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UCLA California Center for Sustainable Communities - Comments on the DER Research Roadmap

Additional submitted attachment is included below.

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June 12, 2020

RE: Comments of the California Center for Sustainable Communities (CCSC) at UCLA on the California Energy Commission (CEC) Workshop on the Distributed Energy Resources (DER) Roadmap Draft Technical Assessment

The California Center for Sustainable Communities (CCSC) at UCLA's Institute for the Environment and Sustainability studies the evolution of urban infrastructural systems in California, and the social and environmental impacts of their operation, with special focus on those that deliver energy and water. Accordingly, we welcome the opportunity to comment on the CEC's DER Research Roadmap. It is imperative that the CEC's DER research program emerge from an open, yet rigorous, discussion of the sociotechnical potential of DER technologies and a coherent vision of the state's energy future.

After viewing the presentation on May 29th and reviewing the draft final report, we make the following comments and recommendations:

1. **Equity as a Top-Level Energy System Goal –** From the content of the presentation and draft report, it is not clear how equity issues are being addressed across the various research categories, or with regard to individual research elements. Is there a reason why equity is not one of the energy system goals? We recommend that it should be.

Equity is a vitally important consideration; one that affects all other aspects of the energy transformation. The creation of specific policy objectives, equity metrics, and the integration of equity as a key consideration in energy research programs are not trivial undertakings. The current goal of "affordability" is a very limited notion of equity as it relates to energy; more holistic and useful conceptions exist. If we in the scientific community fail to grapple with the material reality of energy insecurity, the various inequities imbedded in our energy systems, and how both factors contribute to the economic precarity that so many Californians face, we will diminish the usefulness and relevance of our research efforts.

The CEC's inclusion of "Affordability" as the sole equity-related goal in the DER Roadmap is problematic for a number of reasons, but first among them is the fact that keeping unit prices or total energy costs below the willingness and ability of customers to pay - does nothing to address problems related to the overconsumption of energy within affluent communities.

Building a grid that can meet the state's goal of a fully renewable energy supply by 2045 will require vast amounts of non-renewable mineral and fossil fuel resources. Keeping energy "affordable" will do nothing to curb demand for grid-supplied energy, and likely result in more, and more expensive, generation and distribution infrastructure than would otherwise be necessary.

Additionally, affordability does not address the barriers to broader adoption of DER in low-income and structurally disadvantaged communities, as well as among nearly all renters. As we have seen in the course of our own research and work with community-based organizations, grid constraints and the lack of financial, technical, and legal support for community energy systems often prove to be insurmountable obstacles to broader adoption. Affordability is not an especially relevant or useful conceptual framing for studies that address such barriers, the most stubborn of which can be traced back to fundamental issues of agency and structural inequality

The current draft roadmap identifies a single stand-alone research element (*DER Integration in Low Income Communities*) that proposes to expand on the Barriers Study. While we certainly agree that further work is needed, we have several concerns: (1) It places equity considerations into a separate box rather than integrating these issues throughout the entire plan; and (2) It implies that there aren't already existing research findings that can inform the development this version of the DER roadmap

2. **Research Causes and Impacts of the Overconsumption of Energy**

Understanding the impacts of the overconsumption of grid-supplied energy is essential for an equitable energy transition. Studies of sociodemographic trends in energy consumption by our center and our scientific peers show that the disproportionate consumption of electricity by the affluent jeopardizes the success of California's renewable energy transition in several interrelated ways. We therefore recommend that the CEC's DER research program include research elements to measure the current and future impacts of the overconsumption of electricity so that current DER and EE incentive programs, DER-related state and local policies, and grid operation practices may be revised in light of their findings.

