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2025 California Energy Code

Technical Measure Report

Multifamily Individual Heat Pump Water Heater Baseline

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California Energy Commission

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Introduction

This report proposes specific energy efficiency actions that could result in further reductions of wasteful, uneconomic, inefficient, or unnecessary consumption of energy in the state of California. The code change proposal, or "measure", described in this report is provided to the California Energy Commission (CEC) for consideration and possible inclusion in the California Energy Code (also known as the Energy Code, or Building Energy Efficiency Standards, or Title 24 Part 6). This measure will be considered and may be modified as part of a comprehensive regulatory package proposed and adopted by the CEC. The Energy Code must be found to be technically feasible and cost-effective as a whole.

Code Change Description

This report proposes changes to the prescriptive requirements for space heating and water heating systems for energy and greenhouse gas (GHG) emissions savings in residential multi-family buildings. The CEC investigated heat pump water heating requirements across all climate zones and proposes prescriptive heat pump water heater (HPWH) requirements for buildings of three habitable stories or less across all climate zones. The performance standard design would match the proposed prescriptive requirements, replacing the dual baseline strategy.

Scope of Work

The multifamily individual HPWH baseline proposal will modify the following Energy Code sections, reference appendices and supporting documents listed in Table 1.

Table 1: Code Change Scope of Work

Energy Code Section(s)	Regulation Type(s): M, Ps, or Pm	Reference Appendices	Modeling Tools	Forms	Other Supporting Documents
Section 170.2(d)1	Ps, Pm	N/A	CBECC	N/A	Nonresidential and Multifamily Energy Code Compliance Manual Nonresidential And Multifamily ACM Reference Manual

An (M) indicates mandatory requirements, (Ps) Prescriptive, (Pm) Performance.

Compliance and Enforcement

Individual HPWHs are not new in single family or multifamily construction or in Energy Code compliance. There is no new enforcement procedure being proposed.

Market Assessment

The authors performed a market analysis with the goals of identifying market structure, technical feasibility, and market availability. The market assessment demonstrated that HPWHs are gaining market acceptance and increasing sales, and individual HPWHs are already readily available by multiple manufacturers. Several HPWH manufacturers expressed commitment and confidence that they could meet the market demand.

The authors performed an economic analysis using the IMPLAN model and concluded that the proposed measure would result in minimal if any impact on the market actors. The authors do not anticipate the proposed measure to have a significant impact to jobs or a financial impact to any particular sector of the California economy.

Cost-effectiveness

Table 2 summarizes the estimated benefits, costs and resulting Benefit-Cost Ratios (BCR) by California climate zone for the proposed measures. A measure is cost-effective if the BCR is equal to or greater than 1.0. BCR is calculated by dividing the total present value cost benefits by the total present value costs. The measure is shown to be cost-effective in every climate zone.

Table 2: Cost-effectiveness Summary

Climate Zone	Benefit: Total Incremental LSC Savings and Other Savings (PV$)	Cost: Total Incremental First Costs and Maintenance Costs (PV$)	Benefit-Cost Ratio (BCR)
Climate Zone 1	$2,042	$146	13.98
Climate Zone 2	$2,379	$163	14.64
Climate Zone 3	$3,906	$159	24.61
Climate Zone 4	$2,669	$165	16.17
Climate Zone 5	$3,713	$168	22.11
Climate Zone 6	$4,950	$151	32.71
Climate Zone 7	$5,025	$154	32.57
Climate Zone 8	$4,637	$149	31.11
Climate Zone 9	$4,517	$148	30.54
Climate Zone 10	$4,356	$150	29.00
Climate Zone 11	$2,760	$151	18.27
Climate Zone 12	$2,977	$156	19.08
Climate Zone 13	$3,129	$156	20.11
Climate Zone 14	$2,244	$146	15.41
Climate Zone 15	$4,210	$146	28.90
Climate Zone 16	$1,492	$147	10.12
Weighted Average	**$4,018**	**$153**	**26.23**

Statewide Energy Impacts

Tables 3 and 4 summarize the estimated statewide energy and greenhouse gas (GHG) emissions savings for the first year that the proposed measure is implemented. The tables highlight the first-year energy savings, with a notable total reduction of 36.96 million therms in source energy and a present value (PV$) savings of $23.91 million in long-term system cost (LSC), emphasizing the immediate and long-term economic and environmental benefits of the measures. While this measure will increase statewide electricity use, it will also reduce natural gas use, which results in net source energy savings and energy cost savings statewide.

Table 3: Estimated Statewide Energy Savings

	First Year Statewide Electricity Savings (GWh)	First Year Statewide Power Demand Reduction (MW)	First Year Statewide Natural Gas Savings (Million Therms)	First-Year Statewide Source Energy Savings (Million Therms)	30-Year Statewide LSC Savings (PV$ Million)
Individual HPWH Baseline	(5.59)	(0.63)	0.52	36.96	$23.91
TOTAL	(5.59)	(0.63)	0.52	**36.96**	**$23.91**

Table 4: Estimated Statewide Greenhouse Gas Emission Savings

	First Year Statewide GHG Emission Savings (MT CO_2e/year)	First Year Statewide GHG Emissions Savings (PV$)
Individual HPWH Baseline	2,549	$313,911
TOTAL	**2,549**	**$313,911**

ACRONYMS

Acronym	Definition
ACM	Alternate Calculation Method
BCR	Benefit-Cost Ratio
BEM	Building Energy Modeling
BTU	British Thermal Units
CARB	California Air Resources Board
CBECC	California Building Energy Code Compliance software
CBECC-Res	California Building Energy Code Compliance software for single-family buildings
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
CZ	California Climate Zone
ECC	Energy Code Compliance
GHG	Greenhouse Gas
GWh	Gigawatt-Hour
HVAC	Heating, Ventilation and Air Conditioning
IECC	International Energy Conservation Code
KBTU	Thousands of British Thermal Units
kWh	Kilowatt-Hour
kWh/year	Kilowatt-Hour Per Year
LSC	Long-term System Cost (30-year $)
MMT CO2e	Million Metric Tons of Carbon Dioxide Equivalent

MTCO2e	Metric Tons of Carbon Dioxide Equivalent
MW	Megawatt
PV$	Present Value Dollars
NEEA	Northwest Energy Efficiency Alliance

1. Introduction

This report proposes specific energy efficiency actions that could result in further reductions of wasteful, uneconomic, inefficient, or unnecessary consumption of energy in the state of California. The code change proposal, or "measure", described in this report is provided to the California Energy Commission (CEC) for consideration and possible inclusion in the California Energy Code (also known as the Energy Code, or Building Energy Efficiency Standards, or Title 24 Part 6). This measure will be considered and may be modified as part of a comprehensive regulatory package proposed and adopted by the CEC. The Energy Code must be found to be technically feasible and cost-effective as a whole.

