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In-depth efficiency measures for large existing buildings

Public Comment on EPIC 5 Investment Plan

Submitted by: Paul Raftery, Center for the Built Environment, UC Berkeley

Re: EPIC 5 Building Decarbonization Initiative

Thank you for the opportunity to provide comments. The Building Decarbonization initiative currently focuses on decarbonizing large existing buildings by electrifying heating loads using heat pumps. While this is key to building decarbonization, I encourage the CEC to expand this to include in-depth efficiency measures as a complement to electrification. A sequenced approach, with efficiency first, yields deeper and more cost-effective emissions reductions than electrification alone. Our recent CEC-funded research [1,2] achieved a 70% reduction in annual natural gas consumption in two large San Francisco office buildings while simultaneously reducing utility costs by \$110,000 per year. This 70% site emissions reduction was achieved before any electrification. To achieve it, we combined in-depth HVAC controls updates (aligned with ASHRAE Guideline 36) and heating plant retrofits; measures with far lower first costs than electrification.

In-depth efficiency measures are not alternatives to electrification using heat pumps; they are precursors that make electrification more feasible and cost-effective. By reducing heating loads, efficiency-first measures can shrink the size, weight, first cost, and embodied carbon of subsequent heat pump installations as well as reduce their impact on the electricity grid. They can also ease the electrical and structural constraints that sometimes derail electrification projects in large existing buildings. Importantly, these measures reduce annual utility costs, helping overcome the 'spark gap' between electricity and gas rates that many customers face when electrifying existing heating systems. And if an owner cannot immediately fully decarbonize their building—whether due to capital limitations, building constraints, or other reasons—they can still achieve very substantial, immediate emissions reductions through the efficiency measures.

I encourage the CEC to fund research, demonstrations, and tools that advance in-depth efficiency measures for large existing buildings. There are many open questions, such as: how much different efficiency measures can save and how much this varies between applicable buildings; how much the measures cost to implement; what are the avoided costs of subsequent electrification retrofits after the efficiency measures; and many more.

Overall, a sequenced approach of efficiency first and then electrification using heat pumps will yield faster, deeper, and more cost-effective emissions reductions, making full decarbonization of California's large building stock more practically achievable.

[1] Demonstration project results: Cheng, H., Raftery, P., & Wendler, P. (2024). Are we prioritizing the right thing? Cutting carbon emissions in California's large office buildings before installing a heat pump. ACEEE Conference, Summer Study 2024.

[2] Full research project report: Raftery, P., Cheng, H., Singla, R., Pepper, T., Vernon, D., Duarte Roa, C., Lamon, E., McMurray, R., Paliaga, G., Thawer, M., Wendler, P. 2024. Reducing Gas Consumption in Existing Large Commercial Buildings: Final Report Draft. California Energy Commission.