FAIRFAX TOWN COUNCIL MEETING
STAFF REPORT

MEETING DATE November 5, 2025

PREPARED FOR Mayor and Town Council

PREPARED BY Mark Lockaby, Building Official
Bridget Wipfler, Climate Action Coordinator

SUBJECT Conduct a Public Hearing and Adopt Ordinance No. 901 adopting the 2025 California Building Standards Code (California Code of Regulations, Title 24) including the 2025 California Administrative Code, the 2025 California Building Code, the 2025 California Residential Code, the 2025 California Electrical Code, the 2025 California Mechanical Code, the 2025 California Plumbing Code, the 2025 California Energy Code, the 2025 California Historical Building Code, the 2025 California Existing Building Code, the 2025 California Green Building Standards Code, and the 2025 California Referenced Standards Codes, with Local Amendments, and the 2024 Edition of the International Property Maintenance Code

RECOMMENDATION

1) Conduct a public hearing regarding Ordinance No. 901.

2) Adopt Ordinance No. 901 adopting the 2025 California Building Standards Code(California Code of Regulations, Title 24) including the 2025 California Administrative Code, the 2025 California Building Code, the 2025 California Residential Code, the 2025 California Electrical Code, the 2025 California Mechanical Code, the 2025 California Plumbing Code, the 2025 California Energy Code, the 2025 California Historical Building Code, the 2025 California Existing Building Code, the 2025 California Green Building Standards Code, and the 2025 California Referenced Standards Codes, with Local Amendments, and the 2024 Edition of the International Property Maintenance Code.

BACKGROUND

Routine adoption -
Every three years, the State of California updates its building codes, and the cities and towns must in turn adopt them. Fairfax last adopted the 2022 building codes on December 7, 2022. The Town of Fairfax adopted Tier 1 Reach Codes and Flex Compliance Pathway (FlexPath) from the 2022 Building Standards Code, established by Ordinance No. 872.

New law -
The recently chaptered Assembly Bill 130 (AB 130) created a moratorium until June 1, 2031 on new local amendments for residential requirements, except those substantially equivalent to local amendments in effect as of September 30, 2025. *Fairfax is adopting Tier 1 reach codes and Flex Path that are substantially similar to those adopted as part of the 2022 code cycle.*

If local amendments were not in effect as of September 30, 2025, new local amendments can still be adopted under AB 130 under one of the following exemptions: a) the California Building Standards Commission determines that the changes are necessary to protect health and safety as emergency standards,. b) the changes relate to home hardening, c) the building standards relate to home hardening and are proposed for adoption by a fire protection district pursuant to Health and Safety Code section 13869.7, d) the proposed changes are necessary to implement a local code update that is consistent with a General approved as of June 10, 2025, or e) the changes are related to administrative practices and exclusively result in any of the following—such as streamlined issuance of a post-entitlement permit, post-entitlement fee schedule updates, implementation of new permitting software, reduced agency costs, or changes to local programs related to building code enforcement procedures.

Outreach and Exemptions -
The County of Marin and the Town of Fairfax conducted outreach to the community and builders. The code includes exemptions for hardship/infeasibility for single-family residential projects subject to the flexible compliance pathway requirements because:

- Compliance is disproportionate to overall project cost;
- Strict compliance with the standards would create or maintain a hazardous condition(s) and present a life safety risk to the occupants;
- Conflicts with State standards;
- Measures impair a listed historic structure.

DISCUSSION
On July 1, 2025 the State of California published and made available the 2025 Edition of the California Code of Regulations, Title 24 consisting of the following:

- The California Administrative Code
- The California Building Code
- The California Residential Code
- The California Electrical Code
- The California Mechanical Code
- The California Plumbing Code
- The California Energy Code
- The California Wildland-Urban Interface Code
- The California Historical Building Code
- The California Fire Code
- The California Existing Building Code
- The California Green Building Standards Code (CALGreen)
- The California Referenced Standards

The State has mandated that local jurisdictions must adopt the codes with appendices and amendments to be effective by January 1, 2026. California Building Standards are applicable to all occupancies throughout California

The 2024 edition of the International Property Maintenance Code is not included in the California Code of Regulations and will be adopted by reference as part of Title 15 of the Fairfax Municipal Code.

The California Fire Code and the California Wildland Urban Interface Code (WUI) will be adopted separately under Chapter 8 of the Fairfax Municipal Code. The Ross Valley Fire prevention officers are again requesting changes to Chapter 7 of the building code, and Chapter 3 of the residential code requiring that WUI apply to: new buildings, additions, repairs, and exterior alterations. The amendments have been added to Section 15.04.020 of the Municipal Code.

At its October 15, 2025 meeting, the Town Council introduced and waived first reading of Ordinance 901, and amended the definition of "Substantial Remodel" in the California Building Code to conform to the definition of "Substantial Remodel" in the California Fire Code and the California WUI Code. At tonight's meeting, it is recommended that the Town Council conduct a public hearing and adopt Ordinance No. 901, in order for the ordinance to take effect January 1, 2026.

FISCAL IMPACT
There is no fiscal impact from this routine action, other than minimal staff time used from the existing Building Official and existing part-time Climate Action Coordinator.

ATTACHMENTS
A. Ordinance 901
B. Redline of Changes to Fairfax Town Code, Chapter 15.04 (Building Codes)
C. 2022 Cost-Effectiveness Study: Existing Single Family Building Upgrades
D. Application of the 2022 Studies to the 2025 Energy Code: Existing Single Family Building Upgrades
E. Green Building Chapter Summary

ORDINANCE 901

AN ORDINANCE OF THE TOWN COUNCIL OF THE TOWN OF FAIRFAX AMENDING CHAPTER 15.04 OF THE FAIRFAX TOWN CODE AND ADOPTING BY REFERENCE THE 2025 CALIFORNIA BUILDING STANDARDS CODE, INCLUDING THE 2025 CALIFORNIA ADMINISTRATIVE CODE, THE 2025 CALIFORNIA BUILDING CODE, THE 2025 CALIFORNIA RESIDENTIAL CODE, THE 2025 CALIFORNIA ELECTRICAL CODE, THE 2025 CALIFORNIA MECHANICAL CODE, THE 2025 CALIFORNIA PLUMBING CODE, THE 2025 CALIFORNIA ENERGY CODE, THE 2025 CALIFORNIA HISTORICAL BUILDING CODE, THE 2025 CALIFORNIA EXISTING BUILDING CODE, THE 2025 CALIFORNIA GREEN BUILDING STANDARDS CODE, AND THE 2025 CALIFORNIA REFERENCED STANDARDS CODES, WITH LOCAL AMENDMENTS, AND THE 2024 EDITION OF THE INTERNATIONAL PROPERTY MAINTENANCE CODE

WHEREAS, the Town of Fairfax initiated proposed amendments to Fairfax Town Code Chapter 15.04 (Building Code). The Building Code includes building and energy efficiency regulations that apply to the incorporated areas of Fairfax. The project includes proposed amendments including, but not limited to, modifying green building requirements for new single family and duplex structures, new multi-family projects, new non-residential buildings or additions, remodeling and additions to residential structures, remodeling of multi-family projects, and remodeling to non-residential structures; and

WHEREAS, an inventory of 2020 greenhouse gas emissions for the Town of Fairfax found that the use of energy in residential and non-residential buildings within the Town generates 39% of the total annual greenhouse gas emissions, 90% of which comes from the combustion of natural gas in buildings; and

WHEREAS, the Town of Fairfax Climate Action Plan 2030 identifies reducing building energy use, and specifically natural gas use, as one of the most effective means of meeting the adopted goal of reducing the emissions of greenhouse gases to 100% below 2005 levels by the year 2030; and

WHEREAS, the Town Council adopted a resolution on March 6, 2019, declaring a climate emergency and reaffirming the Town's commitment to reducing greenhouse gas emissions; and

WHEREAS, the California Global Warming Solutions Act of 2006, known as AB 32, established a statewide goal of reducing greenhouse gas emissions to 1990 levels by 2020 and to a level 80% below 1990 levels by 2050, and Senate Bill 32, passed in 2016, set a target to reduce statewide emissions to 40% below 1990 levels by 2030; and

WHEREAS, the State of California Air Resource Board Draft 2025 Scoping Plan states that greenhouse gas reductions from local efforts are important to support state-level measures and highlights building decarbonization as a priority strategy for greenhouse gas reduction; and

WHEREAS, through Senate Bill 100 the State of California has adopted a goal that renewable energy and zero-carbon resources supply 100 percent of electric retail sales to end-use customers by 2045; and

WHEREAS, Fairfax properties can currently access 100% renewable energy via MCE's Deep Green and PG&E's Solar Choice programs, and MCE expects to achieve 95% GHG-free by 2023 for their Light Green service; and

WHEREAS, the Town of Fairfax is already experiencing and at risk of more frequently experiencing the devastating effects of extreme heat and weather events and flooding caused by climate change, including increased frequency and magnitude of wildfires and associated air pollution, health impacts, utility and transportation service interruptions, economic disruption, property loss, dislocation, housing shortages,

food insecurity, school closures, impacts on agricultural production; and increased demand on public sector resources and emergency response capacity; and

WHEREAS, California Health and Safety Code Section 17958.7 provides that before making any local changes or modifications to the California Building Standards Code (CBSC) pursuant to Section 17958.7, the governing body must make an express finding that such modifications or changes are reasonably necessary because of local climatic, geological or topographical conditions, that such findings must be available as a public record, that a copy of the findings together with the modifications or changes expressly marked and identified to which each finding refers, must be filed with the State Building Standards Commission, and that no modification or change shall become effective or operative for any purpose until the findings and the modifications or changes have been filed with the Commission, and that the Commission may reject a modification or change if no finding was submitted; and

WHEREAS, the Town Council hereby finds that the green building local modifications to California Green Building Standards Code Chapters 3, 4, and 5, as set forth in this ordinance, are reasonably necessary to address local climatic, geologic, environmental, and/or topographic conditions that affect the health, safety, and welfare of residents; and

WHEREAS, the Town of Fairfax is the designated enforcement authority for this Title, and with the Ordinance proposed herein is expressly initiating local amendments, additions or deletions to the California Building Standards Code; and

WHEREAS, the Public Resources Code Section 25402.1(h)(2) states that a local enforcement agency may adopt more restrictive energy standards when they are cost-effective and approved by the California Energy Commission; and

WHEREAS, The Town of Fairfax first adopted a green building and energy reach code in 2010 and most recently, in the fall of 2022, the Town Council adopted an energy and electrification reach code for residential additions and alterations (also known as the Flex Path) that went into effect on January 1, 2023.

WHEREAS, The proposed amendments to the Building Code are substantially equivalent to the amendments to the Building Code that were adopted by the Town Council in November 2022 and went into effect January 1, 2023.

WHEREAS, the Town Council hereby determines that the revised energy standards contained herein are cost effective, based upon the findings of studies conducted by Frontier Energy, Inc., Misti Bruceri & Associates LLC, and TRC Energy Services; and

WHEREAS, nothing in this ordinance is intended to amend or conflict with any provisions of the National Appliance Energy Conservation Act of 1975 or to impose requirements to use or install any particular appliance or appliance system.

THE TOWN OF FAIRFAX DOES ORDAIN AS FOLLOWS:

SECTION 1. Findings. The Town Council finds that in order to best protect the health, safety and welfare of the citizens of the Town of Fairfax, the standards of building within the Town must conform with state law except where local conditions warrant more restrictive regulations, and, therefore, the Town Council should adopt the current California Building Standards Codes, contained in California Code of Regulations, Title 24, and other uniform codes governing the construction and regulation of buildings and structures, along with certain local changes and modifications to these Codes, which the Town Council

is authorized to make by California Health and Safety Code Sections 17958.7, and 18941.5, and reasonably necessary due to local climatic, geological, or topographical conditions.

Additional amendments are found to be either administrative or procedural in nature or to concern themselves with subjects not covered in the Codes. They are necessary for administrative clarification, and do not modify a building standard pursuant to California Health & Safety Code Sections 17958, 17958.7, and/or 18941.5. These administrative amendments establish administrative standards for the effective enforcement of the building standards in the Town. The changes made include provisions making each of said Codes compatible with other codes enforced by the Town and fee schedules.

A copy of this Ordinance adopting the 2025 California Building Standards Code, as amended, shall be filed with the California Building Standards Commission by the Town Clerk of the Town of Fairfax.

Pursuant to California Health and Safety Code section 17958.7, the Town Council makes the factual findings set forth in "Exhibit A" attached hereto and incorporated herein by reference, and finds that the amendments made in this ordinance to the California Building Code, California Code of Regulations, Title 24, Part 2, and California Residential Code, California Code of Regulations, Title 24, Part 2.5, and the California Plumbing Code, California Code of Regulations, Title 24, Part 5, are reasonably necessary because of the local climatic, geological or topographical conditions stated in Exhibit A.

The Town Council of the Town of Fairfax further finds that adoption of this ordinance is exempt from the California Environmental Quality Act (CEQA) under California Code of Regulations, Title 14, § 15061(b)(3). Furthermore, the project protects persons and property from emergencies caused by the risk of fire, explosion and earthquake, and is statutorily exempt from CEQA because it is an action necessary to prevent or mitigate an emergency. (Cal. Public Resources Code section 21080(b)(4).)

SECTION 2. Chapter 15.04 of the Municipal Code Amended. Chapter 15.04 of the Town Code is hereby deleted in its entirety and replaced by the following:

"Chapter 15.04

BUILDINGS AND CONSTRUCTION

Sections

Section 15.04.010 – Adoption of Construction Codes

The following parts of Title 24, California Code of Regulations are adopted by reference as construction codes for the Town of Fairfax, subject to the modifications included later in this title:

a) 2025 California Administrative Code (Title 24, Part 1)

b) 2025 California Building Code (Title 24, Part 2) based upon the 2024 International Building Code (IBC), including:
    1) Division II of Chapter 1, but not Section 113,
    2) Appendix Chapter A, Employee Qualifications,
    3) Appendix Chapter G, Flood-Resistant Construction,
    4) Appendix Chapter H, Signs,
    5) Appendix Chapter I, Patio Covers, and
    6) Appendix Chapter J, Grading.

c) 2025 California Residential Code (Title 24, Part 2.5) based on the 2024 International Residential Code (IRC) including:
    1) Division II of Chapter 1, but not Section 112,
    2) Appendix BF Patio Covers
    3) Appendix BH Automatic Vehicular Gates
    4) Appendix BL Hemp Line (Hempcrete) Construction
    5) Appendix BO Existing Buildings and Structures
    6) Appendix CI Swimming Pool Safety Act

d) 2025 California Electrical Code (Title 24, Part 3) based upon the 2023 National Electrical Code (NEC), including:
    1) Article 89, but not Section 89.108.8.

e) 2025 California Mechanical Code (Title 24, Part 4) based upon the 2024 Uniform Mechanical Code (UMC), including:
    1) Division II of Chapter 1, but not Sections 107.0, 107.1, 107.2.

f) 2025 California Plumbing Code (Title 24, Part 5) based upon the 2024 Uniform Plumbing Code (UPC), including:
    1) Division II of Chapter 1, but not Sections 107.0, 107.1, or 107.2

g) 2025 California Energy Code (Title 24, Part 6)

h) 1) Division II of Chapter 1, but not Section 112

i) 2025 California Historical Building Code (Title 24, Part 8)

j) 2025 California Existing Building Code (Title 24, Part 10) based upon the 2024 International Existing Building Code (IEBC) including the following chapters of Appendix A (Guidelines for the Seismic Retrofit of Existing Buildings):

    1) Chapter A1 Seismic Strengthening Provisions for Unreinforced Masonry Bearing Wall Buildings;

    2) Chapter A3 Prescriptive Provisions for Seismic Strengthening of Cripple Walls and Sill Plate Anchorage of Light, Wood-Framed Residential Buildings; and,

    3) Chapter A4 Earthquake Risk Reduction in Wood-Frame Residential Buildings With Soft, Weak or Open Front Walls.

k) 2025 California Green Building Standards Code (CALGreen) (Title 24, Part 11), including:

    1) Appendix A4 and Appendix A5 Tier 1 measures, but excluding Appendix A4.2 and A5.2 (Energy Efficiency). The Tier 1 measures shall be mandatory for commercial and residential construction, and verification of such compliance shall be provided by the installer or designer.

l) 2025 California Referenced Standards Code (Title 24, Part 12).

m) 2024 edition of the International Property Maintenance Code, to the extent the same is not inconsistent with the California Buildings Standards Code (California Code of Regulations, Title 12, Parts 1-12), as adopted and amended herein.

A copy of each of these documents is maintained in the office of the Building Official, and reference is made to them with like effect as if all the provisions and printed matter therein were herein set forth in full.

Section 15.04.015 – Definitions

Section 202 of the California Building Code and Section R202 of the California Residential Code are both hereby amended to add the definitions of “Second Unit” and “Substantial Remodel” as follows:

> **SECOND UNIT**. A completely separate housekeeping unit with kitchen, sleeping and bathroom facilities which is a part of, an extension to, or a separate structure on a site developed with a single-family residence, in excess of the maximum density designated by the zoning district in which the property is situated or as prescribed thereby.
>
> **SUBSTANTIAL REMODEL**. Shall mean the renovation of any structure, which combined with any additions to the structure, affects a floor area which exceeds fifty percent of the existing floor area of the structure within any 36-month period. When any changes are made in the building, such as walls, columns, beams or girders, floor or ceiling joists and coverings, roof rafters, roof diaphragms, foundations, piles or retaining walls or similar components, the floor area of all rooms affected by such changes shall be included in computing floor areas for the purposes of applying this definition. This definition does not apply to the replacement and upgrading of residential roof coverings.

Section 15.04.020 – Exterior Fire Resistive Construction, Automatic Fire Sprinkler Systems, Fire Extinguishers, Smoke Alarms.

Section 501.1 of the 2025 California Wildland-Urban Interface Code (Title 24, Part 7, California Code of Regulations) are hereby amended to read as follows:

501.1 **Scope**. This chapter applies to building materials, systems, and/or assemblies used in the exterior design and construction of new buildings, additions, repairs, and exterior alterations located within a Wildland Urban Interface Fire Area as defined in section 301.1

Section 501.1.1 is hereby added to Chapter 5 of the 2025 California Wildland-Urban interface Code (Title 24, Part 7, California Code of Regulations) are hereby amended to read as follows:

501.1.1 Application.. New buildings, additions, repairs, and exterior alterations to buildings located in any Fire Hazard Severity Zone or any Wildland Urban Interface Fire Area designated by the enforcing agency constructed after the application date shall comply with the provisions of this chapter.

Exceptions:

1. Buildings of an accessory character and not exceeding 120 square feet in floor area, when located at least 30 feet from an applicable building.

2. Buildings of an accessory character classified as a Group U occupancy of any size located at least 50 feet from an applicable building.

3. Buildings classified as a Group U Agricultural Building, as defined in Section 202 and R202 of this code (see also Appendix C - Group U Agricultural Buildings), when located at least 50 feet from an applicable building.

Section 504.5.3 is hereby added to Chapter 5 of the 2025 California Wildland-Urban Interface Code(Title 24, Part 7, California Code of Regulations), which shall read as follows:

504.5.3. When more than fifty percent (50%) of exterior wall coverings of an existing structure are repaired or replaced within a thirty-six (36) month period, the entire exterior wall coverings shall comply with Section 504.5.2.

Section 903.2 of the California Building Code is hereby amended to read as follows:

903.2 **Where Required.** All Occupancies and Facilities. Approved automatic sprinkler systems in new buildings and structures shall be provided in the locations described in Sections 903.2.1 through 903.2.12 and Sections 903.2.14 through 903.2.21. Additionally, an automatic fire sprinkler system shall be installed in all of the following:

1. Every newly constructed building and facility.

Exceptions:

a. Free standing Group U Occupancies not more than 1,000 square feet and provided with exterior wall and opening protection as per Table 602 of the California Building Code.
b. Agricultural buildings as defined in Appendix C of the California Building Code and not exceeding 2,000 square feet, having clear unobstructed side yard of combustible materials, exceeding 60 feet in all directions and not exceeding 25 feet in height.

2. In newly created second units.

Exceptions:

a. Parcels that are not within the Wildland Urban Interface Code, as established by the Town.
b. Parcels for which there is less than a thirty percent (30%) grade change between the subject parcel and Sir Francis Drake Boulevard as illustrated in the "Map of Parcels Qualifying for Exceptions to Sprinkler System Requirements for Newly Created Second Units" or as hereafter designated by resolution of the Town of Fairfax.
c. Junior second units.
d. For an accessory dwelling unit, as defined by Government Code Section 66313, if fire sprinklers are not required for the primary residence. This exception is intended to comply with Government Code Section 66314(C)

3. In all buildings which have more than fifty percent (50%) floor area added or any "substantial remodel" as defined in this code, within any 12 month period. Exceptions may be granted by the Fire Code Official when alternate means of protection are installed as approved by the Fire Code Official.

4. In all buildings except R-3 occupancies, in excess of 3,000 sq. ft. which have more than ten percent (10%) floor area added within any 12 month period. Exceptions may be granted by the Chief when alternate means of protection are installed as approved by the Fire Code Official.

5. A change in the use of a structure that results in a higher fire or life safety exposure when the square footage of the area changing use is more than fifty percent (50%) of the square footage of the building.

Section R309.1 and R309.2 of the California Residential Code each amended to read as follows:

R309.1 / R309.2 **Where Required.** An automatic fire sprinkler system shall be installed in all of the following:

1. Every newly constructed building and facility.

Exceptions:

a. Free standing Group U Occupancies not more than 1,000 square feet and provided with exterior wall and opening protection as per Table 602 of the California Building Code.
b. Agricultural buildings as defined in Appendix C of the California Building Code and not exceeding 2,000 square feet, having clear unobstructed side yard of combustible materials, exceeding 60 feet in all directions and not exceeding 25 feet in height.

2. In newly created second units.

Exceptions:

a. Parcels that are not within the Wildland Urban Interface Code, as established by the Town.

b. Parcels for which there is less than a thirty percent (30%) grade change between the subject parcel and Sir Francis Drake Boulevard as shown on the "Map of Parcels Qualifying for Exceptions to Sprinkler System Requirements for Newly Created Second Units" or as hereafter designated by resolution of the Town of Fairfax.
c. Junior second units.
d. For an accessory dwelling unit, as defined by Government Code Section 66313 if fire sprinklers are not required for the primary residence. This exception is intended to comply with Government Code Section 66314(d) (12)

3. In all buildings which have more than fifty percent (50%) floor area added or any "substantial remodel" as defined in this code, within any 12 month period. Exceptions may be granted by the Fire Code Official when alternate means of protection are installed as approved by the Fire Code Official.

4. In all buildings except R-3 occupancies, in excess of 3,000 sq. ft. which have more than ten per cent (10%) floor area added within any 12 month period. Exceptions may be granted by the Chief when alternate means of protection are installed as approved by the Fire Code Official.

5. A change in the use of a structure that results in a higher fire or life safety exposure when the square footage of the area changing use is more than fifty percent (50%) of the square footage of the building.

Section 903.3 of the California Building Code and Sections R309.1.1 and R309.2.1 of the California Residential Code are each hereby amended by adding the following language to the end of each respective section:

The requirements for fire sprinklers in this code section are not meant to disallow the provisions for area increase, height increase, or Fire-Resistive substitution if otherwise allowed by sections 504 and 506 of the California Building Code. All automatic fire sprinkler systems shall be installed in accordance with the written standards of the Fire Code Official and the following:

a. In all residential buildings required to be sprinkled any attached garages shall be sprinkled, and except for one and two family dwellings, in all residential occupancies the attics shall be sprinkled.

b. In all existing buildings, where fire sprinklers are required by provisions of this code, they shall be extended into all unprotected areas of the building.

c. All single family dwellings in excess of 5,000 square feet shall have automatic fire sprinkler systems designed in accordance with NFPA Standard 13 or 13R and standards developed by the Fire Chief.

d. All public storage facilities shall have installed an approved automatic fire sprinkler system. An approved wire mesh or other approved physical barrier shall be installed 18 inches below the sprinkler head deflector to prevent storage from being placed to within 18 inches from the bottom of the deflector measured at a horizontal plane.

Section 906.11 is hereby added to the California Building Code as follows:

> 906.11 **Fire Extinguisher Documentation.** The owner and/or operator of every Group R Division 1 and R Division 2 occupancies shall annually provide the Chief written documentation that fire extinguishers are installed and have been serviced as required by Title 19 of the California Code of Regulations when such extinguishers are installed in residential units in lieu of common areas.

Section 907.2 of the California Building Code is amended to add the following paragraphs after the second paragraph and before the Exceptions:

> New Construction: Every new building constructed for non-residential occupancies greater than 2,000 square feet shall have installed therein an approved fire detection (products of combustion) system in accordance with the standards established by the National Fire Protection Association. The type of system installed shall be determined by the Fire Chief.
>
> Existing Construction: Every existing building remodeled for non-residential occupancies greater than 2,000 square feet shall have installed therein an approved fire detection (products of combustion) system in accordance with the standards established by the National Fire Protection Association. The type of system installed shall be determined by the Fire Chief.

Section 907.2.11 is hereby amended by changing the first sentence of the exception to read as follows:

> **EXCEPTION:** For group R occupancies other than single family dwellings.

Section 907.8.1 is hereby added as follows:

> Section 907.8.1 **Smoke Alarm Documentation.** The owner and/or operator of every Group R Division 1, Division 2, Division 3.1, and Division 4 Occupancies shall annually provide the Fire Code Official with written documentation that the smoke alarms installed pursuant to the California Building Code have been tested and are operational. If alarms are found to be inoperable or are missing, such alarms shall be repaired or replaced immediately.

Section 15.04.025 – Plan Check Fees

Section 109.2 of the California Building Code is hereby amended to add the following:

> When submittal documents are required by Section 107.1, a plan review fee shall be paid at the time of submitting the submittal documents for plan review. Said plan review fee shall be sixty-five percent (65%) of the building permit fee.
>
> When private contractors are retained to conduct project plan checks, the plan check fee charged by the Town shall be the total cost of the private plan check plus an additional twenty percent (20%) of that cost to defer administrative services provided by the Town.

Section 15.04.030 – Roof Coverings

Section 1505.1 of the California Building Code and Section R902.1 of the California Residential Code are both amended to add the following language after the first paragraph and before the exception(s) to each:

> Notwithstanding anything to the contrary, the roof covering on any structure regulated by this code shall be a Class A Roof Covering Assembly as classified by Section 1505.2. When more than fifty percent (50%) of the total roof area of an existing structure is replaced within a twelve (12) month period, the entire roof must be replaced with a Class A Roof Covering Assembly.

Section 15.04.035 – Barriers for Swimming Pools, Spas and Hot Tubs

The Town Council finds and determines that the maintenance of swimming pools without protective measures constitutes a hazard to the safety of children and other inhabitants of the Town, and therefore the regulations contained in section 3109 of the California Building Code and Appendix CI of the California Residential Code, are hereby adopted and shall apply to existing as well as remodeled and new swimming pools.

Section 15.04.040 – Septic systems

> California Plumbing Code Section 713.1 is amended to read as follows:
>
> Every building in which plumbing fixtures are installed and every premises having drainage piping thereon, shall have a connection to a public sewer, except as provided in Sections 713.2 and 713.4.
>
> Exception: A permit may be issued for the repair, replacement, or alteration of a previously constructed septic tank or sewage disposal system other than a septic system where no public sewer is available upon approval by the Town Council, the Planning Commission, the Marin County Health Department, Sanitary District Number 1 of Marin County, and the Bay Area Water Quality Control Board.

Section 15.04.045 – Correcting Past Violations

Before a new permit can be issued for any parcel, all expired permits for a parcel must be reinstated, all work done without a permit on a parcel must be permitted, and all mandatory correction items noted on the Resale Inspection Reports for that parcel must be permitted or corrected.

Section 109.7 is added to the California Building Code and Section R108.7 is added to the California Residential Code to read as follows:

> Expired permits which are lacking only a final inspection may be reinstated for a fee of $50 or the cost of the permit, whichever is less.

Section 15.04.050 – Fee Adjustments.

The Town Council may, by resolution, revise the fees established by this Chapter 15.04.

Section 15.04.055 – Alternative Power Supplies

Section 1511.10.2 of the California Building Code and Section R329.8.4 of the California Residential Code are added to read as follows:

> Alternative Power Supplies. Roof-mounted photovoltaic panels/modules and other alternative electrical power supply sources shall comply with the requirements of the California Building Code as amended, the California Residential Code as amended, the California Electrical Code, and the California Fire Code as amended.

Section 15.04.065 – Electric Vehicle Charging Stations

(A) Purpose. The purpose of this section is to create an expedited and streamlined electric vehicle charging station permitting process that complies with Cal. Government Code § 65850.7 to achieve the timely and cost-effective installation of electric vehicle charging stations. Pursuant to Cal. Gov't Code § 65850.7 and notwithstanding any other provision of this code pertaining to conditional or accessory uses, only an electrical permit shall be required for an electric vehicle charging station.

(B) Definitions.

> “Electronic Submittal.” The submission of application materials via electronic mail.
>
> “Electric Vehicle Charging Station (EVCS)” means a parking space that includes installation of electric vehicle supply equipment (EVSE) at an EV Ready space. An EVCS space may be used to satisfy EV Ready space requirements. EVSE shall be installed in accordance with the California Electrical Code, Article 625.

(C) Permit.

> (1) An electrical permit is required prior to installing an electric vehicle charging station. Installation shall also meet any applicable requirements of the California Building Standards Code (California Code of Regulations, Title 24) and state law, including but not limited to, Cal. Gov't Code § 65850.7, as may be amended from time to time.
>
> (2) The Building Official shall adopt and maintain a standard electric vehicle charging station checklist that is consistent with the checklist in the most current version of the "Plug-In Electric Vehicle Infrastructure Permitting Checklist" of the "Zero-Emission Vehicles in California: Community Readiness Guidebook" published by the Office of Planning and Research. The checklist and application shall be made available on the town's website.
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> (3) An application to install an electric vehicle charging station may be made by electronic submittal. An applicant's electronic signature shall be accepted on all forms, applications, and other documents in lieu of a wet signature.
>
> (4) An application will be deemed complete if the Building Official determines that the application includes all of the information and documents required by the standard application form and the standard checklist. If an application is deemed incomplete, the Building Official will notify the applicant in writing of the additional information needed to complete the application. After an application is deemed complete, the Building Official will perform an expedited review of the application.

(5) Review of the permit application shall be limited to the Building Official's review of whether the application meets local, state and federal health and safety requirements. The application shall be administratively reviewed by the Building Official as a ministerial permit.

(6) Approval of a permit shall not be conditioned on the approval of an association, as that term is defined in Cal. Civil Code § 4080.

(7) A permit will be issued following the Building Official's approval of an application for an electric vehicle charging station and after all required fees have been paid. If the application was submitted electronically, the permit may be issued electronically. The decision to approve or deny the permit shall be issued in accordance with the timeframes adopted by the Town Council and in no event later than three days after the application is deemed complete.

(8) As soon as practicable after the applicant notifies the Building Official that an electric vehicle charging station has been installed, the Building Official will inspect the system to verify compliance with the permit. No electric vehicle charging station may be operated unless the Building Official verifies in writing that it complies with the permit.

Section 15.04.070 – Green Building Requirements

(A) Purpose. The purpose of this section is to meet or exceed all applicable mandatory measures of the 2025 California Green Building Standards Code (Title 24, Part 11) of the California Code of Regulations and to enhance the long-term public health and welfare by contributing to the overall reduction of greenhouse gas emissions and improving the environmental and economic health of the county through the efficient design, construction, operation, maintenance and deconstruction of buildings and site development by incorporating green building practices and materials. The green building provisions referenced in this chapter are designed to achieve the following objectives:

(1) Increase energy efficiency in buildings;
(2) Reduce consumption of fossil fuels in the Town;
(3) Encourage water and resource conservation;
(4) Reduce waste generated by construction projects;
(5) Reduce long-term building operating and maintenance costs;
(6) Improve indoor air quality and occupant health;
(7) Contribute to meeting state and local commitments to reduce greenhouse gas emissions; and
(8) Satisfy all applicable mandatory measures of the 2025 California Green Building Standards Code (Title 24, Part 11) of the California Code of Regulations.

(B) Applicability.

The provisions of this section shall apply to all construction or development projects defined below as a “covered project.”

(C) Definitions.

For the purposes of interpreting this chapter and the associated standards for compliance, the following terms are defined as follows. When the definitions below differ from those contained elsewhere in this title, the provisions of this chapter shall apply. These definitions are additional to those outlined in Chapter 2 of the California Green Building Standards Code, Title 24, Part 11.

(1) "2025 California Energy Code" refers to the requirements outlined in the 2025 edition of the California Energy Code known as California Code of Regulations, Part 6 of Title 24.

(2) "All-electric Building" or “All-electric Design” means a building or plans for a building that uses a permanent supply of electricity as the source of energy for all space heating (including but not limited to fireplaces), water heating (including but not limited to pools and spas), cooking appliances, and clothes drying appliances, and has no natural gas or propane plumbing installed in the building or within the property lines. An all-electric building may also include solar thermal collectors.

(3) “Accessory Dwelling Unit (ADU)” means a residential unit that meets the definition of an accessory dwelling unit as outlined in Chapter 17 of the Fairfax Town Code . This states that “a residential dwelling unit, which is accessory to a primary dwelling unit, that provides complete independent living facilities for one or more persons and is located on a lot with a proposed or existing primary dwelling. It shall provide permanent provisions for living, sleeping, eating, cooking, sanitation, and independent exterior access, on the same lot as the single-family or multi-family dwelling is or will be situated. An Accessory Dwelling Unit also includes the following: (1) an efficiency unit as defined in section 17958.1 of the California Health and Safety Code and (2) a manufactured home as defined in section 18007 of the California Health and Safety Code.” For purposes of this subchapter, ADU also covers Junior ADUs and detached or attached ADUs.

(4) "CALGreen" refers to the California Green Building Standards Code, as included in Title 24, Part 11 of the California Code of Regulations.

(5) "CALGreen mandatory" means those measures that are required under Title 24, Part 11. Residential mandatory measures are contained in CALGreen Chapter 4. Nonresidential mandatory measures are contained in CALGreen Chapter 5.