Consistent with California Law (Public Resources Code 25000), an energy efficiency measure is cost-effective if the Benefit-Cost Ratio (BCR) is 1.0 or greater, when amortized over the economic life of the structure. BCR is calculated by dividing the total dollar benefit of the measure by the total dollar cost of the measure, over a period of analysis of 30 years.

To calculate benefit, Long-term System Cost (LSC) is used to determine the dollar value of energy efficiency measures in the Energy Code. LSC hourly factors help the state account for long-term benefits associated with policies needed to meet the statewide climate actions goals – such as 100 percent renewable energy generation, proliferation of electric transportation, and drastic reductions in fossil fuel combustion occurring in buildings. Today's energy costs do not adequately account for these long-term values to California's energy system. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are more valuable, and times off-peak demand are less valuable. LSC hourly factors are not utility rates or energy rate forecasts. LSC is not a predicted utility bill.

LSC hourly conversion factors are developed and published by the CEC for each code cycle. These LSC hourly factors are used to convert predicted site energy use – an output common to building energy modeling (BEM) software – to 30-year present value to California's energy system.

Energy savings for proposed measures are estimated using both LSC hourly factors and CEC-established model prototypes. Large sets of survey data are used to create prototypes that act as averaged representations of common building types in California. These prototypes are created for use in BEM software to provide accuracy and consistency amongst energy models that are used to determine energy savings for the state. CEC-developed prototypes and LSC hourly factors are published by the CEC ahead of each code cycle integral to research versions of CEC's reference Energy Code compliance software (CBECC-Res and CBECC). For this reason, CBECC-Res and CBECC are the CEC-recommended BEM software tool when assessing energy savings of proposed measures.

To calculate cost, first costs and ongoing maintenance costs must be assessed for proposed measures and accounted for over a period of analysis of 30 years. In the BCR, both the benefits and the costs are assessed incrementally, meaning in comparison to the latest adopted version of the Energy Code.

Similar to LSC hourly factors, the CEC develops and publishes conversion factors for Source Energy, and for GHG emissions for each code cycle. These three sets of hourly factors are published on CEC's website and formatted to be accessible and usable in combination with broadly available BEM tools.

2. Measure Description

This measure reduces "the wasteful, uneconomic, inefficient, or unnecessary consumption of energy" consistent with Public Resources Code 25402. The measure also has a co-benefit of decarbonizing buildings by reducing source and on-site emissions associated with water heating. Decarbonization is the stated policy goal for the state as enshrined in Assembly Bill 32, Assembly Bill 3232 (Zero-emissions buildings and sources of heat energy, 2018), Senate Bill 350 (Clean Energy and Pollution Reduction Act, 2019) and the 2021 Integrated Energy Policy Report (IEPR) (CEC, 2021). This measure supports the State's decarbonization goals, by encouraging installation of heat pump water heaters (HPWH) in multifamily buildings.

The 2022 Energy Code, Section 170.2(d) includes prescriptive options for multifamily residential buildings with central and individual water heaters. There are three options for compliance with water heaters serving individual dwelling units: 1) a 240 volt HPWH with compact hot water distribution in climate zones 1 and 16 and drain water heat recovery in climate zone 16; 2) a HPWH meeting the requirements of NEEA Advanced Water Heater Specification Tier 3 or higher and drain-water heat recovery in climate zone 16; and 3) a gas or propane instantaneous water heater with an input of 200,000 Btu per hour or less and no storage tank.

This measure applies to multifamily residential buildings. For water heaters serving individual units, it removes the prescriptive compliance option for instantaneous gas heaters. It adds an exception for multifamily residential buildings of four or more stories, retaining the prescriptive option for instantaneous gas heaters for those buildings.

For the performance pathway, the standard design with respect to LSC is changed to be individual HPWH for all multifamily buildings three habitable stories or less with individual water heaters. The standard design with respect to source energy is changed to be instantaneous gas water heaters for all multifamily buildings with individual water heaters.

2.1 Measure Modifications to Energy Code Documents

This section provides descriptions of how the proposed measure will affect each Energy Code document. See *Section 6 Proposed Code Language* of this report for detailed revisions to code language.

2.1.1 Energy Code Change Summary

Section 170.2(d)1 will be amended by the proposed measure.

SECTION 170.2 – PRESCRIPTIVE APPROACH

Subsection 170.2(d)1: The proposed regulations remove the option for water heaters serving individual dwelling units to comply with this subsection under Subsection 170.2(2)1.C, a gas or propane instantaneous water heater with an input under 200,000 Btu/hr. The proposed regulations also add an exception which allows gas or propane instantaneous water heaters to meet the requirements when installed in buildings of four habitable stories or greater. This requirement cost-effectively increases the stringency of the Energy Code, thereby minimizing the energy use of multifamily residential buildings, which in turn improves the state's economic and environmental health.

See *Section 6.1 Energy Code (Title 24, Part 6)* of this report for the detailed proposed revisions to the Standard.

2.1.2 Reference Appendices Change Summary

There are no changes to the reference appendices associated with this proposal.

2.1.3 Compliance Manuals Change Summary

Sections of the Nonresidential and Multifamily Energy Code Compliance Manual will be updated to reflect the proposed prescriptive change. Updates are expected to include but may not be limited to Section 11.6.1, Section 11.6.3 and Section 11.6.6.

2.1.4 ACM Reference Manuals Change Summary

Complying with the performance method is achieved by using CEC approved compliance software. The ACM Reference Manual describes the process for how software must create a building model, how the energy is used (Standard and Proposed Design), and what is reported on the compliance documents.

The proposed code change will modify Section 6.11.2 Individual Dwelling Units of the Title 24 Alternative Compliance Manual. The section will be modified to require that the standard design for multifamily residential buildings of three habitable stories or less with individual water heaters be HPWHs.

See *Section 6.4 ACM Reference Manuals* of this report for the detailed proposed revisions to the text of the ACM Reference Manual.

2.1.5 Compliance Forms Change Summary

There are no changes to the compliance forms associated with this measure. No new equipment or efficiency requirements have been added.

