Welcome

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Public Interest Energy Research Benefits Assessment Workshop May 19, 2011

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California Energy Commission

Workshop Objectives

- Provide a forum to discuss how Public Interest Energy Research (PIER) program has and currently evaluates the benefits resulting from energy research, development, and demonstration (RD&D) projects and to learn from other research organizations about how they approach benefits assessment.

- Share past PIER benefits assessments of energy RD&D projects using varying data
- Hear how other research organizations assess benefits

- Obtain feedback & recommendations for future PIER benefits assessment

- Provide input to the preparation of the 2011 Integrated Energy Policy Report

Agenda for IEPR Staff Workshop on Benefits Assessment

Morning

9:30 am **Introduction to this IEPR Workshop and Opening Comments –**
Asst. Executive Director, Suzanne Korosec
Integrated Energy Policy Report Unit

9:40 am **Welcome to the PIER Benefits Assessment Workshop –**
Deputy Director, Laurie ten Hope
Energy Research and Development Division

9:50 am **The PIER Program's Benefits Assessment Activities –**
Adrienne Kandel, Jean Baronas and Vanessa Kritlow
PIER

10:25 am **PANEL: Ongoing RD&D Benefits Assessments Used by State and Federal Agencies and Research Organizations –**
Moderator - Jean Baronas, PIER

Agenda for IEPR Staff Workshop on Benefits Assessment

Morning Panel

- **ICF International, Overview of Oregon and Iowa Benefit Assessment Activities and Introduction of the panel questions**
  Rick Tidball, Senior Consultant

  Panel questions:

  Question 1: What benefit assessment activities has your organization undertaken?

  Question 2: What did you measure?

  Question 3: How has your organization addressed attribution (public and private sector)?

  Question 4: What are your future plans for benefits assessment?

- **New York State Energy Research and Development Authority (NYSERDA)**
  Tara Rainstrom, Benefits Analyst

Agenda for IEPR Staff Workshop on Benefits Assessment

Morning Panel

- **U.S. Department of Energy (DOE)**
  Pete Whitman, Policy Analyst

- **U.S. Department Of Energy (DOE)**
  Mike Holland, Senior Advisor and Staff Director

- **Overview of National Research Council (NRC) Studies**
  Linda Cohen, Professor of Economics and Law, UC Irvine

- **Electric Power Research Institute (EPRI)**
  Jeff Roark, Senior Project Manager

- **U.S. DOE Sandia National Laboratory**
  Gretchen Jordan, Principal Member of Technical Staff

11:55 am Review of Morning Presentations –
Mike Gravely, Energy Systems Research Office, PIER

12:00 pm Lunch

Agenda for IEPR Staff Workshop on Benefits Assessment

Afternoon

1:00 pm **Overview of Methods Related to Benefits Assessment –**
Moderator, Jean Baronas, PIER

Effects on California's economy
Adrienne Kandel, PIER

Effects on Grid Reliability / Security
Jeff Roark, EPRI

A Few Select Estimates of Generation Side Benefits: Effects on Electricity Customer Costs
Adrienne Kandel, PIER

Qualitative assessment and potential surveys as an avenue for data collection
Jean Baronas, PIER

BREAK – 1:50 pm

Agenda for IEPR Staff Workshop on Benefits Assessment

Afternoon

2:00 pm Continued: Overview of Methods Related to Benefits Assessment –
Moderator, Jean Baronas, PIER

Attribution: public and private sectors — *Linda Cohen, UC Irvine*
Uncertainty: research results and funding — *Audrey Lee and Laura Diaz Anadon, Kennedy School of Government, Harvard University*
Proposed PIER Benefits Approach — *Vanessa Kritlow, PIER*

2:45 pm Open Discussion of Afternoon Presentations –
Moderators: Adrienne Kandel and Vanessa Kritlow, PIER

