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Comments on August 24, 2023 Staff Workshop

Additional submitted attachment is included below.

September 7, 2023

California Energy Commission
Re: Docket No. 22-BSTD-01
715 P Street
Sacramento, CA 95814
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Re: August 24, 2023 Staff Workshop: 2025 Energy Code Pre-Rulemaking – Prescriptive Heat Pump Baselines & Solar Photovoltaic and Energy Storage System Requirements

Dear Commissioners:

The undersigned organizations appreciate the opportunity to comment on the California Energy Commission's ("CEC") 2025 Title 24 Building Energy Efficiency Standards ("2025 Building Code") updated proposal at the August 24 workshop on prescriptive heat pump baselines and solar photovoltaic and energy storage system requirements. We continue to have significant concerns with the proposal's relegation of the replacement of residential central air conditioning ("A/C") units with heat pumps to a voluntary section of the Building Code. CEC adoption of requirements to replace residential A/C units with heat pumps is critical to support implementation of upcoming zero-NO_x space heating standards and avoid the future need for installation of a heat pump upon burn-out of a gas furnace.

The CEC's revised analysis now asserts that residential A/C to heat pump replacements are not cost-effective in certain climate zones. Unfortunately the analysis does not include the underlying data, assumptions and methodology for their cost-effectiveness determination. From what can be garnered from the August 24th workshop, it appears the revised analysis is based on an assumption of future furnace replacement with a low NO_x furnace, system costs provided by a small handful of contractors, and increased electrical requirements associated with heat pump installation.[1] These assumptions serve to incorrectly inflate costs of replacing an A/C unit with a heat pump and ultimately set us further back from reaching the Governor's target of installing 6 million heat pumps by 2030. As explained below the cost-effectiveness analysis should be revised to assume future heat pump replacement for gas furnaces, use systematically collected data such as that from Energy Information Administration Technology Forecast Updates on Residential and Commercial Building Technologies for installation costs, remove assumptions of additional electric requirements, and recognize the savings from heat pump incentives from the Inflation Reduction Act ("IRA") and other programs. In addition, all data, assumptions and

[1] CEC, August 24, 2023, 2025 Energy Code Pre-Rulemaking Workshop Presentation ("August 24th Workshop Presentation"), Slides 18-23, *available at* https://efiling.energy.ca.gov/GetDocument.aspx?tn=252023&DocumentContentId=87020.

methodologies for a cost-effectiveness determination should be publicly available to enable meaningful public participation.

1. The Commission Should Assume Gas Furnaces are Replaced with Heat Pumps in Determining Cost-Effectiveness of Requiring Heat Pump Replacements for Residential A/C Units.

Given there are only three to four years between the January 1, 2026 effective date of the 2025 Building Code and implementation of the California Air Resources Board ("CARB") and Bay Area Air Quality Management District ("BAAQMD") zero-NO_x space heating regulations, the CEC should assume avoided costs of furnace to heat pump replacement in its cost effectiveness assessment of A/C to heat pump replacement requirements. Instead, the current proposal appears to assume replacement of a gas furnace with another gas furnace.[2] This assumption serves to improperly and significantly underestimate the cost-savings from A/C to heat pump replacement.

As set forth in CARB's adopted 2022 State Strategy for the State Implementation Plan, "[b]eginning in 2030, 100 percent of sales of new space heaters and water heaters would need to comply with" a zero-emission standard, providing "criteria pollutant benefits as a key result along with GHG reductions."[3] Similarly, BAAQMD has adopted a rule prohibiting the sale or installation of gas-fired furnaces manufactured after January 1, 2029 that emit any NO_x.[4] The first residential heating replacement in a home with a NO_x-emitting furnace after these standards go into effect could in many cases simply be a decommissioning and thermostat reconfiguration if that home had already replaced its A/C with a heat pump and had not yet removed its gas furnace. If the home were instead to include a cooling-only A/C, a new zero NO_x heating unit would be required. Accordingly, the avoided or delayed cost of a zero NO_x heating unit should be included in CEC's cost effectiveness assessment.

