AB 2514, California AARA energy storage projects, and assessing energy storage needs to meet RPS.

F. Game Changer

The PIER Advisory Board representatives challenged us to come up with a “game changer” at the 2010 PAB meetings. The Game Changer for this group centers around finding more ways to work actively with the Venture Capitalist community. On June 7, 2011, PIER hosted a forum in Sacramento with venture capitalists. Things we are considering as we move forward with this Game Changer include: how do venture capitalists evaluate prospective technologies; how do we better invest and leverage PIER funds; and how do we encourage higher levels of VC investment in PIER technologies? Also, how do we create effective forums for long-term relationships to increase path to the commercial market for PIER technologies.

More than 300 participated attended the forum in person or by web conferencing, there was legislative representation, projects were connected with venture capitalists, and a second Venture Capital Forum is scheduled this fall in Southern California.

G. Invitation for Advisory Group to Provide Feedback

Kevin Dasso—Are there some “game changers” to pursue with PIER funding? The Advisory Group would like to have more technical input before it comes to the advisory board for direction. Utilities want to participate in development of solicitation. A group like this can drill down into the proposals a bit more and provide input from a business and technology perspective. This provides advisory board assurance that the proposal is well thought through and not just a staff suggestion.

Additional focus needs to be placed on the grid to help make the various technologies come together.

Robert Sherick—Big policy drivers are the activities that are requiring a lot of work. At SCE, we are looking for a new product that helps to meet policy objectives and drive technology forward. SCE is focused on demonstration efforts. How can we leverage large federal investments from 2010 ARRA projects. Need to leverage additional research and modeling to further current demonstration programs. Policy drivers are more ambitious in California than in other places in the nation.

Jim McIntosh—PIER projects continue to be leaders in the industry.

Knowing what the requirements are going to be to operate the grid. In other words, knowing what the challenges are facing us will be key to long term success.

Spending dollars to understand impacts at the distribution level.

The visibility for what is going for distribution level. What is happening with the pilot projects? What are the energy needs? What are the demand needs?

We have a history of working with automated demand response. Automated demand response can be made to look like energy storage and the cost is significantly lower. In the last six years the prices for energy storage projects have not come down significantly despite the advances in technologies.

Barry Haaser (advisory group member)—Open ADR alliance to take oasis standards designed products in the market. Take standard from work with Oasis and develop systems that ensure reliability. Open ADR program is being developed so every building can have the opportunity to participate in this DR program. We are currently testing the products on the market. By the end of 2011, 178 MW of ADR will be operating out there in California and we will continue to have the ability to grow it.

David Miller, Center for Renewable Energy (public)—A lot of visibility in Europe of their systems and processes have provided a great level of success. Are we considering increased visibility?

McIntosh responded—Key to making this work is identifying how to increase visibility.

Dasso also responded that the utilities need to also integrate smart meters to help provide more visibility to solar solutions. How can we leverage technology we have to increase visibility and provide opportunities for PIER research?

How do we take next step and leverage current activities?

Sherick indicated that PIER research needs to get published so people have access to it and understand. It is difficult to dovetail into existing projects with regard to following regulatory rules and matching up goals. These activities take significant resources to participate. We want to be sure we are taking advantage of the federal funding available and leveraging all of our resources.

McIntosh—Need to find a way to create storage for using wind energy during peak periods.

Dasso—Look at what storage projects are out there already before creating new efforts. Need to integrate current activities. Not enough focus on that. What can be learned from Edison's efforts on integration? We need to get projects on the grid. Progress in this regard has been slow and may become irrelevant—need to move more quickly.

Gravely indicated that distribution is a major focus for current and future PIER Energy Systems Integration team funding. Integration is a key component to the task of spending those funds. Distribution is where we need to spend more money and requires more attention.

Jim Barks, SMUD (public)—Continue to move things that make sense move forward and at the same time look at new projects. Project size is less of a focus. Move forward on projects that make sense. Several small projects have been attractive in the past but one large project that entails multiple aspects would be attractive to SMUD. We are working with EPRI on a project ... where we are taking thousands of devices to create demand response. Also need to examine multiple device storage facilities. We need to ensure there is an

excellent mix of projects currently being considered. We need to look at research ideas that will bring multiple siloed research projects together so that they will truly communicate as a smart grid through integration. Use of software and other solutions to develop this technology would be very useful.

William Torre, SDG&E—Implementing equipment and systems can result in a large increase in use of renewable. To do that, we need new technology. Meeting these goals is coming at the utilities very fast. It's an uphill curve to get there, to accommodate and to maintain. PIER can help state achieve the goals very quickly and aggressively. Focusing on the distribution system is the right thing to do. How distribution occurs, operation of invertors, how the grid is operated all need to be addressed as they have done in Europe.

Bob Easter (webex)—Micro Grids may deserve a little more attention was a key message. Stove pipe designs may need to have lessons learned before moving forward on that development. More emphasis on Bio Mass. Transition options on new technology like electric cars. Management capabilities associated with storage. Integrated strategy approach to help people make the right decision.

Bill Torre, SDG&E—Energy storage is a big component of plan, electrical vehicle growth, voltage support associated with renewable penetration, auto demand response, DERMS, synchphasers both on distributed and transmission, dynamic line ratings on distribution and transmission sides ... over 20 years of implementation to accommodate renewables, additional customer choice such as home owner network choices, DERMS includes management of energy side performance.

Robert Sherick, SoCal Edison—Highly integrated plan that ensure internal coordination of components of Smart Grid. Tremendous exercise to get components to work. Refresh the deployment plan on an annual basis to tighten up as we move forward in the future to ensure clear vision.

