

Public Comment on Zero-Emission Appliance Workshop

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This is a follow-up to the verbal comment I made during the workshop.

Installation of zero emission space and water heaters will require electric panel upgrades by some, and perhaps many, homeowners. Panel upgrade lead times can be very long, as documented in a 2022 PG&E report (Ref 1). Separately, PG&E reports that half of all panel upgrades require between 5 and 14 months to complete (Ref 2). These lead times could force residents to find alternate housing since they would have no heat or hot water for months.

A California Energy Commission report (Ref 3) indicates that there is a lack of primary data regarding the number of California homes that require an electric panel upgrade to support zero emission space and water heaters.

Detailed housing data is required to assess applicability of available appliance technology and the effectiveness of emerging technologies that could minimize the need for panel upgrades. It is also important when developing a roadmap for technology development.

Finally, this data is vital to accurately forecast cost of government-funded programs to upgrade homes in disadvantaged neighborhoods. For these reasons, I recommend that the California Air Resources Board (CARB) fund a study to characterize the California housing inventory.

These are the data I believe are important to capture:

- A. Number of homes with electric panel capacity in each of several bins: 200A and above, 150A-101A, 75A-100A, less than 75A.
- B. Number of homes whose panel has reached its circuit limit.
- C. Number of homes in bins defined by major Electrical Code updates. This might be presumed by the age of the home, though it would be useful to estimate the number of older homes that have been updated to more recent code versions. This is important since a home might technically be able to support a high current device, but a constant high-current load on old wiring could be unsafe.
- D. Home floor area. Important when assessing required space heating capacity.
- E. Home insulation quality. Might be presumed by build date though it would be useful to estimate the number of older homes that have been retrofitted with better insulation and windows. Need this to assess required space heating capacity.
- F. Number of persons in the household. Important when assessing required water heater performance.
- G. Number of homes whose main panel location is not compliant with current utility standards. Moving the main panel adds cost, sometimes substantial, to the upgrade.
- H. Number of homes with underground electric feeds sized below 200A. Installing a new underground feed adds considerable cost to a panel upgrade.

- I. Water heater location. Important since heat pump water heaters have unique installation requirements.

There are probably other important attributes. The list could be developed in a focused meeting.

I believe that it is important that CARB recognize that there is no 'One Size Fits All' solution when assessing appliance technology. Appliance capacity must be adequate for the home it is intended to support. Currently-available 120V heat pump space and water heaters are an example. Their capacity is less than similar 240V appliances and might not be adequate for a given household. Some of the data I suggested above should be used to assess the number of California homes that can reasonably use the 120V appliances.

Water heater location is another example. Heat pump water heaters have unique installation requirements. Physical modifications will be required in any home whose water heater is located within the living space.

Devices are available to avoid a panel upgrade in some homes whose main electric panel is already at capacity. Their applicability is dependent on the capacity of the main panel and the existing circuit layout.

I further recommend that CARB develop scenarios based on the housing inventory data. The scenarios would spell out a recommended path forward for space and water heater emergency replacement in homes with sets of attributes defined by the data collected. The scenarios need to include cases where both appliances fail within a short time since a double failure might force a panel upgrade.

References

1. PG&E. 2022. Service Upgrades for Electrification Retrofits Study Final Report. CALMAC STUDY ID: PG&E0467.01. Available at: <https://pda.energydataweb.com/#!/documents/2635/view>
2. San Francisco Chronicle, April 1, 2023. 'This S.F. homeowner tried to go all-electric. Her case shows the extraordinary effort that can take.' Julie Johnson. Available at [S.F. homeowner still awaiting PG&E upgrade for all-electric appliances \(sfchronicle.com\)](https://www.sfchronicle.com/sf/homeowner-still-awaiting-pg-e-upgrade-for-all-electric-appliances)
3. Building Decarbonization Assessment. 2021. Kenney, M., N. Janusch, I. Neumann, and M. Jaske. California California Energy Commission. Publication Number: CEC-400-2021-006-CMF. Available at: <https://www.energy.ca.gov/publications/2021/california-building-decarbonization-assessment>