2. Staff's Assumption that Heat Pump Installation Requires New 220V Electric Wiring to the Air Handler Unit is Misplaced.

Staff's revised cost-effectiveness calculation now appears to assume additional electrical costs to replace an A/C with a heat pump due to a stated need to "Run 220V electrical to air handler (HP air handler units **("**AHU") need 200V, even without strip heat)."[5] The assumption of a requirement to "run…electrical" is incorrect and should be removed from the cost-effectiveness calculation. Consider the following scenarios:

- If an A/C is replaced with a heat pump, whereby the indoor equipment installed is a cased coil installed in series with the indoor furnace/fan; then the existing 120V circuit remains.

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[2] August 24th Workshop Presentation at Slide 21.
[3] CARB, 2022 State Strategy for the State Implementation Plan at 101 (Sept. 22, 2022), https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf.
[4] BAAQMD, Regulation 9, Inorganic Gaseous Pollutants, Rule 4, Nitrogen Oxides from Natural Gas-Fired Furnaces, Rule 9-4-301.3 (Mar. 15, 2023), https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230315_rg0904-pdf.
[5] August 24th Workshop Presentation at Slide 17.

- If an A/C is replaced with a heat pump, whereby the indoor equipment is a new AHU, and the indoor unit is powered by the condensing unit, then no additional circuit is run.
- If an A/C is replaced with a heat pump, whereby the indoor equipment is a new AHU, and the indoor unit needs its own 220V power supply; then the wire can remain as originally sized. A review of existing specifications confirms that central furnaces typically require 120V/20A circuits.[6] The amperage for heat pump AHUs can sometimes be 220V, and typically require more than a 20A circuit. As such, the existing wire, which is sized based on the current (as opposed to the voltage) can meet electrical needs. Rather than a new circuit, the only need would be a breaker change.

3. Staff's Reliance on a Handful of Contractor Surveys to Determine the Incremental Cost of A/C to Heat Pump Replacements Likely Overestimates Heat Pump Installation Costs.

Staff has characterized their updated cost analysis as informed by 2023 contractor cost information from between two and five contractors.[7] While obtaining up-to-date information is laudable given the inflation, workforce, and supply chain challenges of the past few years, obtaining it from a very small, self-selecting sample of sources may introduce error into the CEC's analysis. Without transparency regarding the full methodology used by the CEC, it seems the analysis may be informed by too little data or possibly by biased data. Staff should share their data and methodology with the public and conduct a systematic, larger-scale investigation into relative costs of A/C and heat pump installation upon A/C burnout in 2023. Including informants in addition to contractors, such as homeowners or permit offices, may serve to reduce bias.

Based on current, publicly available data, staff's determinations of heat pump incremental costs are likely overestimated. Among condenser units with prices listed by online wholesalers, heat pump units between 1.5 and 4 tons cost $500 more on average than A/C units of like efficiency and capacity.[8] While labor costs to replace an A/C with a heat pump may be higher in some cases due to thermostat reconfiguration required for furnaces to provide backup heat, the Energy Information Administration ("EIA")'s March 2023 Technology Forecast Updates on Residential and Commercial Building Technologies suggests the labor cost (listed costs less retail equipment costs) difference may only be up to $290 in the costliest climate zones.[9] The CEC should use systematically collected data such as that

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[6] *See, e.g.,* Goodman, GMVC80(A)/GCVC80(A), Two-Stage, Variable-Speed ECM GAS Furnace 80% AFUE, https://www.goodmanmfg.com/pdfviewer.aspx?pdfurl=docs/librariesprovider6/default-document-library/ss-gmvc80_gcvc805708530022fa6258827eff0c00754798.pdf; Goodman, AVPTC37C14, 3-Ton Multi-Positional Air-Handler, https://www.alpinehomeair.com/product/air-handlers-electric-furnaces/standard-ducted-air-handlers/variable-speed-blower/goodman/avptc37c14#specifications.

[7] August 24th Workshop Presentation, Slides 19, 21.