3:30 pm Summation –
Fernando Pina, Energy Systems Research Office, PIER

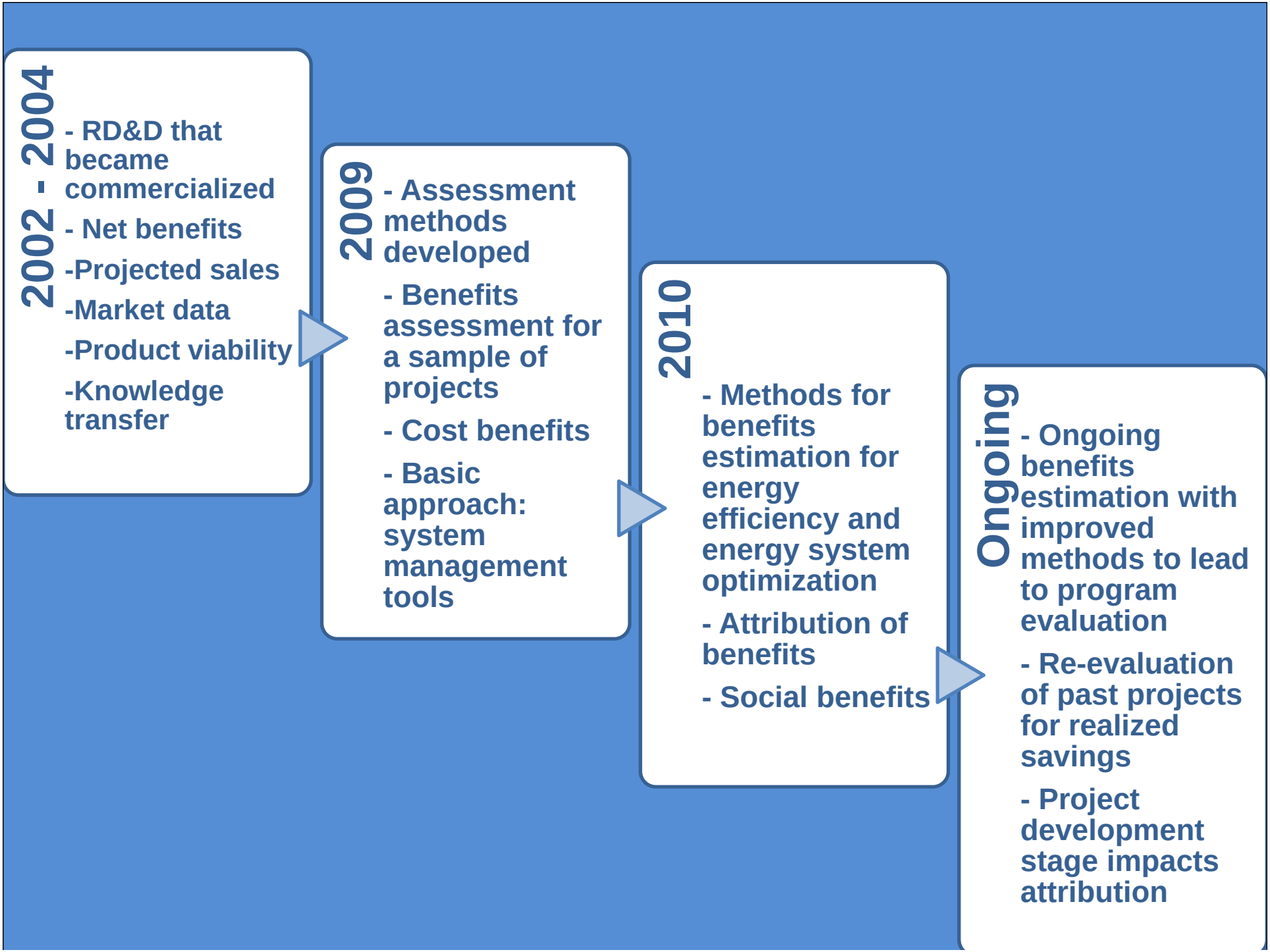
3:45 pm Public Comments

Adjourn

PIER Benefit Assessment Activities and Processes

PIER: Vanessa Kritlow Adrienne Kandel, and Jean Baronas

May 19, 2011


2002 - 2004
- RD&D that became commercialized
- Net benefits
-Projected sales
-Market data
-Product viability
-Knowledge transfer
2009
- Assessment methods developed
- Benefits assessment for a sample of projects
- Cost benefits
- Basic approach: system management tools
2010
- Methods for benefits estimation for energy efficiency and energy system optimization
- Attribution of benefits
- Social benefits
Ongoing
- Ongoing benefits estimation with improved methods to lead to program evaluation
- Re-evaluation of past projects for realized savings
- Project development stage impacts attribution

Process for PIER RD&D Project Evaluations