(6) "CALGreen Tier 1" refers to required pre-requisite and elective measures in addition to the CALGreen mandatory measures, as outlined in CALGreen Appendix A4.601.4 for residential projects and CALGreen Appendix A5.601.2 for nonresidential projects.

(7) "Covered Project(s)" means a development project provided below as set forth by the standards for compliance outlined in § 15.04.085, Table 1, 2, or 3 for which one or more building permits are required:

(i) Additions or alterations to an existing single-family residential building.

(ii) Additions or alterations to an existing multi-family residential building, hotel, or motel.

(8) “Mixed-fuel” means a building or unit in a building that is plumbed for the use of natural gas or propane as fuel for space heating, water heating, cooking or clothes drying appliances or has gas plumbing within a building or within the property lines of the premises connected to a gas meter or propane tank.

(9) “Natural gas” has the same meaning as "Fuel Gas" as defined in the California Plumbing Code and Mechanical Code.

(10) “Newly Constructed” means a building that has never before been used or occupied for any purpose.

(11) "Qualified green building rater" means an individual who has been trained and certified as a CALGreen inspector, LEED AP w/a specialty, GreenPoint rater, PHIUS consultant, or has similar qualifications and certifications if acceptable to the chief building official.

(12) “Single-Family” means a building designed for and/or occupied exclusively by one family. It is used herein to describe one and two-family dwellings and townhouses with attached private garages. It also includes factory-built, modular housing units, constructed in compliance with the California Building Code (CBC), and mobile homes/manufactured housing on permanent foundations and agricultural worker housing.

15.04.075 – Requirements for additions and alterations; Local amendments to 2025 California Energy Code

Pursuant to §15.04.010(g), Fairfax has adopted the 2025 Edition of the California Energy Code known as California Code of Regulations, Part 6 of Title 24, with additions and deletions as provided in this subchapter.

The provisions of this subchapter shall constitute local amendments to the cross-referenced provisions of the 2025 California Energy Code and shall be deemed to replace the cross-referenced sections of said Code with the respective provisions set forth in this subchapter.

The California Energy Code, Title 24, Part 6, is hereby amended provided below:

Section 100.0 of Subchapter 1 of the 2025 California Energy Code is modified to add new section (i) as follows:

(i) Single-Family Building Remodel Energy Reach Code - Purpose and Intent. In addition to all requirements of the California Energy Code applicable to Existing Single-Family Building additions and alterations, the energy efficiency and renewable energy measures specified in Section 150.0(w) shall be required for Covered Projects of mixed-fuel buildings.

Section 100.1(b) is modified by adding the following definitions:

"All-electric Building" or “All-electric Design” as defined in § 15.04.070(C)(2), Fairfax Town Code.

"Covered Project(s)" as defined in § 15.04.070(C)(7), Fairfax Town Code.

“Mixed-fuel” building as defined in § 15.04.070(C)(8), Fairfax Town Code.

Section 150.0 SINGLE-FAMILY RESIDENTIAL BUILDINGS – MANDATORY FEATURES AND DEVICES, first two paragraphs, are modified to read as follows:

Existing Single-Family residential buildings shall comply with the applicable requirements of Sections 150.0(a) through 150.0(v), and Covered Existing Single-Family Projects, other than projects identified as all-electric construction for newly constructed or new construction buildings in § 15.04.070(C)(2) of the Fairfax Town Code, shall comply with the applicable requirements of Section 150.0(w).

NOTE: The requirements of Sections 150.0(a) through 150.0(v) apply to newly constructed buildings. Sections 150.2(a) and 150.2(b) specify which requirements of Sections 150.0(a)

through 150.0(v) also apply to additions or alterations. In addition, Covered Existing Single-Family Projects shall also be required to comply with Section 150.0(w).

Section 150.0(w) is added to read as follows

(w) Requirements for a Covered Project are outlined by project type in §15.04.085, Table 1, Fairfax Town Code. A Covered Existing Single-Family Project, as defined in § 15.04.070(C)(7) of the Fairfax Town Code, in a building originally permitted for construction on or before December 31, 2010, shall install a set of measures from the Measure Menu in § 15.04.085, Table 2, Fairfax Town Code, to achieve a total Measure Point Score that is equal to or greater than the Target Score in said table and shall conform to the List of Measure Specifications in § 15.04.085, Table 3, Fairfax Town Code, except as otherwise described below:

(i) Projects in buildings identified as all-electric as defined in §15.04.070(C)(2) of the Fairfax Town Code.

(ii) Projects less than 200 square feet. Square footage associated with the creation of a new ADU or JADU will not be included in the calculation of project square footage.

(iii) Projects that are limited solely to a newly created attached ADU or JADU as defined in § 15.04.070(C)(3) of the Fairfax Town Code. A newly created ADU and JADU shall include either additions or conversions of existing space. This exception DOES NOT apply to a Covered Existing Single-Family Project of an existing ADU or JADU.

(iv) Mobile Homes, Manufactured Housing, or Factory-built Housing as defined in Division 13 of the California Health and Safety 12 Code (commencing with section 17000 of the Health and Safety Code).

(v) If due to conditions specific to the project, it is technically or economically infeasible to achieve compliance, the chief building official may reduce the Target Score and/or waive some or all of the mandatory requirements.

(vi) If the applicant demonstrates that the Energy Budget of the proposed building, as calculated under Section 150.1(b), would be less than or equal to the Energy Budget of the building if it otherwise complied with this Section 150.0(w).

(vii) A resident owner or occupant demonstrates that they qualify for the California Alternative Rates for Energy (CARE) or Family Electric Rate Assistance (FERA) program may comply by installing, to the specifications in § 15.04.085, Table 3 of the Fairfax Town Code, the following:

(a) E1: Lighting Measures; and

(b) E2: Water Heating Package

Unless otherwise specified, the requirements shall apply to the entire dwelling unit, not just the additional or altered portion. Measures from the Measure Menu table that are to be installed to satisfy requirements under the California Energy Code, Title 24, Part 6, may not count towards compliance with these requirements. Where these requirements conflict with other California Energy Code requirements, the stricter requirements shall prevail.

In addition, all mandatory measures listed in §15.04.085, Table 2 of the Fairfax Town Code, shall be installed.

Measure verification shall be explicitly included as an addendum to the Certificate of Compliance to be filed pursuant to 2025 Title 24, Part 6, Section 10-103.

Section 301.1 of Chapter 3 of the 2025 CALGreen Code is hereby amended as underlined and struck through:

> **301.1 Scope**. Buildings shall be designed to comply with applicable requirements of Town of Fairfax Green Building Requirements beginning at Chapter 15.04.065(A), Fairfax Town Code, and shall also include the green building measures specified as mandatory in the application checklists contained in this code.

15.04.085 Standards for compliance.

The Town of Fairfax Green Building Requirements contain compliance thresholds for different projects that are covered by this chapter. These standards are summarized below in Table 1. The energy efficiency and electrification measures menu and specifications are detailed in Tables 2 and 3.

Table 1: Requirements by Project Type and Size

Project Type and Size	Green Building Requirements	Energy Efficiency Requirements	Electric Vehicle Requirements
Single and Two-Family Newly Constructed or New Construction	CALGreen Tier 1 except Energy Measures	Meet the standards outlined for the project in the 2025 California Energy Code	CAL Green Tier 1
Multifamily Residential Newly Constructed or New Construction			
Nonresidential Newly Constructed or New Construction	CALGreen Tier 1 Except Energy Efficiency Measures	Meet the standards outlined for the project in the 2025 California Energy Code	CALGreen Tier 1
Single and Two-Family Additions and Alterations less than 200 square feet	CALGreen Mandatory	Meet the standards outlined for the project in the 2025 California Energy Code	CALGreen Mandatory

Table 1: Requirements by Project Type and Size			
Project Type and Size	**Green Building Requirements**	**Energy Efficiency Requirements**	**Electric Vehicle Requirements**
Single and Two-Family Additions and Alterations 200 square feet or greater	CALGreen Tier 1 Except the Energy Efficiency Measures	Using the Measure Menu in Table 2, achieve a total score that is equal to or greater than the Target Score for the applicable climate zone	CALGreen Tier 1
Multifamily Residential Additions and Alterations less than 200 square feet	CALGreen Mandatory	Meet the standards outlined for the project in the 2025 California Energy Code	CALGreen Mandatory
Multifamily Residential Additions and Alterations 200 square feet or greater	CALGreen Tier 1 Except Energy Efficiency Measures		CALGreen Tier 1
Nonresidential Additions and Alterations			

The following conditions also apply to Table 1:

(a) Cumulative new construction or remodels during the preceding 36-month period from the acceptance of this application shall be considered as a single covered project, and subject to the highest compliance threshold based on the cumulative project size or valuation.

(b) Mixed use (residential and commercial) projects must comply either with the applicable covered project requirements for the respective residential and commercial portions of the project or may propose to utilize a mixed-use rating system, subject to approval by the chief building official.

Table 2: Energy and Electrification Menu of Measures by Climate Zone			
Measure		**Climate Zone**	**Steps**
		2	1) Choose your Climate Zone using CEC toolfinder[1]
Specification	**Spec. ID (Refer to *Table 3*)**	**Target Score**	2) Minimum Target Score needed to comply (*1 point = 1MMBTU savings per yr.*)
		9	
Lighting	E1	Mandatory	3) Choose a measure or a combination of measures that adds up to the minimum target score above based on CZ. Measures listed as "Mandatory" MUST be installed. 4) Use the Specification Number (Spec. ID) column as a key and conform to the specifications in Table 3 below. Table 3 describes, specifies, and details compliance with each corresponding measure.
Water Heating Package	E2	2	
Air Sealing	E3	1	
R-49 Attic Insulation	E4.B	2	
Duct Sealing	E5	3	
New Ducts, R-8 Insulation + Duct Sealing	E6.B	6	
Windows	E7	3	
R-19 Raised floor insulation	E10.A	8	
Radiant Barrier Under Roof	E12	1	
HPWH Replacing Gas	FS1	12	
High Eff HPWH Replacing Gas	FS2	13	
HPWH Replacing Electric	FS3	4	
High Eff HPWH Replacing Electric	FS4	5	
HVAC Heat Pump	FS5	17	
High Efficiency	FS6	19	

HVAC Heat Pump		
Heat Pump Clothes Dryer	FS8	1
Induction Cooktop	FS9	1
Solar PV	PV.A	14
[1]California Energy Commission climate zone tool finder at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/climate-zone-tool-maps-and.		

The following conditions also apply to Table 2:

(a) Unless otherwise specified, the requirements shall apply to the entire dwelling unit, not just the additional or altered portion.

(b) Measures from the Measure Menu in Table 2 and specified in Table 3, that already exist in the home, may be counted towards compliance with these requirements, unless otherwise specified in Table 3.

(c) Measures from the Measure Menu in Table 2 that are to be installed to satisfy requirements under the State Energy Code, Title 24, Part 6, may also be counted towards compliance with these requirements. Where these requirements conflict with other Energy Code requirements, the stricter requirements shall prevail.

Table 3: Energy Efficiency Measures	
ID	**Measure Specification**
Energy Measurers	
E1	Lighting Measures – Install lighting with an efficiency of 45 lumens per watt or greater in all interior and exterior screw-in fixtures. Install photocell, occupancy sensor or energy management system controls that meet the requirements of 150.0(k)3 in all outdoor lighting permanently mounted to a residential building or to other buildings on the same lot.
E2	Water Heating Package: Insulate all accessible hot water pipes with pipe insulation a minimum of ¾ inch thick. This includes insulating the supply pipe leaving the water heater, piping to faucets underneath sinks, and accessible pipes in attic spaces or crawlspaces. Upgrade fittings in sinks and showers to meet current California Green Building Standards Code (Title 24, Part 11) Section 4.303 water efficiency requirements. Exception: Upgraded fixtures are not required if existing fixtures have rated or measured flow rates of no more than ten percent greater than 2025 California Green Building Standards Code (Title 24, Part 11) Section 4.303 water efficiency requirements.
E3	Air Sealing: Seal all accessible cracks, holes, and gaps in the building envelope at walls, floors, and ceilings. Pay special attention to penetrations including plumbing, electrical, and mechanical vents, recessed can light luminaires, and windows. Weather-strip doors if not already present. Verification shall be conducted following a prescriptive checklist that outlines which building aspects need to be addressed by the permit applicant and verified by an inspector. Compliance can also be demonstrated with blower door testing conducted by a certified ECC Rater no more than three years prior to the permit application date that either: a) shows at least a 30 percent reduction from pre-retrofit conditions; or b) shows that the number of air changes per hour at 50 Pascals pressure difference (ACH50) does not exceed ten for Pre-1978 vintage buildings, seven for 1978 to 1991 vintage buildings and five for 1992-2010 vintage buildings. If combustion appliances are located within the pressure boundary of the building, conduct a combustion safety test by a certified ECC Rater or a professional certified by the Building Performance Institute, in accordance with the BPI Technical Standards for the Building Analyst Professional.
E4.B	R-49 Attic Insulation: Attic insulation shall be installed to achieve a weighted assembly U-factor of 0.020 or insulation installed at the ceiling level shall have a thermal resistance of R-49 or greater for the insulation alone. Recessed downlight luminaires in the ceiling shall be covered with insulation to the same depth as the rest of the ceiling. Luminaires not rated for insulation contact must be replaced or fitted with a fire-proof cover that allows for insulation to be installed directly over the cover. Exception: In buildings where existing R-30 is present and existing recessed downlight luminaires are not rated for insulation contact, insulation is not required to be installed over the luminaires.
E5	Duct Sealing: Air seal all space conditioning ductwork to meet the requirements of the 2025 Title 24, Part 6, Section 150.2(b)1E. The duct system must be tested by a ECC Rater no more than three years prior to the Covered Single Family Project permit application date to verify the duct sealing and confirm that the requirements have been met. This measure may not be combined with the New Ducts and Duct Sealing measure in this Table. Exception: Buildings without ductwork or where the ducts are in conditioned space.
E6.B	New Ducts, R-8 insulation + Duct Sealing: Replace existing space conditioning ductwork with new R-8 ducts that meet the requirements of 2025 Title 24, Part 6, Section 150.0(m)11. This

	measure may not be combined with the Duct Sealing measure in this Table. To qualify, a preexisting measure must have been installed no more than three years before the Covered Single Family Project permit application date.
E7	Windows: Replace at least 50% of existing windows with high performance windows with an area-weighted average U-factor no greater than [0.27 in Climate Zones 2]
E8	R-15 Wall Insulation: Install wall insulation in all exterior walls to achieve a weighted U-factor of 0.095 or install wall insulation in all exterior wall cavities that shall result in an installed thermal resistance of R-15 or greater for the insulation alone.
E9	Reserved for future use
E10.A	R-19 Floor Insulation: Raised-floors shall be insulated such that the floor assembly has an assembly U-factor equal to or less than U-0.037 or shall be insulated between wood framing with insulation having an R-value equal to or greater than R-19.
E12	Radiant Barrier: A radiant barrier that meets the requirements of Section 150.1(c)2 shall be installed under at least 50% of the roof surface.
	Fuel Substitution and Solar PV Measures
FS1	Heat Pump Water Heater (HPWH) Replacing Gas: Replace existing natural gas water heater with a heat pump water heater that meets the requirements of Sections 110.3 and 150.2(b)1.H.iii.b.
FS2	High Efficiency Heat Pump Water Heater (HPWH) Replacing Gas: Replace existing natural gas water heater with heat pump water heater with a Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher rating that also meets the requirements of Sections 110.3 and 150.2(b)1.H.iii.c.
FS3	Heat Pump Water Heater (HPWH) Replacing Electric: Replace existing electric resistance water heater with a heat pump water heater that meets the requirements of Sections 110.3 and 150.2(b)1.H.iii.b.
FS4	High Efficiency Heat Pump Water Heater (HPWH) Replacing Electric: Replace existing electric resistance water heater with heat pump water heater with a Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher rating that also meets the requirements of Sections 110.3, and 150.2(b)1.H.iii.c.
FS5	Heat Pump Space Conditioning System: Replace all existing gas and electric resistance primary space heating systems with a heat pump system that meets the requirements of Sections 110.3, 150.2(b)1.C, 150.2(b)1.E, 150.2(b)1.F, and 150.2(b)1.G.
FS6	High Efficiency Heat Pump Space Conditioning System: Replace all existing gas and electric resistance primary space heating systems with an electric-only heat pump system that meets the requirements of Sections 110.3 and 150.2(b)1.C, 150.2(b)1.E, 150.2(b)1.F, and 150.2(b)1.G and one of the following: A. A ducted heat pump system with a SEER2 rating of 16.5 or greater, an EER2 rating of 12.48 or greater and an HSPF2 rating of 9.5 or greater; or B. A ductless mini-split heat pump system with a SEER2 rating of 14.3 or greater, an EER2 rating of 11.7 or greater and an HSPF2 rating of 7.5 or greater
FS7	Dual Fuel Heat Pump Space Conditioning System: Install a heat pump space conditioning system that meets the requirements of Sections 110.3 and 150.2(b)1.C, 150.2(b)1.E, 150.2(b)1.F, and 150.2(b)1.G and either: A. Replaces all existing gas and electric resistance primary heating systems with a hybrid gas and electric heat pump system, or B. Is an electric-heat pump system in tandem with a gas furnace and controls to use the gas furnace for backup heat only.
FS8	Heat Pump Clothes Dryer: Replace existing electric resistance or gas clothes dryer with heat pump dryer with no resistance element and cap gas line.

FS9	Induction Cooktop: Replace all existing gas and electric resistance stove tops with induction stove top and cap the gas line.
PV.A	Solar PV: Install a solar PV system that meets the requirements of Section 150.1(c)14.

15.04.090 Incentives for compliance

In addition to the required standards for compliance, the Town Council may establish by resolution, financial or application processing incentives and/or award or recognition programs to encourage higher levels of green building compliance for a project.

15.04.095 Administrative procedures.

The procedures for compliance with the provisions of this chapter shall include, but not be limited to the following:

(a) *Project design.* Applicants for a covered project are strongly encouraged to involve a qualified green building rater in the initial design phases of the project in advance of submittal of an application to determine applicable green building compliance thresholds and the most cost effective and appropriate means of achieving compliance.

(b) *Planning applications.* If a discretionary planning application is required for a covered project, applicants should be prepared to identify expected green building measures to be included in the project to achieve the compliance thresholds. Applicants should identify any anticipated difficulties in achieving compliance and any exemptions from the requirements of this chapter that may be requested.

(c) *Building plan check review.* Upon submittal of an application for a building permit, building plans for any covered project shall include a green building program description and completed checklist. The checklist shall be incorporated onto a separate full-sized plan sheet included with the building plans. Evidence that the project, as indicated by the project plans and green building program description, will achieve the standards for compliance outlined in Section 15.04.085, shall be provided prior to issuance of a building permit.

(d) *Changes during construction.* During the construction process, alternate green building measures may be substituted, provided that documentation of the proposed change and the project's continued ability to achieve the standards for compliance to the chief building official shall be provided.

(e) *Final building inspection.* Prior to final building inspection and occupancy for any covered project, evidence that project construction has achieved the required compliance set forth in the standards for compliance outlined in Section 15.04.085 shall be provided. The chief building official shall review the documentation submitted by the applicant and determine whether the project has achieved the compliance threshold as set forth in the standards for compliance outlined in Section 15.04.085. If the chief building official determines that the applicant has met these requirements, the final building inspection may proceed.

(f) *Conflict with other laws.* The provisions of this chapter are intended to be in addition to and not in conflict with other laws, regulations and ordinances relating to building construction and site development. If any provision of this chapter conflicts with any duly adopted and valid statutes or regulations of the federal government or the state of California, the federal or state statutes or regulations shall take precedence.

15.04.100 Exemptions.

(a) The provisions of this chapter shall not apply to:

(1) Buildings which are temporary (such as construction trailers).

(2) Building area which is not or is not intended to be conditioned space.

(3) Any requirements of this chapter which would impair the historic integrity of any building listed on a local, state or federal register of historic structures, as determined by the chief building official and as regulated by the California Historic Building Code (Title 24, Part 8). In making such a determination, the chief building official may require the submittal of an evaluation by an architectural historian or similar expert.

(b) As outlined in the 2025 CALGreen code, sections 4.106.4 and 5.106.5, applicants may be exempted from the electric vehicle changing requirements on a case-by-case basis where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:

(1) Where there is no local utility power supply or the local utility is unable to supply adequate power.

(2) Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of sections 4.106.4 and 5.106.5 may adversely impact the construction cost of the project.

(3) ADUs and JADUs without additional parking facilities.

(4) Areas of parking facilities served by parking lifts, including but not limited to, automated mechanical-access open parking garages as defined in the California Building Code; or parking facilities otherwise of supporting electric vehicle charging.

(c) Hardship or infeasibility exemption. If an applicant for a covered project believes that circumstances exist that make it a hardship or infeasible to meet the requirements of this chapter, the applicant may request an exemption as set forth below. In applying for an exemption, the burden is on the applicant to show hardship or infeasibility.

(1) *Application.* Based on the following, the applicant shall identify in writing the specific requirements of the standards for compliance that the project is unable to achieve and the circumstances that make it a hardship or infeasible for the project to comply with this chapter. The applicant may not petition for relief from any requirement of the 2025 California Energy Code (Title 24, Part 6) and referenced standards, or the 2025 California Green Building Standards (Title 24, Part 11) of the California Building Standards Code. Circumstances that constitute hardship or infeasibility shall include one of the following:

a. That the cost of achieving compliance is disproportionate to the overall cost of the project;

b. That strict compliance with these standards would create or maintain a hazardous condition(s) and present a life safety risk to the occupants;

c. There is a conflict between the provisions of the applicable green building rating system and the California Building Standards Code, other state code provisions, other requirements of this title or conditions imposed on the project through a previously approved planning application;

d. That compliance with certain requirements would impair the historic integrity of buildings listed on a local, state or federal list or register of historic structures as regulated by the California Historic Building Code (Title 24, Part 8).

(2) *Granting of exemption.* If the chief building official determines that it is a hardship or infeasible for the applicant to fully meet the requirements of this chapter and that granting the requested exemption will not cause the building to fail to comply with the 2025 California Energy Code (Title 24, Part 6) and referenced standards, or the 2025 California Green Building Standards (Title 24, Part 11) of the California Building Standards Code, the chief building official shall determine the maximum feasible threshold of compliance reasonably achievable for the project. In making this determination, the chief building official shall consider whether alternate, practical means of achieving the objectives of this chapter can be satisfied, such as reducing comparable energy use at an off-site location within the county. If an exemption is granted, the applicant shall be required to comply with this chapter in all other respects and shall be required to achieve the threshold of compliance determined to be achievable by the chief building official.

(3) *Denial of exception.* If the chief building official determines that it is reasonably possible for the applicant to fully meet the requirements of this chapter, the request shall be denied, and the applicant shall be notified of the decision in writing. The project and compliance documentation shall be modified to comply with the standards for compliance.

(4) *Appeal.* Any aggrieved applicant or person may appeal the determination of the chief building official regarding the granting or denial of an exemption or compliance with any other provision of this chapter. An appeal of a determination of the chief building official shall be filed in writing and processed in accordance with the provisions of Section 15.04.028 of this code."

SECTION 3. CEQA.

This Ordinance was assessed in accordance with the authority and criteria contained in the California Environmental Quality Act (CEQA), the State CEQA Guidelines, and the environmental regulations of the Town. The Town Council finds and determines that the adoption of this Ordinance is exempt from CEQA in accordance with Sections 15307 and 15308 because this Ordinance constitutes action by a regulatory agency to protect natural resources and the environment. The Ordinance will establish regulations to further energy efficiencies and efficient use of natural resources to reduce adverse impacts to the environment, consistent with the Town Council's adopted Climate Action Plan. Pursuant to the "common sense" exemption under CEQA Guidelines section 15061(b)(3), there is no possibility that this Ordinance might have a significant adverse effect on the environment. The Ordinance establishes regulations to minimize and/or avoid impacts to the environment and to protect the health, welfare, and safety of the Town's citizenry. The Town has further determined that no exceptions to the exemptions apply and there is no reasonable possibility that the activity will have a significant adverse effect on the environment due to unusual circumstances (CEQA Guidelines section 15300.2). At the time of future development proposals, additional environmental analysis may be required to analyze the potential environmental impacts associated with specific development projects and uses proposed at specific locations.

SECTION 4. Validity & Severability.

A. Except as specifically provided herein, nothing contained in this Ordinance shall be deemed to modify or supersede any prior enactment of the Town Council which addresses the same subject addressed herein.

B. If any section, subsection, sentence, clause, or phrase of this Ordinance is for any reason held to be invalid by a court of competent jurisdiction, such decision shall not affect the validity of the remaining

portion of this Ordinance. The Town Council of the Town of Fairfax hereby declares that it would have adopted the ordinance and each section, subsection, sentence, clause, or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases shall be declared invalid.

SECTION 5. Ordinance Publication and Effective Date.

A. Within fifteen (15) days after its adoption, this Ordinance shall be posted in at least three public places in the Town of Fairfax as provided in Government Code 36933 and a certified copy of the full text of this Ordinance shall be posted in Town Hall.

B. This Ordinance shall take effect January 1, 2026.

C. The Town Clerk shall cause Section 2 of this Ordinance to be codified in the Fairfax Municipal Code.

D. This Ordinance, together with the findings in Exhibit A, shall be filed with the California Building Standards Commission within thirty (30) days after its final passage.

THE FOREGOING ORDINANCE was first read at a regular meeting of the Fairfax Town Council on October 15, 2025 and was passed and adopted at a regular meeting of the Town Council on November 5, 2025 , by the following vote, to wit:

AYES:
NOES:
ABSENT:

_____
Mayor

Attest:

_____
Town Clerk

EXHIBIT "A"

FINDINGS OF FACT IN SUPPORT OF ORDINANCE NO. 901 ENTITLED "AN ORDINANCE OF THE TOWN OF FAIRFAX AMENDING CHAPTER 15.04 OF THE FAIRFAX TOWN CODE AND ADOPTING BY REFERENCE THE 2025 CALIFORNIA BUILDING STANDARDS CODE, INCLUDING THE 2025 CALIFORNIA ADMINISTRATIVE CODE, THE 2025 CALIFORNIA BUILDING CODE, THE 2025 CALIFORNIA RESIDENTIAL CODE, THE 2025 CALIFORNIA ELECTRICAL CODE, THE 2025 CALIFORNIA MECHANICAL CODE, THE 2025 CALIFORNIA PLUMBING CODE, THE 2025 CALIFORNIA ENERGY CODE, THE 2025 CALIFORNIA HISTORICAL BUILDING CODE, THE 2025 CALIFORNIA EXISTING BUILDING CODE, THE 2025 CALIFORNIA GREEN BUILDING STANDARDS CODE, AND THE 2025 CALIFORNIA REFERENCED STANDARDS CODES, WITH LOCAL AMENDMENTS, AND THE 2024 EDITION OF THE INTERNATIONAL PROPERTY MAINTENANCE CODE

Pursuant to Sections 17958.5 and 17958.7(a) of the State of California Health and Safety Code, the Town Council of the Town of Fairfax has determined and finds that all the changes or modifications in this ordinance to the California Building Standards Code (California Code of Regulations, Title 24) are necessary because of the following local climatic, geological, and/or topographic conditions:

1. CLIMATIC:

a. Precipitation. The normal year's rainfall is approximately 30 to 50 inches on the average calendar year. The area has been subject to extended periods of drought and less than normal rainfall as well as intense rains, which have caused local flooding and damage from geotechnical failure (landslides). Approximately ninety percent (90%) of the annual rainfall is experienced during the months of November through April, and 10% from May through October.

b. Relative Humidity. Moisture in the air, also known as relative humidity, changes significantly during any given day. Humidity generally ranges from 50% during daytime hours to 85% at night. It drops to 30% during the summer months and occasionally drops lower. During periods when the area experiences easterly hot, dry winds, the relative humidity drops significantly, thus creating a greater danger.

c. Temperatures. Average summer highs are in the 75 degree to 85 degree range. There are weather periods where temperatures can rapidly reach 100 degrees and have been recorded even higher.

d. Winds. Prevailing winds are generally from the West. However, winds are experienced from virtually every direction at one time or another, due to topography. Velocities are generally in the 5 – 15 mph range, gusting to 10 – 30 mph, particularly during the summer months. Extreme winds, up to 50 mph, have been known to occur.

e. Summary. The climate (weather patterns) within the Town of Fairfax is predominantly affected by the marine influence of the Pacific Ocean. During the summer months, the southerly exposed slopes and open fields become dry with seasonal grasses, which present a fuel for the rapid spread of fire. The Northerly slopes are heavily wooded and present a moderate to heavy fuel load with respect to fire danger. These local climactic conditions affect the acceleration, intensity, and size of fire in the community. Times of little or no rainfall, of low humidity and high temperatures create extremely hazardous conditions. Furthermore, winds experienced in this area can have a tremendous impact upon structure fires of buildings in close proximity to one another and wildland areas. All water storage and supply comes from reservoirs and lakes within the county, and are affected by the climate accordingly.

2. GEOGRAPHICAL and TOPOGRAPHICAL:

a. Geographical Features. The geographical features in and around the Town of Fairfax are a source of enjoyment for our residents. The hills and valleys give a natural beauty to the area with forested hills and golden yellow meadows leading up to them. These geographic features form the backdrop for the residential and commercial communities and dictate the locations of roadways and building locations. These geographic features also create barriers, which negatively affect accessibility and influence fire behavior during major conflagrations. Many structures (new and old) are constructed of highly combustible material, which offer little resistance to fire and could contribute to the spread of fire. For practical and cost reasons, new structures are built of wood (type V) construction. The potential for conflagration exists with the density of the various specific areas of the Town. The concentrated commercial, as well as residential occupancies, causes concern when considering the "exposure" elements of building to building to grass and brush areas of the Town.

b. **Seismic Location**. The Town of Fairfax lies within the recognized seismic zone #4, which is the most dangerous zone. While the area has experienced several significant seismic events, there has been a minimum of damage. The Town sits between two active earthquake faults (San Andreas and Hayward) and numerous potentially active faults. The potential for great damage exists, and must be considered as a real threat to be planned for.

c. Size and Population. The Town of Fairfax encompasses an area of 2.2 miles with a resident population of approximately 7,500. The Town is served by the Ross Valley Fire Authority. Ross Valley Fire has four (4) stations (two of which are in San Anselmo, one in Fairfax, and one in Ross), 34 fire personnel (serving the Town of Fairfax, San Anselmo, Ross and the Sleepy Hollow Fire Protection District), with diverse responsibilities including wildland, urban, and paramedical.

d. Roads and Streets. Several of the heavily populated areas have limited roadways and escape routes. The Town of Fairfax has numerous narrow, winding roads, some barely passable with modern fire apparatus, causes access problems and extended travel times especially in the older hillside sections of the jurisdiction. The accessibility for fire department apparatus is of concern due to the lack of turnouts and roadway widths which increases response time.

e. Topography. The Department's service area is a conglomeration of oak plains, hills, valleys and ridges. The flatter lands are found in the center portion of the service area and approximately half of the residential development is in this area. The other half of the service area with residential development consists of hillsides with slopes ranging from approximately 15-30% and 30+%. These hazardous conditions present an exceptional and continuing fire danger to the residents of the community due to the difficulty of the terrain and topography of the area, much of it consisting of boxed canyons with steep, brush covered slopes; narrow winding streets used by residents of the area and the Fire Department for ingress and egress, steep hills which hinder Fire Department response time; older and inadequate water systems in certain areas of the community; and the location of buildings and structures with relation to these dangerous areas. The water supply for domestic and fire flow systems within this Town are directly affected by the topographical layout of the Town. The supply of water comes from lakes, which are managed by a public utilities district responsible for maintaining an adequate supply. The water distribution system within the Town is very old in some areas served by mains, which are inadequate in size to provide water for fire protection. The valley floor is served by mains which contain an exceptionally large volume of water for fire protection. The Town of Fairfax has a base elevation of approximately 120 feet and extends to areas in excess of 900 feet above sea level.

f. Vegetation. The Town Council recognizes that the Town of Fairfax has within its borders and along its boundaries, significant areas of grass, brush and heavily forested lands. In addition, the natural vegetation of the area has been altered by the addition of ornamental trees and shrubs, which are not native and add fuel around the houses and buildings of our community. The south facing exposure is primarily annual

grasses, highly flammable brush, with occasional clumps of bay and oak trees in the more sheltered pockets. The north facing slopes are heavily wooded from lower elevations to ridge with oak and bay trees and minor shrubs of the general chaparral class. Expansion of the residential community into areas of heavier vegetation has resulted in homes existing in close proximity to dense natural foliage. Often such dwellings are completely surrounded by highly combustible vegetation compounding the fire problem from a conflagration point of view. Of particular recent notice is the increase in dead down fuel and ladder accumulation directly associated with the sudden oak death syndrome.

g. Summary. The above local geographic and topographic conditions increase the magnitude, exposure, accessibility problems and fire hazards presented to the Fire Department.

Fire following an earthquake has the potential of causing greater loss of life and damage than the earthquake itself.

The valley floor has zones recognized by the Federal Emergency Management Agency as flood zones. During times of intense rainfall, flooding and landslides have occurred which have destroyed structures and threatened lives. Within the past decade, these events have caused the local government to declare disasters and seek state and federal assistance.

Some of the existing structures in the commercial areas of the Town lack the required firewall separation. These structures cause concern to the Fire Department because of the potential for major conflagration. As these structures are replaced, the exposure potential will be significantly reduced.

Several other variables may tend to intensify an incident, such as, the extent of damage to the water system; the extent of roadway damage and/or amount of debris blocking the roadways; climatic conditions (hot, dry weather with high winds); time of day will influence the amount of traffic on roadways and could intensify the risk to life during normal business hours; and the availability of timely mutual aid or military assistance.

3. AB 130 EXCEPTIONS

a. Substantially Equivalent: The Town's proposed amendments are substantially equivalent under AB 130, as they continue adoption of Tier 1 and the Flex Compliance Pathway previously approved and filed with the California Building Standards Commission before September 30, 2025. The updates align the Tier 1 framework with the 2025 CALGreen Code and revise FlexPath measures based on the State's most recent cost-effectiveness guidance. These changes maintain the same intent and performance outcomes as the existing standards and do not introduce new or more stringent local requirements.