2.2 Measure Context

2.2.1 Comparable Model Code or Standard

There are no similar multifamily individual HPWH prescriptive baseline requirements in similar model building codes or technical standards (e.g., ASHRAE 62.2, ASHRAE 90.1, ASHRAE 189.1, IECC).

2.2.2 Conflicts with Other Regulations or Certifications

U.S. D.O.E. has federal minimum efficiency requirements for DHW and HVAC equipment specified in the Code of Federal Regulations at 10 CFR 430.32(d) (Code of Federal Regulations 2020). Efficiency varies with the equipment class and the equipment capacity. Table 5 gives a summary of the federal efficiency requirements. The proposed change includes heat pumps that meet federal minimum efficiency requirements.

Table 5: Federal Minimum Efficiency Requirements for Residential Water Heaters (Partial)

Product class	Rated storage volume and input rating (if applicable)	Draw pattern	Uniform energy factor
Electric Storage Water Heaters	≥20 gallons and ≤55 gallons	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 gallons and ≤120 gallons	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	$2.2418 - (0.0011 \times V_r)$

*Vr is the Rated Storage Volume (in gallons), as determined pursuant to 10 CFR 429.17.

2.3 Compliance and Enforcement

Individual HPWHs are not new in single family or multifamily construction or in energy code compliance. There is no new enforcement procedure being proposed. Therefore, the compliance and enforcement activities will not change for this proposed measure.

3. MARKET AND ECONOMIC ANALYSIS

The authors performed a market analysis with the goals of identifying market structure, technical feasibility, and market availability, and estimating anticipated market and economic impacts. These are described in detail in the subsections below.

3.1 Market Structure and Availability

3.1.1 Market Structure

The heat pump water heating technology market actors include design teams, building owners/developers, contractors, equipment manufacturers, energy consultants and Energy Code Compliance (ECC) Raters. Each type of market actor is described below.

- **Designers:** Designers are part of the project design consultant team that include architects, mechanical, plumbing, structural, and electrical consultants. Designers plan for the spaces where plumbing equipment are installed.
- **Building owners/developers:** Owners and developers are the decision-makers on the type of systems that go into their buildings.
- **Plumbing contractors:** Plumbing contractors are responsible for designing and installing DHW systems. They are responsible for determining system type and ensuring the design satisfies installation requirements. The project consultant team, including plumbing contractors, can have a strong influence on the building owners/developers in their decision of the type of installed plumbing system. After installation, maintenance, and repairs of HPWHs may be required by a licensed contractor. There are many contractors with extensive experience in installing heat pump systems.
- **Manufacturers:** Equipment manufacturers develop, market, and sell heat pump water heating equipment. Manufacturers support design engineers by providing equipment selection software and suggesting equipment layout concept. They also support equipment installation, start-up testing by providing training to contractors and builders. Manufacturer’s reps provide local design, installation, and commissioning assistance for equipment manufactures not located in California.
- **Energy consultants:** Energy consultants complete energy code-compliance modeling and documentation and advise design teams on improved design approaches.
- **ECC Raters:** ECC Raters are special inspectors that enforce code compliance. For water heating systems, ECC Raters verify compact distribution and drain water heat recovery installations.

3.1.1 Market Availability

Information provided at the California Building Industry Association (CBIA) Heat Pump Forums held in April 2023 shows that HPWHs are gaining market acceptance and increasing sales and are readily available by multiple manufacturers. CHEERS registry data presented by Consol of 56,650 single family newly constructed building projects meeting the 2019 T24 code, indicated that 16% were installing HPWHs as of Q4, 2022. CHEERs data shows an upward trend for all heat pumps. CALCERTS data from the CEC shows the same trend, although the most recent data was not available. While production builders expressed concerns of meeting the CEC's heat pump goals, the manufacturers in attendance at the forum expressed commitment and confidence that they could meet the market demand.

Information provided in the utility Statewide Code and Standards Enhancement (CASE) Team 2025 Multifamily Domestic Hot Water (DHW) CASE report[1] indicates that individual water heaters are readily available. The Statewide CASE Team performed a market analysis identifying current technology availability, current product availability, and market trends. According to the report there are 103 models certified by the CEC and listed in the MAEDBS, and 215 models certified by ENERGY STAR. Figure 1 shows example HPWHs from the three manufacturers with the most certified units. These manufacturers (with their subsidiary brand names) make up all but one of the units listed in the MAEDBS, and that one unit is not currently available for sale.

Figure 1: Example consumer integrated HPWHs (left to right: Bradford-White, A.O. Smith, and Rheem).

[1] https://title24stakeholders.com/wp-content/uploads/2023/08/2025_T24_CASE-Report-_MF-DHW-Final-1.pdf

3.2 Design and Construction Practices

Unitary HPWHs can be three times more efficient than their electric resistance counterparts. Their performance is sensitive to the ambient air temperature and the supply water temperature as heat pumps work by moving energy from the surrounding air into the water. It is important that HPWH installation location remains in the 40 to 90-degree Fahrenheit range year around to ensure optimal efficiency performance.

HPWHs have lower recovery rate – the amount of hot water a water heater can increase by 90°F in one hour – than electric or gas tank water heaters with similar tank sizes. HPWH models with larger tank capacity provide higher hot water draw without engaging the electric resistance element as much. The lower recovery rate can also be compensated for with a higher hot water delivery setpoint temperature.

Most HPWHs require a dedicated 30 Amp breaker at the service panel and a 240 Volt electrical supply. These are relatively easy to accommodate in new construction. HPWHs require adequate space for ventilation air, on the order of 700 cubic feet, for heat exchange purposes. Beyond ventilation, there needs to be sufficient space for proper placement for access to the user interface to program and control the unit, and to allow for routine air filter replacement. Additionally, HPWHs require condensate drain hose to discharge condensate from the evaporator coil.

Installation of individual HPWHs is not new in single family or multifamily construction. Therefore, there should be little impact to design and construction practices. Because HPWHs tend to be larger than gas water heaters and require additional ventilation space, designers and builders who typically specify and install gas water heaters will have to slightly modify the water heater closet and other spaces.

3.3 Impacts on Market Actors

The heat pump water heating technology market actors include builders, designers and energy consultants, building owners and occupants, ECC Raters and equipment manufacturers. Each market actor is described below.

3.3.1 Impact on Builders

Multifamily builders and contractors should be familiar with individual HPWHs, and there should be no change to their building practices. If they do need to modify their normal practices, they can engage in continuing education and training to remain compliant with changes to design practices. Many HPWH manufacturers provide training on their products and the technology.