[8] Based on review of air conditioner and heat pump prices listed online at major wholesaler sites, such as The AC Outlet and National Air Warehouse, in August and September 2023.

[9] EIA, Technology Forecast Updates - Residential and Commercial Building Technologies - Reference Case (Mar. 3, 2023, https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/appendix-a.pdf. $290 figure obtained as the outcome of the calculation: residential air-source heat pump (p. 39) total installed cost minus equipment cost, minus residential central air conditioner - south (p. 28) total installed cost minus equipment cost. The "south" region was selected because the labor cost difference between heat pumps and A/C is largest for that region.

summarized in the EIA Forecast Updates in estimates of labor costs in its cost effectiveness analysis. These incremental equipment and labor costs could both be recovered through rebates and/or tax incentives as described in the next section.

Additionally, as the market matures over the next few years, equipment and installation costs will come down, similar to what has happened and is still happening with other clean energy technologies like solar PV, LED, electric vehicles, and batteries. While we believe that in many cases this transition is already cost effective, we know with time installed costs for heat pumps will only further improve with economies of scale in the workforce, efficiency improvements, and business model improvements that can lead to significant soft cost reductions.

4. The IRA and Other Incentive Programs Provide Additional Cost Savings from A/C to Heat Pump Replacements.

While the CEC's cost-effectiveness analysis is for heat pump units that meet minimum federal efficiency requirements, the CEC should recognize that greater up-front and operational cost savings can be achieved from high-efficiency units that can take full advantage of federal and other incentives. Heat pumps are eligible for numerous federal, state and local incentives that can save Californians money up front and enable them to purchase more efficient appliances that will reduce utility bills over time. The IRA offers a tax credit of up to $2,000 per year per owner-occupied residence to cover up to 30% of costs to install a high-efficiency heat pump, inclusive of materials and labor.[10] This same tax credit offers up to $600 per year for up to 30% of the electrical expenses needed to support heat pump installations. Highly-efficient heat pumps are widely available in California and will be affordable with the federal tax credit. The Consortium for Energy Efficiency's tier applicable to California defines a high-efficiency split ducted air source heat pump as one with SEER2 greater than 15.2, EER2 greater than 11.7, and HSPF2 greater than 7.8. Equipment meeting these specifications costs more than similarly sized federal-minimum-efficiency air conditioning equipment, but in many cases, the incremental cost of a qualifying heat pump does not exceed $2,000. Qualifying small to moderately sized heat pumps between 1.5 and 3 tons in capacity are especially likely to save homeowners money in the tax year of their installation, as they typically cost less than $1,500 more than comparably sized minimum-efficiency air conditioners.[11]

National and California rebate programs may affect fewer homes than federal tax credits due to limited program budgets. However, residents who access these programs will reap additional benefits. For example, the federal High-Efficiency Electric Home Rebate (HEEHRA) program offers up to $8,000 toward the installation of a new high-efficiency heat pump for low- and moderate-income households; in California, the median county's moderate income maximum is $114,180. The TECH program, when active and funded, offers up to $1,000 in additional rebates per heat pump, and may cover up to two heat

[10] IRS, Energy Efficient Home Improvement Credit, https://www.irs.gov/credits-deductions/energy-efficient-home-improvement-credit (last visited Sept. 7, 2023).
[11] Based on review of air conditioner and heat pump prices listed online at major wholesaler sites, such as The AC Outlet and National Air Warehouse, in August and September 2023.

pumps. Unlike federal incentives, TECH does not require high-efficiency heat pumps or exclude higher-income households.

What's more, in addition to realizing the upfront benefits of federal tax credits and rebate programs, the majority of households in California that switch from central A/C and delivered fuels, electric resistance, or gas heating to a heat pump are likely to see annual energy bill savings ranging from hundreds to even thousands of dollars.[12]

Thank you for your consideration of these comments. We look forward to working with the CEC to ensure a robust 2025 Building Code that complements efforts of CARB and Air Districts and achieves meaningful reductions in climate and air pollution from the building sector.

Sincerely,

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[12] Based on NREL's ResStock dataset assuming state-averaged energy prices over the past 5 years.