Conclusion: The Town Council of the Town of Fairfax hereby finds and determines that as a result of these conditions and the resulting health and safety hazards, the changes and modifications to the California Administrative, Building, Residential, Electrical, Mechanical, Plumbing, Energy, Historical Building, Existing Building, Green Building Standards, and Referenced Standards Codes, thereto enacted by Chapter 15.04 of the Town Code are reasonably necessary as listed in the table below:

Chapter 15.04 Amendments to the California Building Code

Town Code Section	CBC Section Added or Amended	Substance of Amendment (full text in Ordinance No. 901)	Findings
15.04.015	202	Add definition of “Substantial Remodel” and “Second Unit.”	Admin
	903.2	Automatic Sprinkler Systems in New Buildings—Where Required	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
	903.3	Add language regarding continued allowance of provisions for area and height increase, or Fire-Resistive substitution otherwise allowed by Building Code sections 504 and 506; requirement that attached garages and attics be sprinkled	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
	906.11	Fire Extinguisher Documentation	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
	907.2	Add paragraphs relating to “New Construction” and “Existing Construction”	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
	907.8.1	Smoke Alarm Documentation	2a, 2b, 2c, 2d, 2e, 2g
15.04.025	109.2	Requirement for plan review fee to be paid at time of document submittal	Admin
15.04.030	1505.1	Roof coverings, add language requiring Class A Roof Assembly	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
15.04.045	109.7	Reinstatement of expired permits lacking only final inspection for a fee	Admin
15.04.055	1511.9.2	Alternative Power Supplies for photovoltaic panels to comply with CBSC requirements	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g

Chapter 15.04 Amendments to the California Residential Code

Town Code Section	CRC Section Added or Amended	Substance of Amendment (full text in Ordinance No. 901)	Findings
15.04.015	R202	Add definition of “Substantial Remodel” and “Second Unit.”	Admin
	R313.1/R313.2	Approved Automatic Sprinkler Systems in New Buildings—Where Required	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
	R313.1.1/R313.2.1	Add language regarding continued allowance of provisions for area and height increase, or Fire-Resistive substitution otherwise allowed by Building Code sections 504 and 506; requirement that attached garages and attics be sprinkled	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
15.04.030	R902.1	Roof coverings, add language requiring Class A Roof Assembly	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
15.04.035	Appendix CI	Swimming Pool Safety Act, to the extent it does not conflict with CBC	2c, 2d
15.04.045	R108.7	Reinstatement of expired permits lacking only final inspection for a fee	Admin
15.04.055	R324.7.4	Alternative Power Supplies for photovoltaic panels to comply with CBSC requirements	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g

Chapter 15.04 Amendments to the 2025 California Wildland-Urban Interface Code

Town Code Section	WUI Section Added or Amended	Substance of Amendment (full text in Ordinance No.)	Findings
15.04.015	R202	Add definition of “Substantial Remodel” and “Second Unit.”	Admin
15.04.020	501.1	Scope	Admin
	501.1.1	Application	Admin, 1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g
	504.5.3	Requirement for compliant coverings when more than 50% of exterior wall coverings are repaired or replaced within 36 months	1a, 1b, 1c, 1d, 1e, 2a, 2c, 2d, 2e, 2f, 2g

Chapter 15.04 Plumbing Code

Town Code Section	CPC Section Added or Amended	Substance of Amendment (full text in Ordinance No.)	Findings
15.04.040	713.1	Requirement to have connection to public sewer, exception for existing septic tank systems	1a, 1b

Chapter 15.04 International Building Code

Town Code Section	IBC Section Added or Amended	Substance of Amendment (full text in Ordinance No.	Findings
15.04.035	3109	Swimming Pool Safety Act, to the extent it does not conflict with CBC	2c, 2d

Chapter 15.04 Energy Code

Town Code Section	CENC Section Added or Amended	Substance of Amendment (full text in Ordinance No. 901)	Findings
15.04.070	100.0	Single-Family Building Remodel Energy Reach Code	Admin
	100.1(b)	Add definitions for “All-Electric Building,” “All-Electric Design,” “Covered Projects,” and “Mixed-Fuel”	Admin
	150	Single-Family Residential Buildings – Mandatory Features and Devices	Admin
	150.0(w)	Requirements for a Covered Project	Admin

Chapter 15.04 CALGreen Code

Town Code Section	CALGreen Section Added or Amended	Substance of Amendment (full text in Ordinance No. 901)	Findings
15.04.080	301.1	Scope	Admin
15.04.085	Table 1, 2 and 3	Standards for Compliance	3a

REDLINE OF CHANGES TO FAIRFAX MUNICIPAL CODE
CHAPTER 15.04 (BUILDING CODES)

~~CHAPTER~~"Chapter 15.04~~: CONSTRUCTION CODES~~

~~Section~~

BUILDINGS AND CONSTRUCTION

Sections

~~§ 15.04.010 ADOPTION OF CONSTRUCTION CODES.~~

Section 15.04.010 – Adoption of Construction Codes

~~(A)~~ The following parts of Title 24, California Code of Regulations are adopted by reference as construction codes for the Town of Fairfax, subject to the modifications included later in this ~~Chapter 15.04~~title:

a) ~~(1) 2022 edition of the~~2025 California Administrative Code (Title 24, Part 1)~~;~~

b) ~~(2) 2022 edition of the~~2025 California Building Code (Title 24, Part 2) based upon the ~~2021~~2024 International Building Code (IBC), including:

1) ~~(a)~~ Division II of Chapter 1, but not Section 113~~;~~,

2) ~~(b)~~ Appendix Chapter A, Employee Qualifications~~;~~,

3) ~~(c)~~ Appendix Chapter G, Flood-Resistant Construction~~;~~,

4) ~~(d)~~ Appendix Chapter H, Signs~~;~~,

5) ~~(e)~~ Appendix Chapter I, Patio Covers~~;~~, and

6) ~~(f)~~ Appendix Chapter J, Grading.

c) ~~(3) 2022 edition of the~~2025 California Residential Code (Title 24, Part 2.5) based on the ~~2021~~2024 International Residential Code (IRC) including:

1) ~~(a)~~ Division II of Chapter 1, but not Section 112~~;~~,

~~(b) Appendix Chapter V Swimming Pools, Spas and Hot Tubs,;~~

2) ~~(c)~~ Appendix ~~Chapter H~~BF Patio Covers~~; and~~

3) Appendix BH Automatic Vehicular Gates

4) Appendix BL Hemp Line (Hempcrete) Construction

5) ~~(d)~~ Appendix ~~Chapter J~~BO Existing Buildings and Structures~~; and~~

~~(e) Appendix Q (Tiny Houses).~~

6) Appendix CI Swimming Pool Safety Act

d) ~~(4) 2022 edition of the~~2025 California Electrical Code (Title 24, Part 3) based upon the ~~2020~~2023 National Electrical Code (NEC), including:

1) ~~(a)~~ Article 89, but not Section 89.108.8.

e) ~~(5) 2022 edition of the~~2025 California Mechanical Code (Title 24, Part 4) based upon the ~~2021~~2024 Uniform Mechanical Code (UMC), including:

1) ~~(a)~~ Division II of Chapter 1, but not ~~Section~~Sections 107.0, 107.1, 107.2.

f) ~~(6) 2022 edition of the~~2025 California Plumbing Code (Title 24, Part 5) based upon the ~~2021~~2024 Uniform Plumbing Code (UPC), including:

1) ~~(a)~~ Division II of Chapter 1, but not ~~Section~~Sections 107.0 ~~or~~, 107.1, or 107.2~~.~~

g) ~~(7) 2022 edition of the~~2025 California Energy Code (Title 24, Part 6)~~;~~

h) 1) Division II of Chapter 1, but not Section 112

i) ~~(8) 2022 edition of the~~2025 California Historical Building Code (Title 24, Part 8)~~;~~

j) ~~(9) 2022 edition of the~~2025 California Existing Building Code (Title 24, Part 10) based upon the ~~2018~~2024 International Existing Building Code (IEBC) including the following chapters of Appendix A (Guidelines for the Seismic Retrofit of Existing Buildings):

1) ~~(a) Appendix~~ Chapter A1 Seismic Strengthening Provisions ~~For~~for Unreinforced Masonry Bearing ~~wall~~Wall Buildings;

2) ~~(b) Appendix~~ Chapter A3 Prescriptive Provisions ~~For~~for Seismic Strengthening ~~Of~~of Cripple Walls ~~And~~and Sill Plate Anchorage ~~Of~~of Light, Wood-Framed Residential Buildings; and.

3) ~~(c) Appendix~~ Chapter A4 Earthquake Risk Reduction ~~In~~in Wood-Frame Residential Buildings With Soft, Weak ~~Or~~or Open Front Walls.

k) ~~(10) 2022 edition of the~~2025 California Green Building Standards Code (CALGreen) (Title 24, Part 11), including:

1) ~~(a)~~ Appendix A4 and Appendix A5 Tier 1 measures, but excluding Appendix A4.2 and A5.2 (Energy Efficiency). The Tier 1 measures shall be mandatory for commercial and residential construction, and verification of such compliance shall be provided by the installer or designer.

l) ~~(11) 2022 edition of the~~2025 California Referenced Standards Code (Title 24, Part 12).

m) ~~(12) 2021~~2024 edition of the International Property Maintenance Code, to the extent the same is not inconsistent with the California Buildings Standards Code (California Code of Regulations, Title 12, Parts ~~1 Part 12~~1-12), as adopted and amended herein.

~~(B)~~ A copy of each of these documents is maintained in the office of the Building Official, and reference is made to them with like effect as if all the provisions and printed matter therein were herein set forth in full.

~~(Ord. 872, passed 12-7-2022; Am. Ord. 885, passed 11-1-2023)~~

~~§~~Section 15.04.015 ~~DEFINITIONS.~~ – Definitions

Section 202 of the ~~2022~~ California Building Code and Section R202 of the ~~2022~~ California Residential Code are both hereby amended to add the definitions of ~~substantial remodel and second unit~~"Second Unit" and "Substantial Remodel" as follows:

SECOND UNIT. A completely separate housekeeping unit with kitchen, sleeping and bathroom facilities which is a part of, an extension to, or a separate structure on a site developed with a single-family residence, in excess of the maximum density designated by the zoning district in which the property is situated or as prescribed thereby.

SUBSTANTIAL REMODEL. Shall mean the renovation of any structure, which ~~"Substantial Remodel" shall~~ combined with any additions to the structure, affects a floor area which exceeds fifty percent of the existing floor area of the structure within any ~~twelve-month~~36-month period. When any changes are made in the building, such as walls, columns, beams or girders, floor or ceiling joists and coverings, roof rafters, roof diaphragms, foundations, piles or retaining walls or similar components, the floor area of all rooms affected by such changes shall be included in computing floor areas for the

purposes of applying this definition. This definition does not apply to the replacement and upgrading of residential roof coverings~~, repair or replacement of foundations, the installation of energy efficient windows of like size, or the removal of interior wall coverings solely for the installation of insulation~~.

~~"Second Unit" shall mean a completely separate housekeeping unit with kitchen, sleeping and bathroom facilities which is a part of, an extension to, or a separate structure on a site developed with a single family residence, in excess of the maximum density designated by the zoning district in which the property is situated or as prescribed thereby.~~

~~(Ord. 872, passed 12-7-2022)~~

Section 15.04.020 – Exterior Fire Resistive Construction, Automatic Fire Sprinkler Systems, Fire Extinguishers, Smoke Alarms.

~~§ 15.04.020 EXTERIOR FIRE RESISTIVE CONSTRUCTION, AUTOMATIC FIRE SPRINKLER SYSTEMS, FIRE EXTINGUISHERS, SMOKE ALARMS.~~

Section ~~701A.1 of Chapter 7A~~501.1 of the ~~2022~~2025 California ~~Building~~Wildland-Urban Interface Code (Title 24, Part ~~2, Volume 1), and Section R337.1.1 of the 2022 California Residential Code (Title 24, Part 2.5~~7, California Code of Regulations) are hereby amended to read as follows:

~~701A.1/R337.1.1~~501.1 **Scope**. This chapter applies to building materials, systems, and/or assemblies used in the exterior design and construction of new buildings, additions, repairs, and exterior alterations located within a Wildland Urban Interface Fire Area as defined in section ~~702A and R337.2.~~301.1

Section ~~701A.3 of~~501.1.1 is hereby added to Chapter ~~7A~~5 of the ~~2022~~2025 California ~~Building~~Wildland-Urban interface Code (Title 24, Part ~~2, Volume 1), and Section R337.1.3 of the 2022 California Residential Code (Title 24, Part 2.5~~7, California Code of Regulations) are hereby amended to read as follows:

~~701A.3/R337.1.3~~**501.1.1 Application.** New buildings, additions, repairs, and exterior alterations to buildings located in any Fire Hazard Severity Zone or any Wildland Urban Interface Fire Area designated by the enforcing agency constructed after the application date shall comply with the provisions of this chapter.

Exceptions:

1. ~~1.~~ Buildings of an accessory character and not exceeding 120 square feet in floor area, when located at least 30 feet from an applicable building.

2. ~~2.~~ Buildings of an accessory character classified as a Group U occupancy of any size located at least 50 feet from an applicable building.

3. ~~3.~~ Buildings classified as a Group U Agricultural Building, as defined in Section 202 and R202 of this code (see also Appendix C - Group U

Agricultural Buildings), when located at least 50 feet from an applicable building.

Section ~~707A.3.2~~504.5.3 is hereby added to Chapter ~~7A~~5 of the ~~2022~~2025 California ~~Building~~Wildland-Urban Interface Code(Title 24, Part ~~2~~7, ~~Volume 1~~California Code of Regulations), which shall read as follows:

~~707A.3.2. When more than fifty percent (50%) of exterior wall coverings of an existing structure are repaired or replaced within a thirty-six (36) month period, the entire exterior wall coverings shall comply with Section 707A.3.~~

~~Section R337.7.3.2 is hereby added to the 2022 California Residential Code (Title 24, Part 2.5), which shall read as follows:~~

~~R337.7.3.2~~504.5.3. When more than fifty percent (50%) of exterior wall coverings of an existing structure are repaired or replaced within a thirty-six (36) month period, the entire exterior wall coverings shall comply with Section ~~707A~~504.5.2.~~3.~~

Section 903.2 of the California Building Code is hereby amended to read as follows:

903.2 **Where Required.** All Occupancies and Facilities. Approved automatic sprinkler systems in new buildings and structures shall be provided in the locations described in Sections 903.2.1 through 903.2.12 and Sections 903.2.14 through 903.2.21. Additionally, an automatic fire sprinkler system shall be installed in all of the following:

1. Every newly constructed building and facility.

Exceptions:

a. ~~a.~~ Free standing Group U Occupancies not more than 1,000 square feet and provided with exterior wall and opening protection as per Table 602 of the California Building Code.

b. ~~b.~~ Agricultural buildings as defined in Appendix C of the California Building Code and not exceeding 2,000 square feet, having clear unobstructed side yard of combustible materials, exceeding 60 feet in all directions and not exceeding 25 feet in height.

2. In newly created second units.

Exceptions:

a. ~~a.~~ Parcels that are not within the Wildland Urban Interface Code, as established by the Town.

b. ~~b.~~ Parcels for which there is less than a thirty percent (30%) grade change between the subject parcel and Sir Francis Drake Boulevard as illustrated in the ~~"~~"Map of Parcels Qualifying for Exceptions to Sprinkler System Requirements for Newly

Created Second Units~~"~~" or as hereafter designated by resolution of the Town of Fairfax.

c. ~~c.~~ Junior second units.

d. ~~d.~~ For an accessory dwelling unit, as defined by Government Code Section ~~65852.2(i)(4)~~66313, if fire sprinklers are not required for the primary residence. This exception is intended to comply with Government Code Section ~~65852.2~~66314(~~c~~C)~~.~~

3. In all buildings which have more than fifty percent (50%) floor area added or any ~~"~~"substantial remodel~~"~~" as defined in this code, within any 12 month period. Exceptions may be granted by the Fire Code Official when alternate means of protection are installed as approved by the Fire Code Official.

4. In all buildings except R-3 occupancies, in excess of 3,000 sq. ft. which have more than ten ~~per cent~~percent (10%) floor area added within any 12 month period. Exceptions may be granted by the Chief when alternate means of protection are installed as approved by the Fire Code Official.

5. A change in the use of a structure that results in a higher fire or life safety exposure when the square footage of the area changing use is more than fifty percent (50%) of the square footage of the building.

Section ~~R313.1~~R309.1 and ~~R313.2 of~~R309.2 of the California Residential Code each amended to read as follows:

~~R313.1/R313.2~~R309.1 / R309.2 **Where Required.** An automatic fire sprinkler system shall be installed in all of the following:

1. Every newly constructed building and facility.

Exceptions:

a. ~~a.~~ Free standing Group U Occupancies not more than 1,000 square feet and provided with exterior wall and opening protection as per Table 602 of the California Building Code.

b. ~~b.~~ Agricultural buildings as defined in Appendix C of the California Building Code and not exceeding 2,000 square feet, having clear unobstructed side yard of combustible materials, exceeding 60 feet in all directions and not exceeding 25 feet in height.

2. In newly created second units.

Exceptions:

a. ~~a.~~ Parcels that are not within the Wildland Urban Interface Code, as established by the Town.

b. ~~b.~~ Parcels for which there is less than a thirty percent (30%) grade change between the subject parcel and Sir Francis Drake Boulevard as shown on the ~~"~~"Map of Parcels Qualifying for Exceptions to Sprinkler

System Requirements for Newly Created Second Units"," or as hereafter designated by resolution of the Town of Fairfax.

c. ~~c.~~ Junior second units.

d. ~~d.~~ For an accessory dwelling unit, as defined by Government Code Section ~~65852.2(i)(4),~~66313 if fire sprinklers are not required for the primary residence. This exception is intended to comply with Government Code Section ~~65852.2~~66314(~~c~~d)~~.~~ (12)

3. In all buildings which have more than fifty percent (50%) floor area added or any "~~"~~substantial remodel"," as defined in this code, within any 12 month period. Exceptions may be granted by the Fire Code Official when alternate means of protection are installed as approved by the Fire Code Official.

4. In all buildings except R-3 occupancies, in excess of 3,000 sq. ft. which have more than ten per cent (10%) floor area added within any 12 month period. Exceptions may be granted by the Chief when alternate means of protection are installed as approved by the Fire Code Official.

5. A change in the use of a structure that results in a higher fire or life safety exposure when the square footage of the area changing use is more than fifty percent (50%) of the square footage of the building.

Section 903.3 of the California Building Code and Sections ~~R313.1.1~~R309.1.1 and ~~R313.2.1~~R309.2.1 of the California Residential Code are each hereby amended by adding the following language to the end of each respective section:

The requirements for fire sprinklers in this code section are not meant to disallow the provisions for area increase, height increase, or Fire-Resistive substitution if otherwise allowed by sections 504 and 506 of the California Building Code. All automatic fire sprinkler systems shall be installed in accordance with the written standards of the Fire Code Official and the following:

a. In all residential buildings required to be sprinkled any attached garages shall be sprinkled, and except for one and two family dwellings, in all residential occupancies the attics shall be sprinkled.

b. In all existing buildings, where fire sprinklers are required by provisions of this code, they shall be extended into all unprotected areas of the building.

c. All single family dwellings in excess of 5,000 square feet shall have automatic fire sprinkler systems designed in accordance with NFPA Standard 13 or 13R and standards developed by the Fire Chief.

d. All public storage facilities shall have installed an approved automatic fire sprinkler system. An approved wire mesh or other approved physical barrier shall be installed 18 inches below the sprinkler head deflector to prevent storage from being placed to within 18 inches from the bottom of the deflector measured at a horizontal plane.

Section 906.11 is hereby added to the California Building Code as follows:

> 906.11 **Fire Extinguisher Documentation.** The owner and/or operator of every Group R Division 1 and R Division 2 occupancies shall annually provide the Chief written documentation that fire extinguishers are installed and have been serviced as required by Title 19 of the California Code of Regulations when such extinguishers are installed in residential units in lieu of common areas.

Section 907.2 of the California Building Code is amended to add the following paragraphs after the second paragraph and before the Exceptions:

> New Construction: Every new building constructed for non-residential occupancies greater than ~~2000~~2,000 square feet shall have installed therein an approved fire detection (products of combustion) system in accordance with the standards established by the National Fire Protection Association. The type of system installed shall be determined by the Fire Chief.
>
> Existing Construction: Every existing building remodeled for non-residential occupancies greater than ~~2000~~2,000 square feet shall have installed therein an approved fire detection (products of combustion) system in accordance with the standards established by the National Fire Protection Association. The type of system installed shall be determined by the Fire Chief.

Section 907.2.11 is hereby amended by changing the first sentence of the exception to read as follows:

> **EXCEPTION:** For group R occupancies other than single family dwellings.

Section 907.8.1 is hereby added as follows:

> Section 907.8.1 **Smoke Alarm Documentation.** The owner and/or operator of every Group R Division 1, Division 2, Division 3.1, and Division 4 Occupancies shall annually provide the Fire Code Official with written documentation that the smoke alarms installed pursuant to the California Building Code have been tested and are operational. If alarms are found to be inoperable or are missing, such alarms shall be repaired or replaced immediately.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~Section 15.04.025 ~~PLAN CHECK FEES.~~– Plan Check Fees

Section 109.2 of the California Building Code ~~("CBC")~~ is hereby amended to add the following:

> When submittal documents are required by Section 107.1, a plan review fee shall be paid at the time of submitting the submittal documents for plan review. Said plan review fee shall be sixty-five percent (65%) of the building permit fee.

When private contractors are retained to conduct project plan checks, the plan check fee charged by the Town shall be the total cost of the private plan check plus an additional twenty percent (20%) of that cost to defer administrative services provided by the Town.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~Section 15.04.030 ~~ROOF COVERINGS.~~ – Roof Coverings

Section 1505.1 of the California Building Code and Section R902.1 of the California Residential Code are both amended to add the following language after the first paragraph and before the exception(s) to each:

Notwithstanding anything to the contrary, the roof covering on any structure regulated by this code shall be a Class A Roof Covering Assembly as classified by Section 1505.2. When more than fifty percent (50%) of the total roof area of an existing structure is replaced within a twelve (12) month period, the entire roof must be replaced with a Class A Roof Covering Assembly.

~~(Ord. 872, passed 12-7-2022)~~

~~§ 15.04.035 BARRIERS FOR SWIMMING POOLS, SPAS AND HOT TUBS.~~

Section 15.04.035 – Barriers for Swimming Pools, Spas and Hot Tubs

The Town Council finds and determines that the maintenance of swimming pools without protective measures constitutes a hazard to the safety of children and other inhabitants of the Town, and therefore the regulations contained in section 3109 of the ~~2021 International Building Code (to the extent the same are not inconsistent with the~~ California Building Code~~)~~ and Appendix ~~A~~CI of the California Residential Code, are hereby adopted and shall apply to existing as well as remodeled and new swimming pools.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~Section 15.04.040 ~~SEPTIC SYSTEMS.~~ – Septic systems

California Plumbing Code Section 713.1 is amended to read as follows:

Every building in which plumbing fixtures are installed and every premises having drainage piping thereon, shall have a connection to a public sewer, except as provided in Sections 713.2 and 713.4.

Exception: A permit may be issued for the repair, replacement, or alteration of a previously constructed septic tank or sewage disposal system other than a septic system where no public sewer is available upon approval by the Town Council, the Planning Commission, the Marin County Health Department, Sanitary District Number 1 of Marin County, and the Bay Area Water Quality Control Board.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~**Section 15.04.045** ~~CORRECTING PAST VIOLATIONS.~~**– Correcting Past Violations**

~~(A)~~ Before a new permit can be issued for any parcel, all expired permits for a parcel must be reinstated, all work done without a permit on a parcel must be permitted, and all mandatory correction items noted on the Resale Inspection Reports for that parcel must be permitted or corrected.

~~(B)~~ Section 109.7 is added to the California Building Code and Section R108.7 is added to the California Residential Code to read as follows:

> Expired permits which are lacking only a final inspection may be reinstated for a fee of $50 or the cost of the permit, whichever is less.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~**Section 15.04.050** ~~FEE ADJUSTMENTS~~**– Fee Adjustments.**

The Town Council may, by resolution, revise the fees established by this Chapter 15.04.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~**Section 15.04.055** ~~ALTERNATIVE POWER SUPPLIES.~~**– Alternative Power Supplies**

Section ~~1511.9.2~~1511.10.2 of the California Building Code and Section ~~R324.7.4~~R329.8.4 of the California Residential Code are added to read as follows:

> Alternative Power Supplies. Roof-mounted photovoltaic panels/modules and other alternative electrical power supply sources shall comply with the requirements of the California Building Code as amended, the California Residential Code as amended, the California Electrical Code, and the California Fire Code as amended.

~~(Ord. 872, passed 12-7-2022)~~

~~§ 15.04.060 APPLICABILITY OF 2006 WILDLAND URBAN INTERFACE CODE.~~

~~Section 701 of the California Building Code is hereby amended by adding the following sentence:~~

~~Buildings constructed in designated Wildland Urban Interface areas shall also comply with the 2018 Edition of the Wildland Urban Interface Code, as adopted and amended by the Town of Fairfax in Chapter 8.06 of the Town Code.~~

~~(Ord. 872, passed 12-7-2022)~~

Section 15.04.065 – Electric Vehicle Charging Stations

~~§ 15.04.065 ELECTRIC VEHICLE CHARGING STATIONS.~~

(A) Purpose. The purpose of this section is to create an expedited and streamlined electric vehicle charging station permitting process that complies with Cal. ~~Gov't~~Government Code § 65850.7 to achieve the timely and cost-effective installation of electric vehicle charging stations. Pursuant to Cal. Gov't Code § 65850.7 and notwithstanding any other provision of this code pertaining to conditional or accessory uses, only an electrical permit shall be required for an electric vehicle charging station.

(B) Definitions.

~~ELECTRONIC SUBMITTAL.~~"Electronic Submittal." The submission of application materials via electronic mail.

~~ELECTRIC VEHICLE CHARGING STATION (EVCS). A~~"Electric Vehicle Charging Station (EVCS)" means a parking space that includes installation of electric vehicle supply equipment (EVSE) at an EV Ready space. An EVCS space may be used to satisfy EV Ready space requirements. EVSE shall be installed in accordance with the California Electrical Code, Article 625.

(C) Permit.

(1) An electrical permit is required prior to installing an electric vehicle charging station. Installation shall also meet any applicable requirements of the California Building Standards Code (~~Cal.~~California Code of Regulations, Title 24) and state law, including but not limited to, Cal. Gov't Code § 65850.7, as may be amended from time to time.

(2) The Building Official shall adopt and maintain a standard electric vehicle charging station checklist that is consistent with the checklist in the most current version of the "Plug-In Electric Vehicle Infrastructure Permitting Checklist" of the "Zero-Emission Vehicles in California: Community Readiness Guidebook" published by the Office of Planning and Research. The checklist and application shall be made available on the town's website.

(3) An application to install an electric vehicle charging station may be made by electronic submittal. An applicant's electronic signature shall be accepted on all forms, applications, and other documents in lieu of a wet signature.

(4) An application will be deemed complete if the Building Official determines that the application includes all of the information and documents required by the standard application form and the standard checklist. If an application is deemed incomplete, the Building Official will notify the applicant in writing of the additional information needed to complete the application. After an application is deemed complete, the Building Official will perform an expedited review of the application.

(5) Review of the permit application shall be limited to the Building Official's review of whether the application meets local, state and federal health and safety requirements.

The application shall be administratively reviewed by the Building Official as a ministerial permit.

(6) Approval of a permit shall not be conditioned on the approval of an association, as that term is defined in Cal. Civil Code § 4080.

(7) A permit will be issued following the Building Official's approval of an application for an electric vehicle charging station and after all required fees have been paid. If the application was submitted electronically, the permit may be issued electronically. The decision to approve or deny the permit shall be issued in accordance with the timeframes adopted by the Town Council and in no event later than three days after the application is deemed complete.

(8) As soon as practicable after the applicant notifies the Building Official that an electric vehicle charging station has been installed, the Building Official will inspect the system to verify compliance with the permit. No electric vehicle charging station may be operated unless the Building Official verifies in writing that it complies with the permit.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~Section 15.04.070 ~~GREEN BUILDING REQUIREMENTS.~~ – Green Building Requirements

(A) Purpose. The purpose of this section is to meet or exceed all applicable mandatory measures of the ~~2022~~2025 California Green Building Standards Code (Title 24, Part 11) of the California Code of Regulations and to enhance the long-term public health and welfare by contributing to the overall reduction of greenhouse gas emissions and improving the environmental and economic health of the county through the efficient design, construction, operation, maintenance and deconstruction of buildings and site development by incorporating green building practices and materials. The green building provisions referenced in this chapter are designed to achieve the following objectives:

(1) Increase energy efficiency in buildings;
(2) Reduce consumption of fossil fuels in the ~~town~~Town;
(3) Encourage water and resource conservation;
(4) Reduce waste generated by construction projects;
(5) Reduce long-term building operating and maintenance costs;
(6) Improve indoor air quality and occupant health;
(7) Contribute to meeting state and local commitments to reduce greenhouse gas emissions; and
(8) Satisfy all applicable mandatory measures of the ~~2022~~2025 California Green Building Standards Code (Title 24, Part 11) of the California Code of Regulations.

(B) Applicability.

The provisions of this section shall apply to all construction or development projects defined below as a ~~"~~"covered project.~~"~~"

(C) Definitions.

For the purposes of interpreting this chapter and the associated standards for compliance, the following terms are defined as follows. When the definitions below differ from those contained elsewhere in this title, the provisions of this chapter shall apply. These definitions are additional to those outlined in Chapter 2 of the California Green Building Standards Code, Title 24, Part 11.

~~2022 CALIFORNIA ENERGY CODE. Refers~~(1) "2025 California Energy Code" refers to the requirements outlined in the ~~2022~~2025 edition of the California Energy Code known as California Code of Regulations, Part 6 of Title 24.

~~ALL-ELECTRIC BUILDING or ALL-ELECTRIC DESIGN. A~~(2) "All-electric Building" or "All-electric Design" means a building or plans for a building that uses a permanent supply of electricity as the source of energy for all space heating (including but not limited to fireplaces), water heating (including but not limited to pools and spas), cooking appliances ~~(including but not limited to barbeques)~~, and clothes drying appliances, and has no natural gas or propane plumbing installed in the building or within the property lines. An all-electric building may also include solar thermal collectors.

~~ACCESSORY DWELLING UNIT (ADU). A~~(3) "Accessory Dwelling Unit (ADU)" means a residential unit that meets the definition of an accessory dwelling unit as outlined in Chapter 17 of the Fairfax Town Code . This states that ~~"~~"a residential dwelling unit, which is accessory to a primary dwelling unit, that provides complete independent living facilities for one or more persons and is located on a lot with a proposed or existing primary dwelling. It shall provide permanent provisions for living, sleeping, eating, cooking, sanitation, and independent exterior access, on the same lot as the single-family or multi-family dwelling is or will be situated. An Accessory Dwelling Unit also includes the following: (1) an efficiency unit as defined in ~~§~~section 17958.1 of the California Health and Safety Code and (2) a manufactured home as defined in section 18007 of the California Health and Safety Code.~~"~~" For purposes of this subchapter, ADU also covers Junior ADUs and detached or attached ADUs.

~~AUTOMATIC LOAD MANAGEMENT SYSTEM (ALMS). A control system designed to manage load across one or more electric vehicle supply equipment (EVSE), circuits, panels, and to share electrical capacity and/or automatically manage power at each connection point. ALMS systems shall be designed to deliver no less than 3.3 kVa (208/240 volt, 16-ampere) to each EV Capable, EV Ready or EVCS space served by the ALMS, and meet the requirements of California Electrical Code Article 625. The connected amperage to the building site for the EV charging infrastructure shall not be lower than the required connected amperage per California Green Building Standards Code, Title 24 Part 11.~~

~~CALGREEN. Refers~~(4) "CALGreen" refers to the California Green Building Standards Code, as included in Title 24, Part 11 of the California Code of Regulations.

~~CALGREEN MANDATORY. Those~~(5) "CALGreen mandatory" means those measures that are required under Title 24, Part 11. Residential mandatory measures are contained in CALGreen Chapter 4. Nonresidential mandatory measures are contained in CALGreen Chapter 5.

~~CALGREEN TIER~~(6) "CALGreen Tier 1~~. Refers~~" refers to required pre-requisite and elective measures in addition to the CALGreen mandatory measures, as outlined in CALGreen Appendix A4.601.4 for residential projects and CALGreen Appendix A5.601.2 for nonresidential projects.

~~COMMERCIAL KITCHEN. Non-retail food facility devoted to the commercial preparation, production, and cooking of food and beverages for on-site or off-site consumption.~~

~~COOKING EQUIPMENT. Equipment intended for commercial use, including ovens, ranges, and cooking appliances for use in a commercial kitchen and restaurant where food is dispensed.~~

~~COVERED PROJECT(S). A~~(7) "Covered Project(s)" means a development project provided below as set forth by the standards for compliance outlined in § 15.04.085, Table 1, 2, or 3 for which one or more building permits are required:

~~(a) All residential and nonresidential new construction and newly constructed buildings as defined below in § 15.04.070(C)(27) and (C)(28), respectively; and/or~~

(~~b~~i) Additions or alterations to an existing single-family residential building~~, except for any projects less than 200 square feet~~.

~~DIRECT CURRENT FAST CHARGING (DCFC). A parking space provided with electrical infrastructure that meets the following conditions:~~

(ii) Additions or alterations to an existing multi-family residential building, hotel, or motel.