3.3.2 Impact on Building Designers and Energy Consultants

Although there should be minimal if any impact on designers and energy consultants, adjusting design practices to comply with changing building codes is within the normal practices of building designers. Building codes (including Title 24, Part 6) are typically updated on a three-year revision cycle and building designers and energy consultants engage in continuing education and training to remain compliant with changes to design practices and building codes.

3.3.3 Impact on Occupational Safety and Health

The proposed code changes do not alter any existing federal, state, or local regulations pertaining to safety and health, including rules enforced by the California Division of Occupational Safety and Health. All existing health and safety rules would remain in place. Complying with the proposed code change is not anticipated to have adverse impacts on the safety or health of occupants or those involved with the construction, commissioning, and maintenance of the building.

3.3.4 Impact on Building Owners and Occupants

For multifamily occupants, the proposed measure would result in lower energy bills. The proposed measure would result in reduced on-site electricity and energy costs, and possibly result in lower maintenance costs, which would provide a higher benefit to people in low-income households and low-income census tracts who spend a higher percentage of their income than the average household on rent and energy bills.

3.3.5 Impact on Building Component Retailers (including manufacturers and distributors)

The proposed change would increase demand from manufacturers, distributors, and retailers for HPWH equipment. Supply chains for gas water heating equipment would experience a decrease in demand. Many manufacturers, distributors, and retailers produce and/or sell both heat pump and gas equipment. These businesses would not experience an increase or decrease in overall demand for water heating equipment.

3.3.6 Impact on ECC Raters

ECC Raters are special inspectors that enforce code compliance. For water heating systems, ECC Raters verify compact distribution and drain water heat recovery installations. This proposal does not include any new inspection procedures or requirements.

3.3.7 Impact on Manufacturers

Equipment manufacturers develop, market, and sell heat pump water heating equipment. Manufacturers support design engineers by providing equipment selection software and suggesting equipment layout concept. They also support equipment installation, start-up testing by providing training to contractors and builders. Manufacturer’s reps provide local design, installation, and commissioning assistance for equipment manufactures not located in California. Details on manufacturers and product availability is in Section 3.1.1.

3.4 Economic and Fiscal Impacts

3.4.1 Impacts on Jobs

The authors do not anticipate that the measures proposed for the 2025 code cycle would lead to the creation of new types of jobs or the elimination of existing types of jobs. In other words, the author's proposed change would not result in economic disruption to any sector of the California economy. Rather, the estimates of economic impacts discussed in Section 3.3 would lead to modest changes in employment of existing jobs.

The proposed measure would not have a significant impact to jobs or a financial impact to any particular sector of the California economy. Table 6 below summarizes these impacts.

Table 6. HPWH Multifamily Newly Constructed Building Economic Impacts

Impact Type	Employment[a]	Labor Income	Value Added	Output[b]
Direct Effect	2.3	$185,490	$459,640	$560,548
Indirect Effect	0.5	$39,648	$64,576	$111,364
Induced Effect	0.9	$59,389	$106,328	$169,233
Total Effect	**3.7**	**$284,528**	**$630,544**	**$841,145**

Source: Analysis by Evergreen Economics of data from the IMPLAN V3.1 modeling software.

a. Employment is in units of "annual average of monthly jobs for the respective industry" per IMPLAN V3.1's definition from the Bureau of Labor Statistics. This is not equivalent to a full time equivalent (FTE) but rather represents the industry average mix of full-time and part-time jobs.

b. Output is in terms of the economic value of production.

3.4.2 Impacts on Businesses in California

As stated in Section 3.3, the authors' proposed change would not result in economic disruption to any sector of the California economy. The proposed change represents a modest change to DHW systems, which would not excessively burden or competitively disadvantage California businesses – nor would it necessarily lead to a competitive advantage for California businesses. Therefore, the authors do not foresee any new businesses being created, nor do the authors think any existing businesses would be eliminated due to the proposed code changes.

3.4.3 Competitive Advantages or Disadvantages for Businesses within California

The proposed code changes would apply to all businesses incorporated in California, regardless of whether the business is located inside or outside of the state.[2]

[2] Gov. Code, §§ 11346.3(c)(1)(C), 11346.3(a)(2); 1 CCR § 2003(a)(3) Competitive advantages or disadvantages for California businesses currently doing business in the state.

Therefore, the authors do not anticipate that these measures proposed for the 2025 code cycle would have an adverse effect on the competitiveness of California businesses. Likewise, the authors do not anticipate businesses located outside of California would be advantaged or disadvantaged.

3.4.4 Increase or Decrease of Investments in the State of California

The authors analyzed national data on corporate profits and capital investment by businesses that expand a firm's capital stock (referred to as net private domestic investment, or NPDI).[3] As Table 7 shows, between 2017 and 2021, NPDI as a percentage of corporate profits ranged from a low of 18 in 2020 due to the worldwide economic slowdowns associated with the COVID 19 pandemic to a high of 35 percent in 2019, with an average of 26 percent. While only an approximation of the proportion of business income used for net capital investment, the authors believe it provides a reasonable estimate of the proportion of proprietor income that would be reinvested by business owners into expanding their capital stock.

Table 7. Net Domestic Private Investment and Corporate Profits, U.S.

Year	Net Domestic Private Investment by Businesses, Billions of Dollars	Corporate Profits After Taxes, Billions of Dollars	Ratio of Net Private Investment to Corporate Profits
2017	518.5	1,882.5	28%
2018	636.8	1,977.5	32%
2019	690.9	1,952.4	35%
2020	343.6	1,908.4	18%
2021	506.3	2,620.0	19%
		5-Year Average	26%

Source: (Federal Reserve Economic Data (FRED), 2022)

The authors do not anticipate that the economic impacts associated with the proposed measure would lead to significant change (increase or decrease) in investment, directly or indirectly, in any affected sectors of California's economy. Nevertheless, the authors derived a reasonable estimate of the change in investment by California businesses based on the estimated change in economic activity associated with the proposed measure and its expected effect on proprietor income, which we use as a conservative estimate of corporate profits, a portion of which we assume would be allocated to net business investment.[4]

[3] Net private domestic investment is the total amount of investment in capital by the business sector that is used to expand the capital stock, rather than maintain or replace due to depreciation. Corporate profit is the money left after a corporation pays its expenses.