A. Collect PIER project data. Found the energy and cost savings reported by researchers for demonstration projects.

Data sources:
- **Project write-ups from PIER database**
- **Project final reports**
- **Phone surveys with contractors**
- **PIER contract agreement managers (CAMs)**
- **Prior benefit evaluation reports**
- **Internet research**

B. Categorize projects according to types of savings. Develop estimates of market projections and energy and cost savings.

C. Apply projected energy savings data to estimate the environmental benefits.

D. Confirm the benefits assessment findings with the project managers, report findings to PIER management, and develop plans for refined data collection.

Continuous Improvement

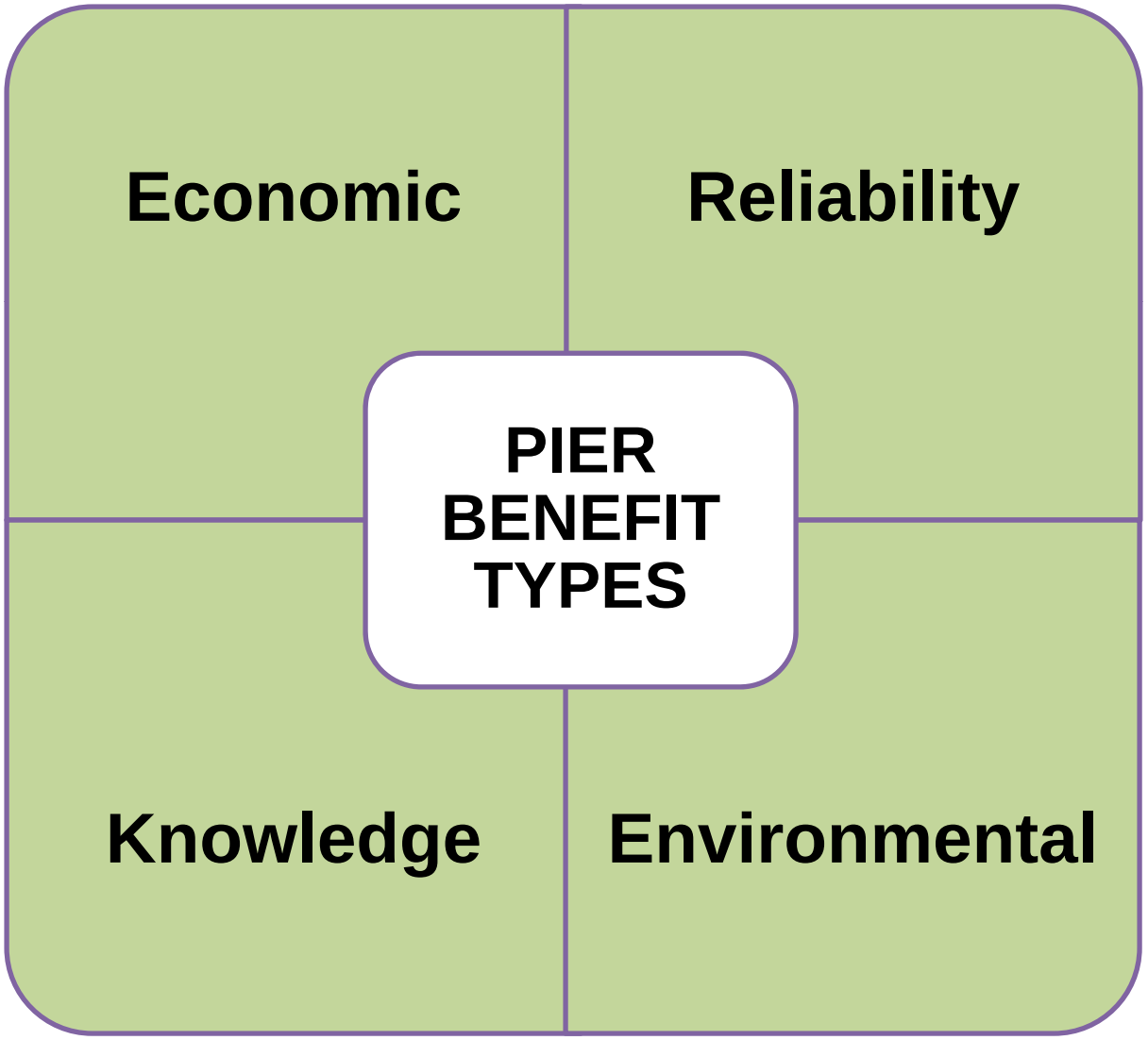
A. Continually evaluate the past and present energy RD&D projects retrospectively to provide recommendations for refined data collection.