~~(a) A minimum of 48 kVa (480 volt, 100-ampere) capacity wiring.~~

~~(b) Electric vehicle supply equipment (EVSE) located within three feet of the parking space providing a minimum capacity of 80-ampere.~~

~~ELECTRIC VEHICLE (EV) CAPABLE SPACE. A vehicle space with electrical panel space and load capacity to support a branch circuit and necessary raceways, both underground and/or surface mounted, to support EV charging.~~

~~ELECTRIC VEHICLE CHARGING SPACE (EV SPACE). A space intended for future installation of EV charging equipment and charging of electric vehicles.~~

~~ELECTRIC VEHICLE CHARGING STATION (EVCS). A parking space that includes installation of electric vehicle supply equipment (EVSE) at an EV Ready space. An EVCS space may be used to satisfy EV Ready space requirements. EVSE shall be installed in accordance with the California Electrical Code, Article 625.~~

~~ELECTRIC VEHICLE (EV) READY SPACE. A vehicle space which is provided with a branch circuit; any necessary raceways, both underground and/or surface mounted, to support EV charging, terminating in a receptacle or a charger.~~

~~LEVEL 1 (L1) EV READY. A parking space that is served by a complete electric circuit with the following requirements:~~

~~(a) A minimum of 2.2 kVa (110/120 volt, 20-ampere) capacity wiring.~~

~~(b) A receptacle labeled "electric vehicle outlet" or electric vehicle supply equipment located within three feet of the parking space. If EVSE is provided the minimum capacity of the EVSE shall be 16-ampere.~~

~~(c) Conduit oversized to accommodate future Level 2 EV Ready (208/240 volt, 40-ampere) at each parking space.~~

~~LEVEL 2 (L2) EV READY. A parking space that is served by a complete electric circuit with the following requirements:~~

~~(a) A minimum of 8.3 kVa (208/240 volt, 40-ampere) capacity wiring.~~

~~(b) A receptacle labeled "electric vehicle outlet" or electric vehicle supply equipment located within three feet of the parking space. If EVSE is provided the minimum capacity of the EVSE shall be 30-ampere.~~

~~ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the undergrounded, grounded and equipment grounding conductors and the electric vehicle connectors, attachment plugs, and all other fittings, devices, power outlets or apparatus installed for the purpose of transferring energy between the premises wiring and the electric vehicle.~~

~~ESSENTIAL SERVICES BUILDING. A facility as defined by the Cal. Health and Safety Code § 16007, as amended from time to time. For purposes of this chapter, essential services buildings are publicly owned and/or publicly operated buildings whose purpose is to safeguard the public health and safety. Essential services buildings generally exclude privately owned residences and/or commercial buildings; except that, privately owned commercial buildings may qualify as essential services buildings to the extent they are publicly operated to safeguard the public health and safety.~~

~~FOOD SERVICE ESTABLISHMENT. Any newly constructed or new construction building with construction plans for a commercial kitchen or cooking equipment.~~

~~INDUSTRIAL PROCESS HEAT. A process or manufacturing equipment for which sustained temperatures typically in excess of 350 degrees Fahrenheit are required and demonstrably not achievable with commercial electric equipment.~~

~~LOW POWER LEVEL 2 ELECTRIC VEHICLE CHARGING RECEPTACLE. A parking space that is served by a complete electric circuit with the following requirements:~~

~~(a) A minimum of 8.3 kVa (208/240 volt, 40 ampere) capacity wiring.~~

~~(b) A receptacle labeled "electric vehicle outlet" or electric vehicle supply equipment located within three feet of the parking space. If EVSE is provided the minimum capacity of the EVSE shall be 30-ampere.~~

~~MIXED-FUEL. A~~(8) "Mixed-fuel" means a building or unit in a building that is plumbed for the use of natural gas or propane as fuel for space heating, water heating, cooking or clothes drying appliances or has gas plumbing within a building or within the property lines of the premises connected to a gas meter or propane tank.

~~MODIFIED PARKING LOT. Those for which paving material and curbing is removed.~~

~~NATURAL GAS. The~~(9) "Natural gas" has the same meaning as "~~fuel gas~~Fuel Gas" as defined in the California Plumbing Code and Mechanical Code.

~~NATURAL GAS INFRASTRUCTURE. Fuel gas piping, other than service pipe, in or in connection with a building, structure or within the property lines of premises, extending from the point of delivery at the meter, service meter assembly, outlet of the service regulator, service shutoff valve, or final pressure regulator, whichever is applicable, as specified in the California Mechanical Code and Plumbing Code.~~

~~NEWLY CONSTRUCTED. A~~(10) "Newly Constructed" means a building that has never before been used or occupied for any purpose.

~~QUALIFIED GREEN BUILDING RATER. An~~(11) "Qualified green building rater" means an individual who has been trained and certified as a CALGreen inspector, LEED AP w/a specialty, GreenPoint rater, PHIUS consultant, or has similar qualifications and certifications if acceptable to the chief building official.

~~SINGLE-FAMILY. A~~(12) "Single-Family" means a building designed for and/or occupied exclusively by one family. It is used herein to describe one and two-family dwellings and townhouses with attached private garages. It also includes factory-built, modular housing units, constructed in compliance with the California Building Code (CBC), and mobile homes/manufactured housing on permanent foundations and agricultural worker housing.

~~(Ord. 872, passed 12-7-2022)~~

15.04.075 – Requirements for additions and alterations; Local amendments to 2025 California Energy Code

~~§ 15.04.075 REQUIREMENTS FOR ADDITIONS AND ALTERATIONS; LOCAL AMENDMENTS TO 2022 CALIFORNIA ENERGY CODE.~~

~~(A)~~ Pursuant to §15.04.010(g), Fairfax has adopted the ~~2022~~2025 Edition of the California Energy Code known as California Code of Regulations, Part 6 of Title 24, with additions and deletions as provided in this subchapter.

~~(B)~~ The provisions of this subchapter shall constitute local amendments to the cross-referenced provisions of the ~~2022~~2025 California Energy Code and shall be deemed to replace the cross-referenced sections of said Code with the respective provisions set forth in this subchapter.

~~(C)~~ The California Energy Code, Title 24, Part 6, is hereby amended provided below:

~~(1)~~ Section 100.0 of Subchapter 1 of the ~~2022~~2025 California Energy Code is modified to add new section (i) as follows:

(i) Single-Family Building Remodel Energy Reach Code - Purpose and Intent. In addition to all requirements of the California Energy Code applicable to Existing Single-Family Building additions and alterations, the energy efficiency and renewable energy measures specified in Section 150.0(w) shall be required for Covered Projects of mixed-fuel buildings.

~~(2)~~ Section 100.1(b) is modified by adding the following definitions:

"All-electric Building" or ~~"~~"All-electric Design~~"~~" as defined in § 15.04.070(C)(2), Fairfax Town Code.

"Covered Project(s)" as defined in § 15.04.070(C)(~~10~~7), Fairfax Town Code.

~~"~~"Mixed-fuel~~"~~" building as defined in § 15.04.070(C)(~~23~~8), Fairfax Town Code.

~~(3)~~ Section 150.0 SINGLE-FAMILY RESIDENTIAL BUILDINGS – MANDATORY FEATURES AND DEVICES, first two paragraphs, are modified to read as follows:

Existing Single-Family residential buildings shall comply with the applicable requirements of Sections ~~150~~150.0(a) through 150.0(v), and Covered Existing Single-Family Projects, other than projects identified as all-electric construction for newly constructed or new construction buildings in § 15.04.070(C)(~~27~~2)~~,~~ of the Fairfax Town Code, shall comply with the applicable requirements of Section 150.0(w).

NOTE: The requirements of Sections 150.0(a) through 150.0(v) apply to newly constructed buildings. Sections 150.2(a) and 150.2(b) specify which requirements of Sections 150.0(a) through 150.0(v) also apply to additions or alterations~~, with the exception that~~. In addition, Covered Existing Single-Family Projects~~, other than projects identified as all-electric construction for newly constructed or new construction buildings,~~ shall also be required to comply with Section 150.0(w).

Section 150.0(w) is added to read as follows

(w) Requirements for a Covered Project are outlined by project type in §15.04.085, Table 1, Fairfax Town Code. A Covered Existing Single-Family Project, as defined in § ~~15.04.075~~15.04.070(C)(~~10~~7)~~(ii),~~ of the Fairfax Town Code, ~~that includes an electrical panel upgrade, a kitchen remodel or a laundry room remodel shall comply with the requirements for Measure ER2 in § 15.04.085, Table 2, Fairfax Town Code. In addition, a Covered Existing Single-Family Project~~ in a building originally permitted for construction on or before December 31, 2010, shall install a set of measures from the Measure Menu in § 15.04.085, Table 2, Fairfax Town

Code, to achieve a total Measure Point Score that is equal to or greater than the Target Score in said table and shall conform to the List of Measure Specifications in § 15.04.085, Table 3, Fairfax Town Code, except as otherwise described below:

(i) Projects in buildings identified as all-electric ~~construction for newly constructed or new construction buildings~~as defined in §15.04.070(C)~~,~~(2) of the Fairfax Town Code.

(ii) Projects less than 200 square feet. Square footage associated with the creation of a new ADU or JADU will not be included in the calculation of project square footage.

(iii) Projects that are limited solely to a newly created attached ~~Accessory Dwelling Units (ADUs) or Junior Accessory Dwelling Unit (~~ADU or JADU~~)~~ as defined in § 15.04.070(C)(3)~~,~~ of the Fairfax Town Code. A newly created ADU and JADU shall include either additions or conversions of existing space. This exception DOES NOT apply to a Covered Existing Single-Family Project of an existing ADU or JADU.

(iv) Mobile Homes, Manufactured Housing, or Factory-built Housing as defined in Division 13 of the California Health and Safety 12 Code (commencing with section 17000 of the Health and Safety Code).

(v) If due to conditions specific to the project, it is technically or economically infeasible to achieve compliance, the chief building official may reduce the Target Score and/or waive some or all of the mandatory requirements.

(vi) If the applicant demonstrates that the Energy Budget of the proposed building, as calculated under Section 150.1(b), would be less than or equal to the Energy Budget of the building if it otherwise complied with this Section~~,~~ 150.0(w).

(vii) A resident owner or occupant demonstrates that they qualify for the California Alternative Rates for Energy (CARE) or Family Electric Rate Assistance (FERA) program may comply by installing, to the specifications in § 15.04.085. Table 3~~,~~ of the Fairfax Town Code, the following:

(a) E1: Lighting Measures; and

(b) E2: Water Heating Package

Unless otherwise specified, the requirements shall apply to the entire dwelling unit, not just the additional or altered portion. Measures from the Measure Menu table that are to be installed to satisfy requirements under the California Energy Code, Title 24, Part 6, may not count towards compliance with these requirements. Where these requirements conflict with other California Energy Code requirements, the stricter requirements shall prevail.

~~(D)~~ In addition, all mandatory measures listed in §15.04.085, Table 2~~,~~ of the Fairfax Town Code, shall be installed.

~~(E)~~ Measure verification shall be explicitly included as an addendum to the Certificate of Compliance to be filed pursuant to ~~2022~~2025 Title 24, Part 6, Section 10-103.

~~(Ord. 872, passed 12-7-2022)~~

~~§ 15.04.080 REQUIREMENTS FOR ELECTRIC VEHICLE INFRASTRUCTURE; LOCAL AMENDMENTS TO 2022 CALGREEN CALIFORNIA GREEN BUILDING STANDARDS CODE.~~

~~(A) Pursuant to § 15.04.010(j), Fairfax has adopted the 2022 edition of the California Green Building Standards Code known as Cal. Code of Regulations, Part 11 of Title 24 (herein referred to as CALGreen Code), including Division A4.6 for Tier 1 with additions, and deletions as provided in this subchapter. Requirements are outlined by project type in Table 1 of § 15.04.085, Fairfax Town Code.~~

~~(B) The provisions of this subchapter shall constitute local amendments to the cross-referenced provisions of the 2022 CALGreen Code and shall be deemed to replace the cross-referenced sections of said Code with the respective provisions set forth in this subchapter.~~

~~(C) Section 202 of Chapter 2 of the 2022 CALGreen Code is hereby amended to add and amend the following definitions:~~

~~Automatic Load Management System (ALMS). A control system designed to manage load across one or more electric vehicle supply equipment (EVSE), circuits, panels and to share electrical capacity and/or automatically manage power at each connection point. ALMS systems shall be designed to deliver no less than 3.3 kVa (208/240 volt, 16-ampere) to each EV Capable, EV Ready or EVCS space served by the ALMS, and meet the requirements of California Electrical Code Article 625. The connected amperage to the building site for the EV charging infrastructure shall not be lower than the required connected amperage per California Green Building Standards Code, Title 24 Part 11.~~

~~Direct Current Fast Charging (DCFC). A parking space provided with electrical infrastructure that meets the following conditions:~~

~~i. A minimum of 48 kVa (480 volt, 100-ampere) capacity wiring.~~

~~ii. Electric vehicle supply equipment (EVSE) located within three (3) feet of the parking space providing a minimum capacity of 80-ampere.~~

~~Electric Vehicle Charging Station (EVCS). A parking space that includes installation of electric vehicle supply equipment (EVSE) at an EV Ready space. An EVCS space may be used to satisfy EV Ready space requirements. EVSE shall be installed in accordance with the California Electrical Code, Article 625.~~

~~Electric Vehicle (EV) Ready Space. [HCD] A vehicle space which is provided with a branch circuit; any necessary raceways, both underground and/or surface mounted; to accommodate EV charging, terminating in a receptacle or a charger.~~

~~Electric Vehicle (EV) Capable Space. A vehicle space with electrical panel space and load capacity to support a branch circuit and necessary raceways, both underground and/or surface mounted, to support EV charging.~~

~~Level 2 (L2) EV Capable. A parking space provided with electrical infrastructure that meets the following requirements:~~

~~i. Conduit that links a listed electrical panel with sufficient capacity to a junction box or receptacle located within three (3) feet of the parking space.~~

~~ii. The conduit shall be designed to accommodate at least 8.3 kVa (208/240 volt, 40-ampere) per parking space. Conduit shall have a minimum nominal trade size of 1 inch inside diameter and may be sized for multiple circuits as allowed by the California Electrical Code. Conduit shall be installed at a minimum in spaces that will be inaccessible after construction, either trenched underground or where penetrations to walls, floors, or other partitions would otherwise be required for future installation of branch circuits, and such additional elements deemed necessary by the Building Official. Construction documents shall indicate future completion of conduit from the panel to the parking space, via the installed inaccessible conduit.~~

~~iii. The electrical panel shall reserve a space for a 40-ampere overcurrent protective device space(s) for EV charging, labeled in the panel directory as "EV CAPABLE."~~

~~iv. Electrical load calculations shall demonstrate that the electrical panel service capacity and electrical system, including any on-site distribution transformer(s), have sufficient capacity to simultaneously charge all EVs at all required EV spaces at a minimum of 40 amperes.~~

~~v. The parking space shall contain signage with at least a 12" font adjacent to the parking space indicating the space is EV Capable.~~

~~Level 1 (L1) EV Ready. A parking space that is served by a complete electric circuit with the following requirements:~~

~~i. A minimum of 2.2 kVa (110/120 volt, 20-ampere) capacity wiring.~~

~~ii. A receptacle labeled "Electric Vehicle Outlet" or electric vehicle supply equipment located within three (3) feet of the parking space. If EVSE is provided the minimum capacity of the EVSE shall be 16-ampere.~~

~~iii. Conduit oversized to accommodate future Level 2 EV Ready (208/240 volt, 40-ampere) at each parking space.~~

~~Level 2 (L2) EV Ready. A parking space that is served by a complete electric circuit with the following requirements:~~

~~i. A minimum of 8.3 kVa (208/240 volt, 40-ampere) capacity wiring.~~

~~ii. A receptacle labeled "Electric Vehicle Outlet" or electric vehicle supply equipment located within three (3) feet of the parking space. If EVSE is provided the minimum capacity of the EVSE shall be 30-ampere.~~

~~Low Power Level 2 (L2) EV Ready. A parking space that is served by a complete electric circuit with the following requirements:~~

~~i. A minimum of 4.1 kVA (208/240 Volt, 20-ampere) capacity wiring.~~

~~ii. A receptacle labeled "Electric Vehicle Outlet" or electric vehicle supply equipment located within three (3) feet of the parking space. If EVSE is provided the minimum capacity of the EVSE shall be 16-ampere.~~

~~iii. Conduit oversized to accommodate future Level 2 EV Ready (208/240 volt, 40-ampere) at each parking space.~~

~~Off-Street Loading Spaces. [BSC-CG, DSA-SS] An area, other than a public street, public way, or other property (and exclusive of off-street parking spaces), permanently reserved or set aside for the loading or unloading of motor vehicles, including ways of ingress and egress and maneuvering areas. Whenever the term "loading space" is used, it shall, unless the context clearly requires otherwise, be construed as meaning off-street loading space. This excludes designated passenger loading/unloading.~~

~~(D)~~ Section 301.1 of Chapter 3 of the ~~2022~~2025 CALGreen Code is hereby amended as underlined and struck through:

> **301.1 Scope**. Buildings shall be designed to comply with applicable requirements of Town of Fairfax Green Building Requirements beginning at Chapter 15.04.065(A), Fairfax Town Code, and shall also include the green building measures specified as mandatory in the application checklists contained in this code.

~~(E) Section 301.1.1 of Chapter 3 of the 2022 CALGreen Code is hereby amended as underlined and struck through:~~

~~301.1.1 Additions and alterations. [HCD] The mandatory provisions of Chapter 4 shall be applied to additions and alterations of existing residential buildings, in accordance with applicable requirements of Town of Fairfax Green Building Requirements beginning at Chapter 15.04.065 (A), Fairfax Town Code. The requirements shall apply only to and/or within the specific area of the addition or alteration.~~

~~(F) The mandatory provisions of section 4.106.4.1.1 may apply to additions or alterations of existing parking facilities or the addition of new parking facilities or the addition of new parking facilities serving existing multifamily buildings. See Section 4.106.4.1.2 for application.~~

~~NOTE: Repairs including, but not limited to, resurfacing, restriping, and repairing or maintaining existing lighting fixtures are not considered alterations for the purpose of this section.~~

~~(G) Section 301.3 of Chapter 3 of the 2022 CALGreen Code is hereby amended as underlined and struck through:~~

~~301.3 Nonresidential additions and alterations. [BSC-CG] The provisions of individual sections of Chapter 5 apply to newly constructed buildings and building additions and alterations (for occupancies within the authority of California Building standards Commission). Code sections relative to additions and alterations shall only apply to the portions of the building being added or altered within the scope of the permitted work.~~

~~(H) Section 4.106.4 of Chapter 4 of the 2022 CALGreen Code is hereby amended as underlined and struck through:~~

~~4.106.4 Electric vehicle (EV) charging. Residential construction shall comply with Section 4.106.4.1 or 4.106.4.2 to facilitate future installation and use of EV chargers. Electric vehicle supply equipment (EVSE) shall be installed in accordance with the California Electrical Code, Article 625. For EVCS signs, refer to Caltrans Traffic Operations Policy Directive 13-01 (Zero Emission Vehicle Signs and Pavement Markings) or its successor(s). Calculation for spaces shall be rounded up to the nearest whole number.~~

~~Exceptions:~~

~~1. On a case-by-case basis, where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:~~

~~1.1. Where there is no local utility power supply or the local utility is unable to supply adequate power.~~

~~1.2. Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section 4.106.4, may adversely impact the construction cost of the project.~~

~~2. Accessory Dwelling Units (ADU) and Junior Accessory Dwelling Units (JADU) without additional parking facilities and without electrical panel upgrade or new panel installation. Detached ADUs, attached ADUs, and JADUs without additional parking but with electrical panel upgrades or new panels must have reserved breakers and electrical capacity according to the requirements of A4.106.8.1.~~

~~3. Multifamily building projects that have approved entitlements before the code effective date.~~

~~4. Parking spaces accessible only by automated mechanical car parking systems are not required to comply with this code section.~~

~~4.106.4.1 Multifamily dwellings with parking facilities. Requirements apply to parking spaces that are assigned or leased to individual dwelling units, as well as unassigned residential parking. Visitor or common area parking is not included.~~

~~4.106.4.1.1 New Construction. Fifteen percent (15%) of dwelling units with parking spaces shall be EVCS with Level 2 EV Ready. ALMS shall be permitted to reduce load when multiple vehicles are charging. Eighty-five percent (85%) of dwelling units with parking spaces shall be provided with a Low Power Level 2 EV Ready space. EV ready spaces and EVCS in multifamily developments shall comply with California Building Code, Chapter 11A, Section 1109A. EVCS shall comply with the accessibility provisions for EV chargers in the California Building Code, Chapter 11B.~~

~~NOTE: The total number of EV spaces should be one hundred percent (100%) of dwelling units or one-hundred percent (100%) of parking spaces, whichever is less.~~

~~4.106.4.1.2 Additions and alterations of existing buildings.~~

~~1. When parking facilities upgrade the service panel or parking lot surface is modified, including the removal of paving material and curbing, comply with the number of spaces designated for the project type as outlined in Table 1 of Chapter 15.04.085, Fairfax Town Code. Upgrades shall be required at currently designated vehicle parking spaces. Upgrades shall be required for remaining parking spaces after meeting the accessibility requirements of California Building Code Chapters 11A and 11B.~~

~~2. When new parking facilities are added and ALMS is installed, the ALMS system must be designed to deliver no less than 2.2 kVa (110/120 volt, 20-ampere).~~

~~4.106.4.2.1 Additions and Alterations of Existing Buildings.~~

~~1. When parking facilities upgrade the service panel or parking lot surface is modified, including the removal of paving material and curbing, comply with the number of spaces designated for the project type as outlined in Table 1 of Chapter 15.04.065(A), Fairfax Town Code. Upgrades shall be required at currently designated vehicle parking spaces. Upgrades shall be required for remaining parking spaces after meeting the accessibility requirements of California Building Code Chapters 11A and 11B.~~

~~2. When new parking facilities are added and ALMS is installed, the ALMS system must be designed to deliver no less than 2.2 kVa (110/120 volt, 20-ampere).~~

~~4.106.4.3 Electric vehicle charging stations (EVCS).~~

~~Electric vehicle charging stations required by Section 4.106.4.1 and 4.106.4.2, shall comply with Section 4.106.4.3.~~

~~Exception: Electric vehicle charging stations serving public accommodations, public housing, motels, and hotels shall not be required to comply with this section. See California Building Code, Chapter 11B, for applicable requirements.~~

~~4.106.4.3.1 Location.~~

~~EVCS shall comply with at least one of the following options:~~

~~1. The charging space shall be located adjacent to an accessible parking space meeting the requirements of the California Building Code, Chapter 11A, to allow use of the EV charger from the accessible parking space.~~

~~2. The charging space shall be located on an accessible route, as defined in the California Building Code, Chapter 2, to the building.~~

~~Exception: Electric vehicle charging stations designed and constructed in compliance with the California Building Code, Chapter 11B, are not required to comply with Section 4.106.4.3.1 and Section 4.106.4.3.2, Item 3.~~

~~4.106.4.3.2 Dimensions.~~

~~The charging spaces shall be designed to comply with the following:~~

~~1. The minimum length of each EV space shall be 18 feet (5486 mm).~~

~~2. The minimum width of each EV space shall be 9 feet (2743 mm).~~

~~3. One in every 25 charging spaces, but not less than one, shall also have an 8-foot (2438 mm) wide minimum aisle. A 5-foot (1524 mm) wide minimum aisle shall be permitted provided the minimum width of the EV space is 12 feet (3658 mm).~~

~~a. Surface slope for this EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083 percent slope) in any direction.~~

~~Exception: Where the Town of Fairfax Municipal or Zoning Code permits parking space dimensions that are less than the minimum requirements stated in this section 4.106.4.3.2, and the compliance with which would be infeasible due to particular circumstances of a project, an exception may be granted while remaining in compliance with California Building Code Section Table 11B-228.3.2.1 and 11B-812, as applicable.~~

~~4.106.4.4 Direct current fast charging stations (DCFC). One DCFC may be substituted for up to five (5) EVCS to meet the requirements of 4.106.4.1 and 4.106.4.2. Where ALMS serve DCFC~~

~~stations, the power demand from the DCFC shall be prioritized above Level 1 and Level 2 spaces.~~

~~(I) Section A4.106.8 of the 2022 CALGreen Code is hereby amended as underlined and struck through:~~

~~New construction shall comply with Sections A4.106.8.1, to facilitate future installation and use of electric vehicle chargers. Electric vehicle supply equipment (EVSE) shall be installed in accordance with the California Electrical Code, Article 625.~~

~~(J) Section 5.106.5.3 of the 2022 CALGreen Code is hereby amended as underlined and struck through:~~

~~5.106.5.3 Electric vehicle (EV) charging.~~

~~Construction to provide electric vehicle infrastructure and facilitate electric vehicle charging shall comply with Section 5.106.5.3.1 and shall be provided in accordance with regulations in the California Building Code and the California Electrical Code. Accessible EVCS shall be provided in accordance with the California Building Code Chapter 11B Section 11B-228.3. For EVCS signs, refer to Caltrans Traffic Operations Policy Directive 13-01 (Zero Emission Vehicle Signs and Pavement Markings) or its successor(s). Calculation for spaces shall be rounded up to the nearest whole number.~~

~~Exceptions:~~

~~1. On a case-by-case basis, where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:~~

~~a. Where there is no local utility power supply~~

~~b. Where the local utility is unable to supply adequate power.~~

~~c. Where there is evidence suitable to the local enforcement agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section 5.106.5.3, may adversely impact the construction cost of the project.~~

~~2. Parking spaces accessible only by automated mechanical car parking systems are not required to comply with this code section.~~

~~(K) Section A5.106.5 of Appendix A5 of the 2022 CALGreen Code is hereby amended as struck through:~~

~~A5.106.5 Electric Vehicle (EV) charging.~~

~~Construction shall comply with Section A5.106.5.3.1 or A5.106.5.3.2, and in accordance with regulations in the California Building Code and the California Electrical Code. Accessible EVCS shall be provided in accordance with the California Building Code Chapter 11B Section 11B-228.3. For EVCS signs, refer to Caltrans Traffic Operations Policy Directive 13-01 (Zero Emission Vehicle Signs and Pavement Markings) or its successor(s). Calculation for spaces shall be rounded up to the nearest whole number.~~

~~Exceptions:~~

~~1. On a case-by-case basis where the local enforcing agency has determined compliance with this section is not feasible based upon one of the following conditions:~~

~~a. Where there is no local utility power supply.~~

~~b. Where the local utility is unable to supply adequate power.~~

~~c. Where there is evidence suitable to the local enforcement agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section A5.106.5, may adversely impact the construction cost of the project.~~

~~2. Parking spaces accessible only by automated mechanical car parking systems are not required to comply with this code section.~~

~~A5.106.5.3 Nonresidential Occupancies - Shared Parking Facilities.~~

~~A5.106.5.3.1 New Construction - Tier 1.~~

~~Table A5.106.5.3.1 shall be used to determine the number of EV capable spaces required. Refer to section 5.106.5.3 for design space requirements.~~

~~When EV capable spaces are provided with EVSE to create EVCS per Table A5.106.5.3.1.~~

~~TABLE A5.106.5.3.1~~

~~Total Number of Actual Parking Spaces~~

~~Tier 1 Number of Required EV Capable Spaces~~

~~Tier 1 Number of EVCS (EV Capable Spaces Provided with EVSE)2~~

~~TABLE A5.106.5.3.1~~

~~Total Number of Actual Parking Spaces~~

~~Tier 1 Number of Required EV Capable Spaces~~

~~Tier 1 Number of EVCS (EV Capable Spaces Provided with EVSE)2~~

~~0-9~~

~~2~~

~~0~~

~~10-25~~

~~5~~

~~0~~

~~26-50~~

~~11~~

~~2~~

~~51-75~~

~~19~~

~~3~~

~~76-100~~

~~26~~

~~4~~

~~101-150~~

~~38~~

~~6~~

~~151-200~~

~~53~~

~~9~~

~~201 and over~~

~~30 percent of total1~~

~~25 percent of EV capable spaces1~~

~~1. Calculation for spaces shall be rounded up to the nearest whole number.~~

~~2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.~~

~~A5.106.5.3.2 Additions and alterations of existing buildings.~~

~~1. When parking facilities upgrade the service panel or parking lot surface is modified, including the removal of paving material and curbing, comply with the number of spaces designated for the project type as outlined in Table 1 of Chapter 15.04.085, Fairfax Town Code. Upgrades shall be required at currently designated vehicle parking spaces. Upgrades shall be required for remaining parking spaces after meeting the accessibility requirements of California Building Code Chapters 11A and 11B.~~

~~2. When new parking facilities are added and ALMS is installed, the ALMS system must be designed to deliver no less than 2.2 kVa (110/120 volt, 20-ampere).~~

~~A5.106.5.4 Direct current fast charging stations. One DCFC may be substituted for up to five (5) EVCS to meet the requirements of 5.106.5.3. Where ALMS serve DCFC stations, the power demand from the DCFC shall be prioritized above Level 1 and Level 2 spaces.~~

~~(L) Section 5.106.5.4 of the 2022 CALGreen Code is hereby amended as struck through:~~

~~5.106.5.4 Electric vehicle charging readiness: medium-duty and heavy-duty. [N]~~

~~Construction shall comply with Section 5.106.5.4.1 to facilitate future installation of electric vehicle supply equipment (EVSE). Construction for warehouses, grocery stores and retail stores with planned off-street loading spaces shall also comply with Section 5.106.5.4.1 for future installation of medium- and heavy-duty EVSE. Accessible EVCS shall be provided in accordance with the California Building Code Chapter 11B Section 11B-228.3. For EVCS signs, refer to Caltrans Traffic Operations Policy Directive 13-01 (Zero-Emission Vehicle Signs and Pavement Markings) or its successor(s).~~

~~Exceptions:~~

~~1. On a case-by-case basis where the local enforcing agency has determined compliance with this section is not feasible based upon one of the following conditions:~~

~~a. Where there is no local utility power supply.~~

~~b. Where the local utility is unable to supply adequate power.~~

~~c. Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of Section 5.106.5.3, may adversely impact the construction cost of the project.~~

~~5.106.5.4.1 Warehouses, grocery stores and retail stores with planned off-street loading spaces.~~

~~[N] In order to avoid future demolition when adding EV supply and distribution equipment, spare raceway(s) or busway(s) and adequate capacity for transformer(s), service panel(s) or subpanel(s) shall be installed at the time of construction in accordance with the California Electrical Code. Construction plans and specifications shall include, but are not limited to, the following:~~

~~1. The transformer, main service equipment and subpanels shall meet the minimum power requirement in Table 5.106.5.4.1 to accommodate the dedicated branch circuits for the future installation of EVSE.~~

~~2. The construction documents shall indicate one or more location(s) convenient to the planned off-street loading space(s) reserved for medium- and heavy-duty EV charging cabinets and charging dispensers, and a pathway reserved for routing of conduit from the termination of the raceway(s) or busway(s) to the charging cabinet(s) and dispenser(s), as shown in Table 5.106.5.4.1.~~

~~3. Raceway(s) or busway(s) originating at a main service panel or a subpanel(s) serving the area where potential future medium- and heavy-duty EVSE will be located and shall terminate in close proximity to the potential future location of the charging equipment for medium- and heavy-duty vehicles.~~

~~4. The raceway(s) or busway(s) shall be of sufficient size to carry the minimum additional system load to the future location of the charging for medium- and heavy-duty EVs as shown in Table 5.106.5.4.1.~~

~~TABLE 5.106.5.4.1, Raceway Conduit and Panel power Requirements for Medium-and-Heavy-Duty EVSE [N]~~

~~Building Type~~

~~Building Size (sq. ft.)~~

~~Number of Off-street Loading Spaces~~

~~Additional capacity Required (kVa) for Raceway & Busway and Transformer & Panel~~

~~TABLE 5.106.5.4.1, Raceway Conduit and Panel power Requirements for Medium-and-Heavy-Duty EVSE [N]~~

~~Building Type~~

~~Building Size (sq. ft.)~~

~~Number of Off-street Loading Spaces~~

~~Additional capacity Required (kVa) for Raceway & Busway and Transformer & Panel~~

~~Grocery~~

~~10,000 to 90,000~~

~~1 or 2~~

~~200~~

~~3 or greater~~

~~400~~

~~Greater than 90,000~~

~~1 or greater~~

~~400~~

~~Retail~~

~~10,000 to 135,000~~

~~1 or 2~~

~~200~~

~~Greater than 135,000~~

~~1 or greater~~

~~400~~

~~Warehouse~~

~~20,000 to 256,000~~

~~1 or 2~~

~~200~~

~~3 or greater~~

~~400~~

~~Greater than 256,000~~

~~1 or greater~~

~~400~~

~~(Ord. 872, passed 12-7-2022)~~

~~§~~ 15.04.085 ~~STANDARDS FOR COMPLIANCE~~Standards for compliance.

The Town of Fairfax Green Building Requirements ~~define~~contain compliance thresholds for different projects that are covered by this chapter. These standards are summarized below in Table 1. The energy efficiency and electrification measures menu and specifications are detailed in Tables 2 and 3.