[4] 26 percent of proprietor income was assumed to be allocated to net business investment; see Table 7.

3.4.5 Effects on the State General Fund, State Special Funds and Local Governments

The authors do not expect the proposed code changes would have a measurable impact on the California's general fund, any state special funds, or local government funds.

3.5 Cost of Compliance and Enforcement

Installation of individual HPWHs is not new in single family or multifamily construction and there are no new forms required, therefore there should be no added cost for compliance and enforcement.

4. COST-EFFECTIVENESS

4.1 Energy Savings Methodology

Energy cost savings were calculated by applying the Long-term System Cost (LSC) hourly factors to the energy savings estimates that were derived using the methodology described below. Consistent with California Law (Public Resources Code 25000.1), an energy efficiency measure is cost-effective if the Benefit-Cost Ratio (BCR) is 1.0 or greater, when amortized over the economic life of the structure. BCR is calculated by dividing the total dollar benefit of the measure by the total dollar cost of the measure, over a period of analysis of 30 years.

To calculate benefit, LSC is used to determine the dollar value of energy efficiency measures in the Energy Code. LSC hourly factors are a normalized metric to calculate LSC savings that accounts for the variable cost of electricity and natural gas for each hour of the year, along with how costs are expected to change over the 30-year period of analysis. LSC hourly factors help the state account for long-term benefits associated with policies needed to meet the statewide climate actions goals – such as 100 percent renewable generation, proliferation of electric transportation, and drastic reductions in fossil fuel combustion occurring in buildings. Today's energy costs do not adequately account for these long-term values to California's energy system. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are more valuable, and times off-peak demand are less valuable. LSC hourly factors are not utility rates or energy rate forecasts. LSC is not a predicted utility bill.

LSC hourly conversion factors are developed and published by the CEC for each code cycle. These LSC hourly factors are used to convert predicted site energy use – an output common to building energy modeling (BEM) software – to 30-year present value to California's energy system. The cost effectiveness analysis uses LSC values in 2026 PV$.

Energy savings for proposed measures are estimated using CEC-established model prototypes. Large sets of survey data are used to create prototypes that act as averaged representations of common building types in California. These prototypes are created for use in BEM software to provide accuracy and consistency amongst energy models that are used to determine energy savings for the state. CEC-developed prototypes and LSC hourly factors are published by the CEC ahead of each code cycle integral to research versions of CEC's reference Energy Code compliance software (CBECC-Res and CBECC). For this reason, CBECC-Res and CBECC are the CEC-recommended BEM software tool when assessing energy savings of proposed measures.

To calculate cost, first costs and ongoing maintenance costs were assessed over a 30-year analysis period. In the BCR, both the benefits and the costs are assessed incrementally, meaning in comparison to the latest adopted version of the Energy Code.

Similar to LSC hourly factors, the CEC develops and publishes conversion factors for Source Energy, and for GHG Emissions for each code cycle. These three sets of hourly factors are published on CEC's website and formatted to be accessible and usable in combination with broadly available BEM tools.

4.2 Energy Savings Results

The authors modeled the energy impacts using specific prototypical building models that represent typical building geometries for different types of buildings. Multifamily results are weighted based on newly constructed building activity, with the Low-Rise Garden and Loaded Corridor prototypes representing 4% and 33% of newly constructed dwelling units, respectively.

Table 8 presents the prototype buildings used in the analysis and their statewide impacts.

Table 8: Prototype(s) Used for Energy, Cost, and Environmental Analysis

Prototype ID	Occupancy Type (Residential, Retail, Office, etc.)	Floor Area (ft^2)	Number of Stories	Statewide Newly Constructed Buildings Impacted (Dwelling Units)
LowRiseGarden	Multifamily	7,680	2	844
LoadedCorridor	Multifamily	40,000	3	5,107

Per-unit energy cost savings for newly constructed buildings in terms of LSC savings realized over the 30-year period of analysis are presented 2026 PV$ in Table 9 and Table 10.

Table 9: 2026 Present Value Systemwide Life Cycle Cost Savings Per Dwelling Unit Over 30-Year Period of Analysis – Low-Rise Garden Prototype

Climate Zone	30-Year Electricity LSC Savings (PV$)	30-Year Natural Gas LSC Savings (PV$)	30-Year Total Energy LSC Savings (PV$)
1	($10,843)	$12,899	$2,056
2	($9,535)	$11,969	$2,433
3	($7,782)	$11,802	$4,020
4	($8,617)	$11,434	$2,817
5	($8,026)	$11,859	$3,833
6	($5,672)	$10,771	$5,100
7	($5,429)	$10,665	$5,236
8	($5,615)	$10,389	$4,773
9	($5,831)	$10,481	$4,650
10	($5,870)	$10,328	$4,458
11	($7,835)	$10,661	$2,826
12	($8,120)	$11,238	$3,117
13	($7,163)	$10,408	$3,245
14	($8,453)	$10,786	$2,333
15	($4,145)	$8,469	$4,324
16	($11,438)	$12,636	$1,198
Weighted Average	**($6,723)**	**$10,872**	**$4,149**

Table 10: 2026 Present Value Systemwide Life Cycle Cost Savings Per Dwelling Unit Over 30-Year Period of Analysis – Low-Rise Loaded Corridor

Climate Zone	30-Year Electricity LSC Savings (PV$)	30-Year Natural Gas LSC Savings (PV$)	30-Year Total Energy LSC Savings (PV$)
1	($10,522)	$12,561	$2,039
2	($9,282)	$11,652	$2,370
3	($7,604)	$11,490	$3,887
4	($8,487)	$11,131	$2,645
5	($7,853)	$11,546	$3,693
6	($5,559)	$10,485	$4,926
7	($5,391)	$10,381	$4,990
8	($5,497)	$10,111	$4,614
9	($5,706)	$10,201	$4,495
10	($5,713)	$10,052	$4,339
11	($7,626)	$10,376	$2,749
12	($7,984)	$10,939	$2,954
13	($7,018)	$10,128	$3,110
14	($8,268)	$10,497	$2,229
15	($4,046)	$8,237	$4,191
16	($10,763)	$12,303	$1,540
Weighted Average	**($6,586)**	**$10,582**	**$3,996**

4.3 Incremental First Cost

This analysis uses first costs based on the DOE Consumer Water Heater Preliminary Analysis Technical Support Document published in March 2022 (EERE-2017-BT-STD-0019-0018), adjusting the national average costs to California for both materials and labor rates. The instantaneous gas water heater costs and the HPWH costs are based on the baseline non-condensing, vertically vented, new construction gas-fired instantaneous water heater and the baseline heat pump greater than 55-gallon water heater, respectively. The costs account for the consumer price of the water heater, and labor and materials to install the water heater and piping. The HPWH cost also accounts for the electrical connection and an additional labor cost for the special handling of a water heater capacity over 55 gallons and condensate drain. The instantaneous water heater also accounts for the labor and material costs of a flue vent system and gas piping. The total installed cost of the instantaneous gas water heater and the HPWH are $1,636 and $2,034, respectively, with an incremental first cost of $398. Table 11 presents a summary of the California state-average first cost for the instantaneous gas water heater and the HPWH.

