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**Bradford White Corporation comments to 2025 CASE Study -
Multifamily Central HPWH Requirements**

Additional submitted attachment is included below.



June 9, 2023

California Energy Commission
Re: Docket #: 22-BSTD-01
Project Title: 2025 Energy Code Pre-Rulemaking
1516 Ninth Street
Sacramento, CA 95814

To: info@title24stakeholders.com
Cc: jfeng@trcompanies.com

Re: Bradford White Corporation Comments to Multifamily Domestic Hot Water Codes and Standards Enhancement (CASE) Proposal- Proposed requirements for Central Heat Pump Water Heater Installations

Dear California Energy Commission and Title 24 Stakeholders:

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 ventilation standards 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.

Central HPWH electric-ready requirements

The CEC's Draft CASE Report – Multifamily Domestic Hot Water¹ proposes electric-ready requirements for central HPWHs, in Mandatory Section 160.9 of Title 24, Part 6. BWC agrees ventilation and space requirements are critical components which impact the installation of a central HPWH. The CASE studies draw a correlation between reserved space and ventilation requirements for a future central HPWH based upon the input of the current gas water heating system. We believe the methodology for determining reserved space, clearances, and ventilation requirements should be provided by central HPWH manufacturers. BWC has the following concerns and questions with the CASE team central HPWH electric-ready proposal:

- What research and analysis did CASE provide to determine the minimum space for a HPWH shall be 2.0 sq feet per input 10,000 BTU/HR of the gas or propane water heating system, and the minimum linear dimension of the space reserved shall be 48 linear inches, if the input capacity of the gas water heating system is less than 200,000 BTU/HR?

¹ https://title24stakeholders.com/wp-content/uploads/2023/05/2025_T24_CASE-Report- MF-DHW-Draft.pdf

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- What research and analysis did CASE provide to determine the minimum space for the HPWH shall be 3.6 sq feet per input 10,000 BTU/HR of the gas or propane water heating system, and the minimum linear dimension of the space reserved shall be 84 linear inches, If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR?
- California's climate zones are likely to support the outdoor installation of a central HPWH. While the ventilation requirements of 160.9(e)(3)(A) *note that physical space reserved for the heat pump shall be located outside*, is it CASE's intent that the HPWH minimum space requirements of 160.9(e)(2)(A)(iii) *The space reserved shall be the space required for a HPWH system that provides equivalent functionality of the gas-powered equipment as calculated and documented by the person associated with the project*, would satisfy this space requirement if the HPWH is installed outdoors?
- What research did CASE provide to determine the minimum space reserved for the storage and temperature maintenance tanks shall be 4.4 square feet per input 10,000 BTU/HR. of the gas or propane water heating system, if the input capacity of the gas water heating system is less than 200,000 BTU/HR?
- What research did CASE provide to determine the minimum space reserved for the storage and temperature maintenance tanks shall be 3.6 square feet per input 10,000 BTU/HR. of the gas or propane water heating system, if the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR?
- What research did CASE provide to determine the space reserved shall be the space required for a heat pump water heater system that provides equivalent functionality of the gas-powered equipment as calculated and documented by the responsible person associated with the project?

Central HPWH systems are typically more complex than individual systems and require more effort to specify, layout, and install. As such, each of the central HPWH electric ready requirements provide these options in their respective requirements:

- Heat pump
 - 160.9(e)(2)(A)(iii). *The space reserved shall be the space required for a heat pump water heater system that meets the total building hot water demand as calculated and documented by the responsible person associated with the project.*
- Tanks
 - 160.9(e)(2)(B)(iii) *The space reserved shall be the space required for a heat pump water heater system that meets the total building hot water demand as calculated and documented by the responsible person associated with the project.*
- Ventilation
 - 160.9(e)(3)(B)(iii) *The reserved pathway and penetrations shall be sized to serve a heat pump water heater system that meets the total building hot water demand as calculated and documented by the responsible person associated with the project.*
- Condensate
 - 160.9(e)(4)(C) *Condensate drainage shall be sized to serve a heat pump water heater system that meets the total building hot water demand as calculated and documented by the responsible person associated with the project.*
- Electrical
 - 160.9(e)(5)(A)(i)(c) *The electrical power required to power a heat pump water heater system that meets the total building hot water demand as calculated and documented by the responsible person associated with the project.*

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- 160.9(e)(5)(A)(ii)(c) *The electrical power required to power a heat pump water heater system that meets the total building hot water demand as calculated and documented by the responsible person associated with the project.*

BWC notes in the above requirements, each requirement states ‘*as calculated and documented by the responsible person associated with the project.*’ The electric ready requirements of 160.9(e) are overly prescriptive. We recommend that CEC should defer the proper sizing, installation, troubleshooting, and maintenance of central HPWHs to the manufacturers of central HPWHs. BWC recommends only those requirements which specify ‘*as calculated and documented by the responsible person associated with the project*’ remain in the central HPWH clean-up language. Recommendations or guides for central HPWH systems could be specified in the Nonresidential and Multifamily Reference Appendix or other Reference Appendix, and not in the mandatory language of the code. Please see attachment A with edits recommended by BWC.

