How Research Development and Demonstration can Help Advance Distributed Generation

PIER Program Overview and Renewable Generation RD&D

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Purpose of this Panel

1. Provide an overview of PIER Program's research efforts on advancing distributed generation;

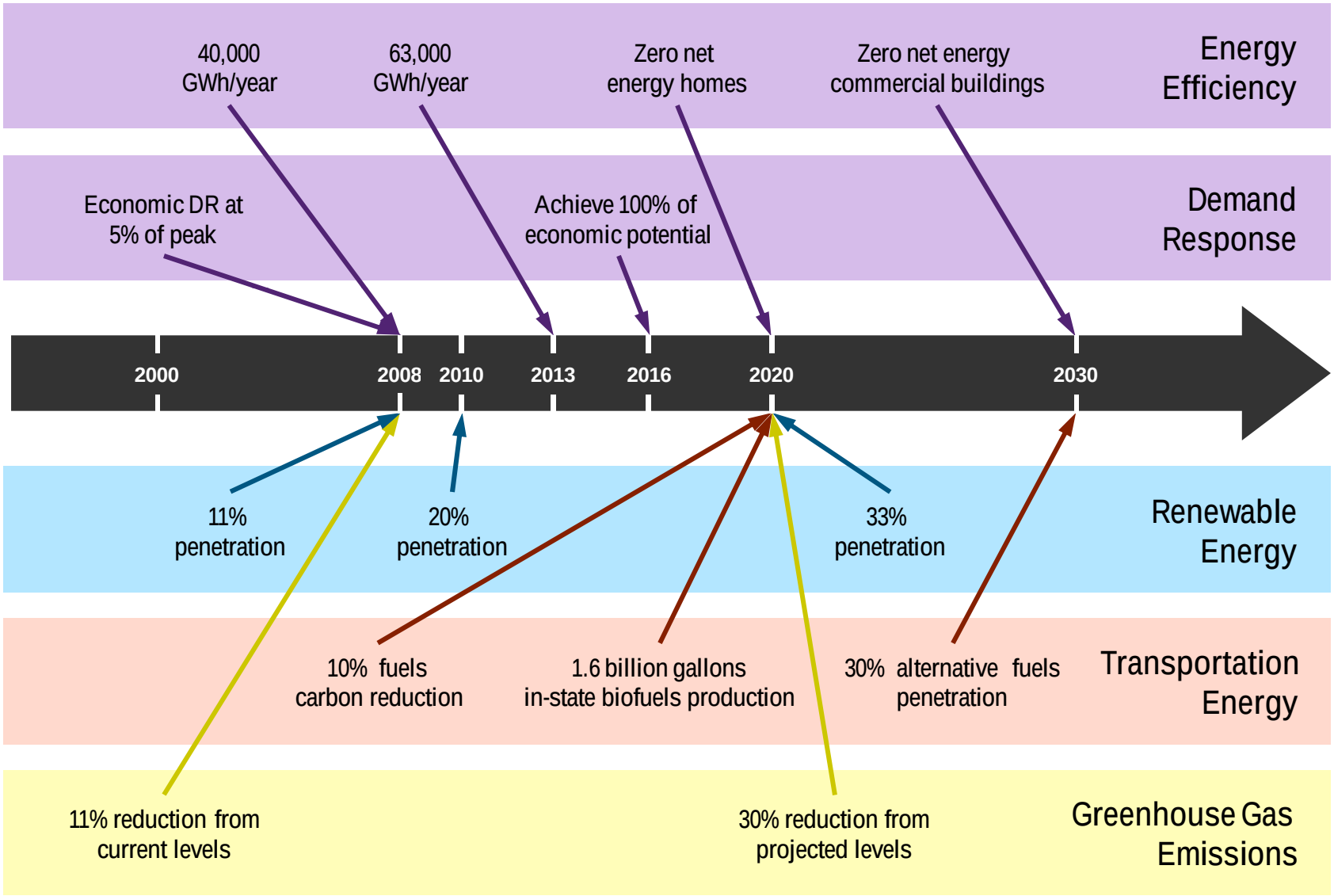
2. Present and discuss selected research activities, projects and strategies for addressing deployment barriers; and

3. Seek input from workshop attendees, renewable distributed generation stakeholders and invited experts on how RD&D can and should advance the deployment of distributed generation.

