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AHRI Comments â€“ Title 24-2025 Pre-Rulemaking July 27, 2023 Staff Workshop â€“ Heat Pump Baseline [Docket No 22-BSTD-01]

Please find attached AHRI's Comments in response to the Title 24-2025 Pre-Rulemaking July 27, 2023 Staff Workshop â€“ Heat Pump Baseline.

Additional submitted attachment is included below.

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August 9, 2023

California Energy Commission (CEC)
Docket Unit, MS-4
Re: Docket No. 22-BSTD-01
1516 Ninth Street
Sacramento, California 95814-5512

(Submitted electronically to Docket 22-BSTD-01)

Re: AHRI Comments – Title 24-2025 Pre-Rulemaking July 27, 2023 Staff Workshop – Heat Pump Baseline *[Docket No. 22-BSTD-01]*

Dear CEC Staff:

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) respectfully submits this letter in response to the California Energy Commission (CEC) July 27, 2023 staff workshop on the 2025 Pre-Rulemaking for Building Energy Efficiency Standards regarding proposed changes to the Heat Pump Baseline in the Energy Code (Title 24, Part 6).

AHRI represents more than 300 air-conditioning, heating, and refrigeration equipment manufacturers. In North America, the annual output of the heating, ventilation, air conditioning, and refrigeration (HVACR) and water heating industry is worth more than $44 billion. In the United States, the industry supports 1.3 million jobs and $256 billion in economic activity annually. AHRI represents most of the manufacturers of North American water heater, central air conditioners, and heat pumps, all of which manufacture products within the scope of the rulemaking. AHRI's members are continuously working to review and design new higher efficiency equipment that improves consumer comfort, without compromising consumer choice, product quality, or safety. In fact, AHRI members offer the most technologically advanced and efficient HVACR and water heating equipment available anywhere in the world. AHRI and its members support the reduction of greenhouse gas (GHG) emissions and will continue to collaborate with stakeholders to work toward that goal.

At the July 27th workshop, the CEC presented the proposal to prescriptively require installation of both heat pump space and water heaters in all residential and many nonresidential buildings. To adequately comment on these significant proposed changes, stakeholders need a robust technical support document and adequate time for review. Currently, stakeholders only have access to the slide deck presented on July 27th, which was posted to the docket on July 31st.

Many of the changes in the heat pump baseline are driven by changes in the cost effectiveness assumptions between 2019/2022 and 2025 codes. AHRI is still reviewing this material and plans to provide more detailed comments later, particularly as it relates to heat pump baseline changes.

At a staff workshop on January 26, 2021, the CEC asserted that moving to an all-electric baseline was premature in the 2022 code. The CEC identified that neither the market, nor the workforce was ready to support electric-only new construction. The CEC did not address observed or expected changes to the market or the workforce that would support moving to an all-electric baseline for residential and many non-residential buildings. Technicians of heat pumps must be trained to the latest of both technical and professional standards. Title 24 is also not ready for policies limiting a consumer's choice to freely select equipment regardless of energy used. Rather than regulations preventing the use of energy sources for space- and/or water-heating, the CEC should focus on incentives for reducing carbon emissions through policies that encourage the installation of equipment that reduces carbon emissions and structural updates that reduce the amount of energy needed for space- and/or water-heating. It is imperative that the CEC preserve the flexibility for equipment to use any energy source when it is economically and environmentally beneficial to do so.

AHRI urges the CEC to address the artificially low performance required when modeling variable capacity heat pumps (VCHP) in the Alternative Calculation Method (ACM) Reference Manual and the residential California Building Energy Code Compliance (CBECC-Res) performance compliance software used for demonstrating compliance with the Performance Standards specified in Title 24, Part 6, Section 150.1(b). The CEC responded to five years of AHRI advocacy by adopting modest credits for heating and cooling; however, modeling ductless heat pumps as barely more efficient than a split system equivalent to the standard design with default duct conditions (minimum efficiency) is misrepresentative and presents a barrier to California consumers adopting more efficient technologies. The CEC should consider permitting the use of rated efficiencies for these products in the ACM and CBECC-Res performance compliance software program.