B. Continually evaluate the effectiveness of methods used in benefits assessments and develop training modules.

C. Perform a quality check on the summation of the benefits and how they are communicated noting discoveries for improvement.

D. Develop recommendations for input to work plans, solicitations, and agreements to gather and evaluate benefits and savings.

Benefit types



Other:
- **Improved quality of life**
- **Water use**
- **Land use**
- **Business growth**

Examples of benefits we have looked at…

Technical potential
Energy efficiency RD&D

- From the start PIER choosing research projects based on their technical potential
  - Assumes full penetration, full attribution to PIER, estimates may exclude unknown technology costs
- Example: 10 energy efficiency projects could save $990 million/ year
  - 590 million kWh/yr
  - 39 MW/yr avoided peak
  - 1.2 billion therms/yr
  - PIER cost = $6.6 million

What does one do when the only data are technical potential ? Take small percent?

If only **1 percent** of technical potential is realized, California ratepayers will ultimately save **$10 million/year** on these 10 out of 700+ PIER projects.

Projections for year 2020
Of Energy efficiency Projects

Look at 2020 because it presents challenges to the grid.

- 9 projects that cost PIER $2.1 million are projected to save ratepayers around $16 million/year by 2020 **+/- .**
  - 21.3 GWh + 230 kW + 24 million therms / year

- How do you deal with big uncertainty, like game changers?

  Radiant HVAC ($2 million expenditure)
  - Contracting research institution predicts 6% drop in HVAC usage **= $234 million/yr**
  - And if it fails to catch on? 1%? $40 million/yr
  - Simple range? Simulations of all uncertainties?

- What about attribution? Uncertain technology costs?

Realized Cost Savings

Automated demand response:

