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California Energy Commission
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Title of Proposed Initiative:

Standardized Distributed Resource Modeling to Support Grid Operations

Investment Areas:

☒ Applied Research and Development

Electricity System Value Chain:

☒ Demand-side management

Issues and Barriers:

A full operational integration, economic dispatch, and utilization for grid reliability of Demand Response (DR) and Distributed Energy Resources (DER) require representation of the resources' operating characteristics in the form of computer models. Currently, limited modeling standards are available to properly represent demand-side resources for the type of operations needed for full grid economic and reliability applications. Unlike standards established for modeling various types of power plants, e.g., parameters needed to determine operating modes, ramping capability, operating limits, cost curve, etc., standards for modeling distributed resources such as large HVAC systems, thermal storage, etc. do not exist. The proposed standard modeling initiative facilitates incorporation of DR and DER into such applications as forecasting, unit commitment, economic dispatch and network analysis, which are important for full integration of these resources with grid operations.

Initiative Description and Purpose:

This initiative will include a systematic investigation of the modeling requirements for integration of DR-DER into grid operations for economic and reliability applications, assessment of available and applicable IEEE, IEC and other standards, classification of DR and DER assets for modeling purposes, development of preliminary modeling standards for different asset classes, stakeholder workshops, establishment of final recommendations, and working with standards organizations for formalization of the recommendations.

The project team must have in-depth experience in grid operational requirements, operational capabilities of DR and DER assets, and underlying business and technical objectives. These objectives will include utilization of the DR and DER assets for supply of energy, ancillary services, flexibility reserves, and balancing energy; as well as incorporation of these capabilities in economic dispatch considering assets' operational, dynamic response, and cost characteristics, among others.

The funding requirement for this project is $500,000 to $750,000 USD.

Stakeholders:

The following stakeholders are the most relevant to the proposed initiative:

- California Energy Commission
- California Independent System Operator
- IEEE and IEC standards committees
- Leading distributed resource vendors
- Major IOU representatives – system operations and technical/engineering groups
- Power system and market applications and optimizations vendors

Background and the State-of-the-Art:

The following research development and demonstration initiatives have been conducted to advance the proposed technology or strategy:

- IEC 61970 (CIM) and 61968 modeling standards
- IEEE 1547
- CAISO generation resource modeling standards and requirements

Various vendors have developed limited models to support integration of DR and DER with energy market and grid reliability operations, but these do not address requirements to support full operational lifecycle from planning, forecasting, scheduling, dispatch, and settlements.

There are related standards that deal with the proposed technology or strategy, e.g., OpenADR 2.0, Smart energy profile 2.0, CIM, MultiSpeak, and IEEE 1547, but none address the intended requirements.

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Justification:

This initiative will facilitate the full integration of DER and DR with energy markets and grid operations, promoting vendors developing interoperable applications and systems and thus reducing the overall cost of the technology deployment and facilitate full integration of distributed clean energy resources with grid operations providing greater level or operational and economic efficiency.

Utilities, CAISO, vendors, and distributed energy vendors will be impacted by, and will directly benefit from, these standards. Consumers will receive indirect benefits through improved operational efficiency of the grid and energy markets.

Ratepayer Benefits:

☒ Promote greater reliability
☒ Environmental benefits (RPS, REC)
☒ Potential energy and cost savings

Based on historical analyses of energy and ancillary service prices in CAISO market, each additional MW of DR enabled through improved standardization and modeling of resources proposed here results in an approximate net present value of $800,000 USD benefits for the state of California. Details can be offered upon request.

Public Utilities Code Sections 740.1 and 8360:

The proposed initiative addresses the following PUC principles:

- Increased use of cost-effective digital information and control technology to improve reliability, security, and efficiency of the electric grid
- Dynamic optimization of grid operations and resources, including appropriate consideration for asset management and utilization of related grid operations and resources
- Deployment and integration of cost-effective distributed resources and generation, including renewable resources
- Development and incorporation of cost-effective DR, demand-side resources, and energy-efficient resources
- Deployment of cost-effective smart technologies, including real-time, automated, and interactive technologies that optimize the physical operation of appliances and consumer devices for communications concerning grid operations and status and distribution automation
- Integration of cost-effective smart appliances and consumer devices
- Deployment and integration of cost-effective advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles and thermal-storage air-conditioning
- Develop standards for interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid

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