Regarding colder climates in California, AHRI asks the CEC to consider several applications where the ventilation rate in commercial Air Source Heat Pump (ASHP) equipment, exceeds 20 percent outdoor air there are many operational complexities that significantly impact customer comfort, energy use and building design that have yet to be addressed. The following system designs and applications need more consideration:

- Make-Up Air (MUA) systems for commercial kitchens and lab exhaust systems
- Direct expansion-dedicated outdoor air systems (DX-DOAS) equipment with and without energy recovery
- Exercise facilities
- Large assembly spaces (gymnasiums, auditoriums, performing arts centers, etc.)
- Industrial space heating

MUA and DX-DOAS equipment typically operate at 100 percent outdoor air conditions during occupied/operational hours and have the following operational concerns that have yet to be properly addressed. Additionally, large assembly spaces need to be capable of operating at 60-100 percent outside air during full occupancy. A significant portion of industrial heating markets leverage gas heating as opposed to electric or heat pump heating due to the large increase in electrical infrastructure that would be required.

1. Cold ambient conditions still require back-up electric heat in cold climates and require either back-up electric heat or preheat during mild condition operation.

   The entering air temperature to the conditioning coil (generally referred to as indoor coils for most HVAC equipment) will be the outdoor temperature where energy recovery cannot be used. For these equipment types, if the entering temperature falls below 40-45°F, scroll compressor technologies can't operate within their allowable operating conditions (commonly referred to as operation envelopes) and the heat pump operation either must be shut down and use backup electric heat operation or use electric preheat to keep coil entering conditions high enough to continue operation. Systems with exhaust air energy recovery can operate at lower ambient temperatures, in some cases around 0°F, but require highly effective energy recovery devices. Getting above 60-70 percent enthalpy recovery ratios or sensible effectiveness without increasing equipment size generally means increased fan power requirements to overcome the additional heat transfer surfaces required for more effective heat exchangers. This additional fan energy should not be ignored since it can result in conditions where the additional fan energy consumes more energy than can be recovered, annually.

2. Defrost operation provides unacceptable air conditions requiring either additional electric heat operation or temporary ventilation reduction.

   Another complication with lower entering temperatures for the ASHP conditioning coils is that during defrost operation, the supply air temperatures are below occupant comfort levels and can approach 35°F with systems using highly effective ventilation energy recovery systems. Or, much lower than 35°F without operating preheat or supplemental heat. These cold supply temperatures can happen in any climate zone that approaches freezing temperatures. Manufacturers have found that defrosting at such cold conditions can cause the indoor/conditioning coil to develop frost causing degradation of ASHP performance. These systems could leverage recirculation to reduce cold supply air temperatures during defrost but the loss of ventilation or recirculation of higher-class air generally disallows it.

3. Packaged refrigeration upsizing requirements along with the need to provide supplemental, back-up and/or electric preheat requires have much larger electrical loads than their predecessors.

   Many high percentage outdoor air systems generally use gas fired furnaces, especially in cold climates, and converting these to heat pumps with electric backup heat requires a significant increase in electrical capacity.

   a. Gas heating only MUA and space heating systems require over 50 times the electrical capacity of their gas counterparts.
   b. In locations that will require backup heat, DX-DOAS and roof top units (RTU) with high percentage outdoor air, will require two to three times the electrical capacity of their gas counterparts.

Lastly, AHRI recommends the CEC review and include in technical support documentation the size and cost (both first and replacement costs) for both space and water heating equipment. Some of the cost data appears low, and it may be partially due to incorrect equipment sizing. For example, the first cost of a heat pump water heater in the 2,100/2,700 square foot (sf) prototype home, Table 501.1(2) of the 2022 State of California Plumbing Code, requires water heaters to produce minimum first hour ratings (FHR) based on the number of bedrooms and bathrooms in a home. The 2100 sf prototype is 3 bedrooms and 2.5 bathrooms and would require a HPWH with a minimum FHR of 62 gallons. The 2700 sf prototype is four bedrooms and three bathrooms with a minimum FHR of 74 gallons. It appears pricing used by the CEC was a less expensive 50-gallon model. AHRI recommends using correctly sized equipment, with average pricing for California consumers.

AHRI appreciates the opportunity to provide these comments and would like to continue to be engaged with this effort as the CEC develops its future work in this arena. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

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