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QQForward DER Research Need: How Can DER Work in Disadvantaged Communities (DACs)?

Additional submitted attachment is included below.

DER Research Needs Template

Summary

The California Energy Commission (CEC) is collecting research topic suggestions for the DER Research Roadmap that will guide the CEC's short (1-2 year), medium (3-5 year) and long (5-10 year) term DER strategy. While these suggestions will be used to inform the DER Research Roadmap, they are preliminary guidance and do not need extensive detail. However, the most successful suggestions will demonstrate alignment with California's energy goals and support ratepayer benefit claims. The process by which these Research Needs will be evaluated will be described in the presentation for the 7/25/19 Public Workshop located at the link below: https://www.energy.ca.gov/research/distributed-energy-resource-roadmap/

Instructions

1. Brief Description: Please provide a brief summary of the suggested research.
2. EPIC Investment Area: Please select which of the three historical CEC EPIC program areas this research would be expected to fall under.
3. Policy Goals Addressed: Please identify any regulatory mandates, legislative requirements or other state goals that this research would support.
4. Barriers Resolved: Please describe what current technical DER limitations the research is expected to alleviate. The Technical Assessment at the link above has identified some barriers, but feel free to describe additional ones.
5. Metrics Impacted: Please describe how the research will measurably improve DER cost or performance.
6. Benefit to Ratepayers: Please identify how the projected DER improvements will benefit California ratepayers using the categories on the next tab.
7. Level of Effort: Please provide a rough budget and timing estimate for the research idea, as well as any pre-requisite research or further research it enables.

1. Brief Description

While concerns for social equity and environmental justice have grown in California as a result of mandates focusing on disadvantaged communities (DACs), there is a long history of energy efficiency and energy subsidy programs targeting low-income and minority households in the state. The results have been quite mixed and we can learn from that experience. Experts in low income weatherization report poor quality of DAC housing stocks and severe lack of resources in those communities, which may well mean that DER strategies, technologies, interventions, and integration that can “work” in more affluent areas may not be applicable (or functional) in DACs if implemented as a “one-size-fits-all” solution. This is not recognized in the conceptual framework of the current version of the DER Roadmap. But it is not a small problem that can be easily set aside as an end-of-the-R&D-pipe as marketing to the “hard-to-reach customers” (the conventional energy efficiency policy approach). Census data show that in California 15% of the population (currently 6 million persons) have incomes below the Federal poverty level. An additional 18% between poverty and 150% of the poverty line. The California EPA CalEnviroScreen 3.0 analysis identifies 2,007 DAC census tracts with a total of 9,356,890 Californians living in them in 2010—about 25% of the state’s population.

It will be very challenging for DER integration to take place in these DAC areas and for low-income populations across the state. These groups are too large to set aside as a “hard-to-reach” customer marketing problem. Affluent households with new housing, highly integrated digital systems, and tech savviness are the natural audience in the residential sector for PV/EV/EE/DR/storage grid-interactivity and micro-grid potentials. But in DACs, issues of poor housing quality, old and inefficient technologies, lack of digital communications infrastructure, and a host of human and financial constraints mean that DER configurations imagined to work elsewhere will not be adopted and/or will do poorly in DACs if imposed. In addition, the burdens of high peak rates, distant load control, de-energizations, exposures to heat and increased air pollution, and so on may well fall on households in DACs who are least resilient and resourced to deal with the requirements of DER integration.

So a special emphasis on DACs in DER integration RD&D is needed to address unique conditions and challenges. Under the Energy Commission's “EPIC Challenge: Accelerating the Deployment of Advanced Energy Communities,” pilot demonstrations are being conducted at some DAC test sites. While the results will be informative, it will take time to build out those systems, and the outcomes may be fairly site-specific—i.e., rather than offering models that can be quickly deployed in other locales or scaled easily to the state level. So we envision a series of linked studies that carefully examine DER in the DAC context, using a combination of quantitative, qualitative, simulation, and collaborative analyses. The work would be conducted in five stages, each building on the earlier work.

