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CERI Draft Solicitation - Comments from Berkeley Lab

Thank you for your consideration. Berkeley Lab

Additional submitted attachment is included below.

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January 19, 2024

Jonah Steinbuck
Director of the Energy Research and Development Division
California Energy Commission
715 P Street
Sacramento, California 95814

Re: Lawrence Berkeley National Laboratory Comments on CERI Draft Solicitation

Director Steinbuck,

Commission staff released a draft solicitation manual and attachments for the Community Energy Resilience Investment (CERI) Program. Berkeley Lab is pleased to present our comments below:

Quantification of Resilience Benefits

There is a need for development of a standard protocol of measurements and assessment to enable a robust evaluation of resilience benefits. Measured parameters include outdoor weather (air temperature, humidity, wind speed, solar irradiance), indoor IEQ (air temperature, humidity, CO2), energy use, and occupancy at the building level and hourly resolution. Benefits to quantify include community level energy savings, energy costs savings, peak demand reduction, GHG emissions reduction, and improvements in occupant comfort. Community benefits also include reduction in number of power interruptions or durations, reduction in mortality and health related costs, reduction in property damages, and other non-energy impacts such as productivity and educational outcomes. Diverse thermal resilience metrics can be used to quantify the resilience benefits for occupants and services.

It is important to note that as an acute climate hazard, extreme heat is an emerging public health threat across the entire state and that in the Central Valley in particular, extreme heat is becoming a chronic climate issue in many years as well, with 69 days over 100 °F in 2021 (exceeding mid-range climate projections for 2045). Thus low cost cooling investments for improved heat resilience can improve outcomes during the hottest days as well as during those other days with elevated temperatures, and it is important to quantify these year-round benefits

Building Modeling Tools

Building performance modeling with tools such as EnergyPlus are recommended for evaluating performance of measures, designs, and operation strategies to inform decisions on prioritizing investment for mitigation or adaptation measures in improving climate resilience.

Those tools can use current and future typical and extreme weather conditions for resilience assessment. CityBES (CityBES.LBL.gov) is one such urban scale tool that can model large ensembles of buildings in a neighborhood or urban area for energy efficiency and resilience measures and that can quantify the distribution of energy and GHG savings and resilience benefits for indoor comfort and safety as well as upfront costs. These tools have modeled a few locations thus far (e.g., Fresno, San Francisco), but should be expanded to cover more portions of the state, enhanced with greater capabilities such as air filtration and air quality impacts and potentially integrated with other models such as those for the electricity distribution grid.

There is also the need for more decision support tools for resilience investments, potentially which could accept building address and type and provide options for extreme weather conditions and recommend lowest cost and highest impact investment measures for greater resilience.

Similarly, the energy efficiency and emerging building electrification ecosystem should be expanded to include climate resilience where possible, rather than having separate stove-piped programs. This has the potential for reduced program costs, lower transaction costs for residents, greater equity, and greater scalability. For example, there is the opportunity to pilot integrated programs seeking to consolidate multiple policy objectives (e.g., https://eta-publications.lbl.gov/publications/action-plan-greater-climate-equity). Energy efficiency audits can be expanded to include electrification readiness assessments as well as health and resilience assessments. Integrated retrofit programs can be piloted with similar objectives to maximize energy as well as health/safety and other non-energy benefits, reduce or eliminate GHG emissions, and improve climate resilience.

Need for Innovative System Designs and Guidance
Extreme weather resilience and heat resilience in particular is a major equity issue. During extreme weather conditions like heat waves and cold snaps, the existing HVAC systems in disadvantaged communities may not have sufficient capacity to maintain thermal comfort/safety for the residents, residents may not be able to afford rising cooling bills, and some houses don't even have a functioning HVAC system (e.g. houses in mild climates like San Francisco). For example, in the King and Kirk neighborhoods of Fresno, one third of the houses are only equipped with evaporative coolers, which provide very limited cooling capacity during local heat waves.

To protect the residents from extreme weather, low cost passive cooling measures can improve heat resilience (e.g., https://eta.lbl.gov/publications/passive-cooling-designs-improve-heat and https://energyanalysis.lbl.gov/cal-thrives) and reduce the required capacity for HVAC units. Cool roofs, cool walls for example can have zero to low incremental cost when re-roofing or repainting a home. There is opportunity to design low energy building upgrade packages by climate zone and housing type to minimize investment costs and maximize heat resilience, e.g., building envelope insulation measures, passive cooling measures such as the cool surfaces above, existing as well as innovative new natural ventilation designs, low energy active cooling measures such as ceiling fans, and individual cooling units.

Even with the passive cooling measures, some active cooling such as HVAC systems will be required in homes to withstand extreme heat waves, and this will bring significant pressure to the electricity grid, which will either trigger more frequent power outages or require large investment on additional grid capacity. Thus alternative innovative solutions need to be developed.

One possible solution that researchers at the lab have been thinking of is to develop an affordable “survival kit” (or “resilience in a box”), which is a portable package of installation-free/easy-to-install and no-power/low-power devices/technologies that help improve indoor environment and thermal comfort. It should be self-powered so it can be isolated from the grid and keep functioning during power outages (e.g., a small capacity, low voltage, direct-current cooling unit with low voltage solar PV and minimal energy storage requirement). It should be easily transportable so it can be quickly distributed to houses in need. The survival kits can protect residents in disadvantaged communities, and at the same time avoid adding pressure to the electricity grid. The public emergency response departments would be a great candidate to purchase such survival kits and distribute to houses in need during extreme conditions.

Similarly, designs should be developed for both new and existing buildings to have the capability to shift into low power mode operation during times of grid stress or during extreme heat waves such as during the evening when solar power is ramping down and less available. This could include innovative designs combining smart panels/smart circuits, advanced controls, low power cooling equipment, and small capacity energy storage. If widely tested and implemented, such low power mode capabilities will greatly reduce the risk of rolling or extended power interruptions while also ensuring safe spaces during extreme weather events.

Berkeley Lab appreciates the opportunity to provide these comments regarding the CERI program.

The following individuals contributed comments: Tianzhen Hong, Max Wei, & Kaiyu Sun

Sincerely,

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