Kevin Dasso, PG&E—Achieving policy goals, ensuring integration and leveraging. Making clear what is in it for the consumer in terms of the Smart Grid. We want to help consumers make choices, improving reliability and ensuring it doesn't degrade. Thirdly to offer consumers new innovative services and products. Utilities should be enabling those services not offering.

Barry Haaser -- Need to make it clear how to learn more about the new projects that are out there.

Mike Gravely—Go to website. Not easy to readily pinpoint specific projects but meeting materials, information and solicitations are available. CEC is working on getting the information presented and available much more accessible.

Public comments from on-line—none.

Gerald Bakes, member of the public—Game changing can happen through looking at micro grids. Look at San Pedro, integrating across and upwards. Hierarchical structure of how they work is very import to look at to see if they are working or not. Need to figure that out.

Mervin Brown, CIS, member of public—Work on transmission side is not completed. The issues of renewable transmission, forecasting, etc. are not finished yet. So how do we need to move forward with limited funds to distribution without sacrificing momentum achieved to date?

Kevin Dasso—Can't be an either/or. Where we were four or five years ago on the transmission is where we are now on distribution. The need to fine tune and bringing home the work on transmission results in uncertainty. Need to bring distribution up to speed and in line. Implementation of all of these things does not ensure cost to consumer is not going down.

IV. Concurrent Breakout Session 2: Environmental and Climate Change

See PowerPoint Presentation (http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/Guido_Franco-EA-Infrastructure_2011-06-21.pdf)

Summary of Comments from Concurrent Breakout Session 2: Environmental and Climate Change:

Is PIER coordinating efforts with the Air Resources Board? Are they putting in funds related to air quality research?

Susan Fisher—ARB total research budget is only \$6 million/year

Louis Blumberg, Nature Conservancy—definitely encourage more research related to species and habitat and how they'll shift due to climate change; this is very important to future siting of infrastructure; research related to habitat and species and water is strong nexus with energy sector; great work so far—do more—

Jim Thorne—agrees with Lewis; PIER should consider eco-regional analyses that can help better understand alternative renewable power; look at more innovative installations. If the State stays with power plants, PIER should look at cumulative impacts of say 15 solar plants in Mojave and impacts to species at that scale

Louis Blumberg—DRECP is starting program and research on species in Desert; the Nature Conservancy has contributed research for that effort; may be some research ideas there that could use support

Louis Blumberg—PIER may need to revisit stopping work on GHG inventory. We need to know what GHG emissions are to understand offset potentials (i.e. rice fields)

May need better science on GHG inventories to get to offsets; need to understand carbon emissions before you develop a new offset method; for new areas like rice, corn fields, managed wetlands, you may want to I.D. offsets and allowances for utilities, but need to fund research on carbon flow.

Lorrie Flint, USGS—USGS has very large carbon sequestering program in Delta; got cut; no funding; any opportunity with CEC?

CA Ocean Protection Council (Abe Doherty)—thanks for putting this together; continue work to look at impacts of climate change; connection to energy infrastructure; PIER work is really crucial for State that is looking at sea-level rise; need new mapping based on sea-level rise projections under revised scenarios; how will shoreline be changing to understand erosion levels; catastrophic failure modeling; extreme precipitation events; need data to guide all infrastructure decisions related to sea level rise; this should be a priority for support. Funding from the Ocean Protection Council is limited. Sea-level rise is a top priority of their org; also support efforts to enhance carbon sequestration projects in managed and tidal wetlands

Steve Wheeler—agree with prior statements; carbon sequestration especially. Also linking energy and adaptation planning

Dave Behar, SFPUC (on phone)—recently had a meeting with several water providers in Bay Area, very productive relating to PIER; Guido, can you discuss statewide scope with Bay Area regional focus?

Guido Franco—Yes, PIER is continuing with climate modeling work but because this work is useful to utilities and the energy sector in general. However the same products, climate scenarios, are also useful to water managers – since they're strongly linked; lots of hydropower units that store water and generate power. Still can work together and hope we can continue down this path.

Cathy Blake—Appreciate direction to make the nexus to energy; infrastructure; would like to see PEIR research helping to queue up things for more localized projects; and keep pursuing things/ideas even if there isn't the finest nexus; look at 5 year plans other state agencies are doing so we can really tackle the things that impact environment and energy.

Lorrie Fluit—there are abilities to improve general climate models and application of hydrologic response at various scales; look at targeted wetlands; encourage PIER to develop statewide level comparison of large scale and fine scale evaluations for hydrologic results vs. monthly/daily results that are currently looked at for facility siting; look at landscape, soils, etc to determine added value – very direct use for those interested in applying.

Ryan McCarthy—Great list of research initiatives presented here– excited about each; good job making nexus that Legislature is pushing for; encourage PIER to tie into systems and integration and how energy system may work in short and long term; make sure that you are touching base with ISO and PUC. Also, the scenario modeling work looks great.

Jim Thorne—you have weather stations that give precipitation and temperature data; use integrating modeling where you have those types of data; could also monitor energy consumption nearby or biological; look for nexus points for 2–3 types of monitoring in one area that will lead to better combined research in future; will equate to better understanding; 2) use of urban modeling techniques to try to develop energy consumption and open space savings; what are savings when you move a percent of population and what that means in regional conditions; we can look at what happens when reconstructing buildings and getting higher efficiencies; 3) have a lot of monthly data, what do we gain when you go to daily? Integrating where we have daily with monthly to understand mechanistically relationships are.

Louis Blumberg—not pleased with restricting impacts and adaptation studies – need to make link to the energy sector; remove “direct” from the statement; state and CEC needs to understand impacts of consumption of energy in CA, may not be direct link; impacts on public health should be fair game for analysis. Research should not be constrained by definition of “direct”. That should be broad and open construct regarding impacts and adaptation.