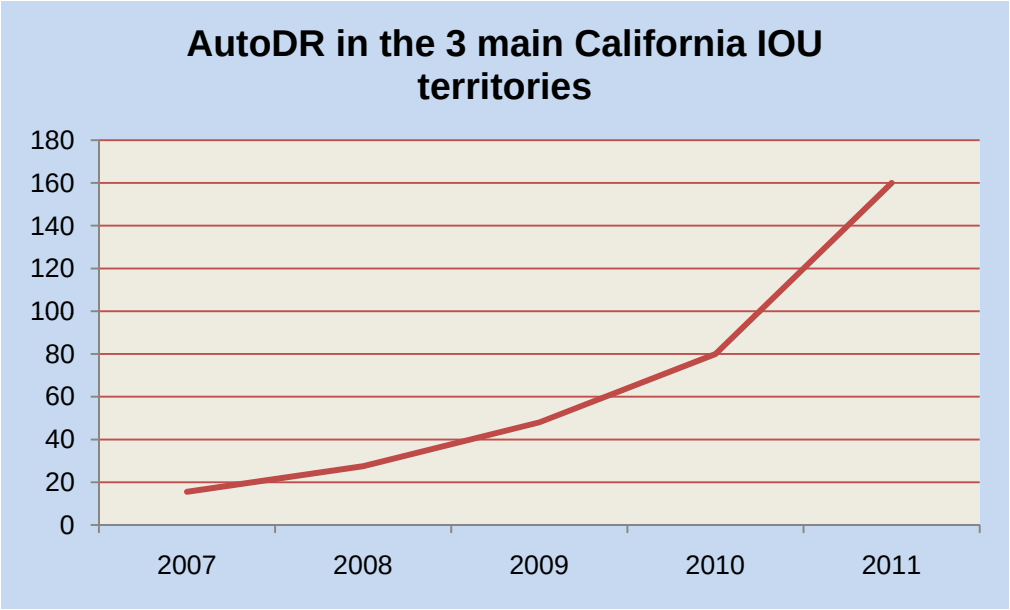
- Customer tells energy using equipment how to respond instantly to real time price signals, equipment reads prices from server
  - Customer can reduce demand, shift it, or neither
  - From conception, PIER the major funder of both hardware and software/communication components
- Already dropping peak demand 123 MW

  → save $13 million/yr (annualized) in foregone power plant construction = .01 cents/kWh
  - Net of installation and incentive costs
  - Participants saving $3 – 4 million more

Qualitative benefit: customer choice

Automating demand response to meet 2020 challenges

- Growing fast, becoming de facto standard
- Good industrial and commercial candidates could save $1.5 to $2 billion/year by 2020
- 10% penetration among these would save **$150 to $200** million/yr



How would you make a projection?

- PIER-funded grid optimization modeling shows potential for ADR replacing some storage as a way to help the grid adjust quickly to changes (ancillary services). ADR cheaper. Preliminary savings estimate: **$70- $280 million/year**

Synchrophasors + applications a smart grid technology: projections for 2020

Allowing clear visibility of grid, quicker and better responses to grid instabilities. Two types of benefits:

RELIABILITY: (cost of outage) x (reduced probability of outage)

- Gathered different expert estimates

→ Improved reliability estimates average to **$85 million/year**

ELECTRICITY SUPPLY COSTS SAVINGS (policy-dependent):

- Transmission lines can more reliably carry more electricity

  Value of the extra electricity is **$8-18 million/yr**

- Wind turbines can safely spend more time connected to grid furnishing their power

  - More hours, same wind turbine investment.
  - **$26 million to $150 million/year**

Environmental RD&D: INFORM

- PIER-funded the Integrated Forecasting and Reservoir Management (INFORM) model to:
  - Provide probabilistic forecasts of water runoff into 4 major California multi-purpose water reservoirs
  - Provide a decision support tool to assist reservoir managers with balancing water supply, hydropower generation, and other demands