PIER Program Overview & Investment Plan

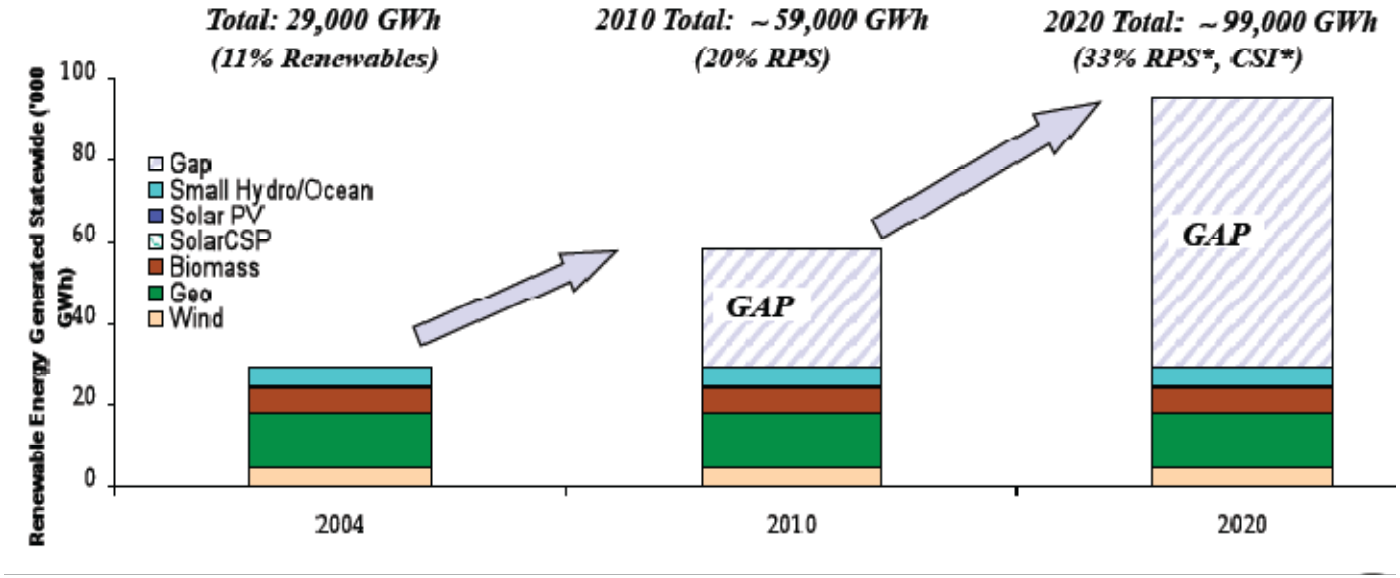
- IOU Ratepayer Funded Program
- Launched in 1997 by AB1890
- $86.5 Million Annual Budget
  - $62.5 million electric
  - $24 million natural gas
- Program Research Areas
  - Energy Efficiency & Demand Response
  - Renewable Energy & Advanced Electricity Generation
  - Transmission & Distribution
  - Climate & Environment
  - Transportation

California Energy Policy Targets



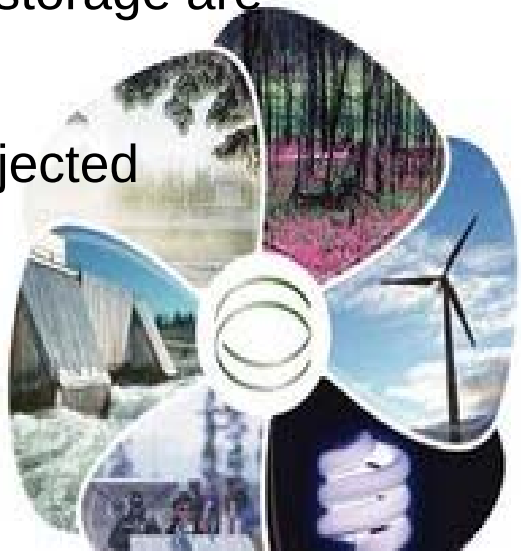
Clean Energy Jobs Plan

- **Governor's Clean Energy Jobs Plan calls for California to develop:**
  - 12,000 MW of additional distributed generation (DG) by 2020.
  - 8,000 MW of additional central station renewable generation by 2020.
  - 6,500 MW of additional combined heat and power (CHP) by 2030.



Challenges

- **High costs** of renewable energy systems in comparison to traditional forms of energy generation.
- **Regulatory and permitting issues** faced by developers of renewable energy systems include water use, animal, plant, and land use impacts, and emissions standards.
- The **intermittency** of solar and wind makes it difficult to reliably forecast the amount of renewable energy available at a given point in time. Additionally, improved forecasting and storage are critical to integration of multiple renewables.
- **Reliable resources assessment** of current and projected renewable and alternative fuels are needed**.**



Renewable Generation RD&D

Goals

- Demonstrate integration of renewable energy at the utility scale, community scale, and building scales
- Address technology integration barriers, and increase reliable access to renewable energy
- Increase renewable storage options
- Improve renewable energy forecasting