(1) Reviews of existing literatures, including scientific research on energy, programs, policies and low-income, minority and other disadvantaged energy-user populations; along with media accounts and official reports from past energy emergencies; intervention case studies; low-income weatherization program records and evaluations, other government and NGO reports and documents. A synthesis would identify key factors and processes at the DAC level related to technology adoption and use, consumer understandings, localized social and cultural practices, and equity issues and implications for technology design and policy. Of particular importance are factors that highlight patterns and differences among DACs in terms of interactions with technologies, energy use and demand patterns, capacities, and barriers that may vary across the state and across population subgroups.

(2) Inventory the current energy, technology and DER situation for California DACs in terms of housing stock, technology, and energy use and demand levels, drawing on a variety of quantitative data sources. Ground-truth with local experts, field observations and interviews with DAC community members to flesh out and refine characterizations. Consult with grid managers and distribution utilities about technical issues, plans, forecasts, and future expectations (esp. related to climate change and grid operations) for specific DACs and utility supply circumstances.

(3) In collaborations involving social researchers, DAC agencies and NGOs, and DER integration engineering/physics/policy-regulation teams, develop a range of prototype DER configurations or build out options/scenarios for different balances of EE, DR, PV, EV, storage, etc. Use these prototype configurations to simulate relative performance and applicability to the range of localized DAC conditions identified.

(4) Collaborate with low-income weatherization agencies, environmental justice groups, local governments in DACs, and community members to assess plausibility, issues and barriers to different DER configuration prototypes. Particularly identify issues in human-device and household-grid interactions/integration that pose challenges for actual DER integrated functioning at multiple levels (i.e., household, distribution network, community, grid, etc.).

(5) Identify areas where redesign of DER configurations to better suit various DAC cases would be appropriate, as well as assess needs for new (hitherto unimagined or known but not conventional) technologies and policies, as well as possible locally tailored intervention strategies for DER integration and build out in DACs across the state.

2. EPIC Investment Area

Applied Research and Development

3. Policy Goals Addressed

Renewables-Centered Grid--Senate Bill 100	Identifies issues, barriers and solutions to integration of local renewables in DER configurations in DAC locales and low-income communities in general.
Serving DACs (Senate Bill 535)	Places consideration of DER in the context of 2007 DACs in the state with 25% of the state's population who risk being left behind in DER build out and disproportionately burdened by DER dynamic control, time/demand related rate regimes, access to tax benefits and other

4. Barriers Resolved

All of the identified barriers (cost, valuation, capability, uncertainty, and coordination) are relevant and would be addressed by the research.	Elaborates the framework to reveal key questions and opportunities that are now obscured. This will allow designers and planners to explicitly consider the consumer sociotechnical environment. Seen openly, there will be a much better chance that flexibility can be designed in. It is hard to imagine the proposed research (or many other possibility) as "resolving" barriers. While we believe that the barriers listed in the DER Roadmap report are a good start, they are not an exhaustive listing of barriers in the user/consumer/resident sector and particularly in DACs.

5. Metrics Impacted

affordability, flexibility, along with technology adoption, equitable participation, effective	A variety of quantitative metrics and qualitative indicators can be developed within and outside the Roadmap metric categories developed

6. Benefit to Ratepayers

2f. Improvements in system operation efficiency from increased flexibility	Encourages technology, program designers, and to account for and support build in energy consumer flexibility
4g. Support for energy system resiliency in the face of de-energizations	Energy consumer flexibility becomes part of societal technology systems, leading to resilience even under de-energizations
1e. Peak load reduction (MW) from summer and winter programs	Energy consumers will have more options availble to shed, shift, and re-shape, creating capacity

7. Level of Effort

The research would be conducted in 5 stages over three years. Stage 1 (knowledge base) and Stage 2 (DAC characterization) would take place in years 1 & 2. Stage 3 (DER configuration prototyping & DAC deployment simulation) would take place in years 2 & 3. Stages 4 (barriers ground truthing) and 5 (technology innovation and DER design-for-DACs) would take place in years 3 & 4. Estimated costs for multiple specialized subcontractors and collaborating DAC NGOs, covering the costs of data collection, analysis, public engagement/collaboration in DER R&D, are estimated to be in the $2.5-3 milion dollar range.