Ryan McCarthy—Excited at looking at beneficial uses of CO2 and expanding carbon capture and sequestration besides pumping underground. PIER could have big impact; clever creative ideas would be very helpful on how to deal with CC&S.

Ryan McCarthy—Climate research has been very successful and needs to be conveyed to Legislature. It is a reasonable argument to say we have budget of \$65 million and it makes

sense to invest in bigger long term ideas as well as the immediate projects that will benefit rate payers. Distinguish PIER from other State money going towards energy efficiency programs. PIER has chance to have a way bigger multiplier down the road.

V. Concurrent Breakout Session 3: Transportation Energy

See PowerPoint Presentation (http://www.energy.ca.gov/research/notices/2011-06-21-23-24_workshop/presentations/Transportation_Breakout.pdf)

Julia Johnston, Director, Land Use and Natural Resources at UC Davis

A. Main Topics from Group Discussion:

1. *Impacts of Human Behavior on Technology Acceptance*

The group discussed the idea that high-level models are not always effective because they are not trusted by the public, as a sketch model may be. This is especially true at the local level. **Charles Powars** suggested PIER be tasked with integrating a human aspect into the modeling to make it more acceptable to the public.

Mr. Powars and **Julia Johnston** commented that those in the field of planning for future transportation technologies are not historically very successful at predicting what the public wants related to future transportation trends and technology and that the field needs to determine a better way to successfully predict what the public will accept. **Brett Williams** commented that he has been working with private auto makers, and they have more intelligence with regard to consumer trends and habits, which would assist in the state of California's effort to predict the public's needs and responses.

2. *Information/Data Sharing between Public and Private Entities*

Mr. Williams discussed his information exchanges with private auto makers commenting on the wealth of knowledge they have accumulated. He suggested an automaker forum to discuss the research being conducted and opportunities to integrate that information into models and planning at the private and public levels.

Tom Turrentine is director of plug-in and electric vehicle research center. **Dr. Williams** and **Dr. Litman** work are from Berkeley. They are funded by PIER.

Dr. Turrentine noted that the statewide goals related to energy efficient transportation are lofty given the behavioral issues demonstrated by the public. He noted how much information car makers have and said it's important that private and public agencies start to share with one another the data they have related to behavior and consumerism in this arena to help best predict future needs and public acceptance. Better anticipating future needs will only occur as a result of transparent information sharing. **Mr. Powars** noted that even in coordinating with automakers, there is always going to be a challenge in predicting needs and behavior.

3. *Sustainable Communities*

Julia Johnston began a discussion related to the idea that increasing electric vehicles (EV) on the road is not going to solve the current problem. Smarter and more predictive land use planning is the only long-term solution. For instance, creating fewer parking spaces, making communities pedestrian and bicycle friendly, etc. These are the measures that will lead to long-term sustainability. There needs to be a transfer of information to local governments

and possibly regulations to implement policy to create sustainability. Local governments get little money or tools to implement the plans necessary to create sustainable communities. Funding opportunities for local governments to implement and experiment with sustainable planning needs to be more available.

4. *Opportunities for Second Life/Recycling EV Batteries*

Mr. Williams said PIER has allowed UC Berkeley to keep their eye keep on statewide trends, for instance those related to the barriers between consumers and EVs.

Williams' department is now working to gather information related to second-life batteries and battery recycling. He stressed the idea that if the state is encouraging EVs there must be something constructive to be done with the EV batteries.

5. *Monitoring and Measuring Electricity as Fuel*

The discussion turned to the idea that the country's infrastructure is based on the idea that vehicles depend on gasoline. Gasoline is taxed and used for infrastructure improvements. It needs to be determined how, if there is a push toward EVs, will electricity used to power EVs be taxed? Without this tax, infrastructure will go unmaintained. The group agreed that our current infrastructure is built upon the traditional gasoline-dependent vehicle, and now that the push is toward EVs and sustainable communities, there needs to be a shift in the system to make up for these discrepancies.

6. *Measuring Outcomes of Modeled Decisions*

The field needs to be more active in tracking actual real world results and trends to react to those and to determine if what is being modeled is playing out in the public.

Lunch Break

VI. Reporting Back Session

A. Session 1: System Integration (T&D, DR, Smart Grid) Session Summary

Pedro Gomez presented the discussions that occurred during Session 1 by providing an overview of the presentation made. He reported that most of the work occurring now is focused on renewable distribution. The System Integration research has an initiative that is looking at all of the activities that would have an impact on distribution. The goal of the outcomes of the research is to make the system more safe and reliable; visibility for transmission operators beyond the substation; informing DG specifications interconnection stands; and informing needs for strategic upgrades. Additionally, they are looking at an additional solicitation that would build upon existing research efforts; promote PIER funded technologies through demonstration projects; focus on zero net-energy building demonstration; and linking to multiple microgrids throughout the state. Pedro then provided an overview of current projects as well as the Venture Capital Forum held on June 7, 2011. Based on the feedback received at that event, future events will be held including one this Fall in Southern California.

Kevin Dasso presented the points that came out of the session's discussions as follows:

Utilities want to participate in development of solicitation.

- Drill down into the proposals a bit more and provide input from a business and technology perspective prior to bringing to Advisory Group/Board. This provides advisory board assurance that the proposal is well thought through and not just a staff suggestion.
- Look for new products that help to meet policy objectives and drive technology forward. Focus on demonstrations. How can we leverage large federal investments from 2010? Need to leverage additional research and modeling to further current demonstration programs.

Reemphasis on distribution

- Smart Grid Integration efforts need to continue. Progress in this regard has been slow and may become irrelevant—need to move more quickly.

Leverage the work utilities are currently doing and how to move forward from there - examining lessons learned from ARRA projects.