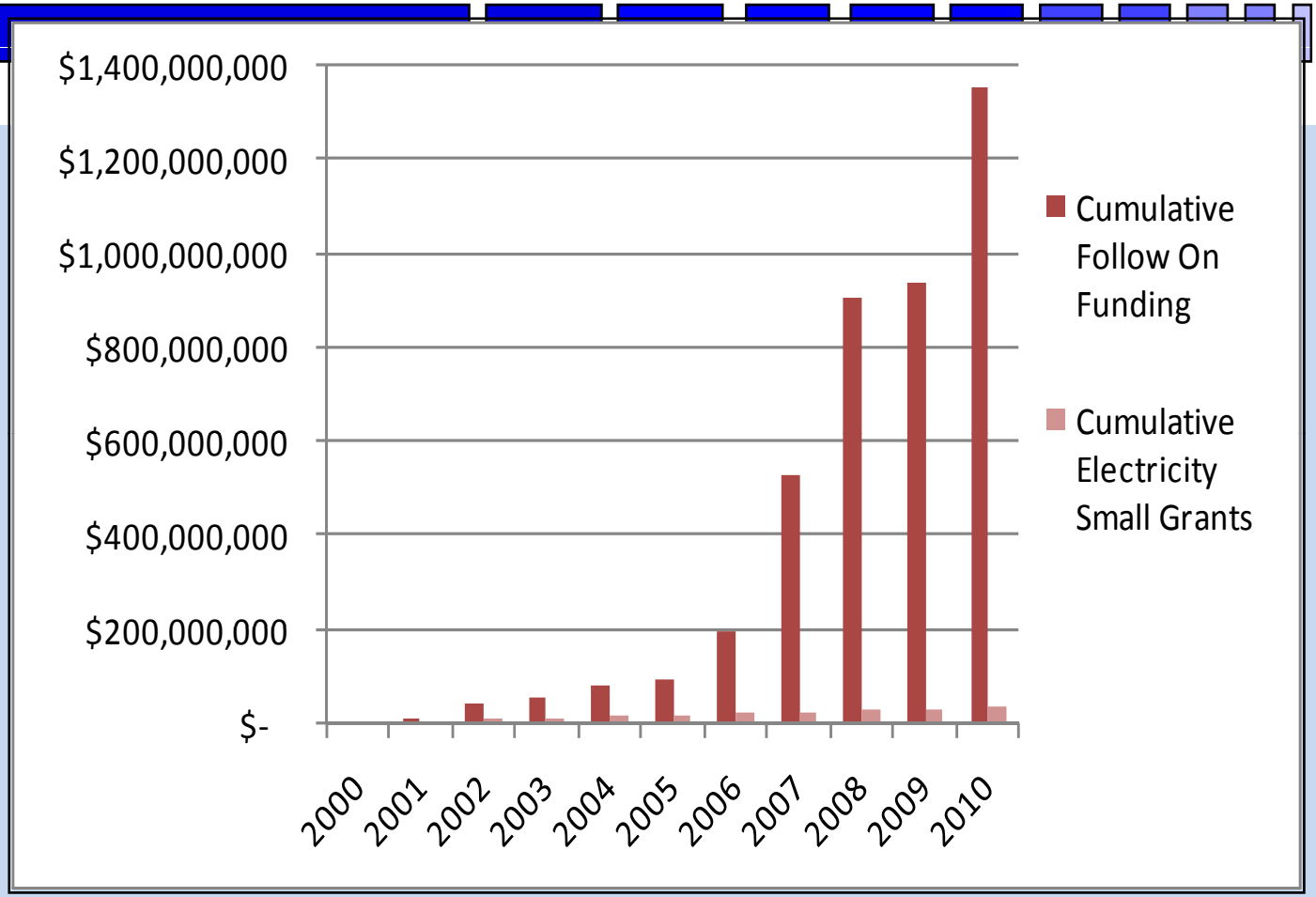
- Potential annual electricity and water (combined) savings of $15M to $82M (depending on implementation)

What about jobs?

Do you measure jobs? How do you measure jobs?

An example: follow on funding results in jobs

PIER Energy Innovation Small Grants Program (5%) of PIER expenditures: $30M has attracted over $1.2 Billion in private follow-on funding and follow-on utility investments.



Applying the concept that $100,000 investment creates one job, the Energy Innovation Small Grants Program has caused approximately 10,000 direct jobs and 20,000 induced jobs.

What types of economic analyses do you carry out?

Summary of the PIER Benefit Assessment Activities and Processes

- Benefits assessment processes apply to a wide range of energy-related RD&D projects
  - Ideas for improvement and refinement of the process are under consideration
- The activities and processes encompass various types of benefits
  - Ideas for improvement and refinement of the process are welcome

NEXT: panel