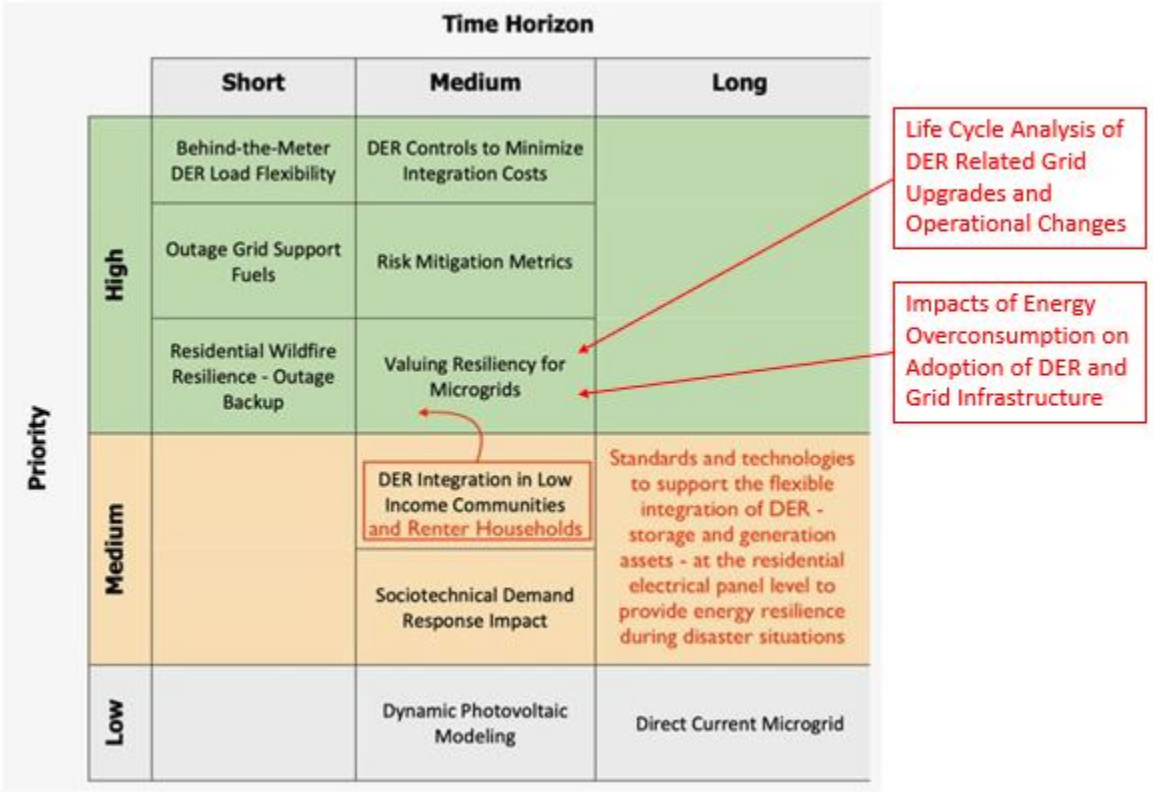
First, it has been demonstrated, here in California and elsewhere, that increasing demand for energy has been swamping efficiency gains from building EE measures. Our center's study of ~1.3 million single family homes in LA County found that while EE programs have succeeded in reducing the per square foot energy usage intensity of homes, they do not necessarily promote conservation, in terms of reduced total energy consumption.[1] Newer, larger homes, while more energy efficient, consume more energy than older, smaller, less efficient housing stock. These findings and others suggest that energy efficiency measures, in the absence of other policies designed to curb demand for energy, will result in overinvestment in generation and grid capacity.

Secondly, perennial economic inequality has – and continues - to influence investment in grid infrastructure and patterns of residential DER adoption. To understand how economic inequality affects residential energy use and DER adoption, we compared energy consumption and DER adoption in disadvantaged and non-disadvantaged communities (as defined by their

[1] Fournier, E. D., Federico, F., Porse, E., & Pincetl, S. (2019). Effects of building size growth on residential energy efficiency and conservation in California. *Applied energy*, *240*, 446-452.

CalEnviroScreen score) in Los Angeles County. We found that disadvantaged communities consume approximately half the electricity and gas that non-disadvantaged communities do, and that current and forecasted DER adoption rates differ greatly between these areas.[2] Inequality with respect to DER adoption is likely to persist and grow unless grid management practices and incentive programs for EVs, residential EE, and DER systems are changed. Differences in DER adoption, and thus grid capacity, will only grow if the state's plans for the energy transition ignore the problems caused or exacerbated by the overconsumption of energy by those who can afford to do so.

