STATE OF CALIFORNIA

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

California Energy Commission
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CALIFORNIA ENERGY COMMISSION

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(This is a Request for Information only - Complete Pages 1 and 2 for each initiative)

Distribution Operator Strategy and Tools for the future smart grid

Investment Areas (Check one or more) – *For definitions, see First Triennial Investment Plan, page 12*:

☒ Applied Research and Development
☐ Technology Demonstration and Deployment
☐ Market Facilitation

Electricity System Value Chain (**Check only one**): *See CPUC Decision 12-05-037, Ordering Paragraph 12.a. http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF.*

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

Issues and Barriers:

The introduction of more active, responsive resources into the distribution system is limited by the inability of the existing distribution operations systems to monitor, control and communicate the impact of distributed Energy resources (DER) remotely with certain parts of the distribution network. Therefore, distribution engineers' and operator's visibility to distributed energy resource is limited. As penetration rates of DER increase, they introduce challenges including reverse power flows and potential instability, particularly when coupled with distribution automation.
Distribution Management Systems (DMS) currently address limited set of issues, such as visualization of outages using AMI, and normally focus on specific areas of expertise of the vendor. DMS systems are not well developed to address the whole future grid. Tools utilizing the standards and control algorithms are needed to be developed in partnership with a DMS vendors to visualize and control pilot smart grid schemes, and DER.

Initiative Description and Purpose:

The initiative will address these challenges by creating operational guidance, and DMS integration with communication standards for development of advanced DMS. The application and enhancement of existing data standards such as IEC 61968, will address optimal communication strategy, control signals and algorithms and high penetration DER strategy for operators. Using this characterization and communication and control schemes will be developed and demonstrated to allow the measurement and control of smart grid components.

Describe knowledge to be advanced to overcome critical barriers.

- How to measure and communicate measurements to plan and operate the grid with increasing DER. Limited understanding of required levels of distribution grid measurement for increased DER
- Gaps and enhancements needed for communication standards as well as understanding latencies for measured grid data
- How to standardize and/or automate validation of grid models
- Evaluate the impact of automation on renewable interconnection
- Lack of open interfaces to access distributed generation data and linking them to demand

Recommended Funding

$1M to $2M

Stakeholders:

DMS Software vendors (Schneider, Eaton,etc)., Inverter manufacturers, PV & EV integrators, IOU's, PU's

Background and the State-of-the-Art:

- What research development and demonstration has been done or is currently being done to advance this technology or strategy (cite past research as applicable)?
- Describe any public and/or private successes and failures the technology or strategy has encountered in its path through the energy innovation pipeline: lab-scale testing, pilot-scale testing, pre-commercial demonstration, commercial scale deployment, market research, workforce development.
- Identify other related programs and initiatives that deal with the proposed technology or strategy, such as state and federal programs or funding initiatives (DOE, ARPA-E, etc.).

Pilot demonstration of DMS at IOU's with DMS vendors, integration and visualization of AMI. Pilot is limited by AMI communication

ARPA-E funding initiatives in to advanced grid sensors and visualization of renewables
CSI RD&D 1 – 3 funding initiatives
IEC 61968 Standard for Common Information Model/Distribution Management

Leverage other initiatives that can provide interoperable access to distribution data and thus improve system operator's dispatch and visibility for grid reliability and efficient integration of grid-side generation.

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Justification:

This project would integrate and visualize the key technologies of a future distribution grid addressing EPIC and state goals. This project will benefit the IOU's, the EPIC program and California and satisfy CPUC Code 740.1 in the following ways:

- Demonstration of technology and visualization will develop lessons learned and use cases for numerous synergistic technologies, which IOU's can build from
- Better utilization of renewable resources and demand response will offset growing need for replacement of aging distribution equipment, and build a better distribution grid for 2020 and beyondsh
- Enhance security and reliability of supply, improve reliability indices during major events
- Increase penetration of distributed renewables, allow for management of the changing load profile
- Reduce costs of manual switching
- Improve safety – less field crew interaction with devices
- Assist California in meeting renewable standards goals by enhancing integration of distributed resources
- Improvement in distribution circuit load factor and available capacity and therefore allowance for higher renewable penetration at the distribution level
- Improved efficiency of distribution grid due to: use of smart PV inverters and better circuit control and operations algorithms programs
- Improved measurement and visualization for both local utility's use and management of distribution circuits and potentially PV owner's use/optimization/participation in other incentive programs.

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