

EPIC TRIENNIAL INVESTMENT PLAN 2015-17**Proposed Energy Research Initiative
Questionnaire**

CALIFORNIA ENERGY COMMISSION



Title of Proposed Initiative (Short and concise): Secure and Interoperable Distributed Generation Management System.

Investment Areas (Check one or more):

- Applied Research and Development
 Technology Demonstration and Deployment
 Market Facilitation

Electricity System Value Chain (Check only one):

- Grid operations/market design
 Generation
 Transmission
 Distribution
 Demand-side management

California Energy Commission

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Issues and Barriers:

To enable reliable and cost-effective energy use, and provide markets and operations for Smart Grid with de-centralized and distributed generation, there are lack of technologies, tools, and secure Smart Grid interfaces that distributed energy resources (DER), demand response, storage, and electric vehicles can use to leverage better grid operations, distribution management, and market competitiveness. There are many different open interfaces within the distributed generation (e.g., IEC, OpenADR, SEP, etc.); however, there is no platform to enable electricity service providers and new generation resources to interoperate and communicate using non-proprietary interfaces. Such system will enable a non-existent integration and interoperability of dynamic distribution and demand-side management systems.

Initiative Description and Purpose:

California's aggressive clean energy generation goals require 33% of annual retail sales from renewable sources by 2020. By the end of 2013, the renewable generation capacity, from both customer- and grid-side distributed systems, was ~3,500 MW. This included ~100,000 installations of 1 GW of Solar PV by 2011 with plans for one million solar rooftops by 2018. For effective integration and use of this massive renewable and distributed generation, California also requires 12 GW of distributed generation and 4 GW of Combined Heat and Power sources and an intelligent distributed grid. This is a paradigm shift of centralized electricity generation to a de-centralized or distributed generation. The technologies and tools from this project will enable reliable and cost-effective energy use, and provide market services and operations for Smart Grid with de-centralized generation. The secure and interoperable interfaces could enable flexibility with distributed energy resources (DER), demand response, storage, and electric vehicles to leverage efficient and cost-effective use of generation resources.

Proposed funding level: \$2M to \$3M

Stakeholders: Retail electricity sellers and/or distribution system operators, state regulators and transmission system operators, generation sources, and electricity customers, vendors and technology integrators that link electricity generation and consumption.

Background and the State-of-the-Art:

California Energy Commission's Public Interest Energy Research Program (PIER) has funded activities to provide open interfaces between electricity service providers and customer-side DR and DER management. There are other initiatives by the IOUs to provide automated metering infrastructure and

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ZigBee-based smart metering solutions. However, with increased distributed generation and storage (e.g., solar, wind, batteries), there is no effective way to tie these previous work with these new technologies and manage the electric grid of the future. As an example, OpenADR development over last 10-years through PIER funds has been immensely successful with about 250MW of enrolled automated DR capacity in California IOUs, its recognition as the U.S. standard for DR and DER communication, and over 100 utilities, vendor, research, and institutional members supporting it. This lab-to-market technology has evolved through research, lab-scale testing, demonstration, pilot-scale testing for pre-commercial demonstration, pre-commercial scale deployments, and finally create pathways toward market research and facilitation.

We will leverage this experience, technology innovation and other related projects that are funded by the DOE and ARPA-E in the area of energy systems and grid integration, distribution network management (micro PMUs), and low-cost metering and telemetry.

Justification:

- Distribution grid, and interfaces to customer-side distributed energy resources – potential to efficiently and cost-effectively use the 33% renewable generation, 12 GW of distributed generation and 4 GW of new CHP, and 1,325 MW of electricity and thermal storage goals by 2020.
- Develop and demonstrate the technology using the utility, research, and vendor participation.
- The market potential is immense – it will enable the use of disparate distributed generation resources and allow markets to evolve for its effective consumption among customers.
- We anticipate this will foster new clean energy technology jobs and revolution that the utilities can build into their existing network. It is difficult to give exact numbers without some analysis.
- National laboratories are typically geared to conduct such research that have larger societal benefits and enable competitive markets for technology solutions, leveraging the public funding.

Ratepayer Benefits (Check one or more):

- Promote greater reliability
- Potential energy and cost savings
- Increased safety
- Societal benefits
- Environmental benefits - specify
- GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost
- Low emission vehicles/transportation
- Waste reduction
- Economic development

Enable effective integration and use of this massive renewable generation and distributed systems, thus enabling clean energy markets and use among customers.

Public Utilities Code Sections 740.1 and 8360:

- Aligns with the electricity restructuring code **330-332.2** for electricity generation markets to enable innovation, efficient, and better service for all market participants at a low cost.
- Enable private energy producers to use utility market structure to effectively sell clean energy.
- Integration of energy storage, solar, wind energy systems within the distribution network, etc.