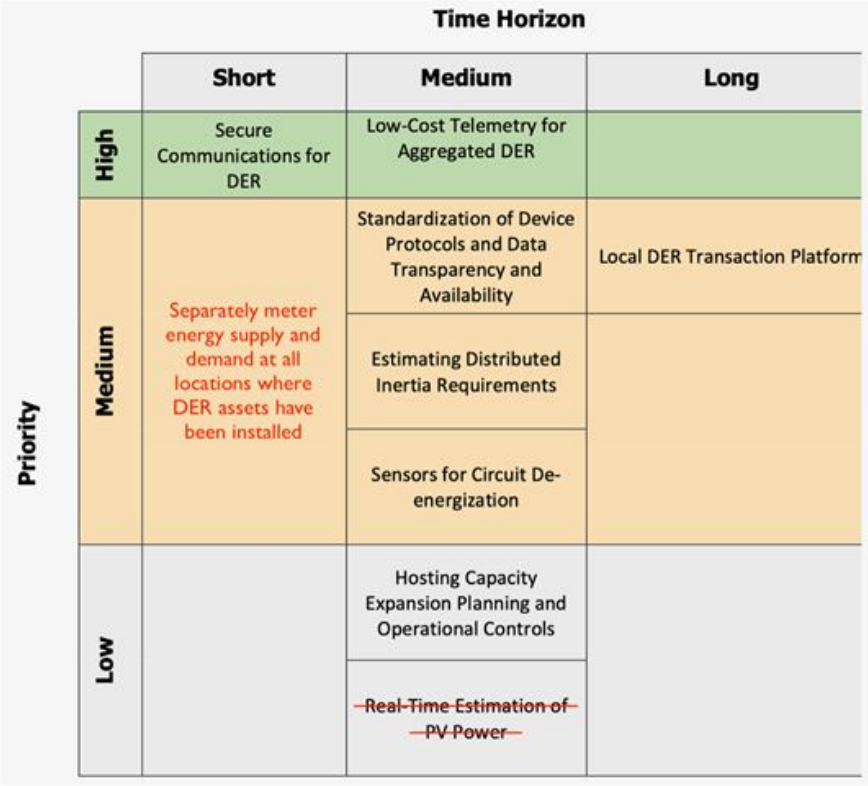
We strongly suggest including the following research elements related to inequality: life cycle analyses of proposed grid upgrades and operations related to the incorporation of DER, and the problems arising from the overconsumption of grid-supplied energy. To make completely informed decisions about changes to the grid's infrastructure and operation, the state must consider whether a) whether the proposed changes exacerbate or alleviate energy inequality and b) the environmental impacts of such changes beyond their contribution to GHG abatement goals.



3. **DER Communications and Controls: Separate Metering of Energy Supply and Demand at DER Deployment Locations** – The current practice of net-metering is useful for monitoring the net-demand of electricity; a metric which is relevant for the purposes of planning near term power generation needs and monitoring grid infrastructure capacity levels. However, simply recording net electricity demand obscures the relative performance of individual DER assets as well as the true extent of on-site energy demand. There is enormous potential value in recording these two attributes separately and then conducting the net-power