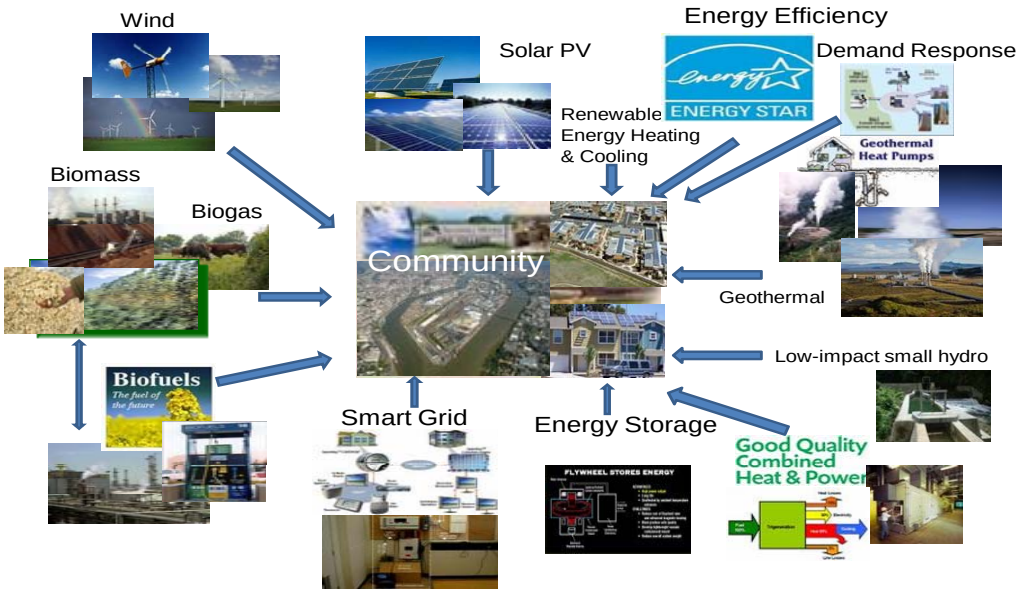
General Approach

- Focus on research to build 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

RESCO

Renewable Energy Secure Community

Building Blocks of Renewable-based Energy Secure Communities (RESCO)



- 11 projects from 2009 solicitation
  - Integration projects (8)
    - Exploratory Stage
    - Pilot Stage
    - Implementation Stage
  - Collateral projects (3)

- Communities that secure their energy supply (electricity and fuel) through indigenous RE resources
- Use of locally-available renewable resources to meet 100% of communities' energy needs

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

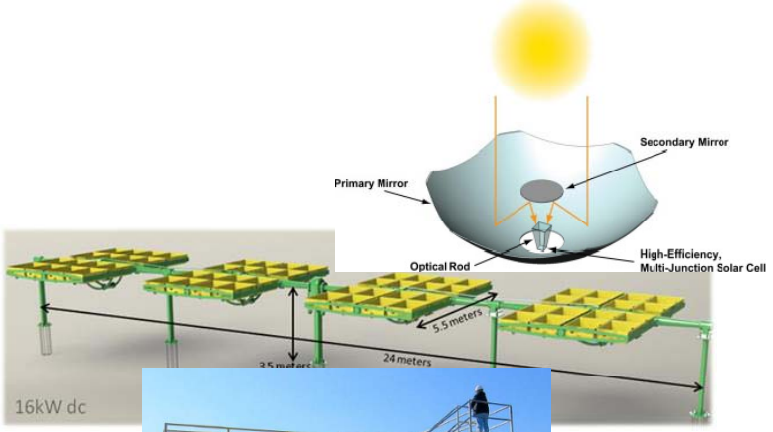
Santa Rita Jail RESCO

- 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, and
  - backup diesel emergency generation system) *[already existing]*

Under a Smart Grid environment

Other Current Research

- **Biomass**
  - *Summers Consulting* – Dairy Digesters
  - *UC Davis* – Anaerobic Digestion
- **Solar Technologies**
  - Greenvolt – Low cost CPV
  - *UC Merced* – Micro-inverters
  - *Hyperlight* – Low cost solar thermal technology



- **Environmental Mitigation**
  - *Project Navigator* – California Landfill-Based Solar Photovoltaic
  - *UC Irvine* – Energy, Air Quality, Water, and Climate Change Co-benefits of Renewable Generation and Fuels Roadmap.
- **ARRA Cost-share**
  - *SMUD* – Community Scale Renewables

How Research Development and Demonstration can Help Advance Distributed Generation

1. **What is the role of RD&D in advancing distributed generation and helping achieve the Governor's Clean Energy Jobs Plan and other current and future state policy goals such as the Renewable Portfolio Standard and AB 32?**

2. **Please comment on the maturity of distributed generation technologies. Which technologies or components should RD&D efforts focus on to address some of the barriers for advanced DG deployment?**

3. **Are currently existing technologies and tools enough to power facilities with nearly 100 percent renewables in a technically and economically feasible manner? What are some emerging technologies that may be able to reduce costs when produced at scale?**

4. **What issues impede the deployment of distributed generation technologies in utility distribution territories that RD&D can help address? If so, please identify the issue and how RD&D can help in a manner that benefits both the utilities and customers.**

5. **What other future research direction, focus, strategies or initiatives may be recommended for PIER to undertake so that RD&D can better help advance DG?**