~~Table 1: Requirements by Project Type and Size~~

~~Project Type and Size~~

~~Green Building Requirements~~

~~Energy Efficiency Requirements~~

~~Electric Vehicle Requirements~~

~~Table 1: Requirements by Project Type and Size~~

~~Project Type and Size~~

~~Green Building Requirements~~

~~Energy Efficiency Requirements~~

~~Electric Vehicle Requirements~~

~~Single and Two-Family Newly Constructed or New Construction~~

~~All-electric design~~

~~AND~~

~~CALGreen Tier 1~~

~~Meet the standards outlined for the project in the 2022 California Energy Code~~

~~Comply with CALGreen Measure A4.106.8.1, Tier 1~~

~~Multifamily Residential~~

~~Newly Constructed or New Construction~~

~~Of the total parking spaces,~~

~~(i) 15% Level 2 (L2) EVCS~~

~~(ii) 85% Low-Power Level 2 (LPL2) EV Ready~~

~~Nonresidential~~

~~Newly Constructed or New Construction~~

~~All-electric design~~

~~AND~~

~~CALGreen Tier 1~~

~~Meet the standards outlined for the project in the 2022 California Energy Code~~

~~For Nonresidential: comply with CALGreen Measure A5.106.5.3.1, Tier 1;~~

~~AND~~

~~For Nonresidential Grocery, Retail, or Warehouses planning off-street medium-heavy-duty loading spaces: comply with CALGreen Measure 5.106.5.4~~

~~Single and Two-Family Additions and Alterations less than 200 square feet~~

~~CALGreen Mandatory~~

~~Meet the standards outlined for the project in the 2022 California Energy Code~~

~~If the project is upgrading the main electrical service panel, comply with CALGreen Measure A4.106.8.1,~~

~~Tier 1~~

~~Single and Two-Family Additions and Alterations 200 square feet or greater~~

~~CALGreen Tier 1~~

~~Using the Measure Menu in Table 2, achieve a total score that is equal to or greater than the Target Score for the applicable climate zone and install the electric readiness measures (ER2) as applicable in Table 3~~

~~Multifamily Residential~~

~~Additions and Alterations less than 200 square feet~~

~~CALGreen Mandatory~~

~~Meet the standards outlined for the project in the 2022 California Energy Code~~

~~If the service panel is modified, add designated electrical capacity for 20% of onsite parking spaces to be Level 2 EV Ready.~~

~~If parking lot surface is modified (paving material and curbing removed):~~

~~(i) add raceway to a minimum of 25% of exposed parking spaces, AND~~

~~(ii) install at minimum 5% EVCS to parking spaces requiring any combination of Level 2 and Direct Current Fast Charging EVSE, except at least one Level 2 EVSE shall be provided.~~

~~Where existing electrical service will not be upgraded in the existing project scope, designate capacity for parking spaces to the maximum extent that does not require an upgrade to existing electrical service.~~

~~Multifamily Residential~~

~~Additions and Alterations 200 square feet or greater~~

~~CALGreen Tier 1~~

~~Nonresidential~~

~~Additions and Alterations~~

Table 1: Requirements by Project Type and Size			
Project Type and Size	**Green Building Requirements**	**Energy Efficiency Requirements**	**Electric Vehicle Requirements**
Single and Two-Family Newly Constructed or New Construction	CALGreen Tier 1 except Energy Measures	Meet the standards outlined for the project in the 2025 California Energy Code	CAL Green Tier 1
Multifamily Residential Newly Constructed or New Construction			

Table 1: Requirements by Project Type and Size			
Project Type and Size	**Green Building Requirements**	**Energy Efficiency Requirements**	**Electric Vehicle Requirements**
Nonresidential Newly Constructed or New Construction	CALGreen Tier 1 Except Energy Efficiency Measures	Meet the standards outlined for the project in the 2025 California Energy Code	CALGreen Tier 1
Single and Two-Family Additions and Alterations less than 200 square feet	CALGreen Mandatory	Meet the standards outlined for the project in the 2025 California Energy Code	CALGreen Mandatory
Single and Two-Family Additions and Alterations 200 square feet or greater	CALGreen Tier 1 Except the Energy Efficiency Measures	Using the Measure Menu in Table 2, achieve a total score that is equal to or greater than the Target Score for the applicable climate zone	CALGreen Tier 1
Multifamily Residential Additions and Alterations less than 200 square feet	CALGreen Mandatory	Meet the standards outlined for the project in the 2025 California Energy Code	CALGreen Mandatory
Multifamily Residential Additions and Alterations 200 square feet or greater	CALGreen Tier 1 Except Energy Efficiency Measures		CALGreen Tier 1

Table 1: Requirements by Project Type and Size			
Project Type and Size	Green Building Requirements	Energy Efficiency Requirements	Electric Vehicle Requirements
Nonresidential Additions and Alterations			

The following conditions also apply to Table 1:

(a) Cumulative new construction or remodels during the preceding 36-month period from the acceptance of this application shall be considered as a single covered project, and subject to the highest compliance threshold based on the cumulative project size or valuation.

(b) Mixed use (residential and commercial) projects must comply either with the applicable covered project requirements for the respective residential and commercial portions of the project or may propose to utilize a mixed-use rating system, subject to approval by the chief building official.

Table 2: Energy and Electrification Menu of Measures by Climate Zone			
Measure		**Climate Zone**	**Steps**
		2	1) Choose your Climate Zone using CEC toolfinder[1]
Specification	**Spec. ID (Refer to *Table 3*)**	**Target Score**	2) Minimum Target Score needed to comply (*1 point = 1MMBTU savings per yr.*)
		9	
Lighting	E1	Mandatory	3) Choose a measure or a combination of measures that adds up to the minimum target score above based on CZ. Measures listed as "Mandatory" MUST be installed. 4) Use the Specification Number (Spec. ID) column as a key and conform to the specifications in Table 3 below. Table 3 describes, specifies, and details compliance with each corresponding measure.
Water Heating Package	E2	2	
Air Sealing	E3	1	
R-49 Attic Insulation	E4.B	2	
Duct Sealing	E5	3	
New Ducts, R-8 Insulation + Duct Sealing	E6.B	6	
Windows	E7	3	
R-19 Raised floor insulation	E10.A	8	
Radiant Barrier Under Roof	E12	1	
HPWH Replacing Gas	FS1	12	
High Eff HPWH Replacing Gas	FS2	13	
HPWH Replacing Electric	FS3	4	
High Eff HPWH Replacing Electric	FS4	5	
HVAC Heat Pump	FS5	17	
High Efficiency	FS6	19	

HVAC Heat Pump			
Heat Pump Clothes Dryer	FS8	1	
Induction Cooktop	FS9	1	
Solar PV	PV.A	14	
[1]California Energy Commission climate zone tool finder at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/climate-zone-tool-maps-and.			

~~Table 2: Energy and Electrification Menu of Measures by Climate Zone~~

~~Table 2: Energy and Electrification Menu of Measures by Climate Zone~~

~~Measure~~

~~Climate Zone~~

~~Steps~~

~~2~~

~~1) Choose your Climate Zone using CEC toolfinder1~~

~~Specification~~

~~Spec. ID (Refer to Table 3)~~

~~Target Score~~

~~2) Minimum Target Score needed to comply~~

~~(1 point = 1MMBTU savings per yr.)~~

~~8~~

~~Lighting~~

~~E1~~

~~Mandatory~~

~~3) Choose a measure or a combination of measures that adds up to the minimum target score above based on CZ. Measures listed as "Mandatory" MUST be installed.~~

~~4) Use the Specification Number (Spec. ID) column as a key and conform to the specifications in Table 3 below. Table 3 describes, specifies, and details compliance with each corresponding measure.~~

~~Water Heating Package~~

~~E2~~

~~1~~

~~Air Sealing~~

~~E3~~

~~1~~

~~R-49 Attic Insulation~~

~~E4~~

~~1~~

~~Duct Sealing~~

~~E5~~

~~1~~

~~New Ducts + Duct Sealing~~

~~E6~~

~~2~~

~~PV + Electric Ready Pre-Wire~~

~~ER1~~

~~12~~

~~Electric Readiness Measures~~

~~ER2~~

~~Mandatory~~

~~(if remodeling kitchen, laundry, or upgrading panel)~~

~~HPWH~~

~~FS1~~

~~12~~

~~High Eff HPWH~~

~~FS2~~

~~13~~

~~HVAC Heat Pump~~

~~FS3~~

~~13~~

~~High Eff HVAC Heat Pump~~

~~FS4~~

~~14~~

~~Heat Pump Clothes Dryer~~

~~FS5~~

~~1~~

~~Induction Cooktop~~

~~FS6~~

~~1~~

~~1California Energy Commission climate zone tool finder at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/climate-z one-tool-maps-and~~

The following conditions also apply to Table 2:

(a) Unless otherwise specified, the requirements shall apply to the entire dwelling unit, not just the additional or altered portion.

(b) Measures from the Measure Menu in Table 2 and specified in Table 3, that already exist in the home, may be counted towards compliance with these requirements, unless otherwise specified in Table 3.

(c) Measures from the Measure Menu in Table 2 that are to be installed to satisfy requirements under the State Energy Code, Title 24, Part 6, may also be counted towards compliance with these requirements. Where these requirements conflict with other Energy Code requirements, the stricter requirements shall prevail.

~~(Ord. 872, passed 12-7-2022)~~

~~Table 3. List of Measure Specifications~~

~~ID~~

~~Measure Specification~~

~~Table 3. List of Measure Specifications~~

~~ID~~

~~Measure Specification~~

~~Energy Measures~~

~~E1~~

~~Lighting Measures – Replace all interior and exterior screw-in incandescent, halogen, and compact fluorescent lamps with LED lamps. Install photocell controls on all exterior lighting luminaires.~~

~~E2~~

~~Water Heating Package: Add exterior insulation meeting a minimum of R-6 to existing storage water heaters. Insulate all accessible hot water pipes with pipe insulation a minimum of ¾ inch thick. This includes insulating the supply pipe leaving the water heater, piping to faucets underneath sinks, and accessible pipes in attic spaces or crawlspaces. Upgrade fittings in sinks and showers to meet current California Green Building Standards Code (Title 24, Part 11) Section 4.303 water efficiency requirements.~~

~~– Exception 1: Water heater blanket is not required on water heaters less than 20 gallons.~~

~~– Exception 2: Water heater blanket not required if application of a water heater blanket voids the warranty on the water heater.~~

~~– Exception 3: Upgraded fixtures are not required if existing fixtures have rated or measured flow rates of no more than ten percent greater than 2022 California Green Building Standards Code (Title 24, Part 11) Section 4.303 water efficiency requirements.~~

~~– Exception 4: Water heaters with factory installed insulation of R-24 or greater~~

~~E3~~

~~Air Sealing: Seal all accessible cracks, holes, and gaps in the building envelope at walls, floors, and ceilings. Pay special attention to penetrations including plumbing, electrical, and mechanical vents, recessed can light luminaires, and windows. Weather-strip doors if not already present. Verification shall be conducted following a prescriptive checklist that outlines which building aspects need to be addressed by the permit applicant and verified by an inspector. Compliance can also be demonstrated with blower door testing conducted by a certified HERS Rater no more than three years prior to the permit application date that either: a) shows at least a 30 percent reduction from pre-retrofit conditions; or b) shows that the number of air changes per hour at 50 Pascals pressure difference (ACH50) does not exceed ten. If combustion appliances are located within the pressure boundary of the building, conduct a combustion safety test by a professional certified by the Building Performance Institute in accordance with the ANSI/BPI-1200-S-2017 Standard Practice for Basic Analysis of Buildings1, the Whole House Combustion Appliance Safety Test Procedure for the Comfortable~~

~~Home Rebates Program 2020 or the California Community Services and Development Combustion Appliance Safety Testing Protocol.~~

~~E4~~

~~R-49 Attic Insulation: Attic insulation shall be installed to achieve a weighted assembly U-factor of 0.020 or insulation installed at the ceiling level shall have a thermal resistance of R-49 or greater for the insulation alone. Recessed downlight luminaires in the ceiling shall be covered with insulation to the same depth as the rest of the ceiling. Luminaires not rated for insulation contact must be replaced or fitted with a fire-proof cover that allows for insulation to be installed directly over the cover.~~

~~Exception: In buildings where existing R-30 is present and existing recessed downlight luminaires are not rated for insulation contact, insulation is not required to be installed over the luminaires.~~

~~E5~~

~~Duct Sealing: Air seal all space conditioning ductwork to meet the requirements of the 2022 Title 24 Section 150.2(b)1E. The duct system must be tested by a HERS Rater no more than three years prior to the Covered Single Family Project permit application date to verify the duct sealing and confirm that the requirements have been met. This measure may not be combined with the New Ducts and Duct Sealing measure in this Table.~~

~~E6~~

~~New Ducts + Duct Sealing: Replace existing space conditioning ductwork with new R-8 ducts that meet the requirements of 2022 Title 24 Section 150.0(m)11. This measure may not be combined with the Duct Sealing measure in this Table. To qualify, a preexisting measure must have been installed no more than three years before the Covered Single Family Project permit application date.~~

~~E7~~

~~Windows: Replace all existing windows with high performance windows with an area-weighted average U-factor no greater than 0.32.~~

~~E8~~

~~R-13 Wall Insulation: Install wall insulation in all exterior walls to achieve a weighted U-factor of 0.102 or install wall insulation in all exterior wall cavities that shall result in an installed thermal resistance of R-13 or greater for the insulation alone.~~

~~Fuel Substitution Measures~~

~~FS1~~

~~Heat Pump Water Heater (HPWH): Replace all existing electric resistance and natural gas storage water heaters with heat pump water heaters.~~

~~FS2~~

~~High Efficiency Heat Pump Water Heater (HPWH): Replace all existing electric resistance and natural gas storage water heaters with heat pump water heaters with a Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher rating.~~

~~FS3~~

~~HVAC Heat Pump: Replace all existing gas space heating system and existing electric resistance heating systems with electric heat pump systems.~~

~~FS4~~

~~High Efficiency HVAC Heat Pump: Replace all existing gas space heating system and existing electric resistance heating systems with electric heat pump systems with a SEER rating of 21 or greater and an HSPF rating of 11 or greater.~~

~~FS5~~

~~Heat Pump Clothes Dryer: Replace all existing electric resistance clothes dryers with heat pump dryers with no resistance element and cap the gas lines.~~

~~FS6~~

~~Induction Cooktop: Replace all existing gas and electric resistance stove tops with inductive stove tops and cap the gas lines.~~

~~Solar PV and Electric-Readiness Measures~~

~~ER1~~

~~PV+ Electric Ready Pre-Wire:~~

~~For New PV Systems: Install a new solar PV system that meets the requirements of 2022 Title 24 Section 150.1(c)14 and upgrade the service panel to meet the requirements of ER2.G. and install any two of the other measures from ER2.A - ER2.F.~~

~~For Existing PV Systems: If the home already has an existing PV system, to claim credit for this measure, ER1, upgrade the service panel to meet the requirements of ER2.G. and install any two of the other measures from ER2.A - ER2.F.~~

~~ER2~~

~~Electric Readiness Measures:~~

~~To claim credit for Item ER1, in addition to the solar PV system installed, upgrade the panelboard to meet the requirements of Item ER2.G and install any two of the other measures ER2.A - ER2.F, below to allow for installation of electric appliances at a future date.~~

~~For any Covered Project, if the service panel is being upgraded, install any two of the other measures below.~~

If the laundry room is being remodeled, comply with Item ER2.D and upgrade the panelboard to meet the requirements of Item ER2.G.

If the kitchen is being remodeled, comply with Item ER2.C and upgrade the service panel to meet the requirements of Item ER2.G.

A. Heat Pump Water Heater Ready, as specified in Section 150.0(n)1.

B. Heat Pump Space Heater Ready, as specified in Section 150.0(t).

C. Electric Cooktop Ready, as specified in Section 150.0(u).

D. Electric Clothes Dryer Ready, as specified in Section 150.0(v).

E. Energy Storage Systems (ESS) Ready, as specified in Section 150.0(s).

F. EV Charger Ready. Install a listed raceway for an EV charger, that meets the requirements of the California Green Building Standards Code (Title 24, Part 11) Section A4.106.8.1, Tier 1 and 2, which otherwise applies to new construction.

G. Upgrade the panelboard serving the individual dwelling to either:

(i) a minimum 200 amp panel with a minimum 225 amp busbar rating to accommodate future connection of electric appliances, including heat pump water heaters, heat pump space heaters, electric cooktops, electric clothes dryers as specified in California Energy Code Section 150.0 (n), (t), (u) and (v) and Level 2 electric vehicle supply equipment; or,

(ii) provide electrical load calculations and appliance specifications for serving all of these end-uses with a minimum 100-amp panel.

Exception: If an electrical permit is not otherwise required for the project other than compliance with this Item, ER2.

~~(Ord. 872, passed 12-7-2022)~~

Table 3: Energy Efficiency Measures	
ID	**Measure Specification**
Energy Measurers	
E1	Lighting Measures – Install lighting with an efficiency of 45 lumens per watt or greater in all interior and exterior screw-in fixtures. Install photocell, occupancy sensor or energy management system controls that meet the requirements of 150.0(k)3 in all outdoor lighting permanently mounted to a residential building or to other buildings on the same lot.
E2	Water Heating Package: Insulate all accessible hot water pipes with pipe insulation a minimum of ¾ inch thick. This includes insulating the supply pipe leaving the water heater, piping to faucets underneath sinks, and accessible pipes in attic spaces or crawlspaces. Upgrade fittings in sinks and showers to meet current California Green Building Standards Code (Title 24, Part 11) Section 4.303 water efficiency requirements. Exception: Upgraded fixtures are not required if existing fixtures have rated or measured flow rates of no more than ten percent greater than 2025 California Green Building Standards Code (Title 24, Part 11) Section 4.303 water efficiency requirements.
E3	Air Sealing: Seal all accessible cracks, holes, and gaps in the building envelope at walls, floors, and ceilings. Pay special attention to penetrations including plumbing, electrical, and mechanical vents, recessed can light luminaires, and windows. Weather-strip doors if not already present. Verification shall be conducted following a prescriptive checklist that outlines which building aspects need to be addressed by the permit applicant and verified by an inspector. Compliance can also be demonstrated with blower door testing conducted by a certified ECC Rater no more than three years prior to the permit application date that either: a) shows at least a 30 percent reduction from pre-retrofit conditions; or b) shows that the number of air changes per hour at 50 Pascals pressure difference (ACH50) does not exceed ten for Pre-1978 vintage buildings, seven for 1978 to 1991 vintage buildings and five for 1992-2010 vintage buildings. If combustion appliances are located within the pressure boundary of the building, conduct a combustion safety test by a certified ECC Rater or a professional certified by the Building Performance Institute, in accordance with the BPI Technical Standards for the Building Analyst Professional.
E4.B	R-49 Attic Insulation: Attic insulation shall be installed to achieve a weighted assembly U-factor of 0.020 or insulation installed at the ceiling level shall have a thermal resistance of R-49 or greater for the insulation alone. Recessed downlight luminaires in the ceiling shall be covered with insulation to the same depth as the rest of the ceiling. Luminaires not rated for insulation contact must be replaced or fitted with a fire-proof cover that allows for insulation to be installed directly over the cover. Exception: In buildings where existing R-30 is present and existing recessed downlight luminaires are not rated for insulation contact, insulation is not required to be installed over the luminaires.
E5	Duct Sealing: Air seal all space conditioning ductwork to meet the requirements of the 2025 Title 24, Part 6, Section 150.2(b)1E. The duct system must be tested by a ECC Rater no more than three years prior to the Covered Single Family Project permit application date to verify the duct sealing and confirm that the requirements have been met. This measure may not be combined with the New Ducts and Duct Sealing measure in this Table. Exception: Buildings without ductwork or where the ducts are in conditioned space.

E6.B	New Ducts, R-8 insulation + Duct Sealing: Replace existing space conditioning ductwork with new R-8 ducts that meet the requirements of 2025 Title 24, Part 6, Section 150.0(m)11. This measure may not be combined with the Duct Sealing measure in this Table. To qualify, a preexisting measure must have been installed no more than three years before the Covered Single Family Project permit application date.
E7	Windows: Replace at least 50% of existing windows with high performance windows with an area-weighted average U-factor no greater than [0.27 in Climate Zones 2]
E8	R-15 Wall Insulation: Install wall insulation in all exterior walls to achieve a weighted U-factor of 0.095 or install wall insulation in all exterior wall cavities that shall result in an installed thermal resistance of R-15 or greater for the insulation alone.
E9	Reserved for future use
E10.A	R-19 Floor Insulation: Raised-floors shall be insulated such that the floor assembly has an assembly U-factor equal to or less than U-0.037 or shall be insulated between wood framing with insulation having an R-value equal to or greater than R-19.
E12	Radiant Barrier: A radiant barrier that meets the requirements of Section 150.1(c)2 shall be installed under at least 50% of the roof surface.
Fuel Substitution and Solar PV Measures	
FS1	Heat Pump Water Heater (HPWH) Replacing Gas: Replace existing natural gas water heater with a heat pump water heater that meets the requirements of Sections 110.3 and 150.2(b)1.H.iii.b.
FS2	High Efficiency Heat Pump Water Heater (HPWH) Replacing Gas: Replace existing natural gas water heater with heat pump water heater with a Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher rating that also meets the requirements of Sections 110.3 and 150.2(b)1.H.iii.c.
FS3	Heat Pump Water Heater (HPWH) Replacing Electric: Replace existing electric resistance water heater with a heat pump water heater that meets the requirements of Sections 110.3 and 150.2(b)1.H.iii.b.
FS4	High Efficiency Heat Pump Water Heater (HPWH) Replacing Electric: Replace existing electric resistance water heater with heat pump water heater with a Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher rating that also meets the requirements of Sections 110.3, and 150.2(b)1.H.iii.c.
FS5	Heat Pump Space Conditioning System: Replace all existing gas and electric resistance primary space heating systems with a heat pump system that meets the requirements of Sections 110.3, 150.2(b)1.C, 150.2(b)1.E, 150.2(b)1.F, and 150.2(b)1.G.
FS6	High Efficiency Heat Pump Space Conditioning System: Replace all existing gas and electric resistance primary space heating systems with an electric-only heat pump system that meets the requirements of Sections 110.3 and 150.2(b)1.C, 150.2(b)1.E, 150.2(b)1.F, and 150.2(b)1.G and one of the following: A. A ducted heat pump system with a SEER2 rating of 16.5 or greater, an EER2 rating of 12.48 or greater and an HSPF2 rating of 9.5 or greater; or B. A ductless mini-split heat pump system with a SEER2 rating of 14.3 or greater, an EER2 rating of 11.7 or greater and an HSPF2 rating of 7.5 or greater
FS7	Dual Fuel Heat Pump Space Conditioning System: Install a heat pump space conditioning system that meets the requirements of Sections 110.3 and 150.2(b)1.C, 150.2(b)1.E, 150.2(b)1.F, and 150.2(b)1.G and either: A. Replaces all existing gas and electric resistance primary heating systems with a hybrid gas and electric heat pump system, or B. Is an electric-heat pump system in tandem with a gas furnace and controls to use the gas furnace for backup heat only.

FS8	Heat Pump Clothes Dryer: Replace existing electric resistance or gas clothes dryer with heat pump dryer with no resistance element and cap gas line.
FS9	Induction Cooktop: Replace all existing gas and electric resistance stove tops with induction stove top and cap the gas line.
PV.A	Solar PV: Install a solar PV system that meets the requirements of Section 150.1(c)14.

~~§~~ 15.04.090 ~~INCENTIVES FOR COMPLIANCE.~~Incentives for compliance

In addition to the required standards for compliance, the Town Council may establish by resolution, financial or application processing incentives and/or award or recognition programs to encourage higher levels of green building compliance for a project.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~ 15.04.095 ~~ADMINISTRATIVE PROCEDURES~~Administrative procedures.

The procedures for compliance with the provisions of this chapter shall include, but not be limited to the following:

(~~A)~~ a) *Project design.* Applicants for a covered project are strongly encouraged to involve a qualified green building rater in the initial design phases of the project in advance of submittal of an application to determine applicable green building compliance thresholds and the most cost effective and appropriate means of achieving compliance.

(~~B)~~ b) *Planning applications.* If a discretionary planning application is required for a covered project, applicants should be prepared to identify expected green building measures to be included in the project to achieve the compliance thresholds. Applicants should identify any anticipated difficulties in achieving compliance and any exemptions from the requirements of this chapter that may be requested.

(~~C)~~ c) *Building plan check review.* Upon submittal of an application for a building permit, building plans for any covered project shall include a green building program description and completed checklist. The checklist shall be incorporated onto a separate full-sized plan sheet included with the building plans. Evidence that the project, as indicated by the project plans and green building program description, will achieve the standards for compliance outlined in ~~§~~Section 15.04.085, shall be provided prior to issuance of a building permit.

(~~D)~~ d) *Changes during construction.* During the construction process, alternate green building measures may be substituted, provided that documentation of the proposed change and the project's continued ability to achieve the standards for compliance to the chief building official shall be provided.

(~~E)~~ e) *Final building inspection.* Prior to final building inspection and occupancy for any covered project, evidence that project construction has achieved the required compliance set forth in the standards for compliance outlined in ~~§~~Section 15.04.085 shall be provided. The chief building official shall review the documentation submitted by the applicant and determine whether the project has achieved the compliance threshold as set forth in the standards for compliance outlined in ~~§~~Section 15.04.085. If the chief building official determines that the applicant has met these requirements, the final building inspection may proceed.

(~~F)~~ f) *Conflict with other laws.* The provisions of this chapter are intended to be in addition to and not in conflict with other laws, regulations and ordinances relating to building construction and site development. If any provision of this chapter conflicts with any duly adopted and valid statutes or regulations of the federal government or the state of California, the federal or state statutes or regulations shall take precedence.

~~(Ord. 872, passed 12-7-2022)~~

~~§~~ 15.04.100 ~~EXEMPTIONS~~Exemptions.

(~~A)~~ a) The provisions of this chapter shall not apply to:

(1) Buildings which are temporary (such as construction trailers).

(2) Building area which is not or is not intended to be conditioned space.

(3) Any requirements of this chapter which would impair the historic integrity of any building listed on a local, state or federal register of historic structures, as determined by the chief building official and as regulated by the California Historic Building Code (Title 24, Part 8). In making such a determination, the chief building official may require the submittal of an evaluation by an architectural historian or similar expert.

(~~B)~~ b) As outlined in the ~~2022~~2025 CALGreen code, ~~section~~sections 4.106.4 and ~~A5.106.5~~5.106.5, applicants may be exempted from the electric vehicle changing requirements on a case-by-case basis where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:

(1) Where there is no ~~commercial~~local utility power supply or the local utility is unable to supply adequate power.

(2) Where there is evidence suitable to the local enforcing agency substantiating that additional local utility infrastructure design requirements, directly related to the implementation of ~~section~~sections 4.106.4 and ~~A5.106.5~~5.106.5 may adversely impact the construction cost of the project.

(3) ADUs and JADUs without additional parking facilities.

(4) ~~Parking spaces accessible only by automated mechanical car parking systems are not required to comply with CALGreen Code section 4.106.4 and A5.106.5~~Areas of parking facilities served by parking lifts, including but not limited to, automated mechanical-access open parking garages as defined in the California Building Code; or parking facilities otherwise of supporting electric vehicle charging.

(~~C)~~ c) Hardship or infeasibility exemption. If an applicant for a covered project believes that circumstances exist that make it a hardship or infeasible to meet the requirements of this chapter, the applicant may request an exemption as set forth below. In applying for an exemption, the burden is on the applicant to show hardship or infeasibility.

(1) *Application.* Based on the following, the applicant shall identify in writing the specific requirements of the standards for compliance that the project is unable to achieve and the circumstances that make it a hardship or infeasible for the project to comply with this chapter. The applicant may not petition for relief from

any requirement of the ~~2022~~2025 California Energy Code (Title 24, Part 6) and referenced standards, or the ~~2022~~2025 California Green Building Standards (Title 24, Part 11) of the California Building Standards Code. Circumstances that constitute hardship or infeasibility shall include one of the following:

~~(~~a~~)~~ . That the cost of achieving compliance is disproportionate to the overall cost of the project;

~~(~~b~~)~~ . That strict compliance with these standards would create or maintain a hazardous condition(s) and present a life safety risk to the occupants;

~~(~~c~~)~~ . There is a conflict between the provisions of the applicable green building rating system and the California Building Standards Code, other state code provisions, other requirements of this title or conditions imposed on the project through a previously approved planning application;

~~(~~d~~)~~ . That compliance with certain requirements would impair the historic integrity of buildings listed on a local, state or federal list or register of historic structures as regulated by the California Historic Building Code (Title 24, Part 8).

(2) *Granting of exemption.* If the chief building official determines that it is a hardship or infeasible for the applicant to fully meet the requirements of this chapter and that granting the requested exemption will not cause the building to fail to comply with the ~~2022~~2025 California Energy Code (Title 24, Part 6) and referenced standards, or the ~~2022~~2025 California Green Building Standards (Title 24, Part 11) of the California Building Standards Code, the chief building official shall determine the maximum feasible threshold of compliance reasonably achievable for the project. In making this determination, the chief building official shall consider whether alternate, practical means of achieving the objectives of this chapter can be satisfied, such as reducing comparable energy use at an off-site location within the county. If an exemption is granted, the applicant shall be required to comply with this chapter in all other respects and shall be required to achieve the threshold of compliance determined to be achievable by the chief building official.

(3) *Denial of exception.* If the chief building official determines that it is reasonably possible for the applicant to fully meet the requirements of this chapter, the request shall be denied, and the applicant shall be notified of the decision in writing. The project and compliance documentation shall be modified to comply with the standards for compliance.

(4) *Appeal.* Any aggrieved applicant or person may appeal the determination of the chief building official regarding the granting or denial of an exemption or compliance with any other provision of this chapter. An appeal of a determination of the chief building official shall be filed in writing and processed in accordance with the provisions of ~~§~~Section 15.04.028 of this code."

~~(Ord. 872, passed 12-7-2022)~~

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Last modified: 2024/04/25
Revision: 1.0

2022 Cost-Effectiveness Study: Existing Single Family Building Upgrades

Prepared by:
Ada Shen, Alea German, Rebecca Evans, & Marc Hoeschele, Frontier Energy, Inc
Misti Bruceri, Misti Bruceri & Associates, LLC

ATTACHMENT C

Prepared for: Kelly Cunningham, Codes and Standards Program, Pacific Gas and Electric

SDGE™ | Southern California Edison® Energy for What's Ahead® | PG&E Pacific Gas and Electric Company®

Legal Notice

Acronym List

2023 PV$ – Present value costs in 2023

ACH50 – Air Changes per Hour at 50 pascals pressure differential

ACM – Alternative Calculation Method

ADU – Accessory Dwelling Unit

AFUE – Annual Fuel Utilization Efficiency

B/C – Lifecycle Benefit-to-Cost Ratio

BEopt – Building Energy Optimization Tool

BSC – Building Standards Commission

CA IOUs – California Investor-Owned Utilities

CASE – Codes and Standards Enhancement

CBECC-Res – Computer program developed by the California Energy Commission for use in demonstrating compliance with the California Residential Building Energy Efficiency Standards

CEER – Combined Energy Efficiency Rating

CFI – California Flexible Installation

CFM – Cubic Feet per Minute

CO_2 – Carbon Dioxide

CPAU – City of Palo Alto Utilities

CPUC – California Public Utilities Commission

CZ – California Climate Zone

DFHP – Dual Fuel Heat Pump

DHW – Domestic Hot Water

DOE – Department of Energy

DWHR – Drain Water Heat Recovery

EDR – Energy Design Rating

EER – Energy Efficiency Ratio

EF – Energy Factor

GHG – Greenhouse Gas

HERS Rater – Home Energy Rating System Rater

HPA – High Performance Attic

HPSH – Heat Pump Space Heater

HPWH – Heat Pump Water Heater

HSPF – Heating Seasonal Performance Factor

HVAC – Heating, Ventilation, and Air Conditioning

IECC – International Energy Conservation Code

IOU – Investor Owned Utility

kBtu –British thermal unit (x1000)

kWh – Kilowatt Hour

LBNL – *Lawrence Berkeley National Laboratory*

LCC – Life Cycle Cost

LLAHU – Low Leakage Air Handler Unit

VLLDCS – Verified Low Leakage Ducts in Conditioned Space

LSC – Long-term Systemwide Cost

MF – Multifamily

MSHP – Mini-Split Heat Pump

NEEA – Northwest Energy Efficiency Alliance

NEM – Net Energy Metering

NPV – Net Present Value

NREL – *National Renewable Energy Laboratory*

PG&E – Pacific Gas and Electric Company

POU – Publicly-Owned-Utilities

PV – Photovoltaic

SCE – Southern California Edison

SDG&E – San Diego Gas and Electric

SEER – Seasonal Energy Efficiency Ratio

SF – Single Family

SMUD – Sacramento Municipal Utility District

SoCalGas – Southern California Gas Company

TDV – Time Dependent Valuation

Therm – Unit for quantity of heat that equals 100,000 British thermal units

Title 24 – Title 24, Part 6

TOU – Time-Of-Use

UEF – Uniform Energy Factor

VCHP – Variable Capacity Heat Pump, Title 24 compliance credit

ZNE – Zero-net Energy

Summary of Revisions

Date	Description	Reference (page or section)
4/25/2024	Original Release	N/A

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Executive Summary

The California Codes and Standards (C&S) Reach Codes program provides technical support to local governments considering adopting a local ordinance (reach code) intended to support meeting local and/or statewide energy efficiency and greenhouse gas (GHG) reduction goals. The program facilitates adoption and implementation of the code when requested by local jurisdictions by providing resources such as cost-effectiveness studies, model language, sample findings, and other supporting documentation.

This report documents cost-effective measure upgrades in existing single family buildings that exceed the minimum state requirements. It evaluates efficiency measures such as adding insulation, replacing windows, and duct upgrades, fuel substitution measures that upgrade space heating and water heating to heat pumps, and solar photovoltaics (PV) across all 16 California climate zones. A 1,665 square foot single family home prototype with an attached garage was evaluated in this study.

This analysis used two different metrics to assess the cost-effectiveness of the proposed upgrades. Both methodologies require estimating and quantifying the incremental costs and energy savings associated with each energy efficiency measure over a 30-year analysis period. On-Bill cost-effectiveness is a customer-based lifecycle cost (LCC) approach that values energy based upon estimated site energy usage and customer utility bill savings using today's electricity and natural gas utility tariffs. Long-term Systemwide Cost (LSC) is the California Energy Commission's LCC methodology for the 2025 Title 24, Part 6 (Title 24) code cycle (previously referred to as Time Dependent Valuation (TDV)), which is intended to capture the long-term projected cost of energy including costs for providing energy during peak periods of demand, carbon emissions, grid transmission and distribution impacts. This is the methodology used by the Energy Commission in evaluating cost-effectiveness for efficiency measures in Title 24 code development.