Central HPWH system design

CEC has laid out installation requirements for 170.2(d), which are overly prescriptive. As BWC noted previously, it is critical that plumbers and installers receive the necessary training regarding proper sizing, installation, troubleshooting, and maintenance of central HPWHs. We believe CEC had good intentions with the requirements of 170.2(d) as HPWHs, especially central HPWHs, are a relatively new technology; central HPWH systems are typically more complex than individual systems and require more effort to specify, layout, and install. Again, we recommend CEC defer the proper sizing, installation, troubleshooting, and maintenance of central HPWHs to the manufacturers of central HPWHs.

California Government Code Section 11346.2(b)(1) requires a statement of the reasons why an agency believes any mandates for specific technologies or equipment or prescriptive standards are required. This code is founded on principles intended to establish provisions consistent with the scope of a building and fire code that adequately protects public health, safety and welfare; provisions that do not unnecessarily increase construction costs; provisions that do not restrict the use of new materials, products or methods of construction; and provisions that do not give preferential treatment to types or classes of materials, products or methods of construction. The overly prescriptive requirements of 170.2(d) are restrictive and limit improvements in known and unknown technologies.

Accordingly, we refer CEC to existing language in the Energy Code, Section 110.3(c)(4)(E) Mandatory requirements for service water-heating systems and equipment, which states, ‘*Storage water heaters and boilers shall be plumbed in accordance with the manufacturer’s specifications.*’ Another such example is within 170.2(d)(2) ‘*Recirculation distribution systems serving individual dwelling units, shall use Demand Recirculation Systems with manual on/off control as specified in the Reference Appendix RA4.4.9.*’ Recommendations or guides for central HPWH systems could be specified in the Nonresidential and Multifamily Reference Appendix or other Reference Appendix, and not in the mandatory language of the code. Please see attachment B with edits recommended by BWC.

Thank you for continuing to include BWC and other stakeholders in the 2025 California Energy Code discussions. Please let me know if you have any questions, and we stand ready to work with the Commission moving forward.

Respectfully Submitted,

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Bradford White Corporation

Tom Gervais
Senior Director, Regulatory Affairs

Cc: E. Truskoski; B. Wolfer; B. Ahee; M. Corbett;

Attachments:

Attachment A - Edits to Central HPWH electric-ready requirements.

Attachment B - Edits to Central HPWH system design.

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(e) Central Heat Pump Water Heater Electric Ready. Water heating systems using gas or propane to serve multiple dwelling units shall meet the requirements of 160.9(f) and include the following for the future heat pump:

1. The system input capacity of the gas or propane water heating system shall be determined as the sum of the input gas or propane capacity of all water heating devices associated with each gas or propane water heating system.
2. Space shall be reserved and shall include service and air flow clearances as applicable. The space reserved shall be:
 - A. Heat Pump. The minimum space reserved shall include space for service clearances, air clearances, and keep outs., and shall meet one of the following:
 - ~~i. If the input capacity of the gas water heating system is less than 200,000 BTU/HR, the minimum space reserved for the heat pump shall be 2.0 square feet per input 10,000 Btu/ HR of the gas or propane water heating system, and the minimum linear dimension of the space reserved shall be 48 linear inches.~~
 - ~~ii. If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR, the minimum space reserved for the heat pump shall be 3.6 square feet per input 10,000 Btu/ HR of the gas or propane water heating system, and the minimum linear dimension of the space reserved shall be 84 linear inches.~~
 - i Physical space reserved for the heat pump shall be located outside, or
 - iii. ii The space reserved shall be the space required for a heat pump water heater system that provides equivalent functionality of the gas-powered equipment as calculated and documented by the responsible person associated with the project.

B. Tanks. The minimum space reserved shall include space for service clearances and keep outs. ~~and shall meet one of the following:~~

- ~~i. If the input capacity of the gas water heating system is less than 200,000 BTU/HR, the minimum space reserved for the storage and temperature maintenance tanks shall be 4.4 square feet per input 10,000 Btu/HR. of the gas or propane water heating system.~~
- ~~ii. If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR, the minimum physical space reserved for the storage and temperature maintenance tanks shall be 3.6 square feet per input 10,000 Btu/HR. of the gas or propane water heating system.~~
- iii. The space reserved shall be the space required for a heat pump water heater system that provides equivalent functionality of the gas-powered equipment as calculated and documented by the responsible person associated with the project.

