

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

CALIFORNIA ENERGY COMMISSION



**Title of Proposed Initiative** (Short and concise): Low-Cost Metering and Telemetry for Wholesale and Retail Market Integration.

**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:**

In order to allow California's demand side resources to provide load balancing and grid reliability services to California's wholesale energy markets, these resources must be able to provide real time telemetry and must be capable of rapidly responding to signals from market operators. The grid reliability problems presented by distributed energy resources (DER) will become increasingly severe as California moves toward its goal of adding 33% renewable energy by 2020. The key barriers that currently prevent the demand side from providing grid services are the cost and complexity of deploying high performance and scalable telemetry and response automation infrastructure. These issues and their development barriers are part of current CAISO discussions.

**Initiative Description and Purpose:**

This project will develop cost effective and scalable low cost metering and telemetry solutions to allow any demand and distributed resources within the distribution network to participate in wholesale markets. The results of this effort will advance California Rule 24 for direct participation of retail utility customers with wholesale markets and grid services infrastructure. Such low cost telemetry technologies will make customers better able to support improved grid operations. While the current AMI initiatives within the distribution system has certain benefits, for advanced integration of wholesale and retail DR markets, this technology will support California goals to better integrate renewable generation, distributed generation, and electric vehicles into the electric grid, and will enable the transition toward price-responsive demand.

**Proposed funding level:** \$1.5M to \$2.5M

**Stakeholders:** CA Utilities, CAISO, customers, regulators, and vendors.

**Background and the State-of-the-Art:**

The utility or aggregator receives millions of data points every minute that are tagged with a location in the distribution grid. They take the minute average power readings for a particular local area, aggregate them, and calculate demand vs. the capacity of the upstream distribution resources (considering local renewable energy generation etc.). We will apply a price to demand given the available capacity, add the price of the locational marginal price (determined by the CAISO and the transmission grid market), and add some additional fixed price related to overhead. For each specific location in the distribution grid, we then make that price available to the few dozen endpoints at the location. We do this for hundreds of thousands of endpoints in our system, and we provide updated state estimates on a 1-minute (or 2.5 minute, some value that makes sense) basis. We have to calculate our entire grid state at least every 5 min so that we can set

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price at the next interval. This will require some serious low-cost metering and telemetry solutions that is secure and interoperable and is not supported by any of the current technologies.

We have experience of such developments through related CEC, CPUC, DOE, and ARPA-E projects.

We will leverage this experience, technology innovation and other related projects that are funded by the DOE and ARPA-E in the area of low-cost metering and telemetry.

**Justification:**

- Potential to efficiently and cost-effectively use the 33% renewable generation, 1,325 MW of electricity and thermal storage goals by 2020 using flexible demand-side resources.
- Develop and demonstrate the technology using the utility, research, and vendor participation.
- The continued uptake of market potential is immense – it will enable the use of demand-side resources and customer end uses to participate in retail and wholesale DR markets.
- We anticipate this will foster 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 demand-side resources to better enable integration of clean energy generation and lowering the reliance on fossil-based peaking plants.

**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.