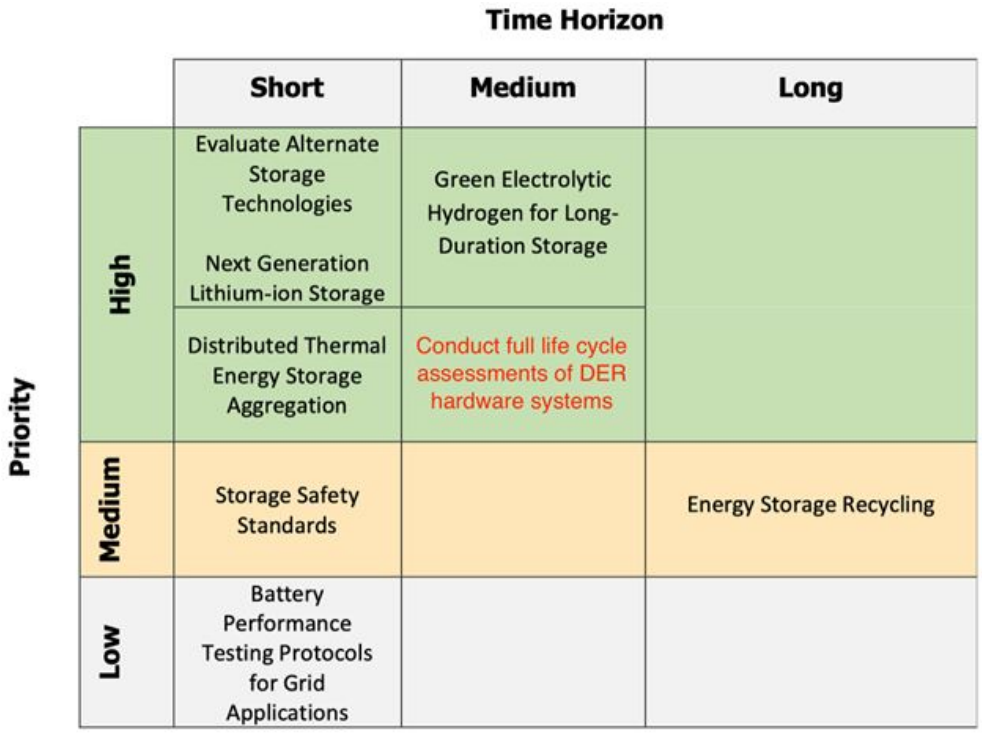
2 Fournier, ED, et al. 2020. On energy sufficiency and the need for new policies to combat growing inequities in the residential energy sector. Elem Sci Anth, X(X): XX. DOI: https://doi.org/10.1525/elementa.419

demand calculation retroactively. Doing so will allow energy planners to isolate load growth trends from the growing influence of installed DER assets. Moreover, the disaggregation of these data streams would better facilitate data driven evaluations of individual DER system efficacies. We recommend the following changes to research elements in this area:



4. **Life Cycle Analysis of Energy Storage and DER Communications & Control Technologies –** We recognize that the development of a broader range of energy storage technologies, customized for specific technical applications, is necessary if the state is to decarbonize its energy systems. However, we also noted that descriptions of the research elements related to these efforts - *Evaluating Alternative Storage Technologies*, *Next-Generation Lithium Ion Storage, Green Electrolytic Hydrogen for Long Duration Storage,* etc. – do not mention the need for life-cycle analyses (LCAs) of these systems. The same can be said for the research elements calling for the development of new residential and commercial building energy system control technologies under the area of **Energy Flexible Load Assets**.

It bears repeating that the development and deployment of energy storage technologies, especially batteries, are hugely consumptive of energy and mineral resources. We cannot afford to ignore these costs. Too often the life cycle of new technologies is not analyzed, understood or considered in benefit/cost analyses. The CEC should fund LCAs of automated DER communications and control hardware and other technologies to ascertain the degree to which they require rare Earth minerals, and increasingly critical elements such as copper, as well as the degree to which they can be readily disassembled and their constituent components recycled or reused in products of equivalent value or performance. We recommend the following additions to the **Energy Storage** research need area:



4. **Public Health Impacts of Energy Storage Recycling**

Furthermore, there is the associated issue of the toxicity of many of these minerals and chemicals used to both produce and recycle energy storage equipment, specifically batteries. The research description for the *Energy Storage Recycling* element mentions that safety considerations in recycling any toxic storage components should be part of research projects, but this is too vague and narrowly defined. Health impacts of the supply chain and of disposal must be considered as well.

5. **DER Planning and Strategy: Residential Outage Backup** – the proposed *Residential Outage Backup* element is a vital area of research, but it is too narrowly defined as currently written. There is an urgent need for residential backup technology in a range of locations, particularly, but not limited to:

- Urban areas that are predicted to experience large increases in numbers of high heat days, with resultant cooling loads from future increases in air conditioner penetration levels and the strains which these loads will place on regional substations and transmission circuits as well as local distribution feeders.
- Rural areas where energy access is essential for water pumping and treatment.
- Households with occupants who depend upon grid-supplied energy to power life-sustaining medical equipment.