Table 11. Cost for instantaneous gas water heater and HPWH with incremental first cost

	Instantaneous Gas WH	HPWH	Incremental
Water Heater Cost	$733	$1,443	$710
Installation Cost	$903	$591	($312)
Total Installed Cost	$1,636	$2,034	$398

4.4 Incremental Maintenance and Replacement Costs

The incremental maintenance cost is the incremental cost of replacing the equipment or parts of the equipment, as well as periodic maintenance required to keep the equipment operating relative to current practices over the period of analysis of 30 years. The present value of equipment and maintenance costs or savings is calculated using the following equation:

$$\text{Present Value of Maintenance Cost} = \text{Maintenance Cost} \times \left\lfloor \frac{1}{1+\text{d}} \right\rfloor^{\text{n}}$$

Where:
d = the discount rate of 3%
n = the number of periods of 30 years

The instantaneous gas water heater and HPWH require regular maintenance and occasional repair. This analysis uses annualized maintenance and repair costs based on the DOE Consumer Water Heater Preliminary Analysis Technical Support Document published in March 2022 (EERE-2017-BT-STD-0019-0018), adjusting the national average costs to California for both materials and labor rates. The instantaneous gas water heater costs and the HPWH costs are based on the baseline non-condensing, vertically vented, new construction gas-fired instantaneous water heater and the baseline heat pump greater than 55-gallon water heater, respectively, from the DOE analysis. Table 12 summarizes the annualized maintenance and repair costs for the instantaneous gas water heater and HPWH, which shows an annualized incremental savings of $48 for the HPWH compared to the instantaneous gas water heater and the 30-year Net Present Value.

Table 12. Annualized and present value maintenance and repair costs for instantaneous gas water heater and HPWH

	Instantaneous Gas Water Heater Cost	HPWH Cost	Incremental Cost
Maintenance	$69	$28	($40)
Repair	$18	$11	($7)
Annualized Total	$87	$39	($48)
30-Year Net Present Value	$1,749	$784	($965)

The replacement cost for the instantaneous gas heater and the HPWH are also calculated based on the DOE Consumer Water Heater Preliminary Analysis Technical Support Document published in March 2022 (EERE-2017-BT-STD-0019-0018). The instantaneous gas water heater effective life is estimated at 20 years, and the HPWH effective life is estimated at 15 years. Over the 30-year term each is replaced once, and the remaining lifespan of the instantaneous gas water heater at the end of 30 years is discounted back to the gas heater present value. Table 13 gives the replacement cost at the year of replacement and the 30-year replacement costs for the instantaneous gas water heater and HPWH.

Table 13. 30-Year replacement costs for instantaneous gas water heater and HPWH

	Instantaneous Gas Water Heater Cost	HPWH Cost	Incremental Cost
Replacement Cost at year of replacement	$1,636	$2,034	$398
30-Year Replacement Cost - PV	$569	$1306	$737

4.5 Cost Effectiveness

A cost-effectiveness analysis is completed to determine the economic impact of proposed measures over a 30-year period of analysis. This analysis considers and include incremental energy savings for all impacted energy sources (electricity and natural gas), incremental first costs, and incremental maintenance costs over a 30-year period of analysis. Design costs and incremental costs associated with code compliance are not included in this analysis. Materials and labor cost factors are used to adjust California state-average costs for each climate zone.

For purposes of the California Energy Code, a measure is cost-effective if the Benefit-Cost Ratio (BCR) is equal to or greater than 1.0. BCR is calculated by dividing the total present value cost benefits by the total present value costs.

Results of the per-unit, cost-effectiveness analyses are presented in Table 14 for newly constructed buildings. The measure is shown to be cost-effective in every climate zone.

Table 14: Cost-effectiveness Summary – All Prototypes

Climate Zone	Benefit: Total Incremental LSC Savings and Other Savings (PV$)	Cost: Total Incremental First Costs and Maintenance Costs (PV$)	Benefit-Cost Ratio (BCR)
CZ 1	$2,042	$146	13.98
CZ 2	$2,379	$163	14.64
CZ 3	$3,906	$159	24.61
CZ 4	$2,669	$165	16.17
CZ 5	$3,713	$168	22.11
CZ 6	$4,950	$151	32.71
CZ 7	$5,025	$154	32.57
CZ 8	$4,637	$149	31.11
CZ 9	$4,517	$148	30.54
CZ 10	$4,356	$150	29.00
CZ 11	$2,760	$151	18.27
CZ 12	$2,977	$156	19.08
CZ 13	$3,129	$156	20.11
CZ 14	$2,244	$146	15.41
CZ 15	$4,210	$146	28.90
CZ 16	$1,492	$147	10.12
Weighted Average	**$4,018**	**$153**	**26.23**

5. Statewide Energy Impacts

This section provides the first-year statewide savings of the proposed measure. This analysis is to help determine overall value of the proposed measure to the State of California, and not used to determine cost effectiveness of the proposed measure. To assist with this analysis a statewide new construction forecast was developed by the CEC for 2026, which is presented in more detail in *Appendix A: Statewide Savings Methodology*. The first year energy impacts represent the first year annual savings from all buildings forecasted to be completed in 2026.

5.1 Statewide Energy and Energy Cost Savings

The first-year statewide savings for newly constructed buildings were calculated by multiplying the per-unit savings, which are presented in Section 4.2, by assumptions of the percentage of newly constructed buildings that would be impacted by the proposed code. The statewide newly construction forecast for 2026 is presented in Appendix A, as are the assumptions for the percentage of new construction that would be impacted by the proposal (by climate zone and building type).

The first-year energy impacts represent the first-year annual savings from all buildings that are estimated to be completed in 2026. The 30-year LSC savings represent the LSC savings over the entire 30-year analysis period. Table 15 presents the first-year statewide energy and energy cost savings from newly constructed buildings.