3. Ventilation shall be provided by meeting one of the following:

A. Physical space reserved for the heat pump shall be located outside, or

B. A pathway shall be reserved for future routing of supply and exhaust air via ductwork or louvers from the reserved heat pump location to an appropriate outdoor location. Penetrations through the building envelope for louvers and ducts shall be installed and capped for future use.

~~Ductwork and louvers shall be sized to meet one of the following:~~

- ~~i. If the input capacity of the gas water heating system is less than 200,000 BTU/HR, the minimum air flow rate shall be 70 CFM per input 10,000 Btu/HR of the gas or propane water heating system and the total external static pressure drop of ductwork and louvers shall not exceed 0.17" when the future heat pump water heater is installed.~~
- ~~ii. If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR, the minimum air flow rate shall be 420 CFM per input 10,000 Btu/HR of the gas or propane water heating system and the total external static pressure drop of ductwork and louvers shall not exceed 0.17" when the future heat pump water heater is installed.~~
- iii. Ductwork and louvers shall be sized to serve a heat pump water heater system that provides equivalent functionality of the gas-fired

equipment as calculated and documented by the
responsible person associated with the project.

4. Condensate drainage piping. An approved receptacle that is sized in accordance with the California Plumbing Code to receive the condensate drainage shall be installed within 3 feet of the reserved heat pump location, or piping shall be installed from within 3 feet of the reserved heat pump location to an approved discharge location that is adequately sized in accordance with the California Plumbing Code., and meets one of the following:

- A. ~~If the input capacity of the gas water heating system is less than 200,000 BTU/HR,, condensate drainage shall be sized for 0.2 tons of refrigeration capacity per input 10,000 Btu/HR~~
- B. ~~If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR,, condensate drainage shall be sized for 0.7 tons of refrigeration capacity per input 10,000 Btu/HR~~
- C. Condensate drainage shall be sized to serve a heat pump water heater system that provides equivalent functionality of the gas-powered equipment as calculated and documented by the responsible person associated with the project.

5. Electrical

- A. Physical space shall be reserved on the bus system of the main switchboard or on the bus system of a distribution board to serve the future heat pump water heater system including the heat pump and temperature maintenance tanks. In addition, the physical space reserved shall be capable of providing adequate power to the future heat pump water heater in accordance with one of the following:

- i. Heat Pump

- A. ~~If the input capacity of the gas water heating system is less than 200,000 BTU/HR,, provide 0.1 kVA per input 10,000 Btu/HR~~
- B. ~~If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR,, provide 1.1 kVA per input 10,000 Btu/HR~~
- C. The electrical power required to power a heat pump water heater system that provides equivalent functionality of the gas-powered equipment as

calculated and documented by the responsible person associated with the project.

ii. Temperature Maintenance Tank

- A. ~~If the input capacity of the gas water heating system is less than 200,000 BTU/HR,, provide 1.0 kVA per input 10,000 Btu/HR~~
- B. ~~If the input capacity of the gas water heating system is greater than or equal to 200,000 BTU/HR,, provide 0.6 kVA per input 10,000 Btu/HR~~
- C. The electrical power required to power a heat pump water heater system that provides equivalent functionality of the gas powered equipment as calculated and documented by the responsible person associated with the project.

(f) For the electric ready equipment in 160.9 a - e, the building electrical system shall be sized to meet the future electric requirements of appliances. The building main service conduit, the electrical system to the point specified in each subsection, and any on-site distribution transformers shall have sufficient capacity to supply full rated amperage at each electric ready appliance. The capacity requirements may be adjusted for demand factors in accordance with the California Electric Code.

Attachment B – Section 170.2 edits

Section 170.2(d) ~~Water Heating Systems~~ Water heating systems shall meet the requirements of either 1, 2, 3 or 4. Domestic Hot Water System.

Domestic hot water systems serving individual dwelling units shall meet the requirements of either 1 and 2. Domestic hot water systems serving multiple dwelling units shall meet the requirements of either 3, 4 or 5, and 6, 7 and 8.

1. For systems serving individual dwelling units, the water heating system shall meet the requirement of either A, B, C, or shall meet the performance compliance requirements of Section 170.1:
 - A. A single 240 volt heat pump water heater. In addition, meet the following:
 - i. A compact hot water distribution system as specified in the Reference Appendix RA4.4.6. in climate 1 and 16; ~~and~~.
 - ii. A drain water heat recovery system that is field verified as specified in the Reference Appendix RA3.6.9 in Climate Zone 16; and
 - iii. Installation shall meet requirements specified in Section 110.3 (c).
 - B. A single heat pump water heater that meets the requirements of NEEA Advanced Water Heater Specification Tier 3 or higher. In addition, for Climate Zones 16, a drain water heat recovery system that is field verified as specified in the Reference Appendix RA3.6.9.
 - C. A gas or propane instantaneous water heater with an input of 200,000 Btu per hour or less and no storage tank.
2. Recirculation distribution systems serving individual dwelling units, shall use Demand Recirculation Systems with manual on/off control as specified in the Reference Appendix RA4.4.9.
- ~~3.~~ For heat pump water-heating systems serving multiple dwelling units, the water heating system shall be installed according to the manufacturer design and installation guidelines. Design documentation shall be provided in accordance with JA14.4. and meet A or B, or shall meet the performance compliance requirements of Section 170.1; the following requirements:
 - A. A system meeting the following requirements:
 - i. ~~Use single pass primary heat pump water heater. The hot water return from the recirculation loop shall connect to a recirculation loop tank and shall not directly connect to the primary heat pump water heater inlet or the primary thermal storage tanks.~~
 - ii. ~~The primary storage tank temperature setpoint shall be at least 135°F.~~