The CEC should be aware of the conversations around this issue in Southern California. Two specific examples that the CCSC have been directly involved in are as follows:

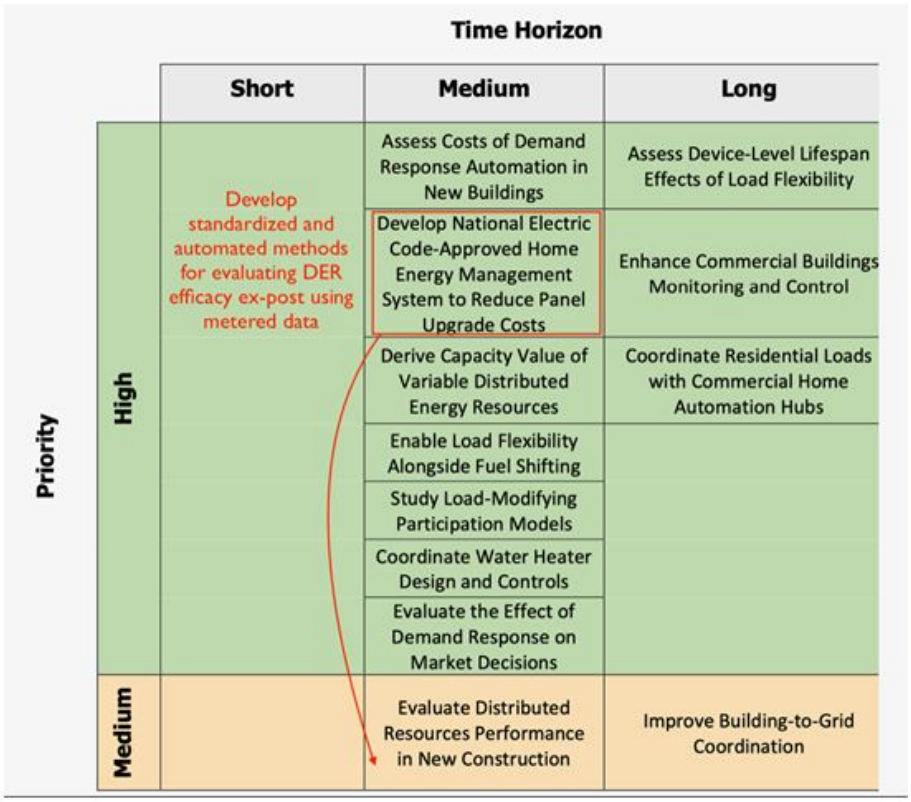
- At a Resilience Workshop sponsored by the LGC and the Clean Power Alliance (CPA) on Feb 27, 2020, the CPA executive director (whose territory includes ~3M customers and 1M customer accounts) stated that his number one concern related to the resilience

discussion was that it was too limited to wildfire and public safety power shutoff scenarios, and that it needed to be much broader, including areas of extreme heat impacts in the LA Basin.

- On Feb 26, 2020, CCSC convened a meeting around a Strategic Growth Council-funded grant. In attendance were representatives from seven community-based organizations, with whom we are collaborating to advance clean energy transitions in disadvantaged communities (DACs) throughout LA County. Multiple attendees expressed concern that the resilience discussion is only focused on fire season outages, but that there is an enormous need for people in low-income and DACs to be able to deal with outages unrelated to wildfire.