Table 15: Estimated Statewide Energy Savings

	First Year Statewide Electricity Savings (GWh)	First Year Statewide Power Demand Reduction (MW)	First Year Statewide Natural Gas Savings (Million Therms)	First-Year Statewide Source Energy Savings (Million Therms)	30-Year Statewide LSC Savings (PV$ Million)
Individual HPWH Baseline	(5.59)	(0.63)	0.52	36.96	$23.91

5.2 Statewide Greenhouse Gas Emissions Savings

The team calculated avoided GHG emissions associated with energy consumption using the CEC's hourly GHG emissions factors along with the 2025 LSC hourly factors and an assumed cost of $123.15 per metric tons of carbon dioxide equivalent emissions (metric tons CO_2e) (California Energy Commission, 2020).

The monetary value of avoided GHG emissions is based on a proxy for permit costs (not social costs).[5] The Cost-Effectiveness Analysis presented in Section 4.5 of this report does not include the cost savings from avoided GHG emissions. To demonstrate the cost savings of avoided GHG emissions, the authors disaggregated the value of avoided GHG emissions from the other economic impacts.

Table 16 presents the estimated first-year avoided GHG emissions of the proposed code change. During the first year, GHG emissions of 2,549 (metric tons of CO2e) would be avoided.

Table 16: Estimated Statewide Greenhouse Gas Emissions Savings

	Electricity Savings (GWH/yr)	Reduced GHG Emissions from Electricity Savings (MT CO_2e)	Natural Gas Savings (Million Therm/yr)	Reduced GHG Emissions from Natural Gas Savings (MT CO_2e)	Total Reduced CO2e Emissions (MT CO_2e)
Individual HPWH Baseline	(5.59)	(553.48)	0.52	3,103	2,549

5.3 Statewide Water Savings

The proposed code change will not result in water savings.

5.4 Other Non-Energy Impacts

Electric heat pump water heating systems save on-site and system-wide emissions. Additionally, use of heat pump technologies provides improved indoor air quality due to the lack of any combustion devices and they replace natural gas or propane systems that produce harmful pollutants in the space. These air quality improvements in turn provide health benefits to occupants, especially those with respiratory illnesses such as asthma.

5.4.1 Improved Safety

Heat pump water heating systems reduce or eliminate gas piping and combustion from the property, and with them the associated risk of fire and explosion (particularly during/after an earthquake). Eliminating combustion from a building significantly reduces sources of carbon monoxide poisoning for occupants.

Since there is no combustion in electric heat pump water heating systems, projects would have no combustion safety testing requirements for water heating equipment.

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[5] The permit cost of carbon is equivalent to the market value of a unit of GHG emissions in the California Cap-and-Trade program, while social cost of carbon is an estimate of the total economic value of damage done per unit of GHG emissions. Social costs tend to be greater than permit costs. See more on the Cap-and-Trade Program on the California Air Resources Board website: https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program.

Depending on local fire inspector requirements, eliminating combustion equipment from a building may also eliminate some other requirements under California Fire Code.

5.4.2 Improved Air Quality and Resiliency

Heat pump water heating systems improve air quality at the building, as well as locally and regionally by eliminating a source NOx emission.

All modern gas equipment requires electricity to operate. Since modern gas equipment has done away with standing pilot lights in favor of electronic ignition, power outages would take both gas and electric equipment offline. Studies show that after a natural disaster, such as an earthquake, electricity is restored more quickly than gas service.

5.4.3 Increase in Refrigerant Amount

Increase adoption of heat pump water heating would increase the amount of refrigerant usage. Refrigerants are very potent greenhouse gas emitters when released into the environment and regulatory bodies are working to encourage use of less potent refrigerants to curb this environmental issue. Due to their destructive properties, refrigerants with very high GWP are getting phased out and will not be allowed to be used in new products including a halt of production and import. Most manufacturers are actively developing products with low GWP refrigerants, and the impact is likely less significant as lower GWP products become available.

Refrigerant GHG emissions constitute only a minimal portion of the total GHG emissions associated with the building sector. Any potential increase in GHG emissions resulting from increased adoption of heat pump space heating and water heating will be negligible when compared to the overall GHG emissions originating from the building sector. The analysis does assume that California Air Resources Board (CARB) would require R-32 effective in 2025. The most recent CARB regulations have a January 1, 2023 effective date for room/window and wall units and January 1, 2025 effective date for other equipment, except for new variable refrigerant flow equipment, which has an effective date of January 1, 2026.

Heat pump systems have used a variety of refrigerants; recently, manufacturers have begun the transition from R-410A to refrigerants with lower global warming potential, such as R-454B and R-32. At the end of the heat pump useful life, the used refrigerant can be reclaimed. As this requires equipment for removing impurities and waste products and testing the composition for purity, currently, less than 2% of refrigerant is reclaimed (U.S. EPA, 2022). The ongoing transition to products using low-GWP refrigerants will further reduce heat pump emissions.

6. Proposed Code Language

6.1 Energy Code (Title 24, Part 6)

This measure would include the following change to the prescriptive requirements for new construction multifamily buildings:

Section 170.2(d)

- 1. For systems serving individual dwelling units, the water-heating system shall meet the requirement of either A, <u>or</u> B ~~or 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 Reference Appendix RA4.4.6 in climate zones 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.

    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 zone 16, a drain water heat recovery system that is field verified as specified in 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.~~

<u>**Exception to Section 170.2(d)1:** Multifamily buildings four habitable stories or greater may install a gas or propane instantaneous water heater with an input of 200,000 btu per hour or less and no storage tank.</u>

6.2 Reference Appendices

There are no proposed changes to the Reference Appendices.

6.3 Compliance Manuals

The Nonresidential and Multifamily Energy Code Compliance manual will be updated to reflect the proposed prescriptive changes. Updates are expected to include but may not be limited to Section 11.6.1, Section 11.6.3 and Section 11.6.6.

6.4 ACM Reference Manuals

The proposed code change will modify the following section of the Title 24 Nonresidential and Multifamily Alternative Compliance Manual:

Section 6.11.2 Individual Dwelling Units

Multifamily buildings three habitable stories or less:

- The standard design is a single heat pump water heater with a 2.0 UEF, with compact distribution basic credit in Climate Zones 1 and 16, and a drain water heat recovery system in Climate Zone 16.
- If the proposed building has an attached garage, then the standard design HPWH location is in the garage. If the proposed building does not have an attached garage, then the standard design HPWH location is in an exterior closet with louvers open to the exterior.