- Need to leverage additional research and modeling to further current demonstration programs.

Better ways to communicate what we are doing and what we are going to do.

- PIER research needs to get published so people have access to it and understand it. It is difficult to dovetail into existing projects with regard to following regulatory rules and matching up new goals.
- Help consumers make choices, while improving reliability and ensuring reliability doesn't degrade. Want to offer consumers new innovative services and products. Utilities should be enabling those services not offering.

B. Session 2: Environmental and Climate Change Session Summary

Guido Franco indicated that some Legislators believe that the climate change work in PIER should be more directly linked to the energy sector. As such the PIER has refocused the climate change sub-program. PIER will continue to support work on climate monitoring analyses, and modeling for California. There would be no new GHG inventory methods projects. PIER will focus its research on options to reduce emissions only on project that would allow the identification of offsets/allowances for utilities. PIER impacts adaptation work will cover only things dealing with the energy sector.

Main topics from the group discussion included:

- Encourage more research related to habitat, species and water since there is strong nexus with energy sector.
- Reconsider stopping work on GHG inventory.
- PIER work on sea-level rise is crucial for the State. Need data to guide infrastructure decisions related to sea level rise. This work is very important for coastal energy facilities.

- Review and coordinate with other State agencies and their long-term planning activities to better understand cumulative impact on the environment and energy.
- Develop statewide comparison of large scale versus fine scale evaluations for hydrologic results (instead of monthly/daily results that are currently used for facility siting).
- Encourage a broad and open construct regarding impacts and adaptation; don't just focus on "direct" links (public health and use of air conditioners was the example used).
- Look for opportunities to integrate modeling (i.e., monitor biological, energy consumption usage where you already have precipitation and temperature monitoring); gathering comprehensive data will lead to better combined research in the future.
- Appreciate PIER looking at beneficial uses of CO₂ and expanding carbon capture and sequestration opportunities; PIER could have big impact.
- Need to invest in bigger long-term ideas as well as the immediate projects that will benefit rate payers.

Ryan McCarthy gave his perspective on the session. There is a fine line between trying to move forward and to abide by the legislature's desire to reduce the scope of the PIER climate change science work. The proposed initiatives accomplish that. . Land use, future electricity supply and demand, and GHG all work well together. He reported back about the recommendation to continue work on GHG inventory methods because this work is needed to properly determine potential emission reduction options .

C. Session 3: Transportation Energy Session Summary

Philip Misemer provided the PowerPoint recap on the current focus of transportation research:

- Reducing barriers to electric vehicles;
- Integrating energy into existing land use models; and
- Distribution of energy storage for AES

Julia Johnston, Director, Land Use and Natural Resources at UC Davis presented the main topics from group discussion:

1. Impacts of human behavior on technology acceptance
2. Information/data sharing between public and private entities
 - a. Accessible and trustworthy
3. Sustainable communities
 - a. Integrated outcomes
4. Opportunities for second life/recycling EV batteries
5. Monitoring and measuring electricity as fuel
6. Measuring outcomes of modeled decisions

D. Advisory Group Questions and Comments on Breakout Sessions

Mike Gravely requested that the Advisory Group members provide feedback on the format of the sessions.

Charles Powars—What types of proposals can be funded under the PIER program?

CEC staff person provided an overview of that process and what qualifies and what doesn't.

Kevin Dasso reported that the whole idea was to get a little closer to the technical aspects of the programs. One of the challenges of this group is to do a better job of connecting the dots. Today is a good start for doing that but there is still more work to be done there. The breakout sessions were fine for specific feedback and direction. We need to look at how to better integrate across the programs. Need to demonstrate a clear transition on how we functioned before and how we are working on these issues going forward.

Ryan McCarthy indicated that at the Air Resources Board they are in the early stages of implementing AB 375 and building their team to do that. Example includes travel model expertise. There are lots of opportunities statewide to demonstrate policy development tools and best practices. There may be some synergies between the work and research that the ARB is doing in this regard and what the PIER needs to accomplish.

CEC staff **Mike Gravely** asked if the change in Governor's priorities has changed how we are proceeding moving forward.

Kevin Dasso indicated that from a grid perspective it is very different. The grid was not set-up to do the things currently being proposed. Need to better understand the impacts, how to meet the different characters and demands going forward.

Barry Haaser reported that he is encouraged by the opportunity to take open automated demand response and demonstrate how the investment made has had an impact in the market.

CEC staff **Philip Misemer** presented that the four bullets provided at the onset still really speak to how we can design our initiatives. The four bullets are as follows:

- 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.

Need to be sure research we are doing is complimentary to what is occurring within the industry.

CEC staff **Guido Franco** indicated that we need to clearly demonstrate the strong links between the environment, climate change, and transportation. The detailed analysis and modeling of the energy systems needs to be complimented by a more clear process.

Mike Gravely led the group in a presentation of public comments and to provide feedback to the Advisory Group.

Joe Bakes (member of the public) indicated there was a lot of coordination between the Department of Energy, ARB and CEC on other similar efforts.

David Cellini (member of the public)—Where are there results of current efforts and activities as well as past projects available for the public to review? Are there technology and documented research results documented somewhere?

Mike Gravely indicated that all of this information can be found on the website.

Bob Easter—Need to be looking a modeling and integration analysis frameworks.

Mike Gravely indicated that they are doing some work in this regard but that this work would also be presented at the workshop tomorrow.

Brent Williams, UC Berkley (member of the public)—PIER should look at non-research activities that are associated with deployment so that data is collected and provided to the public and then provided back to the strategic planning process. Need to be sure we are looking beyond silo-focused projects and more towards opportunities to increase integration.

Joe Bakes (member of the public)—Recycle of energy cells for vehicles.

