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Bradford White Corporation Comments to 2025 Heat Pump Water Heater Baseline

Additional submitted attachment is included below.

September 7, 2023

California Energy Commission
Re: Docket #: 22-BSTD-01
Project Title: 2025 Energy Code Pre-Rulemaking
1516 Ninth Street
Sacramento, CA 95814
[Electronically Submitted to: title24@energy.ca.gov]

Re: Bradford White Corporation Comments to Heat Pump Water Heater Baseline Standards

Dear California Energy Commission:

On behalf of Bradford White Corporation (BWC), we would like to thank you for the opportunity to comment on the California Energy Commission (CEC) 2025 Energy Code Pre-Rulemaking, proposed baseline for heat pump water heater (HPWH) installations.

BWC is an American-owned, full-line manufacturer of residential, commercial, and industrial products for water heating, space heating, combination heating, and water storage. In California, a significant number of individuals, families, and job providers rely on our products for their hot water and space heating needs.

BWC understands that the CEC plays an important role in reducing greenhouse gas (GHG) emissions with each code cycle. For the 2025 code cycle, the CEC intends to establish HPWHs as the baseline equipment for standard design in single family new construction for all 16 climate zones. Upon reviewing the CEC presentations and associated reports on cost-effectiveness, we have found inconsistencies and respectfully request the CEC address the following comments:

2022 California Plumbing Code, Chapter 5 Water Heaters, Table 501.1(2) First Hour Rating

We wish to bring to CEC's attention the 2022 California Plumbing Code[1] (CPC) Chapter 5 Water Heaters, Table 501.1(2) First Hour Rating. Water heaters installed in residential occupancies shall be sized in accordance with CPC Table 501.1(2). The water heater must at a minimum meet the First Hour Rating requirements of Table 501.1(2). The sizing requirements are based on the number of bedrooms and the number of bathrooms for each prototype building. Based on Table 501.1(2)., the CEC building prototypes should be designed accordingly:

[1] 2022 California Plumbing Code (iapmo.org)

1) The 500 sq ft prototype would have 1 bedroom and 1 bathroom;
2) The 2,100 sq ft prototype would have 3 bedrooms and 2.5 bathrooms; and
3) The 2,700 sq ft prototype would have 4 bedrooms and 3 bathrooms.

The CEC cost-effectiveness study reflects an identical product and cost for all three building prototypes utilizing a 50-gallon HPWH. However, each building prototype has different hot water needs reflected in the minimum required First Hour Rating (FHR). The AHRI Directory of Certified Product Performance[2] and CEC's Modernized Appliance Efficiency Database System[3] (MAEDbS) list the FHR for HPWHs, allowing for proper selection of a water heater sized in accordance with the California Plumbing Code.

1) The 500 sq ft prototype, with 1 bedroom and 1 bathroom, the minimum FHR is 38 gallons.
2) The 2,100 sq ft prototype, with 3 bedrooms and 2.5 bathrooms, the minimum FHR is 62 gallons.
3) The 2,700 sq ft prototype, with 4 bedrooms and 3 bathrooms, the minimum FHR is 74 gallons.

Market research indicates that different size HPWHs would be required in each of these building prototypes based on available FHR performance. Additionally, there are price differences between different size HPWHs. The cost-effectiveness study reflects an identical replacement cost for the 500 sq ft prototype, the 2,100 sq ft prototype, and the 2,700 sq ft prototype. We recommend each prototype be sized with a properly selected HPWH. Selecting a water heater sized in accordance with the California Plumbing Code impacts the HPWH cost-effectiveness study. We request that the CEC provide additional comments supporting their reasoning for using a single HPWH capacity and cost as the baseline for all three building prototypes.

HPWH Annual Maintenance Costs and Replacement Cost Assumptions

Cost-effectiveness analysis for single family, new construction notes that incremental costs represent the equipment, installation, replacement, and maintenance costs of the proposed measures relative to the base case. Maintenance costs are estimated for Photovoltaic systems, but not any other measures. Gas storage water heaters, electric storage water heaters, and HPWHs have similar yearly maintenance programs, which recommend the following:

- Inspection of the temperature and pressure relief valve;
- Drain and flush the water heater tank;
- Clear the condensate drain tube and the drain lines;
- Anode rod(s) must be removed and inspected.

Additionally, cleaning the air filter is a maintenance service, which is specific to HPWHs. A clean air filter is important to achieve the highest efficiency. A dirty filter will make the system work harder and result in a reduction of efficiency. If the filter gets too dirty, the HPWH may automatically switch to electric resistance only operation. The CEC has already made an important step to ensure efficiency of HPWHs by establishing minimum ventilation standards in the 2025 Multifamily CASE Study. Dirty air filters prohibit the proper exchange of air and is integral to the proper ventilation of HPWHs.