The following summarizes key results from the study:

Conclusions and Discussion:

1. Envelope measures. Improving envelope performance is very cost-effective in many older homes. In addition to reducing utility costs, these measures provide many other benefits such as improving occupant comfort and satisfaction and increasing a home's ability to maintain temperatures during extreme weather events and power outages. Below is a discussion of the results of specific measures.
    a. Adding attic insulation is cost-effective based on both LSC and On-Bill in many climate zones in homes with no more than R-19 existing attic insulation levels. Increasing attic insulation from R-30 to R-49 was still found to be cost-effective based on at least one metric in the colder and hotter climates of Climate Zone 10 (SDG&E territory only) through 16.
    b. Insulating existing uninsulated walls is very cost-effective based on both metrics everywhere except Climate Zones 6 and 7 (in Climate Zone 8 it's only cost-effective based on LSC).
    c. Adding R-19 or R-30 floor insulation is cost-effective based on LSC in the older two vintages (Pre-1978 and 1978-1991) in all CZ except CZ 6-10.
    d. Replacing old single pane windows with new high-performance windows has a very high cost and is typically not done for energy savings alone. However, energy savings are substantial and justify cost-effectiveness of this measure based on at least one metric in Climate Zones 4, 8 through 12 (PG&E territory only), and 13 through 16.
    e. At time of roof replacement, a cool roof with an aged solar reflectance of 0.25 was found to be cost-effective in Climate Zones 4, 6 through 12 (PG&E territory only), and 13 through 15. When the roof deck is replaced during a roof replacement, adding a radiant barrier is low cost and provides substantial cooling energy savings, and was found to be cost-effective in almost all climate zones and homes.
2. Duct measures: Many older homes have old, leaky duct systems that should be replaced when they reach the end of life, typically 20-30 years. In this case, installing new ducts was found to be cost-effective based on at least one metric (both in most cases) everywhere except mild Climate Zone 7 and Climate Zones 5 and 6 in

the 1978-1991 vintage. If duct systems still have remaining life they should be sealed and tested to meet 10% leakage or lower; however, duct upgrades alone were only found to be cost-effective for newer homes in Climate Zones 10 (SDG&E territory only), 11, and 13 through 16. Duct upgrades may be able to be coupled with other measures to reduce the cost.

3. Heat pump space heating: HPSHs were found to be LSC cost-effective in many cases. The Dual Fuel Heat Pump (existing furnace) was LSC cost-effective everywhere except Climate Zone 15. The HPSH was LSC cost-effective everywhere except Climate Zones 8 and 15.
    a. Challenges to On-Bill cost-effectiveness include higher first costs and higher first-year utility costs due to higher electricity tariffs relative to gas tariffs. SMUD and CPAU are two exceptions where first year utility costs are lower for heat pumps than for gas equipment. Table 11 shows the impact of utility rates on cost-effectiveness of HPSH where the standard and high efficiency HPSH and the HPSH + PV measures are cost-effective under SMUD but not PG&E. Even with higher first year utility bills, there were some cases that still proved On-Bill cost-effective including the DFHP with an existing furnace in the central valley and northern coastal PG&E territories, the ducted MSHP in the central valley as well as Climate Zone 14 in SDG&E territory, and the HPSH + PV measure in CZ 3-5 (PGE), 7-11, and 12 (SMUD) – 15.
    b. The ductless MSHPs were only found to be cost-effective based on either metric in Climate Zones 1 and 16. Ductless MSHPs have a high incremental cost because it is a more sophisticated system than the base model of a wall furnace with a window AC unit. However, the ductless MSHP would provide greater comfort benefits if properly installed to directly condition all habitable spaces (as is required under the VCHP compliance credit as evaluated in this study) which may be an incentive for a homeowner to upgrade their system.
    c. Higher efficiency equipment lowered utility costs in all cases and improved cost-effectiveness in many cases, particularly with a ducted MSHP.
4. Heat pump water heating: All the HPWH measures were LSC cost-effective in all climate zones. Most measures were not On-Bill cost-effective with the exception of the HPWH + PV which was cost-effective On-Bill in CPAU, SMUD, and SDG&E territories in addition to Climate Zones 11, 13, 14, and 15. The HPWH measures share many of the same challenges as the HPSH measures to achieving cost-effectiveness including high first costs and utility rates and assumptions. Table 13 shows the impact of utility rates on cost-effectiveness where some HPWH measures are cost-effective under SMUD utility rates but are not cost-effective anywhere under PG&E rates in Climate Zone 12.
    a. Various HPWH locations were also explored, however there are some factors outside of cost-effectiveness that should also be considered.
        i. HPWHs in the conditioned space can provide benefits such as free-cooling during the summer, reduced tank losses, and shorter pipe lengths, and in some cases show improved cost-effectiveness over garage located HPWHs. However, there are various design considerations such as noise, comfort concerns, an additional heating load in the winter, and condensate removal. Ducting the inlet and exhaust air resolves comfort concerns but adds costs and complexity. Split heat pump water heaters address these concerns, but currently there are limited products on the market and there is a cost premium relative to the packaged products.
        ii. Since HPWHs extract heat from the air and transfer it to water in the storage tank, they must have adequate ventilation to operate properly. Otherwise, the space cools down over time, impacting the HPWH operating efficiency. This is not a problem with garage installations but needs to be considered for water heaters located in interior or exterior closets. For the 2025 Title 24 code the CEC is proposing that all HPWH installations meet mandatory ventilation requirements (California Energy Commission, 2023).
5. The contractor surveys revealed overall higher heat pump costs than what has been found in previous analyses. This could be due to incentive availability raising demand for heat pumps and thereby increasing the price. This price increase may be temporary and may come down once the market stabilizes. There are also

new initiatives to obtain current costs including the TECH Clean California program[1] that publishes heat pump data and costs; however, at the time of this analysis, the TECH data did not contain incremental costs because it only had the heat pump costs but not the gas base case costs.

6. Table 18 shows how CARE rates and escalation rate assumptions will impact cost-effectiveness.
    a. Applying CARE rates in the IOU territories has the overall impact to increase utility cost savings for an all-electric building compared to a code compliant mixed fuel building, improving On-Bill cost-effectiveness. This is due to the CARE discount on electricity being higher than that on gas. The reverse occurs with efficiency measures where lower utility rates reduce savings and subsequently reduce cost-effectiveness.
    b. If gas tariffs are assumed to increase substantially over time, in-line with the escalation assumption from the 2025 LSC development, cost-effectiveness substantially improves for the heat pump measures over the 30-year analysis period and many cases become cost-effective that were not found to be cost-effective under the CPUC / 2022 TDV escalation scenario. There is much uncertainty surrounding future tariff structures as well as escalation values. While it's clear that gas rates will increase, how much and how quickly is not known. Future electricity tariff structures are expected to evolve over time, and the CPUC has an active proceeding to adopt an income-graduated fixed charge that benefits low-income customers and supports electrification measures for all customers.[2] The CPUC will make a decision in mid-2024 and the new rates are expected to be in place later that year or in 2025. While the anticipated impact of this rate change is lower volumetric electricity rates, the rate design is not finalized. While lower volumetric electricity rates provide many benefits, it also will make building efficiency measures harder to justify as cost-effective due to lower utility bill cost savings.
7. Under NBT, utility cost savings for PV are substantially less than what they were under prior net energy metering rules (NEM 2.0); however, savings are sufficient to be On-Bill cost-effective in all climate zones except Climate Zones 1 through 3, 5, and 6.
    a. Combining a heat pump with PV allows the additional electricity required by the heat pump to be offset by the PV system while also increasing on-site utilization of PV generation rather than exporting the electricity back to the grid at a low rate.
    b. While not evaluated in this study, coupling PV with battery systems can be very advantageous under NBT increasing utility cost savings because of improved on-site utilization of PV generation and fewer exports to the grid.

Recommendations:

1. There are various approaches for jurisdictions who are interested in reach codes for existing buildings. Some potential approaches are listed below along with key considerations.
    a. Prescriptive measures: Non-preempted measures that are found to be cost-effective may be prescriptively required in a reach code. One example of this type or ordinance is a cool roof requirement at time of roof replacement. Another example is requiring specific cost-effective measures for larger remodels, such as high-performance windows when new windows are installed or duct sealing and testing when ducts are in an unconditioned space.
    b. Replacement equipment: This flavor of reach code sets certain requirements at time of equipment replacement. This study evaluated space heating and water heating equipment. Where a heat pump measure was found to be cost-effective based on either LSC or On-Bill, this may serve as the basis of a reach code given the following considerations.
        i. Where reach codes reduce energy usage and are not just fuel switching, cost-effectiveness calculations are required and must be based on equipment that does not exceed the federal minimum efficiency requirements.
        ii. Where reach codes are established using cost-effectiveness based on LSC, utility bill impacts and the owner's first cost should also be reviewed and considered.

[1] TECH Public Reporting Home Page (techcleanca.com)
[2] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/demand-flexibility-rulemaking

iii. A gas path should also be prescriptively allowed to safely satisfy federal preemption requirements considering the CRA v. Berkeley case.[3] Additional requirements may apply to the gas path, as described in Section 3.3, as long as the paths are reasonably energy or cost equivalent.

c. "Flexible Path", minimum energy savings target: This flexible approach establishes a target for required energy savings based on a measure or a set of measures that were found to be cost-effective based on either LSC or On-Bill. A points menu compares various potential upgrades ranging from efficiency, PV, and fuel substitution measures, based on site or source energy savings. The applicant must select upgrades that individually or in combination meet the minimum energy savings target. The maximum target value shown in the Cost-effectiveness Explorer is based on a combination of cost-effective, non-preempted measures.

2. Equipment replacement ordinances should consider appropriate exceptions for scenarios where it will be challenging to meet the requirements, such as location of the HPWH, total project cost limitations, or the need for service panel upgrades that wouldn't have been required as part of the proposed scope of work in absence of the reach code.
3. Consider extending relevant proposals made by the CEC for the 2025 Title 24 code (California Energy Commission, 2023) in ordinances that apply under the 2022 Title 24 code, such as the following:
    a. Mandatory ventilation requirements for HPWH installations (Section 110.3(c)7). The cost-effectiveness analysis can be found in the Multifamily Domestic Hot Water CASE report (Statewide Team, 2023).
    b. Requirement for HERS verified refrigerant charge verification for heat pumps in all climate zones (Table 150.1-A[4]). The cost-effectiveness analysis can be found in the Residential HVAC Performance CASE report (Statewide Team, 2023).
4. When evaluating reach code strategies, the Reach Codes Team recommends that jurisdictions consider combined benefits of energy efficiency alongside electrification. Efficiency and electrification have symbiotic benefits and are both critical for decarbonization of buildings. As demand on the electric grid is increased through electrification, efficiency can reduce the negative impacts of additional electricity demand on the grid, reducing the need for increased generation and storage capacity, as well as the need to upgrade upstream transmission and distribution equipment.
5. Education and training can play a critical role in ensuring that heat pumps are installed, commissioned, and controlled properly to mitigate grid impacts and maximize occupant satisfaction. Below are select recommended strategies.
    a. The Quality Residential HVAC Services Program[5] is an incentive program to train California contractors in providing quality installation and maintenance while advancing energy-efficient technologies in the residential HVAC industry. Jurisdictions can market this to local contractors to increase the penetration of contractors skilled in heat pump design and installation.
    b. Educate residents and contractors of available incentives, tax credits, and financing opportunities.
    c. Educate contractors on code requirements. Energy Code Ace provides free tools, training, and resources to help Californians comply with the energy code. Contractors can access interactive compliance forms, fact sheets, and live and recorded trainings, among other things, on the website: https://energycodeace.com/. Jurisdictions can reach out to Energy Code Ace directly to discuss offerings.
6. Health and safety
    a. Combustion Appliance Safety and Indoor Air Quality: Implementation of some of the recommended measures will affect the pressure balance of the home which can subsequently impact the safe operation of existing combustion appliances as well as indoor air quality. Buildings with older gas appliances can present serious health and safety problems which may not be addressed in a remodel

[3] https://www.publichealthlawcenter.org/sites/default/files/2024-01/CRA-v-Berkeley-Ninth-Circuit-Opinion-Jan2024.pdf
[4] This requirement does not show up in the Express Terms for alterations in Section 150.2(b)1F, but the Statewide Reach Codes Team expects that it will be added to the next release of the proposed code language in the 45-day language as it aligns with the proposal made by the Codes and Standards Enhancement Team (Statewide CASE Team, 2023).
[5] https://qualityhvac.frontierenergy.com/

if the appliances are not being replaced. It is recommended that the building department require inspection and testing of all combustion appliances located within the pressure boundary of the building after completion of retrofit work that involves air sealing or insulation measures.

b. Jurisdictions may consider requiring mechanical ventilation in homes where air sealing has been conducted. In older buildings, outdoor air is typically introduced through leaks in the building envelope. After air sealing a building, it may be necessary to forcefully bring in fresh outdoor air using supply and/or exhaust fans to minimize potential issues associated with indoor air quality.

Local jurisdictions may also adopt ordinances that amend different Parts of the California Building Standards Code or may elect to amend other state or municipal codes. The decision regarding which code to amend will determine the specific requirements that must be followed for an ordinance to be legally enforceable. For example, reach codes that amend Part 6 of the CA Building Code and require energy performance beyond state code minimums must demonstrate the proposed changes are cost-effective and obtain approval from the Energy Commission as well as the Building Standards Commission (BSC). Amendments to Part 11, such as requirements for increased water efficiency or electric vehicle infrastructure only require BSC approval. Although a cost-effectiveness study is only required to amend Part 6 of the CA Building Code, this study provides valuable context for jurisdictions pursuing other ordinance paths to understand the economic impacts of any policy decision. This study documents the estimated costs, benefits, energy impacts and greenhouse gas emission reductions that may result from implementing an ordinance based on the results to help residents, local leadership, and other stakeholders make informed policy decisions.

This report documents the key results and conclusions from the Reach Codes Team analysis. A full dataset of all results can be downloaded at https://localenergycodes.com/content/resources. Results alongside policy options can also be explored using the Cost-effectiveness Explorer at https://explorer.localenergycodes.com/. Model ordinance language and other resources are posted on the C&S Reach Codes Program website at LocalEnergyCodes.com. Local jurisdictions that are considering adopting an ordinance may contact the program for further technical support at info@localenergycodes.com.

1 Introduction

This report documents cost-effective measure upgrades in existing single family buildings that exceed the minimum state requirements, the 2022 Building Energy Efficiency Standards, effective January 1, 2023. Local jurisdictions in California may consider adopting local energy ordinances to achieve energy savings beyond what will be accomplished by enforcing building efficiency requirements that apply statewide. This report was developed in coordination with the California Statewide Investor-Owned Utilities (IOUs) Codes and Standards Program, key consultants, and engaged cities—collectively known as the Statewide Reach Codes Team.

The focus of this study is on existing single family buildings and does not apply to low or high-rise multifamily buildings. Each jurisdiction must establish the appropriate structure and threshold for triggering the proposed requirements. Some common jurisdictional structures include triggering the requirements at major remodels, additions, or date-certain (upgrades must be completed by a specific date). Some of these measures could be triggered with a permit for another specific measure, such as a re-roofing project. The analysis includes scenarios of individual measures and identifies cost-effective options based on the existing conditions of the building in all 16 California Climate Zones (CZ) (see Cost-Effectiveness Results for a graphical depiction of climate zone locations).

This report documents the key results and conclusions from the Reach Codes Team analysis. A full dataset of all results can be downloaded at https://localenergycodes.com/content/resources. Results alongside policy options can also be explored using the Cost-effectiveness Explorer at https://explorer.localenergycodes.com/.

The California Codes and Standards (C&S) Reach Codes program provides technical support to local governments considering adopting a local ordinance (reach code) intended to support meeting local and/or statewide energy efficiency and greenhouse gas reduction goals. The program facilitates adoption and implementation of the code when requested by local jurisdictions by providing resources such as cost-effectiveness studies, model language, sample findings, and other supporting documentation.

The California Building Energy Efficiency Standards Title 24, Part 6 (Title 24) (CEC, 2019) is maintained and updated every three years by two state agencies: the California Energy Commission (the Energy Commission) and the Building Standards Commission (BSC). In addition to enforcing the code, local jurisdictions have the authority to adopt local energy efficiency ordinances—or reach codes—that exceed the minimum standards defined by Title 24 (as established by Public Resources Code Section 25402.1(h)2 and Section 10-106 of the Building Energy Efficiency Standards). Local jurisdictions must demonstrate that the requirements of the proposed ordinance are cost-effective and do not result in buildings consuming more energy than is permitted by Title 24. In addition, the jurisdiction must obtain approval from the Energy Commission and file the ordinance with the BSC for the ordinance to be legally enforceable.

The Department of Energy (DOE) sets minimum efficiency standards for equipment and appliances that are federally regulated under the National Appliance Energy Conservation Act, including heating, cooling, and water heating equipment (E-CFR, 2020). Since state and local governments are prohibited from adopting higher minimum efficiencies than the federal standards require, the focus of this study is to identify and evaluate cost-effective packages that do not include high efficiency heating, cooling, and water heating equipment. High efficiency appliances are often the easiest and most affordable measure to increase energy performance. While federal preemption limits reach code mandatory requirements for covered appliances, in practice, builders may install any package of compliant measures to achieve the performance requirements.

2 Methodology and Assumptions

2.1 Analysis for Reach Codes

This section describes the approach to calculating cost-effectiveness including benefits, costs, metrics, and utility rate selection.

2.1.1 Modeling

The Reach Codes Team performed energy simulations using the 2025 research version of the Residential California Building Energy Code Compliance software (CBECC). The 2025 version of CBECC was used instead of the 2022 version to take advantage of updated weather files and metrics. Site energy results are similar between CBECC-Res 2022 and 2025; however, the 2025 compliance metrics applies assumptions reflective of an electrified future, such as high escalation for natural gas retail rates, which favors electric buildings. In addition, in 2025 the weather stations were changed in Climate Zones 4 and 6 from San Jose to Paso Robles and Torrance to Los Angeles International Airport, respectively.

Three unique building vintages are considered: pre-1978, 1978-1991, and 1992-2010. The vintages were defined based on review of historic Title 24 code requirements and defining periods with distinguishing features. Prospective energy efficiency measures were identified and modeled to determine the projected site energy (therm and kWh), source energy, GHG emissions, and LSC (long-term systemwide cost) impacts. Annual utility costs were calculated using hourly data output from CBECC, and current (as of 11/01/2023) electricity and natural gas tariffs for each of the investor-owned utilities (IOUs) appropriate for that climate zone.

Equivalent CO_2 emission reductions were calculated based on outputs from the CBECC-Res simulation software. Electricity emissions vary by region and by hour of the year. CBECC-Res applies two distinct hourly profiles, one for Climate Zones 1 through 5 and 11 through 13 and another for Climate Zones 6 through 10 and 14 through 16. Natural gas emissions do not vary hourly. To compare the mixed-fuel and all-electric cases side-by-side, GHG emissions are presented as lbs CO_2-equivalent (CO_2e) emissions.

The Statewide Reach Codes Team designed the analysis approach and selected measures for evaluation based on the 2019 existing building single family reach code analysis (Statewide Reach Codes Team, 2021) and work to support the 2025 Title 24 code development cycle as well as from outreach to architects, builders, and engineers.

2.1.2 Prototype Characteristics

The Energy Commission defines building prototypes which it uses to evaluate the cost-effectiveness of proposed changes to Title 24 requirements. Average home size has steadily increased over time,[6] and the Energy Commission single family new construction prototypes are larger than many existing single family homes across California. For this analysis, a 1,665 square foot prototype was evaluated. Table 1 describes the basic characteristics of the single family prototype. Additions are not evaluated in this analysis as they are already addressed in Section 150.2 of Title 24, Part 6. The CEC has proposed changes to the 2025 Energy Code that would remove the allowance of gas space heating and water heating equipment for additions and instead require additions to follow the same space heating and water heating equipment requirements as new construction (California Energy Commission, 2023). The proposed prescriptive requirements for single family new construction homes are heat pump space heaters and water heaters, with gas equipment only allowed in the performance approach.

[6] https://www.census.gov/const/C25Ann/sftotalmedavgsqft.pdf

Table 1. Prototype Characteristics

	Specification
Existing Conditioned Floor Area	1,665 ft^2
Num. of Stories	1
Num. of Bedrooms	3
Window-to-Floor Area Ratio	13%
Attached Garage	2-car garage

Three building vintages were evaluated to determine sensitivity of existing building performance on cost-effectiveness of upgrades. For example, it is widely recognized that adding attic insulation in an older home with no insulation is cost-effective, however, newer homes will likely have existing attic insulation reducing the cost-effectiveness of an incremental addition of insulation. The building characteristics for each vintage were determined based on either prescriptive requirements from Title 24 that were in effect or standard construction practice during that time period. Homes built under 2001 Title 24 are subject to prescriptive envelope code requirements very similar to homes built under the 2005 code cycle, which was in effect until January 1, 2010.

Table 2 summarizes the assumptions for each of the three vintages. Additionally, the analysis assumed the following features when modeling the prototype buildings. Efficiencies were defined by year of the most recent equipment replacement based on standard equipment lifetimes.

- Individual space conditioning and water heating systems, one per single family building.
- Split-system air conditioner with natural gas furnace.
    - Scenarios with an existing natural gas wall furnace without AC were also evaluated.
- Small storage natural gas water heater.
    - Scenarios with an existing electric resistance storage water heater were also evaluated.
- Gas cooktop, oven, and clothes dryer.

The methodology applied in the analyses begins with a design that matches the specifications as described in Table 2 for each of the three vintages. Prospective energy efficiency measures were modeled to determine the projected energy performance and utility cost impacts relative to the baseline vintage. In some cases, where logical, measures were packaged together.

Table 2. Efficiency Characteristics for Three Vintage Cases

Building Component Efficiency Feature	Vintage Case		
	Pre-1978	**1978-1991**	**1992-2010**
Envelope			
Exterior Walls	2x4, 16-inch on center wood frame, R-0[a]	2x4 16 inch on center wood frame, R-11	2x4 16 inch on center wood frame, R-13
Foundation Type & Insulation	Uninsulated slab (CZ 2-15) Raised floor, R-0 (CZ 1 & 16)	Uninsulated slab (CZ 2-15) Raised floor, R-0 (CZ 1 & 16)	Uninsulated slab (CZ 2-15) Raised floor, R-19 (CZ 1 & 16)
Ceiling Insulation & Attic Type	Vented attic, R-5 @ ceiling level for CZ 6 & 7, Vented attic, R-11 @ ceiling level (all other CZs)	Vented attic, R-19 @ ceiling level	Vented attic, R-30 @ ceiling level
Roofing Material & Color	Asphalt shingles, dark (0.10 reflectance, 0.85 emittance)	Asphalt shingles, dark (0.10 reflectance, 0.85 emittance)	Asphalt shingles, dark (0.10 reflectance, 0.85 emittance)
Radiant Barrier	No	No	No
Window Type: U-factor/SHGC[b]	Metal, single pane: 1.16/0.76	Metal, dual pane: 0.79/0.70	Vinyl, dual pane Low-E: 0.55/0.40
House Infiltration at 50 Pascals	15 ACH50	10 ACH50	7 ACH50
HVAC Equipment			
Heating Efficiency	78 AFUE (assumes 2 replacements)	78 AFUE (assumes 1 replacement)	78 AFUE
Cooling Efficiency	10 SEER (assumes 2 replacements)	10 SEER (assumes 1 replacement)	13 SEER, 11 EER
Duct Location & Details	Attic, R-2.1, 30% leakage at 25 Pa	Attic, R-2.1, 25% leakage at 25 Pa	Attic, R-4.2, 15% leakage at 25 Pa
Whole Building Mechanical Ventilation	None	None	None
Water Heating Equipment			
Water Heater Efficiency	0.575 Energy Factor (assumes 2 replacements)	0.575 Energy Factor (assumes 1 replacement)	0.575 Energy Factor
Water Heater Type	40-gallon gas storage	40-gallon gas storage	40-gallon gas storage
Pipe Insulation	None	None	None
Hot Water Fixtures	Standard, non-low flow	Standard, non-low flow	Standard, non-low flow

[a] Pre-1978 wall modeled with R-5 cavity insulation to better align wall system performance with monitored field data and not overestimate energy use.

[b] Window type selections were made based on conversations with window industry expert, Ken Nittler. If a technology was entering the market during the time period (e.g., Low-E during 1992-2010 or dual-pane during 1978-1991) that technology was included in the analysis. This provides a conservative assumption for overall building performance and additional measures may be cost-effective for buildings with lower performing windows, for example buildings with metal single pane windows in the 1978-1991 vintage.

2.1.3 Cost-Effectiveness Approach

2.1.3.1 Benefits

This analysis used two different metrics to assess the cost-effectiveness of the proposed upgrades. Both methodologies require estimating and quantifying the incremental costs and energy savings associated with each energy efficiency measure. The main difference between the methodologies is the way they value energy impacts (the numerator in the benefit cost calculation):

Utility Bill Impacts (On-Bill): This customer-based lifecycle cost (LCC) approach values energy based upon estimated site energy usage and customer utility bill savings using the latest electricity and natural gas utility tariffs available at the time of writing this report. Total savings are estimated over a 30-year duration and include discounting of future utility costs, as well as assumed energy cost inflation over time.

Long-term Systemwide Cost (LSC): Formerly known as Time Dependent Valuation (TDV) energy cost savings, LSC reflects the Energy Commission's current LCC methodology, which is intended to capture the total value or cost of energy use over 30 years. This method accounts for the hourly cost of marginal generation, transmission and distribution, fuel, capacity, losses, and cap-and-trade-based CO2 emissions (California Energy Commission, 2023). This is the methodology used by the Energy Commission in evaluating cost-effectiveness for efficiency measures in the 2025 Energy Code.

2.1.3.2 Costs

The Reach Codes Team assessed the incremental costs of the measures and packages over a 30-year analysis period. Incremental costs represent the equipment, installation, replacement, and maintenance costs of the proposed measure relative to the 2022 Title 24 Standards minimum requirements or standard industry practices. Present value of replacement cost is included only for measures with lifetimes less than the 30-year evaluation period. In cases where at the end of the analysis period the measure has useful life remaining, the value of this remaining life is calculated and credited in the total lifetime cost.

2.1.3.3 Metrics

Cost-effectiveness is presented using net present value (NPV) and benefit-to-cost (B/C) ratio metrics.

NPV: Equation 1 demonstrates how lifetime NPV is calculated. If the NPV of a measure or package is positive, it is considered cost-effective. A negative value represents a net increase in costs over the 30-year lifetime.

B/C Ratio: This is the ratio of the present value of all benefits to the present value of all costs over 30 years (present value benefits divided by present value costs). A value of one indicates the NPV of the savings over the life of the measure is equivalent to the NPV of the lifetime incremental cost of that measure. A value greater than one represents a positive return on investment. The B/C ratio is calculated according to Equation 2.

Equation 1

$$NPV = present\ value\ of\ lifetime\ benefit - present\ value\ of\ lifetime\ cost$$

Equation 2

$$Benefit - to - Cost\ Ratio = \frac{present\ value\ of\ lifetime\ benefit}{present\ value\ of\ lifetime\ cost}$$

Improving the efficiency of a project often requires an initial incremental investment. In most cases the benefit is represented by annual On-Bill utility or LSC savings, and the cost is represented by incremental first cost and future replacement costs. Some packages result in initial construction cost savings relative to the assumed base case scenario, and either energy cost savings (positive benefits), or increased energy costs (negative benefits). In cases where both construction costs and energy-related savings are negative, the construction cost savings are treated as the 'benefit' while the increased energy costs are the 'cost.' In cases where a measure or package is cost-effective immediately (i.e., upfront construction cost savings and lifetime energy cost savings), B/C ratio cost-effectiveness is represented by ">1".

The lifetime costs or benefits are calculated according to Equation 3.

Equation 3

$$Present\ value\ of\ lifetime\ cost\ or\ benefit = \sum_{t=0}^{n} \frac{(Annual\ cost\ or\ benefit)_t}{(1+r)^t}$$

Where:

1. n = analysis term in years
2. r = discount rate

The following summarizes the assumptions applied in this analysis to both methodologies.

3. Analysis term of 30 years
4. Real discount rate of three percent

Both base case measures and alternative energy efficiency measures may have different lifetime assumptions which impact life cycle economics. Future costing of many of the evaluated electrification measures are only based on current cost assumption, which may be overly conservative as the expected growth in heat pump-based technologies is growing rapidly and will likely lead to future cost reductions (at least relative to current fossil fueled equipment) as production volumes increase.

2.1.4 Utility Rates

In coordination with the CA IOU rate team (comprised of representatives from Pacific Gas and Electric (PG&E), Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E)) and two Publicly-Owned-Utilities (POUs) (Sacramento Municipal Utility District (SMUD) and City of Palo Alto Utilities (CPAU)), the Reach Codes Team determined appropriate utility rates for each climate zone to calculate utility costs and determine On-Bill cost-effectiveness for the proposed measures and packages. The utility tariffs, summarized in Chapter 6.2, were determined based on the appropriate rate for each case in each territory. Utility rates were applied to each climate zone based on the predominant IOU serving the population of each zone, with a few climate zones evaluated multiple times under different utility scenarios. Climate Zones 10 and 14 were evaluated with both SCE for electricity and Southern California Gas Company (SoCalGas) for gas and SDG&E tariffs for both electricity and gas since each utility has customers within these climate zones. Climate Zone 5 is evaluated under both PG&E and SoCalGas natural gas rates. Two POU or municipal utility rates were also evaluated: SMUD in Climate Zone 12 and CPAU in Climate Zone 4.

For cases with onsite generation (i.e. solar photovoltaics (PV)), the approved NBT tariffs were applied along with monthly service fees and hourly export compensation rates for 2024.[7] In December 2022, the California Public Utilities Commission (CPUC) issued a decision adopting NBT as a successor to NEM 2.0 that went into effect April of 2023[8].

Utility rates are assumed to escalate over time according to the assumptions from the CPUC 2021 En Banc hearings on utility costs through 2030 (California Public Utilities Commission, 2021a). Escalation rates through the remainder of the 30-year evaluation period are based on the escalation rate assumptions within the 2022 TDV factors. The Statewide Natural Gas Residential Average Rate for 2023 through 2030 is projected to be 4.6%. The Electric Residential Average Rate for PG&E, SCE and SDG&E for 2023 through 2030 is projected to be 1.8%,1.6% and 2.8% respectively. A second set of escalation rates were also evaluated to demonstrate the impact that utility cost changes have on cost-effectiveness over time. This utility rate escalation sensitivity analysis, presented in Section 3.2.4, was based on those used within the 2025 LSC factors (LSC replaces TDV in the 2025 code cycle) which assumed steep

[7] Hourly export compensation rates were based on the NBT spreadsheet model created by E3 for the CPUC. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/net-energy-metering-nem/nemrevisit/nbt-model--12142022.xlsb

[8] https://www.cpuc.ca.gov/nemrevisit

increases in gas rates in the latter half of the analysis period. See Appendix 6.2.7 Fuel Escalation Assumptions for details.

Future electricity tariff structures are expected to evolve over time, and the CPUC has an active proceeding to adopt an income-graduated fixed charge that benefits low-income customers and supports electrification measures.[10] These were not included in this analysis but may be evaluated later in 2024 once the rates are finalized.

2.1.5 Measure Cost Data Collection Approach

To support this effort, a detailed cost study was completed in the summer of 2023 to gather data from a range of contractors to inform actual installed costs in the areas they provide services. These areas include HVAC, plumbing, envelope and air-sealing, and PV installation. Home performance contractors were also approached to collect this data. Collecting this type of data is challenging, both due to contractor reticence to share cost information and due to the timing of the survey which unfortunately coincided with the summer busy season for most contractors, especially HVAC installers. With these known challenges, the outreach effort focused on leveraging existing relationships between the analysis team and contractors to both gain access and provide assurance that all cost data would remain confidential and aggregated. Contractors that provided feedback were nominally compensated for their time.

The collected cost data was intended to represent recent costs for a “typical” retrofit installation. Each home in which a contractor does work has different site-specific issues that will likely affect costs. In addition, different jurisdictions have different levels of building department installation oversight and permit fees. Finally, each contractor typically has a different manufacturer product line they prefer to install. All these factors will influence installed costs[11].

The most detailed and broad cost request was for the HVAC contractors, as there are a wide range of equipment replacement scenarios available for an existing ducted gas furnace with central split-system air conditioning. Options range from a base case scenario (like for like swap out), split-system heat pump replacement, dual fuel heat pumps (DFHP), ducted mini-split heat pumps, non-ducted mini-splits, etc. For plumbing contractors, a range of scenarios existed for water heater replacements including like-for-like replacement, HPWHs (in different locations- garage, indoor), need for electrical upgrade for HPWH installation, need for HPWH ducting, etc. Envelope measures focused on attic and wall insulation, window replacement, re-roofing (with Cool Roof materials or not), and attic ceiling plane air-sealing. PV costing included different system sizes, panel upgrades costs, and battery costs. Home performance contractors were asked to provide as much data as they could on the different measure options. All costing information requested was intended to represent most recent installations, in an effort to capture current pricing as best as possible.

The contractors that responded with their cost estimates work in different regions of the state, operate in different markets with (potentially) different local efficiency incentives, do varying amounts of work based on the size of their company, target different market demographic sectors, and install different brands of equipment. All these factors will contribute to price variability. The Team considered applying climate zone specific cost adjustments to reflect some of these differences, but ultimately decided not to since a climate zone is not a monolithic entity with uniform customer pricing throughout. The Team recognizes that “zip code” pricing is a reality, but for simplicity, as well as consistency with Title 24, Part 6 code development costing approaches, applied uniform statewide costs to all measures.

2.2 Measure Details and Cost

This section describes the details of the measures and documents incremental costs. All measure costs were obtained from the contractor survey unless otherwise noted. All contractor provided costs reflect the cost to the customer and

[10] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/demand-flexibility-rulemaking

[11] One HVAC contractor mentioned that equipment brand alone may contribute to a +/-%5 variation in the total bid cost.

include equipment, labor, permit fees, and required HERS testing. Additional details of the measures can be found in Appendix Section **Error! Reference source not found.**.

All measures are evaluated assuming they are not otherwise required by Title 24. For example, duct sealing is required by code whenever HVAC equipment is altered. For this analysis duct sealing was evaluated for those projects where it is not already triggered by code (i.e., no changes to the heating or cooling equipment). Where appropriate, measure requirements align with those defined in Title 24. In some cases, cost-effective measures were identified that exceed Title 24 requirements, such as attic insulation, cool roofs, and duct sealing.