- ~~iii. The fuel source for the recirculation loop tank shall be electricity, if auxiliary heating is needed. The recirculation loop heater shall be capable of multi-pass water heating operation.~~
- ~~iv. For systems with single-pass primary heat pump water heater, the primary thermal storage tanks shall be piped in series if multiple tanks are used. For systems with multi-pass primary heat pump water heater, the primary thermal storage tanks shall be piped in parallel if multiple tanks are used.~~
- ~~v. The recirculation loop tank temperature setpoint shall be at least 10°F lower than the primary thermal storage tank temperature setpoint such that hot water from the recirculation loop tank is used for the temperature maintenance load before engaging the recirculation loop tank heater.~~
- ~~vi. The minimum heat pump water heater compressor cut-off temperature shall be equal to or lower than 40°F ambient air temperature.~~
- ~~vii. A recirculation system~~
- ~~viii. Design documentation shall be provided in accordance with JA14.4.~~

~~Exception to Section 170.2(d)2G3A.vii.: Buildings with eight or fewer dwelling units.~~

- B. A system that meets requirement of NEEA Advanced Water Heating Specification for commercial HPWH system Tier 2 or higher.
4. For gas or propane systems serving multiple dwelling units, a central water-heating system that includes the following components shall be installed:
- A. For Climate Zones 1 through 9, gas service water-heating systems with a total installed gas water-heating input capacity of 1 MMBtu/h or greater shall have gas service water-heating equipment with a minimum thermal efficiency of 90 percent. Multiple units are allowed to meet this requirement with an input capacity-weighted average of at least 90 percent.

~~Exception 1 to Section 170.2(d)34A: Individual gas water heaters with input capacity at or below 100,000 Btu/h shall not be included in the calculations of the total system input or total system efficiency.~~

~~Exception 2 to Section 170.2(d)34A: If 25 percent of the annual water-heating requirement is provided by site-solar energy or site-recovered energy.~~

- B. A recirculation system.

~~Exception to Section 170.2(d)34B: Buildings with eight or fewer dwelling units.~~

- C. A solar water-heating system meeting the installation criteria specified in Reference Residential Appendix RA4 and with a minimum solar savings fraction of either i or ii below:
 - i. A minimum solar savings fraction of 0.20 in Climate Zones 1 through 9 or a minimum solar savings fraction of 0.35 in Climate Zones 10 through 16; or
 - ii. A minimum solar savings fraction of 0.15 in Climate Zones 1 through 9 or a minimum solar savings fraction of 0.30 in Climate Zones 10 through 16. In addition, a drain water heat recovery system that is field verified as specified in the Reference Appendix RA3.6.9.
- 5. A water-heating system serving multiple dwelling units determined by the Executive Director to use no more energy than the one specified in Subsection 1,2, or 33, or 4 above.
- 6. For hot water distribution piping serving multiple dwelling units, verify pipe sizing is in accordance with CPC Appendix M.
- 7. Recirculation distribution systems serving multiple dwelling units shall meet the requirements in Section 110.3(c)2 and 110.3(c)5 4, ~~and shall be capable of automatically controlling the recirculation pump operation based on measurement of hot water demand and hot water return temperature.~~
- 8. Domestic hot water distribution systems with recirculation loop(s) serving multiple dwelling units shall install a mechanical or digital thermostatic master mixing valve on each distribution supply and return loop that:
 - A. Conforms to the American Society of Sanitation Engineers (ASSE) 1017-2009 standard, *Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems*
 - B. Shall be installed on the central heating plant hot water supply outlet header leading to the recirculation loop; and
 - C. Shall be installed and commissioned in accordance with manufacturer's instructions and meet requirements in Nonresidential and Multifamily Reference Appendix section RA3.6.11.
 - D. Shall indicate water mixing parameters as defined in RA3.6.11 on the plumbing plans, if this exceeds the mixing capability of the specified master mixing valve, then the designer shall provide instructions to commission a balancing valve to prevent temperature.