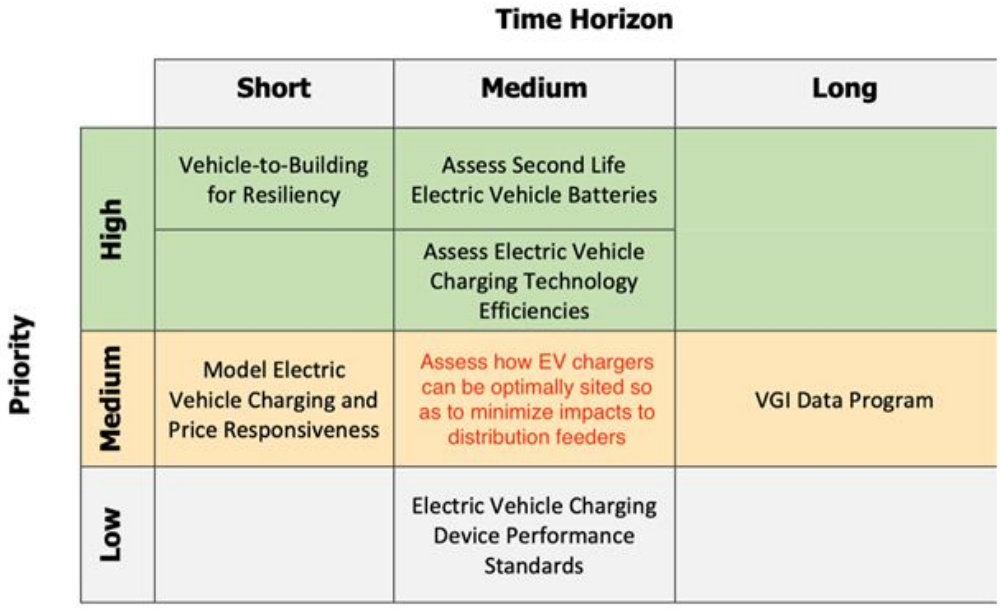
The same energy storage technologies used to back up residences can also potentially play a role in load shifting (see ethical issue below). As standalone devices, residential backups also offer benefits to renters and the occupants of multifamily homes, who may not have ability or means to install residential PV-storage systems. By broadening the scope of this particular research focus area, the CEC will be able to address the needs of the great numbers of Californians who do not own, or live in, single family homes.

6. **Standard Method for Ex-Post Assessment of DER and Building Energy Efficiency Measures using Metered Data**– All participants in California's energy transitions would benefit from a standard method for assessing the performance of DER and/ or building energy efficiency measures from metered data. Such a method would give property owners, utilities, and energy research organizations the means to compare the performance of different DER systems and building retrofit packages. Ex-post performance evaluation methods could also be helpful in understanding and measuring rebound effects. New smart buildings with smart controls, for example, may not be as efficient as assumed, they should not be part of a solution unless they can be shown to provide sufficient comfort and do not contribute to additional energy demand.



7. **Electric Vehicle Integration: Assessing Impacts of EV Charging Stations on Distribution Circuits** – Ongoing adoption of electric personal and commercial vehicles is key to meeting the state's climate mitigation and electrification goals. What is lacking, however, are systematic methods for utilities and other electric service providers (ESPs) to optimally site charging infrastructure. Providers must be able to predict the impacts the installation of charging stations will have on feeder circuits.

As we have observed in our applied work, there exists an acute need for tools to predict the likely impacts of charging station installation at various locations within circuits, and, in the case of ESPs, assess second order impacts on neighboring circuits. We recommend the addition of the following research elements:



8. **Survey of Energy Service Satisfaction** – The extent to which Californians are satisfied with the energy services they consume is an important but somewhat underappreciated of energy planning. We recommend that the CEC ask residents and occupants of commercial buildings with various combinations of EE and DER about their level of satisfaction with the energy services these buildings provide. Such a survey should also include questions about the level of satisfaction with energy services provided by ESPs as well.

9. **Comments on the DER Draft Final Report Format:**

The final report should include a table that maps the final list of proposed projects to the goals and market barriers for ease of reference. Currently, each individual project includes breakdown of related goals and barriers, but a mapping in the other direction would be helpful.

9. **Additional Ethical Considerations –** Current thinking around load-shifting program adoption within disadvantaged communities is problematic. The promotion of approaches in which third parties can make money from, for example, convincing people in the Central Valley to shut off their refrigerator in exchange for a few dollars a month, raises profound ethical concerns, especially when we know that people in low-income communities are already living in a state of energy insufficiency. These households may either not have air conditioning, or have it but don't use it as much as they need to because of cost considerations. We are now asking them to use less and are encouraging others to make a profit from convincing them to do so. Consideration of a much wider range of societal and grid benefits as well as ethical considerations should drive investment decisions, and research into how to do this should be an element of the DER Roadmap.