Multifamily buildings four habitable stories or greater:

If the proposed design uses electricity as the fuel source, the standard design is a single heat pump water heater with a 2.0 UEF with compact distribution basic credit in Climate Zones 1 and 16, and a drain water heat recovery system in Climate Zone 16.

If the proposed building has an attached garage, then the standard design HPWH location is the garage. If the proposed building does not have an attached garage, then the standard design HPWH location is in the conditioned space with the air inlet and outlet ducted to the outside.

If the proposed design is gas, then the standard design is a single gas or propane consumer instantaneous water heater for each dwelling unit. The single consumer instantaneous water heater is modeled with an input of 200,000 Btu/h, a tank volume of zero gallons, a high draw pattern, and a UEF meeting the minimum federal standards. The current minimum federal standard for a high-draw-pattern instantaneous water heater is 0.81 UEF.

6.5 Compliance Forms

There are no proposed changes to the compliance forms.

7. REFERENCES

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APPENDICES

Appendix A: Statewide Savings Methodology

Estimated statewide energy savings for the first year that the Energy Code becomes in effect (2026) can be generated by multiplying the proposed measure's per unit savings by the provided statewide construction forecasts in this appendix.

The CEC has provided multifamily residential new construction forecasts for 2026, by building type as follows: Low-Rise Garden (4 percent), Loaded Corridor (33 percent), Mid-Rise Mixed-Use (58 percent) and High-Rise Mixed Use (5 percent)(California Energy Commission, 2022). The authors did not make any changes to the CEC's construction estimates.

This code change affects newly constructed dwelling units served by individual water heating systems with a gas heat source. Table 17 shows the percentage of new dwelling units that use a gas fuel source, by prototype. Table 18 shows the percentage of new dwelling units that are served by individual gas water heaters, by prototype.[6]

Table 17. Multifamily Building Types and Associated DHW Fuel

Building Prototype	2026 Projection Percentage of Gas	2026 Projection Percentage of Electric
Low-Rise Garden	72%	28%
Low-Rise Loaded Corridor	83%	17%

Table 18. Multifamily Building Types and DHW Distribution System Types

Building Prototype	Percentage of Central Systems	Percentage of Individual Systems
Low-Rise Garden	45%	55%
Low-Rise Loaded Corridor	65%	35%

It is assumed that the distribution of fuel sources for individual water heaters reflects the overall distribution of fuel sources. Therefore, the percentage of new dwelling units that are served by individual gas water heaters, and affected by the code change, was determined by multiplying these two factors for each prototype. The resulting statewide impact was calculated for each prototype as shown in Table 19.

[6] https://title24stakeholders.com/wp-content/uploads/2023/08/2025_T24_CASE-Report-_MF-DHW-Final-1.pdf

Table 19. Individual HPWH Statewide Impact

Building Prototype	Percentage of Buildings Impacted	Number of Dwelling Units Impacted
Low-Rise Garden	40%	844
Low-Rise Loaded Corridor	29%	5,107

When applied to the CEC's construction forecasts, after including high-rise multifamily buildings not affected by this code change, the impact assumptions outlined in this section represent 11 percent of all newly constructed multifamily dwelling units. Table 20 presents the number of newly constructed dwelling units that the authors assume would be impacted by the proposed code change during the first year the 2025 code is in effect.

Table 20: Estimated New Construction Stock for Multifamily Buildings by Climate Zone (2026)

Climate Zone	Total Dwelling Units Completed in 2026 (New Construction) [A]	Percent of New Dwelling Units Impacted by Proposal [B]	New Dwelling Units Impacted by Proposal in 2026 C = A x B
1	144	11%	16
2	1,391	11%	155
3	7,699	11%	860
4	3,417	11%	382
5	285	11%	32
6	2,243	11%	251
7	5,156	11%	576
8	8,600	11%	961
9	10,302	11%	1,151
10	4,306	11%	481
11	1,173	11%	131
12	5,537	11%	618
13	1,009	11%	113
14	1,446	11%	162
15	373	11%	42
16	187	11%	21
Total	**53,268**		**5,950**

Appendix B: Embedded Electricity in Water Methodology

There are no on-site water savings associated with the proposed code change.

Appendix C: Environmental Impacts Methodology

Greenhouse Gas Emissions Impacts Methodology

GHG emissions are calculated assuming the latest applicable GHG Emissions hourly factors published by the CEC and used by the CEC's reference code compliance software (CBECC-Res and CBECC).

Water Use and Water Quality Impacts Methodology

The authors have determined that the proposal would not significantly impact water use or water quality.

Potential Significant Environmental Effect of Proposal

The CEC is the lead agency under the California Environmental Quality Act (CEQA) for the 2025 Energy Code and must evaluate any potential significant environmental effects resulting from the proposed Energy Code. A "significant effect on the environment" is "a substantial adverse change in the physical conditions which exist in the area affected by the proposed project." (Cal. Code Regs., tit. 14, § 15002(g).)

The authors have considered the environmental benefits and adverse impacts of its proposal including, but not limited to, and evaluation of factors contained in the California Code of Regulations, Title 14, section 15064 and determined that the proposal will not result in a significant effect on the environment.

Appendix D: CBECC Software Specification

The proposed code change will require adjustments to the Standard Design assumptions. It will not require changes to user inputs.

For multifamily residential buildings of three habitable stories or less:

- If the user's proposed design includes individual water heaters, then the standard design includes Individual heat pump water heaters.
    - If the user's proposed building has an attached garage, then the standard design HPWH location is the garage.
    - If the proposed building does not have an attached garage, then the standard design HPWH location is in an exterior closet with louvers open to the exterior.

For multifamily residential buildings of four habitable stories or greater:

- If the user's proposed design includes individual heat pump water heaters, then the standard design uses heat pump water heating.
- If the proposed design excludes HPWH(s), the standard design in climate zones 3, 4, 10, 13, and 14 use heat pump space heating and gas water heating, and all other climate zones use gas space heating and heat pump water heating.

For all multifamily residential buildings, the standard design in Climate Zones 1 and 16 includes Basic Compact Distribution (compactness factor of 0.7). Climate Zone 16 also includes drain water heat recovery (CSA rated efficiency of 65 percent present on all showers, feeding showers' cold side and water heater ("equal flow" configuration)).