VII. Closing

Mike Gravely thanked everyone for attending and indicated that results from the workshop will be provided to the public. Laurie ten Hope (PIER Deputy Director) closed the session by requesting members feel free to pick up the phone and call the PIER staff if there are questions or recommendations for improvements. Laurie thanked everyone for participating. We look forward to many more successful meetings of this advisory group in the future.

July 26 Follow-up Staff Workshop Agenda (also available at http://www.energy.ca.gov/research/notices/2011-07-26_workshop/2011-07-26_agenda.pdf)

**California Energy Commission
Staff Workshop on FY 2011/12 Public Interest Energy Research (PIER)
Follow-up to Workshops on June 21, 23, 24th, 2011**

**July 26, 2011
AGENDA**

- 9:00 a.m. Welcome, Overview and Introductions (Laurie ten Hope, Deputy Director, Energy Research and Development Division)
- 9:10 a.m. Overview of PIER Advisory Group Meetings
- Smart Infrastructure (Mike Gravely, Office Manager of Energy Systems Research Office)
 - Renewable Energy (Linda Spiegel, Office Manager of Energy Generation Research Office)
 - Energy Efficiency (Virginia Lew, Office Manager of Energy Efficiency Research Office)
- 9:40 a.m. Advisory Group Comments
- 10:40 a.m. Public Comments
- 11:10 a.m. Closing/Next Steps (Laurie ten Hope)

JULY 26 Meeting Summary Notes (with list of participants)

California Energy Commission (CEC)

Public Interest Energy Research (PIER) FY 2011/12 Research Initiatives - PIER Advisory Groups (PAGs) Follow-up Workshop

July 26, 2011 – Meeting Summary Notes

Online Attendees (non-CEC staff): (Note: List reflects only those participants who chose to identify themselves)

Al Baez, South Coast Air Quality Management District (SCAQMD) (for Matt Miyasato, Renewables PAG member)

Cathy Bleier, California Department of Forestry and Fire Prevention (Cal Fire) (Smart Infrastructure and Renewables PAG member)

Ayat Osman, California Public Utilities Commission (CPUC)

Bonnie Dalton, Silicon Valley Leadership Group

Charles Powars, St. Croix Research

Ed Becker, Sempra Energy

Elliot Crowe, PECl

Frank Goodman, San Diego Gas and Electric (SDG&E) (Renewables PAG member)

Gail Brager, University of California at Berkeley (UCB)-Center for the Built Environment

Jim Blatchford, California Independent System Operator (CAISO) (Renewables PAG member)

John Andrew, California Department of Water Resources (DWR) (Smart Infrastructure PAG member)

Kerilyn Ambiosi

Max Sherman, Lawrence Berkeley National Laboratory (LBNL)

Michael Montoya, Southern California Edison (SCE)

Rebecca Simonson

Steven Ly, Southern California Gas Company (SoCalGas)

Stuart Styles, California Polytechnic State University, San Luis Obispo (Cal Poly)

Wendell Brase, University of California at Irvine (UCI) (Energy Efficiency PAG member)

Wolfgang Weiss, ergSol Inc.

Woody Hastings, Climate Protection-Sonoma County

John Holmes, SDG&E

Barbara Haden, SRI International

Mark Nero

Attendees in room (non-CEC staff)

Susan Patterson, Gas Technology Institute (GTI)

Martha Krebs, University of California at Davis (UCD)

I. Opening Presentations: Laurie ten Hope, Mike Gravely, Linda Spiegel, and Virginia Lew, CEC (see workshop powerpoint presentations at http://www.energy.ca.gov/research/notices/2011-07-26_workshop/presentations/)

Today's objective is to get any corrections to comments from the June PIER research initiatives workshops and any additional comments so that staff can finalize the research initiatives report and present it to the PIER Advisory Board at the August 18 meeting.

Questions put to group:

1. Did we capture your input and comments from the June 21, 23, and 24 workshops?
2. Are there additional suggestions to integrate research initiatives holistically?
3. Any suggestions for future PAG meetings?

II. Comments from PIER Advisory Group Members

1. Cathy Bleier, Cal Fire

- Regarding permitting issues and biomass in particular, there is an element of research that could address permitting. PIER can help identify research gaps and inform future siting issues. There are multi-discipline efforts being undertaken to look at social, political, economic pieces together that may help to address biomass permitting issues.

Response from Linda Spiegel, CEC: PIER is conducting research on forest biomass and biodiversity and water issues that can be applied to permitting processes. We are about to release a report on environmental issues associated with woody biomass, which also identifies some research gaps.

2. John Holmes, SDG&E

- Transportation: Need to include battery model standardization—this is a key enabler for 2nd use batteries—important subject area. This was raised in June 21 workshop but wasn't reflected in the meeting notes.
- Energy Efficiency: Important to focus on integration of energy storage from an energy efficiency perspective. Looking for opportunities to integrate energy storage from a customer perspective.

3. Frank Goodman, SDG&E

- Interconnection vs. Integration: Suggests instead of “interconnection” of renewables, we should use the word “integration”. Integration captures several other concepts/elements, such as impacts on interconnection, interoperability, distribution systems and migration to new standards.
- End-of-Life Wastestreams and Disposal: Suggests PIER looks at end-of-life disposal for renewables and their wastestreams. Which of the options for renewable energy has the least end-of-life disposal impact/cost? It really becomes a procurement issue – if there is a big expense for end-of-life disposal, then that will need to be included in cost projections, etc.
- Solar thermal energy (electric): Suggests that solar thermal not be shortchanged in preference for photovoltaics (PV). Should be given more emphasis. Solar thermal has storage options whereas PV needs batteries.
- Small Wind: Should be on the agenda. Recommends that PIER provide for research that determines if small wind turbines are cost effective and feasible - Where is the threshold for viability for small wind turbines? Would they work in an 8-10 mile/hour wind speed?