[2] AHRI Certification Directory (ahridirectory.org)
[3] Modernized Appliance Efficiency Database System (MAEDbS) Enhancements and Improvements (ca.gov)

Has the CEC similarly considered the importance of cleaning the HPWH's air filter to achieve and maintain the highest efficiency? Fouled HPWH air filters could negate much of the expected benefit of HPWHs. A labor cost for annual maintenance of an air filter should be included in the cost-effectiveness study.

The cost-effectiveness analysis uses a 30-year timeline for evaluating HPWH cost-effectiveness. This model includes assumptions for inflation, rate changes, etc. As California strives to achieve stated climate goals, individual jurisdictional requirements may already impact assumptions in the cost-effectiveness model as to incremental GHG savings from using electric versus natural gas products. California Air Resources Board (CARB), along with individual districts, have already proposed and/or adopted rules to ban the sale of gas equipment. At least one district has adopted a rule that would overlap with the implementation of the 2025 Energy Code cycle. Given these proposals, we pose the following questions:

- If the proposed emission rules are implemented prior to the year 15 replacement of a HPWH, how does the CEC then justify a 30-year savings for the equipment if consumers are not able to make a choice between a gas or electric product?
    - For instance, a HPWH installed in a newly constructed home in 2026, may only have four years before it would be required to be replaced with another HPWH if it were to fail.
- How will the CEC treat the standard building design in climate zones affected by air district rules that are implemented mid building cycle?
    - For instance, Bay Area zip codes affected by Bay Area Air Quality Management District (BAAQMD) Rule 9-6.

HPWH Baseline Equipment Used

As a manufacturer, we rely on clear and objective rules, whether that be federal or state regulations, codes and standards, and rebate programs to design and build products to meet consumer and regulatory needs. We respectfully request that the assumptions used are adjusted, based on our feedback, to ensure the analysis fairly represents what will transpire in the field.

As previously addressed, the CEC used the same HPWH equipment for all three building prototypes, which is inconsistent with the California Plumbing Code's requirements for FHR. Additionally, the proposed baseline HPWH is a "federal minimum efficiency generic heat pump water heater (UEF 2.0)." While theoretically possible, this would require the use of a 55-gallon or larger tank. In all three models, a 50-gallon HPWH is used, which according to current federal minimum standards, has a minimum Uniform Energy Factor (UEF) rating well below 2.0, as defined in the following table[4]:

[4] eCFR :: 10 CFR 430.32 -- Energy and water conservation standards and their compliance dates.

Product class	Rated storage volume and input rating (if applicable)	Draw pattern	Uniform energy factor
Electric Storage Water Heaters	≥20 gal and ≤55 gal	Very Small	$0.8808 - (0.0008 \times V_r)$
		Low	$0.9254 - (0.0003 \times V_r)$
		Medium	$0.9307 - (0.0002 \times V_r)$
		High	$0.9349 - (0.0001 \times V_r)$
	>55 gal and ≤120 gal	Very Small	$1.9236 - (0.0011 \times V_r)$
		Low	$2.0440 - (0.0011 \times V_r)$
		Medium	$2.1171 - (0.0011 \times V_r)$
		High	$2.2418 - (0.0011 \times V_r)$

According to the table, all 50-gallon HPWHs would have a federal minimum UEF in the 0.9 range. With this in mind, BWC poses the following questions and comments:

1) Was the CEC's intent to establish HPWHs as a baseline using a federally minimum compliant equipment? Or was the intent to use a higher UEF as the standard?
    a. If the intent was to use a federally minimum compliant HPWH, BWC suggests that the building compliance models be adjusted to reflect this for each building prototype.
    b. If the intent was to use a higher UEF than the federal minimum standard, why does the standard building model use a product that does not exist on the market?
    c. Are there any statutory requirements preventing the CEC from establishing the standard building design using equipment that has a higher efficiency than what is federally regulated?

2) The cost-effectiveness studies use a variety of sources to establish equipment cost. Based on market research and AHRI listings, there are no HPWHs on the market that would be representative of a federal minimum standard. Product currently offered on the market typically exceeds a UEF of 3.0.
    a. How did the CEC justify applying equipment costs of high efficiency HPWH product to the baseline HPWH equipment?
    b. If using the cost of a high efficiency HPWH product, shouldn't the energy performance in the standard building model reflect this assumption?
        i. Would the standard building model and cost assumptions be better matched if the "Generic Model NEEA Tier 3" was used as the baseline instead?

BWC strongly urges the CEC to consider our questions and comments, which seek to clarify assumptions and resolve inconsistencies in the proposed HPWH baseline. We thank the CEC for the opportunity to provide feedback on the proposed 2025 HPWH baseline. Please let me know if you have any questions or would like to schedule a meeting to discuss our comments further.

Respectfully Submitted,

Bradford White Corporation

Michael Corbett
State Government Affairs & Product Specialist

Cc: E. Truskoski; T. Gervais; C. Sanborn; K. Doyle; B. DeJager; B. Ahee