2.2.1 Building Envelope & Duct Measures

The following are descriptions of each of the efficiency upgrade measures applied in this analysis.

Attic Insulation: Add attic insulation in buildings with vented attic spaces to meet either R-38 or R-49. The pre-1978 vintage assumes an existing condition of R-11, the 1978-1991 vintage assumes an existing condition of R-19, and the 1992-2010 vintage assumes R-30 as the existing insulation level. For pre-1978 vintage homes this measure was also evaluated to include air sealing of the attic. A 14% leakage reduction was modeled such that 15 ACH50 was reduced to 12.9 ACH50 in this measure. The costs for this measure include removing existing insulation.

Air Sealing and Weather-stripping: Apply air sealing practices throughout all accessible areas of the building. For this study, it was assumed that older vintage homes would be leakier than newer buildings and that approximately 30 percent improvement in air leakage is achievable through air sealing of all accessible areas. For modeling purposes, it was assumed that air sealing can reduce infiltration levels from 15 to ten air changes per hour at 50 Pascals pressure difference (ACH50) in the oldest vintages (pre-1978), to ten to seven ACH50 for the 1978-1991 vintage, and seven to five ACH50 in the 1992-2010 vintage.

Cool Roof: For steep slope roofs, install a roofing product rated by the Cool Roof Rating Council (CRRC) with an aged solar reflectance of 0.20 or 0.25 and thermal emittance of 0.75 or higher. This measure only applies to buildings that are installing a new roof as part of the scope of the remodel; the cost and energy savings associated with this upgrade reflects the incremental step between a standard roofing product with one that is CRRC rated with an aged solar reflectance of 0.20 or 0.25. This is similar to cool roof requirements in 2022 Title 24 Section 150.2(b)1Ii but assumes a higher solar reflectance.

Radiant Barrier: Add radiant barrier to any existing home vintage. This measure only applies to buildings that are installing a new roof as part of the scope of the remodel; the cost and energy savings associated with this upgrade reflects the incremental step between a standard roofing product with one that includes a laminated radiant barrier.

Raised Floor Insulation: In existing homes with raised floors and no insulation (pre-1978 and 1978-1991 vintages), add R-19 insulation. An upgraded R-30 floor insulation, assuming no current insulation, was evaluated in the pre-1978 and 1978-1991 vintages.

Wall Insulation: Blow-in R-13 wall insulation in existing homes without wall insulation (pre-1978 vintages).

Window Replacement: Replace existing windows with a non-metal dual-pane product, which has a U-factor equal to 0.28 Btu/hour-ft^2-°F or lower and a Solar Heat Gain Coefficient (SHGC) equal to 0.23 or lower, except in heating dominated climates (Climate Zones 1, 3, 5, and 16) where an SHGC of 0.35 was evaluated.

Duct Sealing, New Ducts, and Duct Insulation: Air seal all ductwork to meet the requirements of the 2022 Title 24, Part 6 Section 150.2(b)1E. For this analysis, final duct leakage values of ten percent (proposed revised leakage rate for 2022 Title 24) was evaluated. The pre-1978 and 1978-1992 vintages assume leaky existing ducts (25-30% leakage). The 1992-2010 vintage assumes moderately leaky existing ducts (15-20% leakage).

Replacing existing ductwork with entirely new ductwork to meet Sections 150.2(b)1Di and 150.2(b)1Diia of the 2022 Title 24 was also evaluated. This assumed new ducts meet 5% duct leakage and the option of R-6 and R-8 duct insulation in all climate zones.

Table 3 summarizes the cost assumptions for the building envelope and HVAC duct improvement measures evaluated. All the measures in Table 3 assume a 30-year effective useful life.

Table 3. Measure Cost Assumptions – Efficiency & Duct Measures

Measure	Performance Level	Incremental Cost – Single Family Building		
		Pre 1978	1978 – 1991	1992 - 2010
Wall Insulation	R-13	$2,950	N/A	N/A
Raised Floor Insulation	R-19	$3,633	$3,633	N/A
	R-30	$4,113	$4,113	$4,113
Attic Insulation	R-38	$6,762	$2,555	$1,781
	R-49	$7,446	$3,612	$1,827
Air Sealing	10 ACH50	$4,684	N/A	N/A
	7 ACH50	N/A	$4,684	N/A
	5 ACH50	N/A	N/A	$4,684
Cool Roof	0.25 Aged Solar Reflectance CZs 1-3,5-7,16	$2,407	$2,407	$2,407
	0.25 Aged Solar Reflectance CZs 4, 8-15	$1,203	$1,203	$1,203
Window U-factor/SHGC	0.28 U-factor. 0.23 SHGC in CZs 2,4,6-15.	$11,463	$11,463	$11,463
	0.28 U-factor. 0.35 SHGC in CZs 1,3,5,26	$11,871	$11,871	$11,871
Radiant Barrier	Add Radiant Barrier	$893	$893	$893
Duct Sealing	10% nominal airflow	$2,590	$2,590	$1,400
All New Duct System	R-6 ducts; 5% duct leakage	$4,808	$4,808	$4,808
	R-8 ducts; 5% duct leakage	$6,311	$6,311	$6,311

2.2.2 PV Measures

Installation of on-site PV is required in the 2022 Title 24 code for new construction homes, but there are no PV requirements for additions or alterations to existing buildings. PV was evaluated in CBECC-Res according to the California Flexible Installation (CFI) 1 assumptions and 98% solar access. To meet CFI eligibility, the requirements of 2022 Reference Appendices JA11.2.2 (California Energy Commission, 2021b) must be met. A 3 kW PV system was modeled both as a standalone measure as well as coupled with heat pump installations.

The costs for installing PV are summarized in Table 4. They include the first cost to purchase and install the system, future inverter replacement costs, and annual maintenance costs. Upfront solar PV system costs are estimated from the contractor surveys to be $4.58/$W_{DC}$ and are reduced by 30 percent to account for the federal income Residential Clean Energy Credit. The solar panels are estimated to have an effective useful life of 30 years and the inverter 25 years. The inverter replacement cost of $7,000 (future value) is also from the contractor surveys. System maintenance costs are taken from the 2019 PV CASE Report (California Energy Commission, 2017) and are assumed to be

$0.31/W$_{DC}$ present value. These costs do not include costs associated with electrical panel upgrades, which will be necessary in some instances.

Table 4. Measure Descriptions & Cost Assumptions – PV

Measure	Performance Level	Incremental Cost		
		Pre 1978	1978 – 1991	1992 - 2010
PV	3 kW	$9,608		

2.2.3 Equipment Fuel Substitution Measures – Heat Pump Equipment

The fuel substitution measures are evaluated as replacements at the end of the life of the existing equipment. This means the baseline compared against is usually a like-for-like change-out of the natural gas equipment, and the upgrade is a heat pump.

For most of the space heating and water heating cases, costs for electrical service panel upgrades are not included as it is assumed many existing homes have the service capacity to support converting one appliance from gas to electric. For homes with existing air conditioners, any incremental electric capacity necessary to support a heat pump space heater is marginal. The same applies for homes with existing electric resistance equipment. Section 3.2.4 presents the impacts for select cases where an upgrade to the electric panel is required.

Heat Pump Space Heating

All the heat pump space heater (HPSH) measures are described below. All were evaluated with HERS verified refrigerant charge aligned with the proposed code requirements for the 2025 Title 24 code. Dual fuel heat pumps (DFHPs) were controlled to lockout furnace operation above 35°F.

DFHP (Existing Furnace): Replace existing ducted air conditioner (AC) with an electric heat pump and install controls to operate the heat pump to use the existing gas furnace for backup heat. A minimum federal efficiency (14.3 SEER2, 11.7 EER2, 7.5 HSPF2) heat pump was evaluated. Savings are compared to a new AC (14.3 SEER2, 11.7 EER2) alongside the existing furnace (78 AFUE).

DFHP (New Furnace): Replace existing ducted AC and natural gas furnace with an electric heat pump and new gas furnace plus controls to operate the heat pump and use the new gas furnace for backup heat. A minimum federal efficiency (14.3 SEER2, 11.7 EER2, 7.5 HSPF2) heat pump and furnace (80 AFUE) were evaluated to replace existing equipment. Savings are compared to a new ducted AC and natural gas furnace (14.3 SEER2, 11.7 EER2, 80 AFUE).

Heat Pump Space Heater: Replace existing ducted AC and natural gas furnace with an electric heat pump. Minimum federal efficiency (14.3 SEER2, 11.7 EER2, 7.5 HSPF2) and higher efficiency (17 SEER2, 12.48 EER2, 9.5 HSPF2) heat pumps were evaluated. Savings are compared to a new ducted natural gas furnace and AC (14.3 SEER2, 11.7 EER2, 80 AFUE).

Ducted Mini-Split Heat Pump (MSHP): Replace existing ducted AC and natural gas furnace with a ducted high efficiency MSHP (16.5 SEER2, 12.48 EER2, 9.5 HSPF2). Savings are compared to a new ducted AC and natural gas furnace (14.3 SEER2, 11.7 EER2, 80 AFUE).

Ductless MSHP: In a home without AC, replace existing wall furnace with a ductless MSHP. A standard efficiency unit meeting minimum federal efficiency standards (14.3 SEER2, 11.7 EER2, 7.5 HSPF2) was evaluated by modeling the variable capacity heat pump (VCHP) compliance credit in CBECC-Res. A premium, higher efficiency upgrade was also

evaluated using CBECC-Res' detailed VCHP model[12] by simulating the performance of a representative high efficiency product (14.3 SEER2, 11.7 EER2, 7.5 HSPF2). Savings are compared to a new natural gas wall furnace with fan distribution (75% AFUE) and window AC (9 CEER).

Over the 30-year analysis period, certain changes are assumed when the equipment is replaced that impact both lifetime costs and energy use. Table 5 presents the lifetime scenario for the DFHP (existing furnace) measure. The analysis assumed a 20-year effective useful lifetime (EUL) for a furnace, a 15-year EUL for an air conditioner and a 15-year EUL for a heat pump. Lifetimes are based on the Database for Energy Efficient Resources (DEER) (California Public Utilities Commission, 2021b). The existing furnace is assumed to be halfway through its EUL at the beginning of the analysis period. After 10 years when the furnace reaches the end of its life and needs to be replaced, it will be subject to new federal efficiency standards for residential gas furnaces that go into effect in 2028 requiring 95 AFUE[13]. 5 years later the air conditioner reaches the end of its life and is replaced with a new air conditioner.

For the DFHP upgrade case, after 10 years when the furnace fails it's expected that the furnace will be abandoned in place since the heat pump serves primary heating and was sized to provide the full design heating load. In this case it is assumed that the fan motor would be replaced with a new aftermarket unit and would operate another 5 years until the heat pump fails and is replaced with a new heat pump and air handler.

The other ducted heat pump cases similarly apply a 95 AFUE furnace in the baseline when the furnace reaches its EUL after 20 years.

Table 5. Lifetime Analysis Replacement Assumptions for DFHP (Existing Furnace) Scenario

Year	Baseline	Upgrade
0	AC fails, install new AC, keep existing furnace	AC fails, install new HP, keep existing furnace
10	Furnace fails, install new 95AFUE furnace	Furnace fails, replace fan motor
15	AC fails, install new AC	HP fails, install new HP and air handler

Costs were applied based on the system capacity from heating and cooling load calculations in CBECC-Res as presented in Table 6. Air conditioner nominal capacity was calculated as the CBECC-Res cooling load, rounded up to the nearest half ton. Heat pump nominal capacity was calculated as the maximum of either the CBECC-Res heating or cooling load, rounded up to the nearest half ton. In both cases a minimum capacity of 1.5-ton was applied as this represents the typical smallest available split system heat pump equipment. Load calculations demonstrated that Climate Zones 2 - 15 were cooling-dominated while Climate Zones 1 and 16 were heating-dominated. In the heating dominated climate zones the heat pump needed to be upsized relative to an air conditioner that only provides cooling.

[12] The detailed VCHP option allows for the user to input detailed specifications based on the published National Energy Efficiency Partnership (NEEP) manufacturer specific performance data. It is not currently available for compliance analysis.

[13] https://www.energy.gov/articles/doe-finalizes-energy-efficiency-standards-residential-furnaces-save-americans-15-billion#:~:text=These%20furnace%20efficiency%20standards%20were,heat%20for%20the%20living%20space.

Table 6. System Sizing by Climate Zone

Climate Zone	Air Conditioner Capacity (tons)	Heat Pump Capacity (tons)
1	1.5	3.0
2	3.5	3.5
3	2.5	2.5
4	3.5	3.5
5	3.0	3.0
6	3.0	3.0
7	3.0	3.0
8	4.0	4.0
9	4.0	4.0
10	4.0	4.0
11	4.5	4.5
12	4.0	4.0
13	4.5	4.5
14	4.0	4.0
15	5.0	5.0
16	3.5	4.0

Table 7 presents estimated first and lifetime costs for the various ducted baseline and heat pump scenarios for 4-ton equipment. Costs include all material and installation labor including providing new 240 V electrical service to the air handler location for all new air handler installations and decommissioning of the furnace for the cases where the furnace is removed. DFHP costs incorporate controls installation and commissioning to ensure the heat pump and the furnace communicate properly and don't operate at the same time. Future replacement costs do not include any initial costs associated with 240V electrical service or furnace decommissioning.

Table 8 presents estimated first and lifetime costs for the ductless baseline and 2 heat pump scenarios, also for 4-ton heat pump equipment. EULs are based on 20 years for the gas wall furnace, 10 years for the window AC, and 15 years for the heat pump.[14]

[14] The gas wall furnace and heat pump EULs were based on DEER (California Public Utilities Commission, 2021b). Gas wall furnace lifetime was assumed to be the same as for central gas furnace equipment. Room air conditioner EUL was based on the DOE's latest rulemaking for room air conditioned (Department of Energy, 2023). DOE determined an average lifetime of 9.3 years, which was rounded up to 10 years for this analysis.

Table 7. Ducted HVAC Measure Cost Assumptions – 4-Ton Electric Replacements

Case	AC + Coil	Gas Furnace /AC	DFHP (Existing Furnace)	DFHP (New Furnace)	Min. Eff. Heat Pump	High Eff. Heat Pump	Ducted MSHP
Base Case	-	-	AC + Coil	Gas Furnace /AC	Gas Furnace /AC	Gas Furnace /AC	Gas Furnace /AC
First Cost	$10,402	$16,653	$12,362	$20,676	$17,825	$20,802	$18,075
Replacement Cost (Future Value)	$19,365	$19,365	$19,025	$19,025	$16,825	$19,802	$18,075
Replacement Cost (Present Value)	$13,346	$11,639	$12,334	$12,897	$10,800	$12,710	$11,601
Remaining Value at Year 30	$0	($1,846)	$0	($1,846)	$0	$0	$0
Total Lifecycle Cost	$23,748	$26,446	$24,696	$31,727	$28,625	$33,512	$29,676
Incremental Cost	-	-	**$948**	**$5,281**	**$2,179**	**$7,066**	**$3,230**

Table 8. Non-Ducted HVAC Measure Cost Assumptions – 4-Ton Electric Replacements

	Wall Furnace + Window AC	Min. Eff. Ductless MSHP	High Eff. Ductless MSHP
First Cost	$4,075	$17,412	$21,342
Replacement Cost (Future Value)	$4,075	$17,412	$21,342
Replacement Cost (Present Value)	$3,365	$11,176	$13,698
Remaining Value at Year 30	($532)	$0	$0
Total Lifecycle Cost	$6,908	$28,588	$35,040
Incremental Cost	-	**$21,680**	**$28,132**

Heat Pump Water Heating:

The heat pump water heater (HPWH) measures are described below, and costs are presented in Table 9 and Table 10. The most typical scenario in California is a home with existing natural gas storage tank water heaters. However, there are also many existing homes with existing electric resistance storage tank water heaters and this work considers both baselines. This analysis evaluates the following 65-gallon replacement HPWHs:

1. HPWH that meets the federal minimum efficiency requirements of UEF 2.0
2. HPWH that meets the Northwest Energy Efficiency Alliance (NEEA)[15] Tier 3 rating (3.45 UEF)
3. HPWH that meets the NEEA Tier 4 rating and that has demand response (DR) or load shifting control capability (4.02 UEF)
4. 120V HPWH that meets the NEEA Tier 3 rating (3.3 UEF).

[15] Based on operational challenges experienced in the past, NEEA established rating test criteria to ensure newly installed HPWHs perform adequately, especially in colder climates. The NEEA rating requires an Energy Factor equal to the ENERGY STAR® performance level and includes requirements regarding noise and prioritizing heat pump use over supplemental electric resistance heating.

The four cases above were evaluated with the HPWH located within an attached garage. Additionally, three separate cases for the federal minimum efficiency HPWH were analyzed to consider the impacts of location on performance and cost-effectiveness. These locations included the following:

1. Exterior closet.
2. Interior closet, no ducting.
3. Interior closet, ducted to the outside.

Additional costs for providing electrical wiring to these locations and for providing ductwork were included. Savings are compared to a new 50-gallon natural gas storage water heater (UEF 0.63) or a new 50-gallon electric water heater (UEF 0.92).

For this analysis, a HPWH that just meets the federal minimum efficiency standards of close to 2.0 Uniform Energy Factor (UEF) was evaluated in order to satisfy preemption requirements. However, the Reach Codes Team is not aware of any 2.0 UEF products that are available on the market. The lowest UEF reported for certified products in the Northwest Energy Efficiency Alliance (NEEA)[16] database is 2.73. In fact, of the four certification tiers offered by NEEA for high efficiency HPWHs, those meeting Tier 3 or Tier 4 are the dominant products on the market today. According to NEEA all major HPWH manufacturers are represented in NEEA's qualified product list[17] and there are fewer than 10 integrated products certified as Tier 1 or Tier 2, all of which have UEFs greater than 3.0.[18] Therefore, in this analysis, we refer to the NEEA rated HPWH as the "market standard" HPWH.

The HPWH costs for the 120V and NEEA certified units are based on a larger (60 or 65 gallon) HPWH, as most contractors are upsizing the HPWH tank size relative to an equal volume, but higher capacity gas storage water heater. Costs include all material and installation labor including providing a new 240 V electrical service to the water heater location (not needed for the 120V product). Water heating equipment lifetimes are based on DOE's recent water heater rulemaking (Department of Energy, 2022) and assume 15-year EULs for both the baseline water heaters and the HPWHs.[19] Future replacement costs for 240V HPWHs do not include any initial costs associated with 240V electrical service, condensate disposal, etc.

Table 9. Water Heating Measure Cost Assumptions – Existing Gas

	Gas Storage Water Heater	240V Fed. Min. HPWH	240V Market Std. NEEA HPWH	240V Market Std. NEEA HPWH + DR	120V Market Std. NEEA HPWH	240V Fed. Min. HPWH, Exterior Closet	240V Fed. Min. HPWH, Interior Closet, Not Ducted	240V Fed. Min. HPWH, Interior Closet, Ducted
First Cost	$2,951	$7,283	$8,144	$8,144	$5,844	$7,702	$7,363	$8,442
Replacement Cost (Future Value)	$2,951	$6,413	$7,274	$7,274	$5,101	$6,413	$6,413	$6,413
Replacement Cost (Present Value)	$1,894	$4,116	$4,669	$4,669	$3,274	$4,116	$4,116	$4,116
Total Lifecycle Cost	$4,845	$11,399	$12,813	$12,813	$9,118	$11,818	$11,479	$12,558
Incremental Cost	**-**	**$6,554**	**$7,968**	**$7,968**	**$4,273**	**$6,973**	**$6,634**	**$7,713**

[16] Based on operational challenges experienced in the past, NEEA established rating test criteria to ensure newly installed HPWHs perform adequately, especially in colder climates. The NEEA rating requires products comply with ENERGY STAR and includes requirements regarding noise and prioritizing heat pump use over supplemental electric resistance heating.
[17] https://neea.org/success-stories/heat-pump-water-heaters
[18] As of 12/21/23: https://neea.org/img/documents/residential-unitary-HPWH-qualified-products-list.pdf
[19] The recent DOE rulemaking references a lifetime of 14 years for gas storage water heaters and 14.8 years for electric storage water heaters. 15 years for each was used in this analysis for both types for simplification.

Table 10 presents similar costs to Table 9, except that the costs assume replacement of an existing 50-gallon electric storage water heater and does not include the 240 V electrical service cost.

Table 10. Water Heating Measure Cost Assumptions – Existing Electric Resistance

	Electric Storage Water Heater	240V Fed. Min. HPWH	240V Market Std. NEEA HPWH	240V Market Std. NEEA HPWH + DR	120V Market Std. NEEA HPWH	240V Fed. Min. HPWH, Exterior Closet	240V Fed. Min. HPWH, Interior Closet, Not Ducted	240V Fed. Min. HPWH, Interior Closet, Ducted
First Cost	$2,583	$6,413	$7,274	$7,274	$5,101	$6,413	$6,413	$7,492
Replacement Cost (Future Value)	$2,583	$6,413	$7,274	$7,274	$5,101	$6,413	$6,413	$6,413
Replacement Cost (Present Value)	$1,658	$4,116	$4,669	$4,669	$3,274	$4,116	$4,116	$4,116
Total Lifecycle Cost	$4,241	$10,529	$11,943	$11,943	$8,375	$10,529	$10,529	$11,608
Incremental Cost	**-**	**$6,288**	**$7,702**	**$7,702**	**$4,134**	**$6,288**	**$6,288**	**$7,367**

3 Results

The primary objective of the evaluation is to identify cost-effective energy upgrade measures and packages for existing single family buildings, to support the design of local ordinances requiring upgrades, which may be triggered by different events, such as at the time of a significant remodel or at burnout of mechanical equipment. In this report, the 1992-2010 vintage is shown for the equipment measures because it is the most conservative case (lowest loads), while the pre-1978 vintage is shown for the envelope and duct measures because some of those measures only apply to the pre-1978 vintage. A full dataset of all results can be downloaded at https://localenergycodes.com/content/resources. Results alongside policy options can also be explored using the Cost-effectiveness Explorer at https://explorer.localenergycodes.com/.

3.1 Cost-Effectiveness Results

The extensive analysis for this type of report leads to an overwhelming number of scenarios including different base cases, house vintages, replacement options, and climate zones. To simplify the reporting, the Statewide Reach Codes Team has relied on graphical representation of select key cases indicating high level measure cost effectiveness from either an On-Bill perspective, an LSC perspective, both metrics, or neither. Figure 1 through Figure 13 present this reduced set of results of the LSC and On-Bill cost-effectiveness conclusions across the 16 climate zones. In the cases where there are multiple utilities serving a single climate zone, an asterisk "*" label is added to separately show the alternate utility cases. These graphs provide a general sense of the findings. A full dataset of all results can be downloaded at https://localenergycodes.com/content/resources. Results alongside policy options can also be explored using the Cost-effectiveness Explorer at https://explorer.localenergycodes.com/.

3.1.1 HPSH Measures

Figure 1 through Figure 5 show the cost-effectiveness of space heating equipment replacement measures for the 1992-2010 vintage including the following cases. The 1992-2010 vintage results are presented here as this is the most conservative scenario for HPSH measures. In general, where a HPSH measure is cost-effective for a new home it was also found to be cost-effective for older homes.

- Dual fuel heat pump with existing furnace as backup.
- Standard efficiency ducted central heat pump replacement.
- High efficiency ducted central heat pump replacement.
- Ducted mini-split heat pump replacement.
- Standard efficiency ducted central heat pump replacement with 3kW PV system.

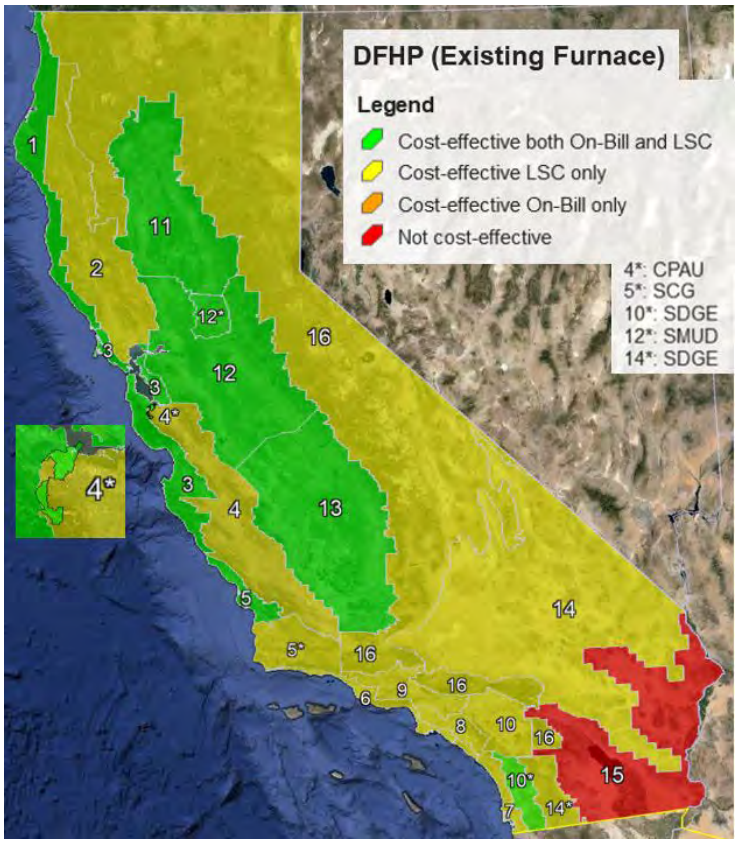

Figure 1: DFHP with Existing Furnace

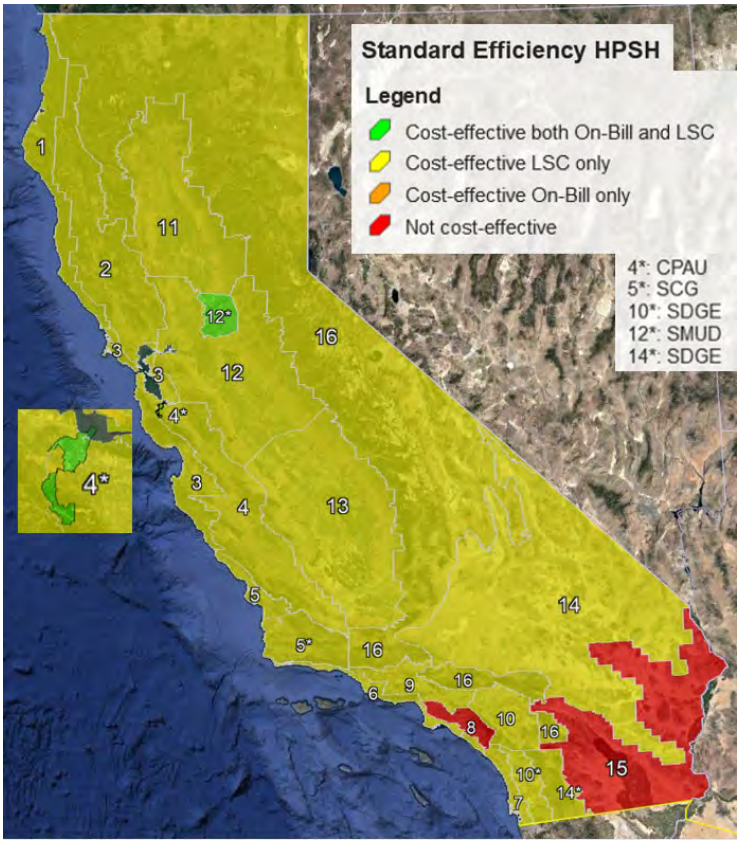

Figure 2: Standard Efficiency HPSH

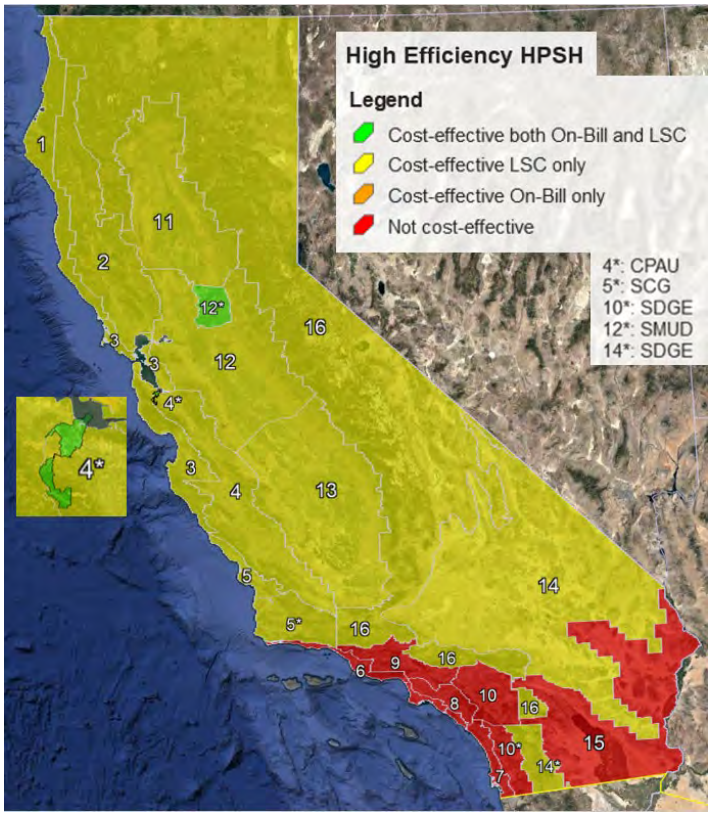

Figure 3: High Efficiency HPSH

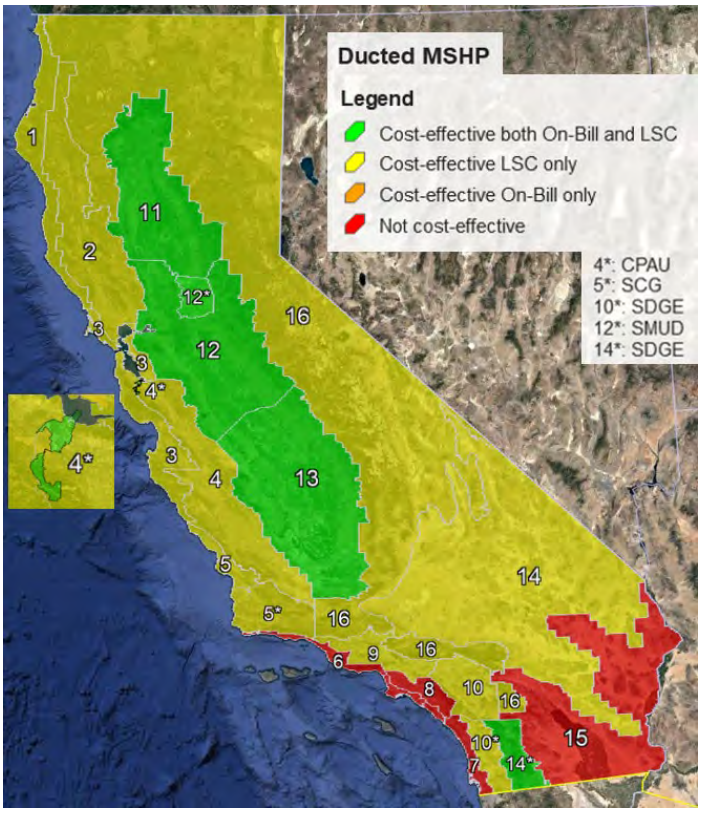

Figure 4: Ducted MSHP

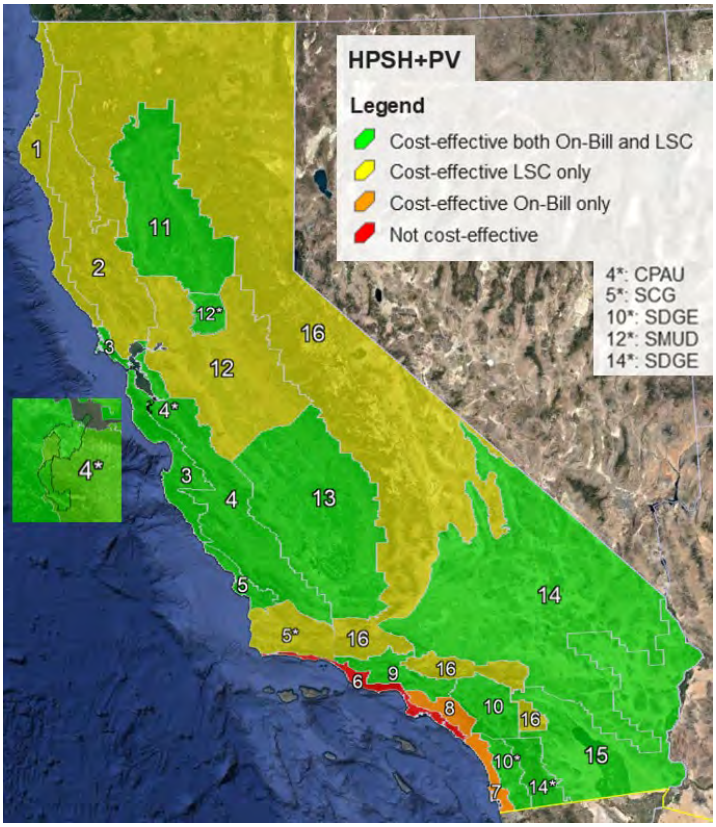

Figure 5: HPSH + PV

3.1.2 HPWH Measures

Figure 6 through Table 11 show the cost-effectiveness of water heater measures for the 1992-2010 vintage including the following cases. HPWH energy savings and LSC cost-effectiveness is not sensitive to home vintage but rather depends on the magnitude of hot water loads, which are typically driven by the number of occupants. On-Bill cost-effectiveness does vary slightly by vintage due to the impact of the electrification tariff relative to the load profile of the existing home. The impact is largest for the HPWH + PV case where On-Bill cost-effectiveness improves for older homes or homes with overall higher energy use resulting in less exports to the grid for a fixed size PV system.