4. Elliot Crowe, PECl

- Publicize ongoing PIER research-availability of documentation is difficult to find—hard to locate resources for on-going projects—missed opportunities for knowing what's going on.
- Marketing and Outreach: Suggests that PIER conduct separate solicitations for marketing and for research. Right now most projects do their own marketing, etc. There are firms that specialize in marketing and there are firms that specialize in research, but they may not do both well.
- Contracting: Need to speed up contract approval process and allow for more flexibility in the agreements. Sometimes during the research you find you need to do something different from what is in agreement but contract rigidity prevents this from happening. Need to have more flexibility to change as needed—should be an easy way for course correction.

Response from Laurie ten Hope, CEC: We're currently working on the following: a) revamping the PIER website to include more information; b) having teams conduct more research forums to provide insight into existing research; c) sharing ideas on research initiatives and publishing possible future solicitations in advance; and d) working on contract streamlining (although some things are a function of the state contracting process that we cannot change).

5. Cathy Bleier, Cal Fire

- Important to continue climate change studies – is climate modeling continuing?

Response from Guido Franco, CEC: Climate modeling will be continued.

III. Additional Comments On Integration from Participants

1. Frank Goodman, SDG&E

- Integration in all three areas is important. Work in general requires large deployment/ big demonstrations. Monitoring is important if there is commercial activity. Recommends we try to piggy back onto existing projects to leverage funds [i.e., on Department of Energy (DOE) funded projects or commercial projects].
- CEC solicitation process: Notes that more advanced notice of PIER solicitations would be very helpful. Need to give as much notice as far in advance as possible this will be helpful in looking for matches with DOE and other funding.

Comment from Laurie ten Hope, CEC: We are asking everyone for help with identifying funding opportunities and solicitations.

Response from Mike Gravely: The revamped website will include information on solicitations, including planned solicitations.

Response from Laurie ten Hope: We're doing a six month look ahead and posting that information on the website. We are also considering a two-phase solicitation process involving a pre-application and final application that may allow for more time to develop project partnerships, etc.

2. Gail Brager, UCB

- Building Energy Efficiency: Net zero needs better integration. There is a fundamental paradigm shift in thermal conditioning (similar to task lighting in buildings) and involves issues of building envelope, retrofit opportunities and recognizing ways on how to operate buildings. Rethink how we condition buildings.

IV. Closing Comments from Laurie ten Hope, CEC

- Staff will incorporate comments into June workshop summaries.
- Staff will finalize initiatives report.
- Staff will share this information at the August 18 PIER Advisory Board Meeting.
- Send final thoughts on this round by August 1 to Phil Misemer at pmisemer@energy.state.ca.us.

Appendix: Comments Received After Workshop

1. Text of follow-up comments received from Wolfgang Weiss, ergSol Inc., dated July 31, 2011.

RE: Public Comment – California Energy Commission’s PIER Program and Solar Thermal Technology

Dear Mr. Misemer,

We appreciate the opportunity to provide comments about the CEC’s Public Interest Energy Research Program and its Advisory Board as you determine projects and funding for the next cycle. We have attended your meetings and followed with interest your thorough approach to determining how best to support renewable, clean technologies to meet the state’s needs and regulatory targets.

Our company, ergSol (www.ergsol.com) is a California-based enterprise working to advance the use of energy-saving solar thermal technology in California and the U.S. We are convinced more than ever that solar thermal systems can play an important role in reducing grid power demand as well as meeting climate change challenges. Yet solar thermal is still largely missing from the discussion.

This is probably because when we hear "solar energy" we think of photovoltaic (PV), and its application for renewable electricity. Or, concentrating solar thermal megasystems used solely to produce electricity. Here's the difference:

Solar thermal systems, like ours, harness the sun to provide applications that displace the need for grid power or fossil fuel. Our systems collect energy from the sun by heating up a transfer fluid inside highly efficient evacuated tube collectors; solar radiation is transformed into heat energy within the fluid, which can then be tapped for hot water, space heating, process heat, or cooling. A business that needs to sterilize equipment with hot water, for example, need not use electricity or gas to heat its water.

It is important to recognize that this is not an electricity generating system – instead, solar thermal systems displace the need for (carbon-emitting) grid power and generate heat very efficiently, which in turn can be harnessed for multiple applications – even air conditioning. These systems are highly adaptable to any facility, in any environment, and can be sized for practically any business or residential need. These well-insulated solar systems also provide superior energy storage capacity for later use, so the output is available 24/7.

We believe there is still a need to fund the R&D of cooling systems, and how they might be efficiently applied in both industrial and residential settings. So we encourage this as a possible project for PIER funding.

To summarize, the attraction of solar thermal systems includes:

- reduced demand for electricity loads;
- highly energy efficient;
- completely renewable and pollution-free;
- ideal for localized energy situations;

- presents storage opportunities; and
- cost-competitive with -- in fact, less costly than -- PV and other renewables.

Thanks again for the opportunity to comment, and for your consideration of solar thermal technology as part of the PIER program and other energy efficiency applications. Please contact us if you would like additional information or a presentation. We know the way to Sacramento very well.

Sincerely,

Wolfgang Weiss

Text of CEC Presentations

- I. July 26, 2011 Staff Workshop on FY 2011/12 PIER Initiatives and Integration Opportunities - Laurie ten Hope, Deputy Director, Research & Development Division.

