Proposal Summary

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

2022 California Energy Code (Title 24, Part 6)

Multifamily Central Heat Pump Water Heater

Thursday, August 22, 2019

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Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on October 3, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by October 17, 2019.

Measure Description

This measure will develop a prescriptive compliance pathway for central domestic water heating systems with heat pump technology serving multiple dwelling units by leveraging existing software algorithm development, lab testing, and design guide development. The Statewide CASE Team will perform additional market readiness research across a broad group of stakeholders and develop code and compliance manual language.

Central heat pump water heating (HPWH) is a key design strategy to decarbonize domestic water heating. Several successful designs have been implemented and are operational in Washington and California in field demonstrations. However, energy savings are highly dependent on design and not guaranteed. Heat pump water heaters require low entering water temperature to operate at high efficiencies. Design variables that must be considered include hot water draw schedules and volume throughout a multifamily building, and stratification strategies including tank sizing and piping configuration. Multiple water heaters can be designed to operate in parallel to increase overall capacity, and each heat pump water heater model has different performance characteristics.

Central HPWH is a relatively new design approach and no design guidelines exist to ensure appropriate design. This measure would integrate best practices into the code language for central HPWH design and operation to ensure energy savings. The Statewide CASE Team will gather the following information from various on-going research efforts:

- Heat pump water heater sizing and model selection in different climates
- Tank sizing and piping configurations that lead to beneficial stratification
- Control methods to maintain supply water temperature, reduce cycling, and optimize defrosting
- Location within the building and distribution piping, including impact on space heating and cooling loads.

The goal of this measure is to develop a prescriptive compliance pathway for central HPWH to encourage implementation in multifamily buildings. The Statewide CASE Team will collaborate and build upon the PG&E funded lab testing effort that include:

- Conduct performance testing of central HPWH systems and develop central HPWH model to be included in CBECC-Res and CBECC-Com
- Develop installation criteria for multifamily HPWH systems

There are several overlapping issues with accurately modeling central HPWH, which the Statewide CASE Team needs to coordinate with other domestic hot water (DHW) CASE topics and on-going research efforts:

- Recirculation loop modeling accounting for multiple loops or length of loops, solar thermal, or solar PV designs.
- Updating CBECC-Res to allow for central HPWH modeling in all multifamily buildings

Based on the outcome of the research, the Statewide CASE Team may recommend several alternate compliance pathways depending on the location, number of loops, and/or number of dwelling units being served by the central HPWH system.

Draft Code Language

The Energy Commission plans to create a multifamily chapter for inclusion in 2022 Title 24, Part 6. The multifamily chapter will draw from the appropriate sections of the 2019 residential and nonresidential Standards. The Statewide CASE Team uses the language and section numbering from residential and nonresidential Standards and Reference Appendices to show the proposed changes below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in yellow. These changes are specific to multifamily buildings and not indicative of changes that apply to residential or nonresidential buildings.

2019 Title 24 SECTION 150.1(c)

8. Domestic Water-Heating Systems. Water-heating systems shall meet the requirements of either A B or C. For recirculation distribution systems serving individual dwelling unit, only Demand Recirculation Systems with manual on/off control as specified in the Reference Appendix RA4.4.9 shall be used:

A. For systems serving individual dwelling units, the water heating system shall meet the requirement of either i, ii, iii, iv, or v:

i. One or more gas or propane instantaneous water heater with an input of 200,000 Btu per hour or less and no storage tank.

ii. A single gas or propane storage type water heater with an input of 75,000 Btu per hour or less, rated volume less than or equal to 55 gallons and that meets the requirements of Sections 110.1 and 110.3. The dwelling unit shall have installed fenestration products with a weighted average Ufactor no greater than 0.24, and in addition one of the following shall be installed:

a. A compact hot water distribution system that is field verified as specified in the Reference Appendix RA4.4.16; or

b. A drain water heat recovery system that is field verified as specified in the Reference Appendix RA3.6.9.

iii. A single gas or propane storage type water heater with an input of 75,000 Btu per hour or less, rated volume of more than 55 gallons. iv. A single heat pump water heater. The storage tank shall be located in the garage or conditioned space. In addition, one of the following:

a. A compact hot water distribution system as specified in the Reference Appendix RA4.4.6 and a drain water heat recovery system that is field verified as specified in the Reference Appendix RA3.6.9; or

b. For Climate Zones 2 through 15, a photovoltaic system capacity of 0.3 kWdc larger than the requirement specified in Section 150.1(c)14; or

c. For Climate Zones 1 and 16, a photovoltaic system capacity of 1.1 kWdc larger than the requirement specified in Section 150.1(c)14.

iv. A single heat pump water heater that meets the requirements of NEEA Advanced Water Heater Specification Tier 3 or higher. The storage tank shall be located in the garage or conditioned space. In addition, for Climate Zones 1 and 16, a photovoltaic system capacity of 0.3 kWdc larger than the requirement specified in Section 150.1(c)14 or a compact hot water distribution system as specified in the Reference Appendix RA4.4.6.

B. For systems serving multiple dwelling units, a central water-heating system that includes the following components shall be installed:

i. Gas water heating system, ~~or~~ propane water heating system, or heat pump water heater; and

ii . A recirculation system that meets the requirements of Sections 110.3(c)2 and 110.3(c)5, includes two or more separate recirculation loops serving separate dwelling units, and is capable of automatically controlling the recirculation pump operation based on measurement of hot water demand and hot water return temperature; and

EXCEPTION to Section 150.1(c)8B-ii: Buildings with eight or fewer dwelling units may use a single recirculation loop.

iii. A solar water-heating system meeting the installation criteria specified in Reference Residential Appendix RA4 and with a minimum solar savings fraction of either a or b below:

a. 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

b. 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.

C. A water-heating system serving multiple dwelling units determined by the Executive Director to use no more energy than the one specified in subsection B above.