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Data-driven microgrid planning for community resilience

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:

Strategically planned microgrids and distributed energy resources (DERs) can provide significant economic and environmental benefits. This proposed initiative aims to further enhance the viability of microgrids and DER by positioning them as strategic assets for community resilience. As an example, this initiative could leverage the data created by Prop. 39 on energy usage in schools to develop data-driven models for the sizing and placement of strategic microgrids at schools around the state. School facilities are already seen as community centers and shelters and thus providing them with an independent energy source after natural disasters could prove vital recovery and emergency services provision. By quantifying the additional benefits of microgrid and DER for schools, this initiative would help accelerate their widespread adoption across the state. And, because schools are ubiquitous, it could also prioritize tools targeted for disadvantaged communities.

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?

Current tools for microgrid and DER planning are limited in their ability to harness smart meter and/or satellite imaging data and quantify the potential benefits to community resilience. This initiative would build upon previous work by adding both of these components to a microgrid/DER planning tool.

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?

If successful, this initiative would provide a model and tool that would allow state agencies, local governments, utilities to analyze the energy usage profiles of schools across their respective geographical area and identify schools that are best suited for the placement of DERs that maximize the economic, environmental, and community resilience benefits. Additionally, schools could utilize the tool to size a potential DER system and quantify/understand the economic, environmental and community resilience benefits based on energy usage data and satellite imaging.

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

Quantitative metrics - performance of developed models to previous work, adoption of DER by schools, capacity of new DERs installed, economic/environmental/resilience benefits of new DER installations

Qualitative metrics - satisfaction of state and local agencies/utilities in tool usability, satisfaction/usage by schools, perception of citizens on enhancement of resilience in their communities

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.

Khodaei, Amin. "Resiliency-oriented microgrid optimal scheduling." IEEE Transactions on Smart Grid 5.4 (2014): 1584-1591.
Strbac, Goran, et al. "Microgrids: Enhancing the resilience of the European megagrid." IEEE Power and Energy Magazine 13.3 (2015): 35-43.
Fares, Robert L., and Michael E. Webber. "Combining a dynamic battery model with high-resolution smart grid data to assess microgrid islanding lifetime." Applied Energy 137 (2015): 482-489.
Alarcon-Rodriguez, Arturo, Graham Ault, and Stuart Galloway. "Multi-objective planning of distributed energy resources: A review of the state-of-the-art." Renewable and Sustainable Energy Reviews 14.5 (2010): 1353-1366.
Desideri, Umberto, and Stefania Proietti. "Analysis of energy consumption in the high schools of a province in central Italy." Energy and Buildings 34.10 (2002): 1003-1016.
Ronan, Kevin, and David Johnston. Promoting community resilience in disasters: The role for schools, youth, and families. Springer Science & Business Media, 2005.

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?

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

Catalyze Clean Energy Investments in California's Underrepresented and Disadvantaged

If Other, Please Specify

Accelerate Widespread Customer Adoption of Distributed Energy Resources