Powerpoint presentation available at: http://www.energy.ca.gov/research/notices/2011-07-26_workshop/presentations/01_PIER_Adv_Group_Intro.pdf

A. Today's Agenda

- Welcome and Introductions
- Overview of PIER Advisory Group Meetings
- Smart Infrastructure
- Renewable Energy
- Energy Efficiency
- Advisory Group Member Comments --Did we capture your input?
- Public Comments
- Closing/Next Steps

B. Public Interest Energy Research (PIER) Program Overview

- IOU Ratepayer Funded Program launched in 1997
- Purpose: Fund public interest energy research that is not provided by the competitive or regulated markets, advances energy science and technology to the benefit of California ratepayers and will provide environmentally sound, safe, reliable and affordable energy services and products. Research areas:
 - Energy Efficiency and Demand Response
 - Renewable Energy and Advanced Electricity Generation
 - Transmission & Distribution and Storage
 - Climate and Environment
 - Transportation
- Approximate \$86.5 Million Annual Budget
 - \$62.5 million electric
 - \$24.0 million natural gas

C. PIER Advisory Board

- Provides strategic advice on R&D funding priorities and makes recommendations on future programmatic directions to R&D Policy Committee
- Established by statute and composed of key stakeholders
 - 3 members of Senate, 3 members of Assembly, IOU's, CPUC, CARB, CAISO, environmental organizations, consumer representatives, venture capital firms, and other experts
- March 2011 PAB meeting results
 - Characterize research into 3 subgroups: Smart Infrastructure, Renewable Energy, Energy Efficiency
 - Would like more information on research initiatives so can make better recommendations

D. PIER Advisory Groups

- Provides advice and input on proposed research initiatives, including identify possible duplications; identify opportunities to gain synergies, and assist in effective transfer and use of research results
- Three PAGs established: Smart Infrastructure, Renewables and Energy Efficiency
- Membership includes Policy Advisory Board appointments, with augmentations to fill gaps
- Meetings are public --Feedback from research community and the public is also encouraged

E. WebEx Workshop

- Today's Objectives:
 - Finalize input on the proposed PIER research initiatives for fiscal year 2011/12
 - Input will help structure future initiatives to maximize electricity ratepayer benefits
- Questions for Participants:
 - Did we capture your input from workshops and written comments?
 - Are there additional suggestions to integrate research initiatives holistically?
 - Any suggestions for future PAG meetings?

F. Websites

- Public Interest Energy Research Program
General Program information: <http://www.energy.ca.gov/research/index.html>
- Energy Commission Mailing List Registration
<http://www.energy.ca.gov/listservers/index.html>
- PIER Advisory Board Information:
http://www.energy.ca.gov/research/advisory_board.html

II. Summary of PIER Advisory Group Workshop Comments On the 2011/12 Proposed Smart Infrastructure Research Initiatives - July 26, 2011 Michael Gravely, Office Manager, Energy Systems Research Office

Powerpoint presentation is available at:

http://www.energy.ca.gov/research/notices/2011-07-26_workshop/presentations/02_Smart_Infrastructure_Adv_Group_Summary.pdf

A. Summary of June 21st Workshop - Staff Program Presentations

Policy Drivers

Goals

General Approach

Current Research Initiatives

Planned Solicitations with FY 10/11 Funds

Proposed Research Initiatives FY 11/12

B. Advisory Group Agenda

- Overview of advisory group meeting
- Break out in to three sessions:
 - Smart Grid
 - Transportation Energy
 - Environmental and Climate Change
- Presentation on results of break-out sessions
- Discussions on Smart Infrastructure Group Operation

C. Advisory Group Recommendations

- Smart Grid
 - The Advisory Group supported the overall initiatives as presented and recommended no specific modifications.
 - The group requested additional attention be given to field demonstrations of new and emerging technology and the integration of these technologies (especially micro grids).
 - The group emphasized that distribution research is high priority.
 - The group recommended that the PIER staff work to leverage ongoing DOE ARRA funded work into new future initiatives as much as possible (especially smart grid activities).
 - The group indicated that the PIER Renewable and Energy Efficiency Game Changers need to be coordinated with any similar CPUC funded field demonstration efforts with the IOUs.
- Transportation Energy
 - Implement research on impacts of human behavior on vehicle technology acceptance.
 - Facilitate information/data sharing between PIER and private entities working on advanced transportation technologies.
 - Sustainable communities research is needed and encouraged.
 - Integrate research outcomes across the three transportation focus areas.
 - Pursue opportunities for second life/ EV recycling research.
 - Develop research projects for monitoring and measuring electricity as fuel.
- Environmental and Climate Change
 - Encourage more research related to habitat, species, and water since there is a strong nexus with energy sector.
 - PIER work on sea-level rise is crucial for the State.
 - Review and coordinate with other State agencies and their long-term planning activities.

- Do not stop working on GHG inventory methods.
- Encourage a broad and open construct regarding impacts and adaptation. Do not reduce the scope of this area of work.
- PIER is the main source of scientific information on impacts and adaptation in CA. This work should be continued.
- Appreciate PIER looking at beneficial uses of CO2.
- Overall Group Recommendations
 - Continue to pursue good technology and system integration demonstrations.
 - Utilities want to be more actively involved in project planning, selection and implementation.
 - Coordination is key to maximizing value.
 - Work to leverage the billions of dollars being spent by ARRA in California and the nation when future planning is done.
 - Integration between Smart Infrastructure sub groups is critical to solving interdisciplinary challenges.
 - Find new opportunities to efficiently work across PIER teams (ETSI, Transportation, Environmental, Renewables, IAW, and Buildings) to demonstrate new integrated system level solutions.
 - Unhappy that CC focus has been reduced and believe adaptation work is important.

D. FY 11/12 Initiatives

- The staff's proposed FY 11/12 initiatives demonstrate they are responsive to Advisory Group recommendations.
 - As funded projects are finalized, the input received from the Advisory Group will help project managers define their integrated project ideas.
- ETSI, Transportation and Environmental teams should work to ensure the Renewable and Building Efficiency Game Changers are fully integrated and address the issues identified by the Advisory Group.
- The Advisory Group was very supportive of the Venture Capitol Game Changer ESRO is managing and recommended increasing the activity (if possible).

