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2018-2020 EPIC Triennial Plan Project Description

Additional submitted attachment is included below.

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The Energy Commission is currently soliciting ideas and stakeholder input for the 2018 – 2020 EPIC Triennial Investment Plan. For those that would like to submit an idea for consideration in the 2018-2020 EPIC Triennial Plan, we ask that you complete the form below. Submittals are due by **5:00 p.m. on February 10, 2017.**

Part 1. Initiative Description and Purpose:

1. Please provide a brief description of the proposed initiative:

The proposed initiative will demonstrate a Transactive Energy System (TES) utilizing distributed intelligent computing resources. A TES is a collection of regional computing and communication resources that link together utility and customer distributed energy resources, smart meters and other utility sensing equipment, and exchanges information about grid conditions, energy price, weather, opt-in smart customer devices and grid-edge systems, allowing for new or improved operations, analytics and planning capabilities across the energy ecosystem. The proposed initiative will demonstrate the information exchange between the utility and select customers about satisfaction and energy flexibility, and test technology using that data to optimize real-time and day-ahead energy and capacity operations. Finally, the initiative will demonstrate the financial technology system used to represent the value of DER as an energy market portfolio asset and optimize its use as a security constrained economic resource. Signals exchanged between system participants will be demonstrated to inform planning and operations decision making, for utilities, system operators and utility customers. The initiative will demonstrate a customer oriented local forward price curve, and a detailed forward demand curve for grid operators, as a new tool for utility operations and market coordinator roles to address planning, local power quality and system reliability challenges from DER penetration.

2. What technical and/or market barriers would the proposed initiative help overcome? For scientific analysis and tools, what knowledge gaps would the proposed initiative help fill?

(Technical 1) Demonstrations of behind-the-meter technology and utility operations technology used together in a transaction based system to balance supply and demand are limited in the industry. The proposed initiative would demonstrate such a system to test new low-power-wide-area communications telemetry, AMI systems and low cost sensors as an integrated communication and measurement system resource tied to utility and customer analytics, with broad benefits extended even to customers that are not directly participating.
(Technical 2) There are limited trials of such technology within network orchestrator roles such that utilities will benefit and may learn from.
(Market 1) The initiative can offset the bargaining power of existing suppliers for grid energy and their economy of scale, by empowering customer choice for additional DER energy services and products.
(Market 2) The initiative will assist utilities overcome the market barrier of a threat of substitutes, such that the utility enterprise will be able to leverage its existing operations skillset to develop new services that will benefit customers, including a management role in extending wholesale market advantages to customers that are willing to offer additional flexibility in their energy profile.

The gap that calls for development of transactive energy systems is emerging quickly from fast development of distributed energy resources, the increased need for demand side management, and distributed intelligent grid control and aggregation players competing in parallel to own or influence the customer relationship ahead of the traditional utility and/or system operator. Notably, there is a lack of acceptable international standards and approaches to align such interests across wholesale and retail markets, and a lack of standardized control methods for management of customer systems in parallel with distribution system constraints and market functions.

Part 2. Benefits and Impacts

3. If this initiative is successful, either fully or partially, what would be the expected impact? Who are the primary users and/or beneficiaries?

Reliability: Deployment of a TES will demonstrate new insight into customer loads, customer responsive energy system management (load and generation), and improve data available for engineering practices related to ongoing operations and maintenance, network design, and protection services. The initiative will impact the future development of retail markets for reliability centric energy services offered between utilities, customers, energy service providers, and emerging industry stakeholders as an example for future market development and DER grid integration.

Increased affordability, effective use of ratepayer monies, and operational efficiency: Deployment of a TES will provide a new source of data to optimize grid operations in real-time and day-ahead, and contribute to lowering the cost of energy required to balance supply and demand through the effective use of DER. TES network orchestration enables more financial benefits from optimization of DER to pass directly to the customer, as well as improving planning capabilities of utility and regional energy stakeholders from an operator and engineering perspective.

Customer experience: Deployment of a TES will assist customer service in designing distributed energy and demand side management programs that improve customer satisfaction. It will provide the mechanism whereby customers may realize greater value from their investments in DER since the system will provide the means to monetizing the value of their DER and support new market activity.

Environmental benefits: Deployment of a TES allows further optimization of distributed resources in real-time that can offset the use of larger spinning reserve and energy resources often using fossil based fuels. It will incentivize customers to invest in DER (including solar DG, energy storage, demand response) because they will be able to monetize more of the value stream thus reducing the need for fossil based fuel generation.

4. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed initiative:

Impacts will be quantified in terms of (a) power marketing, such as load forecasting improvement, and portfolio optimization comparing security constrained and price constrained economic dispatch perspectives with and without TES resources, and qualitative improvement of situational awareness of DER operations; (b) distribution operations analytics, such as load forecasting improvement, prediction of system conditions, and customer reliability and power quality metrics; and (c) customer satisfaction metrics, such as qualitative assessment of satisfaction with DER management, and quantifying and qualifying the leverage of local DER generation and load management in terms of baselines for cost of service, power quality and reliability.

5. Please provide a list of peer-reviewed references that support the responses for questions 3 and 4. Proposed initiatives that include peer-reviewed references will be given stronger consideration.

Department of Energy, 2016. "Valuation of Transactive Energy," PNNL Report 25323.

Pacific Northwest National Labortatory, 2015. "Technology Performance Report," http://www.pnwsmartgrid.org/docs/PNW_SGDP_AnnualReport.pdf

Chassin, David P., and Lynne Kiesling. "Decentralized coordination through digital technology, dynamic pricing, and customer-driven control: The gridwise testbed demonstration project." The Electricity Journal 21.8 (2008): 51-59.

Siano, Pierluigi, and Debora Sarno. "Assessing the benefits of residential demand response in a real time distribution energy market." Applied Energy 161 (2016): 533-551.

Khodayar, M. E., S. D. Manshadi, and A. Vafamehr. "The short-term operation of microgrids in a transactive energy architecture." The Electricity Journal 29.10 (2016): 41-48.

6. (For technologies only) What competitive advantages does the proposed technology solution have over current benchmark technologies? If the technology is beyond the prototype stage, what strategies do you suggest to bring to scale?

The proposed solution would utilize a low-cost, low-power, wide-area sensor network in addition to other available grid operations data streams to accomplish the optimization of local and regional resources.

The proposed solution would utilize a cutting-edge open-source platform to host the computational intelligence required for grid resource optimization.

Part 3. Connection to Energy Commission's EPIC Framework
Energy Commission staff have developed a draft strategic framework to guide the CEC's planning and implementation of EPIC across triennial investment cycles. One of the objectives of the draft strategic framework is to communicate a consistent set of priorities for organizing current and future EPIC investments.

7. Please indicate which of the following strategic framework themes you feel the proposed initiative best fits within:
    - Advance Technology Solutions for Deep Energy Savings in Building and Facilities
    - Accelerate Widespread Customer Adoption of Distributed Energy Resources
    - Increase System Flexibility from Low-Carbon Resources
    - Increase the Cost-Competiveness of Renewable Generation
    - Create a Statewide Ecosystem for Incubating New Energy Innovations
    - Maximize Synergies in the Water-Energy-Food Nexus
    - Develop Tools and Analysis to Inform Energy Policy and Planning Decisions
    - Catalyze Clean Energy Investments in California's Underrepresented and Disadvantaged Communities

If Other, Please Specify