III. Summary of Renewable Energy 2011/12 Proposed Research Initiatives - July 26, 2011 Linda Spiegel, Office Manager, Energy Generation Research Office

Powerpoint presentation is available at:

http://www.energy.ca.gov/research/notices/2011-07-26_workshop/presentations/03_Renewables_Adv_Group_Summary.pdf

A. Renewable Advisory Group - June 23 Attendance

- 18/21 Group Members: Utilities, CAISO, state and local gov't, conservation and advocacy groups
- Researchers: UC, SMUD
- Public

B. Workshop Summary – June 23 Staff Program Presentations

- Policy drivers
- Goals
- General approach
- Current research initiatives
- Planned solicitations with FY 10/11 funds
- Proposed research initiatives FY 11/12

C. Advisory Group Recommendations

- Supported demonstration projects
- Engage utilities
- Collaborate with ETSI
- Biomass – greater focus
- Biogas – to pipeline
- Forecasting/Resource assessments
- Storage
- New technology development/Existing technology improvement
- Leverage funds
- Continue environmental research
- Non-research items
 - Fix permitting process

D. Integration

- Work closely with utilities and CAISO to ensure transition to the grid of the future.
- Help advance environmental science to resolve impacts to inform decision makers.
- Work efficiently across teams:
 - ETSI, Renewable, Transportation, IAW, Buildings, Environmental
- Find opportunities to demonstrate technologies and reduce waste streams.

E. FY 11/12 Initiatives

- The renewable team believes the FY 11/12 initiatives are responsive to the Advisory Group recommendations.
- Game changer: Renewable energy is teaming with Buildings Efficiency, and ETSI to ensure grid integration, storage and energy efficiency components in the

advanced community based energy systems demonstration project.

- Metrics for success: quantifiable, specific, measurable, establish targets and clear timelines, successful interconnection.

F. Contact Information

- Energy Generation Research Office
 - Linda Spiegel, lspiegel@energyg.state.ca.us
- Renewable
 - Sandra Fromm, sfromm@energy.state.ca.us
- Environmental -Renewable
 - Guido Franco, gfranco@energy.state.ca.us

IV. Summary of the PIER Advisory Group Workshop Comments on the 2011/12 Proposed Energy Efficiency Research Initiatives - July 26, 2011 Virginia Lew, Office Manager, Energy Efficiency Research Office

Powerpoint presentation is available at:

http://www.energy.ca.gov/research/notices/2011-07-26_workshop/presentations/04_Energy_Efficiency_Adv_Group_Summary.pdf

A. Energy Efficiency Advisory Group

- First meeting on June 24, 2011
- Group members(20 members/14 attended)
 - Utilities
 - California Independent System Operator
 - Government agencies
 - Energy and environmental advocacy
 - Academia
 - Clean tech and industry
- Invited researchers
 - Utilities, academia, private consultants, state agencies
- Approximately 50 public attendees (in person and by WebEx)

B. June 24 Workshop Summary - Staff Presentations

- PIER Program overview, policy drivers and role of participants
- Program background and discussion of research initiatives, questions and

comments

- Building End Use Efficiency
- Industrial, Agriculture and Water

C. Advisory Group Recommendations and Workshop Comments

- Building Energy Efficiency
 - Support for initiatives
 - Emphasized need to coordinate with utilities and PIER should look farther ahead than utility programs
 - Provided input on areas for further emphasis or research for HVAC, lighting, whole buildings, consumer electronics, behavior and environmental research
 - Supported zero net energy building demonstration (game changer) for all types of buildings, identified other technical, funding, timing, coordination and program considerations (e.g., maintenance and sustainability)
 - Emphasized continued support for research centers
 - Need for integration with renewable energy-emphasize applied side and assessments of renewable energy with energy efficiency
- Industrial, Agriculture and Water Energy Efficiency
 - Support for initiatives
 - Emphasized the need to reduce risk by establishing an industrial research center to aid in technology adoption -link end users, manufacturers and regulators
 - ITRC in Cal Poly San Luis Obispo and water center starting at UCD
 - High tech solutions will require support infrastructure, especially in operation and maintenance of technologies-needs to be addressed in demonstration proposals
 - Provided input on areas for further emphasis such as need for technologies and road map considerations
 - Non-research area assistance: regulatory (permitting), tax/incentives
 - Need for integration with renewable energy-emphasize applied side and assessments of renewable energy with energy efficiency

D. Integration with Others

- Coordinate with utilities
 - Utilities want active involvement in project planning, selection and implementation

- Coordinate with other PIER teams, especially Renewable Energy and Energy Technology Systems Integration (ETSI)
- Inform the marketplace and share research results to regulators, industry and other stakeholders

E. FY 11/12 Initiatives

- Overall: Advisory Group supports staff's proposed FY 11/12 initiatives
- Buildings
 - Zero Net Energy Game Changer: Building Energy Efficiency team is coordinating with the Renewable Energy and the ETSI teams to include building level meter/grid integration, storage and renewable energy components.
 - General solicitation to include many of the Advisory Group recommendations that fall within PIER's oversight
- Industrial, Agriculture and Water
 - General solicitation to include many of the Advisory Group recommendations that fall within PIER's oversight

F. Contact Information

- Energy Efficiency Research Office
 - Virginia Lew, vlew@energy.state.ca.us
- Buildings
 - Chris Scruton, cscruton@energy.state.ca.us
- Industrial, Agriculture and Water
 - Beth Chambers, bhchambe@energy.state.ca.us