- 240V federal minimum HPWH
- 240V market standard NEEA HPWH
- 120V market standard NEEA HPWH
- 240V federal minimum HPWH with 3kW PV

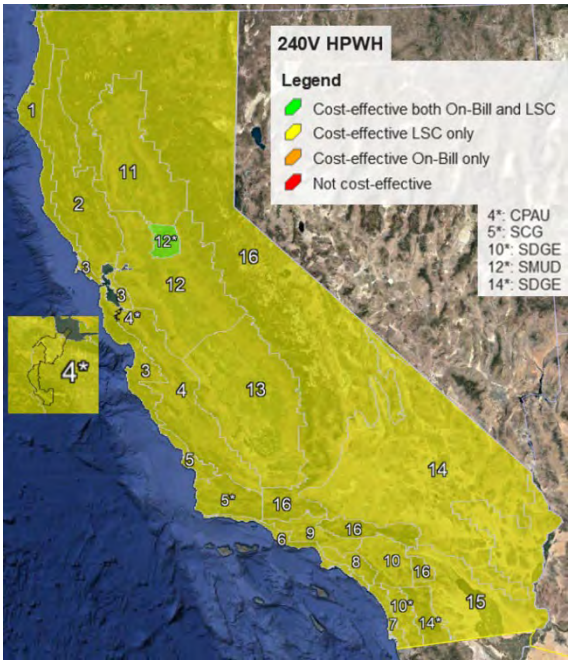

Figure 6: 240V Federal Minimum HPWH

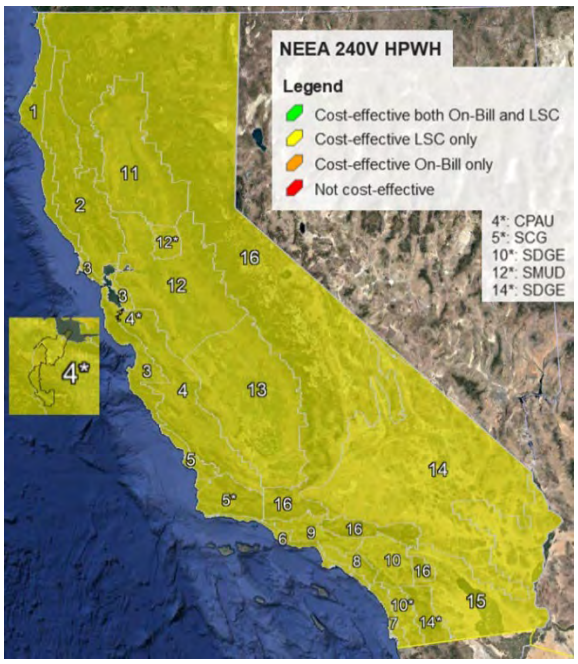

Figure 7: 240V Market Standard NEEA HPWH

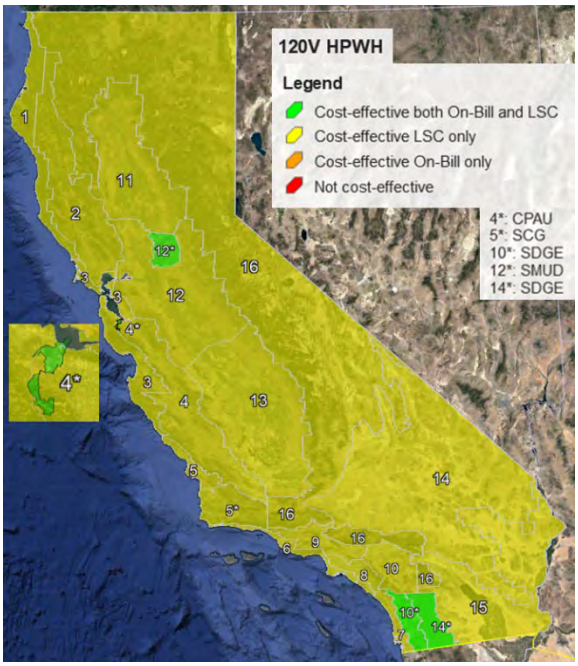

Figure 8: 120V Market Standard NEEA HPWH

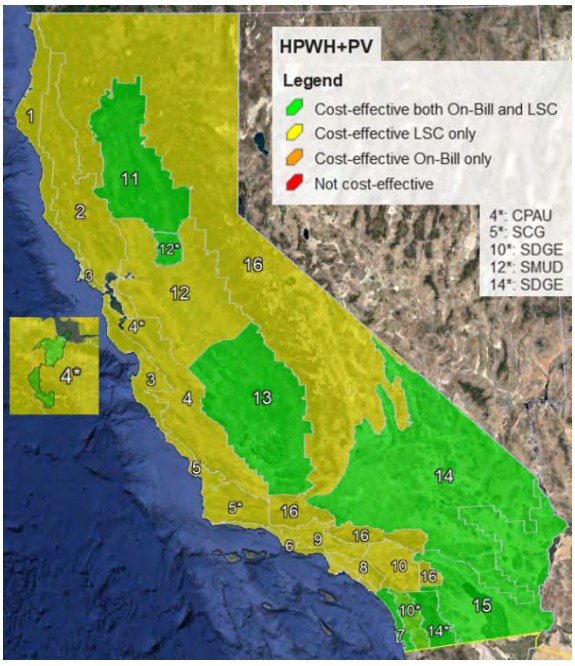

Figure 9: 240V Federal Minimum HPWH + PV

- Envelope and Duct Measures

Figure 10 through Figure 13 show the cost-effectiveness results of envelope and duct measures for the pre-1978 vintage including the following measures. The pre-1978 vintage is presented as representing the most favorable existing conditions for cost-effective upgrades. Newer homes with higher performing envelope may still benefit from these types of upgrade measures, but cost-effectiveness is reduced. Some measures, like R-13 wall insulation, aren't applicable to newer homes which would have been constructed originally with insulated walls.

- New R-6 ducts
- 10% duct leakage
- R-13 wall insulation
- R-49 attic insulation

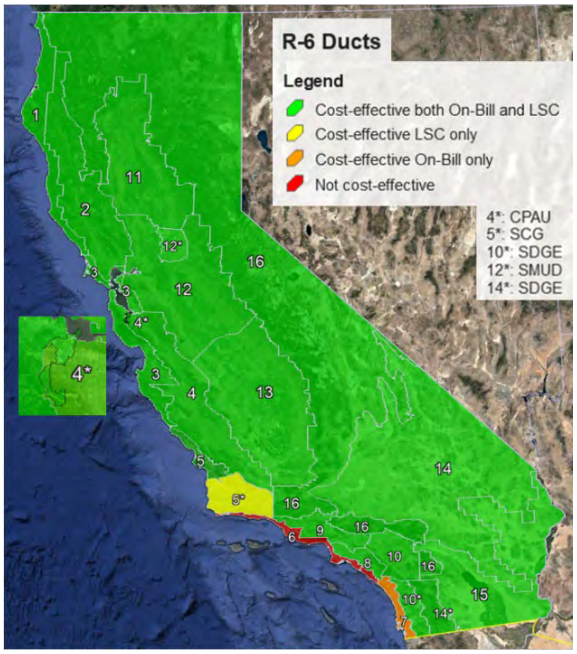

Figure 10: R-6 Ducts

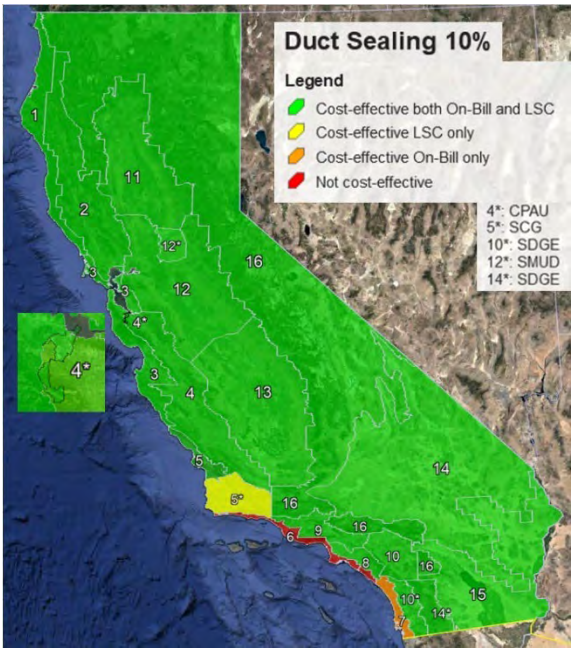

Figure 11: 10% Duct Leakage

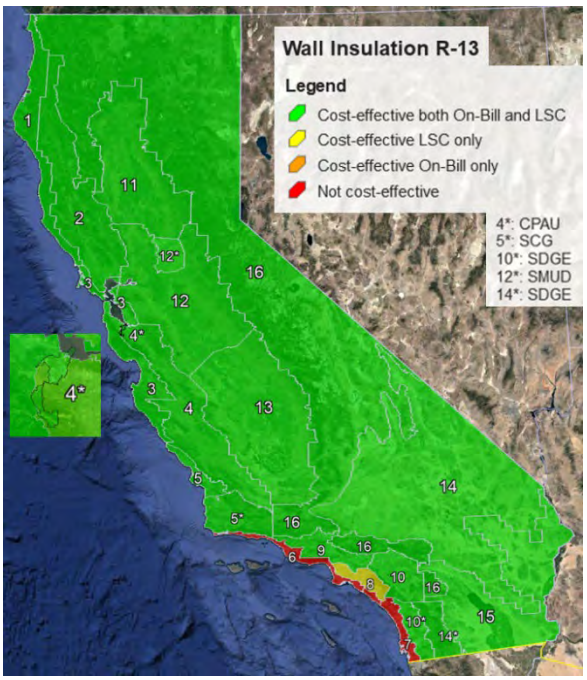

Figure 12: R-13 Wall Insulation

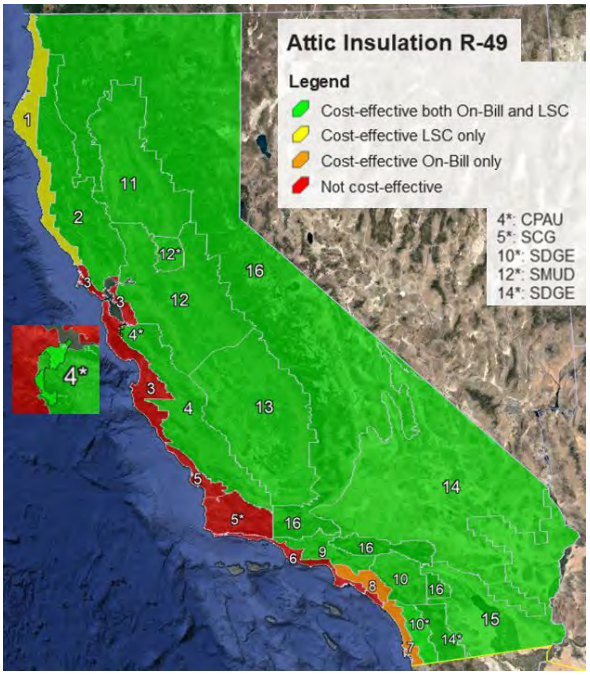

Figure 13: R-49 Attic Insulation

3.2 Climate Zone Case Studies

To better understand the details of the results, a few climate zones were selected to provide a more detailed presentation of cost-effectiveness results. Section 3.2.1 through 3.2.3 show the first-year incremental cost, first-year utility savings, and NPV for a variety of cases. Section 3.2.4 shows the sensitivity of the cost effectiveness results due to varying utility escalation rates, the impact of CARE rates, future equipment cost assumptions, and the need for electrical panel upgrades. The climate zones were selected to be representative of areas of significant reach code activity. Please refer to the Cost-Effectiveness Explorer (Statewide Reach Codes, 2023) or the source dataset for the full analysis.

3.2.1 HPSH Cost-Effectiveness

Cost-effectiveness of heat pump space heating measures for Climate Zones 12 and 16 is summarized in Table 11 and Table 12 below. In Climate Zone 12, HPSH measures are cost-effective based on LSC in all cases except the ductless MSHP cases and are cost-effective On-Bill with SMUD rates in all cases except the DFHP case with a new furnace and the ductless MSHP cases. These measures are cost-effective On-Bill with PGE for the DFHP with an existing furnace and ducted MSHP measures. Climate Zone 16 provides an example of HPSH cost-effectiveness in a cold climate where almost all HPSH measures are cost effective based on LSC but not cost-effective On-Bill.

Table 11. HPSH CZ 12 [1992-2010]

Measure	First Incremental Cost	2025 LSC NPV	PGE		SMUD	
			First-year Utility Savings	On-Bill NPV	First-year Utility Savings	On-Bill NPV
DFHP Existing Furnace	$1,960	$7,093	($19)	$1,633	$247	$7,693
DFHP New Furnace	$4,023	$3,915	($34)	($3,134)	$234	$2,979
HPSH (Std Efficiency)	$1,172	$6,990	($147)	($2,151)	$246	$6,812
HPSH (High Efficiency)	$4,149	$5,366	$13	($3,368)	$300	$3,160
Ducted MSHP	$1,421	$9,136	$10	$378	$298	$6,951
Ductless MSHP (Std Efficiency)	$13,336	($9,175)	$30	($18,039)	$276	($12,428)
Ductless MSHP (High Efficiency)	$17,266	($6,753)	$409	($15,853)	$423	($15,532)
HPSH + PV	$10,780	$5,289	$452	($59)	$885	$9,821

Table 12. HPSH CZ 16 [1992-2010]

Measure	First Incremental Cost	2025 LSC NPV	PGE	
			First-year Utility Savings	On-Bill NPV
DFHP Existing Furnace	$2,397	$7,289	($116)	($1,891)
DFHP New Furnace	$4,757	$2,457	($133)	($6,322)
HPSH (Std Efficiency)	$2,725	$11,142	($480)	($8,532)
HPSH (High Efficiency)	$5,701	$12,099	($204)	($7,125)
Ducted MSHP	$2,155	$16,554	($221)	($2,853)
Ductless MSHP (Std Efficiency)	$13,336	($134)	($170)	($19,742)
Ductless MSHP (High Efficiency)	$17,266	$9,397	$539	($10,031)
HPSH + PV	$12,333	$10,640	$316	($1,949)

3.2.2 HPWH Cost-Effectiveness

Cost-effectiveness of heat pump water heating measures for Climate Zones 12 and 16 is summarized in Table 13 and Table 14 below. This sensitivity study looks at a wider range of HPWH tank locations and whether or not the unit has ducting for supply and exhaust air. All the HPWH measures in Climate Zones 12 and 16 are cost effective based on LSC.

Table 13. HPWH CZ 12 [1992-2010]

Measure	First Incremental Cost	2025 LSC NPV	PGE		SMUD	
			First-Year Utility Savings	On-Bill NPV	First-Year Utility Savings	On-Bill NPV
240V Fed. Min. HPWH	$4,332	$3,536	($213)	($8,738)	$191	$477
240V Market Std. NEEA HPWH	$5,193	$4,304	($82)	($7,164)	$230	($56)
240V Market Std. NEEA HPWH + DR	$5,193	$5,536	($21)	($5,773)	$248	$362
120V Market Std. NEEA HPWH	$2,893	$9,730	($2)	($1,651)	$254	$4,203
240V Fed. Min. HPWH (Exterior Closet)	$4,751	$2,834	($224)	($9,431)	$186	($78)
240V Fed. Min. HPWH (Interior Closet)	$4,413	$3,123	($71)	($6,138)	$188	($235)
240V Fed. Min. HPWH (Interior Closet, ducted)	$5,492	$3,359	($202)	($9,505)	$205	($231)
240V Fed. Min. HPWH + PV	$13,940	$3,567	$577	($2,300)	$831	$3,486

Table 14. HPWH CZ 16 [1992-2010]

Measure	First Incremental Cost	2025 LSC NPV	PGE	
			First-Year Utility Savings	On-Bill NPV
240V Fed. Min. HPWH	$4,332	$4,186	($250)	($9,307)
240V Market Std. NEEA HPWH	$5,193	$4,088	($160)	($8,652)
240V Market Std. NEEA HPWH + DR	$5,193	$5,653	($79)	($6,804
120V Market Std. NEEA HPWH	$2,893	$10,646	($13)	($1,602)
240V Fed. Min. HPWH (Exterior Closet)	$4,751	$3,317	($268)	($10,154)
240V Fed. Min. HPWH (Interior Closet)	$4,413	$5,004	($18)	($4,690)
240V Fed. Min. HPWH (Interior Closet, ducted)	$5,492	$4,857	($202)	($9,174)
240V Fed. Min. HPWH + PV	$13,940	$5,049	$620	($1,043)

3.2.3 Envelope & Duct Improvement Cost-Effectiveness

Cost-effectiveness of envelope and duct measures for Climate Zones 3, 10, and 12 is summarized in Table 15 through Table 17.

Table 15. Envelope and Duct Measures CZ 3 [Pre-1978]

Measure	First Incremental Cost	2025 LSC NPV	PG&E	
			First-year Utility Savings	On-Bill NPV
R-6 Ducts	$4,808	$2,851	$188	$463
R-8 Ducts	$6,311	$1,747	$198	($776)
10% Duct Sealing	$2,590	$1,956	$104	$397
R-13 Wall Insulation	$2,950	$3,476	$144	$1,221
R-38 Attic Insulation	$6,762	($1,567)	$127	($3,178)
R-49 Attic Insulation	$7,446	($1,768)	$139	($3,520)
R-30 Raised Floor Insulation	$4,113	$9,008	$224	$2,975
Cool Roof (0.20 Ref)	$893	($2,419)	($18)	($1,811)

Table 16. Envelope and Duct Measures CZ 10 [Pre-1978]

Measure	First Incremental Cost	2025 LSC NPV	SCE/SCG		SDGE	
			First-year Utility Savings	On-Bill NPV	First-year Utility Savings	On-Bill NPV
R-6 Ducts	$4,808	$7,463	$783	$13,168	$1,100	$22,155
R-8 Ducts	$6,311	$6,326	$800	$12,076	$1,125	$21,268
10% Duct Sealing	$2,590	$3,438	$370	$5,969	$518	$10,166
R-13 Wall Insulation	$2,950	$1,795	$179	$1,476	$250	$3,494
R-38 Attic Insulation	$6,762	$664	$416	$2,951	$582	$7,654
R-49 Attic Insulation	$7,446	$796	$467	$3,435	$655	$8.756
R-30 Raised Floor Insulation	$4,113	($999)	($29)	($4,235)	($46)	($4,687)
Cool Roof (0.20 Ref)	$893	$428	$174	$2,647	$246	$4,656

Table 17. Envelope and Duct Measures CZ 12 [Pre-1978]

Measure	First Incremental Cost	2025 LSC NPV	PG&E		SMUD	
			First-year Utility Savings	On-Bill NPV	First-year Utility Savings	On-Bill NPV
R-6 Ducts	$4,808	$11,609	$804	$14,727	$413	$5,816
R-8 Ducts	$6,311	$10,722	$828	$13,849	$427	$4,711
10% Duct Sealing	$2,590	$6,418	$397	$7,280	$222	$3,281
R-13 Wall Insulation	$2,950	$5,774	$262	$4,054	$187	$2,342
R-38 Attic Insulation	$6,762	$3,727	$499	$5,461	$261	$19
R-49 Attic Insulation	$7,446	$4,092	$552	$6,063	$288	$33
R-30 Raised Floor Insulation	$4,113	$5,245	$27	($1,176)	$156	$1,175
Cool Roof (0.20 Ref)	$893	($354)	$154	$2,123	$44	($386)

3.2.4 Sensitivities

Table 18 shows the On-Bill NPV results of Climate Zone 12 with PG&E utility rates and the impacts of escalation rates, and CARE rates. The "Standard Results" in Table 18 assumes the escalation rates used in the analysis presented elsewhere in this report. Table 19 shows the impact of electrical panel upgrades. The "Standard Results" in Table 19 does not assume a panel upgrade is required.

Table 18. Sensitivity Analysis Results for On-Bill NPV Cost-Effectiveness in Climate Zone 12, PG&E

Measure	Vintage	Standard Results	2025 LSC Escalation	CARE
DFHP Existing Furnace	1992-2010	$1,063	$8,443	$1,884
DFHP New Furnace	1992-2010	($6,770)	$383	($5,846)
HPSH (Std Efficiency)	1992-2010	($2,151)	$6,011	($220)
HPSH (High Efficiency)	1992-2010	($3,368)	$4,987	($2,721)
Ducted MSHP	1992-2010	$378	$8,729	$1,057
Ductless MSHP (Std Efficiency)	1992-2010	($18,039)	($10,732)	($17,623)
Ductless MSHP (High Efficiency)	1992-2010	($15,853)	($8,091)	($18,460)
HPSH + PV	1992-2010	($59)	$8,822	($1,255)
240V Fed. Min. HPWH	1992-2010	($8,738)	($2,433)	($6,448)
240V Market Std. NEEA HPWH	1992-2010	($7,164)	($694)	($5,918)
240V Market Std. NEEA HPWH + DR	1992-2010	($5,773)	$770	(5,014)
120V Market Std. NEEA HPWH	1992-2010	($1,651)	$4,930	(1,038)
240V Fed. Min. HPWH (Exterior Closet)	1992-2010	($9,431)	($3,184)	($7,055)
240V Fed. Min. HPWH (Interior Closet)	1992-2010	($6,138)	($1,000)	($5,098)
240V Fed. Min. HPWH (Interior Closet, ducted)	1992-2010	($9,505)	($2,836)	($7,271)
240V Fed. Min. HPWH + PV	1992-2010	($2,300)	$4,952	($4,858)
R-6 Ducts	Pre-1978	$14,727	$18,685	$8,592
R-8 Ducts	Pre-1978	$13,849	$17,990	$7,532
10% Duct Sealing	Pre-1978	$7,280	$9,752	$4,294
R-13 Wall Insulation	Pre-1978	$4,054	$6,898	$2,196
R-38 Attic Insulation	Pre-1978	$5,461	$8,126	$1,668
R-49 Attic Insulation	Pre-1978	$6,063	$8,978	$1,864
R-30 Raised Floor Insulation	Pre-1978	($1,776)	$2,468	($1,602)
Cool Roof (0.20 Ref)	Pre-1978	$2,123	$1,848	$851

Table 19. Electric Panel Upgrade Sensitivity for CZ 12 [1992-2010]

Measure	Standard Results		Electric Panel Upgrade	
	On-Bill NPV	LSC NPV	On-Bill NPV	LSC NPV
HPSH (Std Efficiency)	($2,151)	$6,990	($4,931)	$4,210
240V Fed. Min. HPWH	($8,738)	$3,536	($11,624)	$756

3.3 Gas Pathways for Heat Pump Replacements

Many jurisdictions are exploring policy options to accelerate the decarbonization of existing homes. A recent Ninth Circuit Court ruling in *California Rest. Ass'n v. City of Berkeley*[20] invalidated Berkeley's ordinance banning the installation of gas infrastructure in new construction. The ruling stated that the ordinance effectively banned covered products and was preempted by the Energy Policy and Conservation Act ("EPCA"), 42 U.S.C. § 6297(c). Given the possible impacts of that ruling, the Reach Codes Team analyzed policy options targeting equipment replacements that allow for the installation of either electric or gas-fueled equipment. These packages include gas equipment combined with additional efficiency measures resulting in options that are reasonably energy or LSC cost equivalent, to the extent feasible.

For space heating, the heat pump path is a DFHP (existing furnace).. The gas pathway is a new air conditioner with the following list of efficiency upgrades:

- 400 cfm/ton system airflow (HERS verified).
- 0.35 W/cfm fan efficacy (HERS verified).
- Refrigerant charge verification (HERS verified).
- R-8 ducts, 5% leakage (HERS verified).
- R-49 (from R-30) attic insulation.
- Air sealing of the ceiling from 7 to 6.5 ACH50.

The two pathways are presented in Figure 14 comparing total LSC energy use relative to the existing home for the 1992-2010 vintage. In most climate zones, the DFHP (existing furnace) path results in higher energy savings, in the milder climates the air conditioner path saves marginally more energy. A reach code that establishes requirements when an air conditioner is replaced or installed new, could allow for either a heat pump to be installed or an air conditioner as long as the performance measures listed above are met. Note that in this analysis a DFHP (existing furnace) was used; however, a reach code could require a different heat pump measure for the heat pump path. This approach aligns with the CEC's proposal for the 2025 Title 24 code cycle for heat pump alterations in single family homes (California Energy Commission, 2023).

[20] *California Rest. Ass'n v. City of Berkeley*, 65 F.4th 1045 (9th Cir. 2023) amended by 89 F.4th 1094 (9th Cir. 2024).

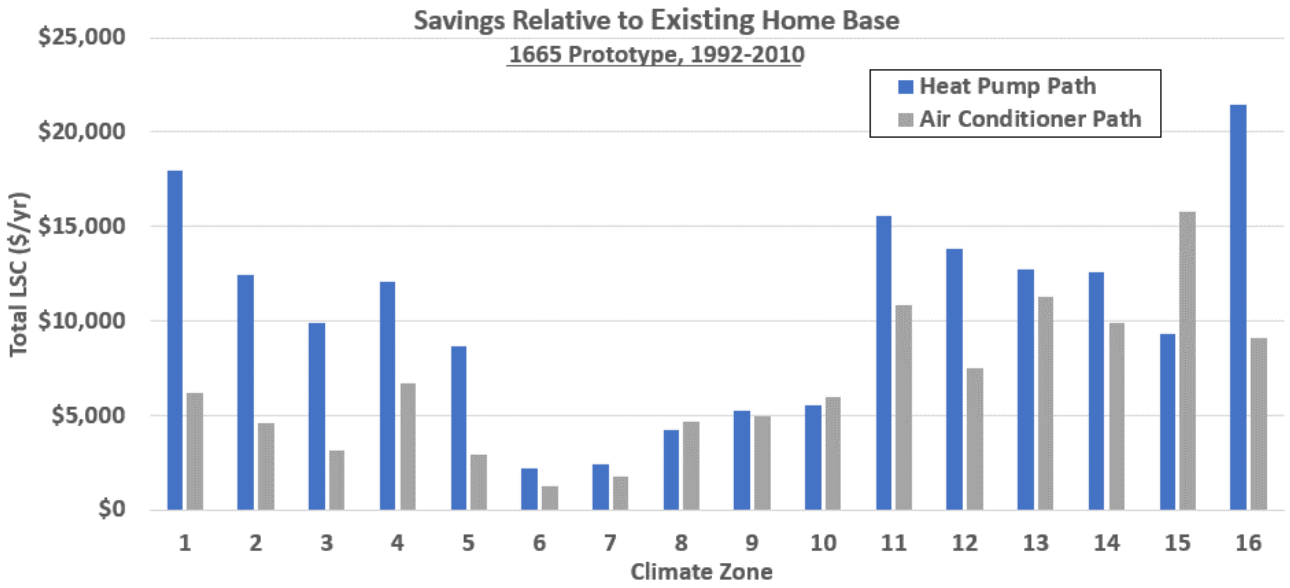

Figure 14. Heat pump space heater path compared to the air conditioner path.

For water heating, the federal minimum HPWH case was used to develop the package. The HPWH was compared to a new gas storage water heater with a 50% solar thermal backup system.

The two pathways are presented in Figure 15 comparing total LSC energy use relative to the existing home for the 1992-2010 vintage. In all climate zones, the heat pump path results in higher energy savings than the gas path. A reach code that establishes requirements when a water heater is replaced could allow for either a HPWH to be installed or a gas water heater in combination with a solar thermal system that meets the solar fraction requirements listed above.

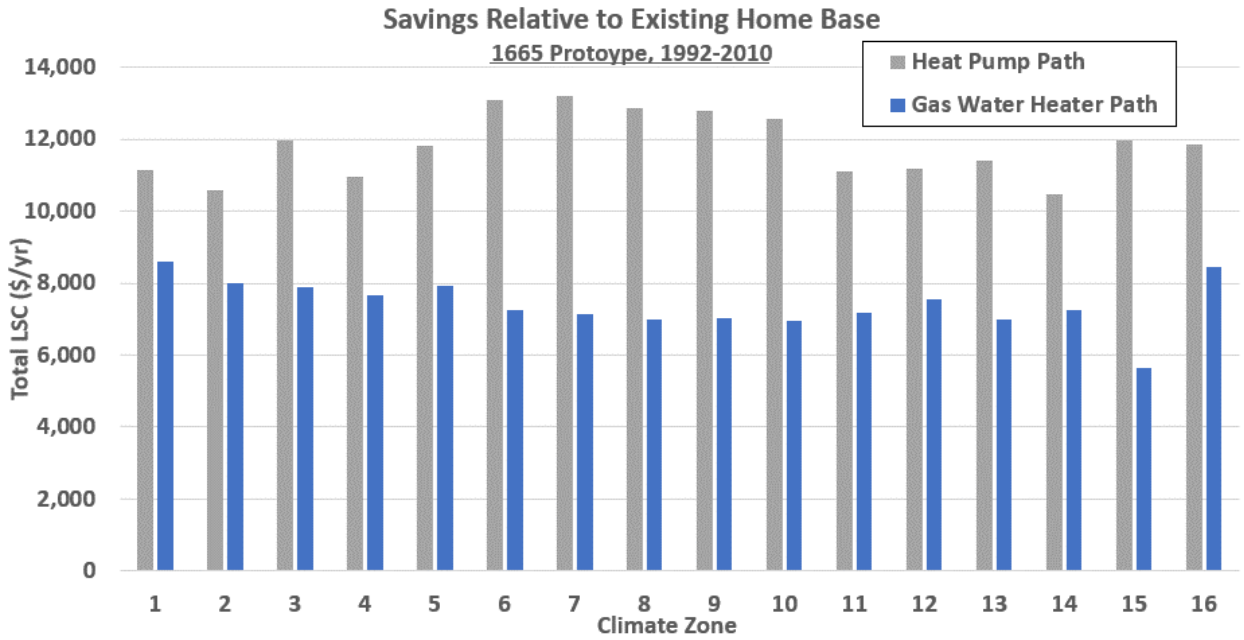

Figure 15. Heat pump water path compared to gas with solar thermal.

4 Recommendations and Discussion

This analysis evaluated the feasibility and cost-effectiveness of retrofit measures in California existing homes built before 2010. The Statewide Reach Codes Team used both On-Bill and LSC-based LCC approaches to evaluate cost-effectiveness and quantify the energy cost savings associated with energy efficiency measures compared to the incremental costs associated with the measures.

Conclusions and Discussion:

1. Envelope measures. Improving envelope performance is very cost-effective in many older homes. In addition to reducing utility costs these measures provide many other benefits such as improving occupant comfort and satisfaction and increasing a home's ability to maintain temperatures during extreme weather events and power outages. Below is a discussion of the results of specific measures.
    a. Adding attic insulation is cost effective based on both LSC and On-Bill in many climate zones in homes with no more than R-19 existing attic insulation levels. Increasing attic insulation from R-30 to R-49 was still found to be cost-effective based on at least one metric in the colder and hotter climates of Climate Zone 10 (SDG&E territory only) through 16.
    b. Insulating existing uninsulated walls is very cost-effective based on both metrics everywhere except Climate Zones 6 and 7 (in Climate Zone 8 it's only cost-effective based on LSC).
    c. Adding R-19 or R-30 floor insulation is cost-effective based on LSC in the older two vintages (Pre-1978 and 1978-1991) in all climate zones except Climate Zones 6-10.
    d. Replacing old single pane windows with new high-performance windows has a very high cost and is typically not done for energy savings alone. However, energy savings are substantial and justify cost-effectiveness of this measure based on at least one metric in Climate Zones 4, 8 through 12 (PG&E territory only), and 13 through 16.
    e. At time of roof replacement, a cool roof with an aged solar reflectance of 0.25 was found to be cost-effective in Climate Zones 4, 6 through 12 (PG&E territory only), and 13 through 15. When the roof deck is replaced during a roof replacement, adding a radiant barrier is low cost and provides substantial cooling energy savings to be cost-effective in almost all climate zones and homes.
2. Duct measures: Many older homes have old, leaky duct systems that should be replaced when they reach the end of life, typically 20-30 years. In this case, installing new ducts was found to be cost-effective based on at least one metric (both in most cases) everywhere except mild Climate Zone 7 and Climate Zones 5 and 6 in the 1978-1991 vintage. If duct systems still have remaining life they should be sealed and tested to meet 10% leakage or lower; however, duct upgrades alone were only found to be cost-effective for newer homes in Climate Zones 10 (SDG&E territory only), 11, and 13 through 16. Duct upgrades may be able to be coupled with other measures to reduce the cost.
3. Heat pump space heating: HPSHs were found to be LSC cost-effective in many cases. The DFHP (existing furnace) was LSC cost-effective everywhere except Climate Zone 15. The HPSH was LSC cost-effective everywhere except Climate Zones 8 and 15.
    a. Challenges to On-Bill cost-effectiveness include higher first costs and higher first-year utility costs due to higher electricity tariffs relative to gas tariffs. SMUD and CPAU are two exceptions where first year utility costs are lower for heat pumps than for gas equipment. Table 11 shows the impact of utility rates on cost-effectiveness of HPSH where the standard and high efficiency HPSH and the HPSH + PV measures are cost-effective under SMUD but not PG&E. Even with higher first year utility bills, there were some cases that still proved On-Bill cost-effective including the DFHP with an existing furnace in the central valley and northern coastal PG&E territories, the ducted MSHP in the central valley as well as Climate Zone 14 in SDG&E territory, and the HPSH + PV measure in CZ 3-5 (PGE), 7-11, and 12 (SMUD) – 15.
    b. The ductless MSHPs, evaluated for homes with existing ductless systems, were only found to be cost-effective based on either metric in Climate Zones 1 and 16. Ductless MSHPs have a high incremental cost because it is a more sophisticated system than the base model of a wall furnace with a window AC unit. However, the ductless MSHP would provide greater comfort benefits if properly installed to

directly condition all habitable spaces (as is required under the VCHP compliance credit as evaluated in this study) which may be an incentive for a homeowner to upgrade their system.

c. Higher efficiency equipment lowered utility costs in all cases and improved cost-effectiveness in many cases, particularly with a ducted MSHP.

4. Heat pump water heating: All the HPWH measures were LSC cost-effective in all climate zones. Most measures were not On-Bill cost-effective with the exception of the HPWH + PV which was cost-effective On-Bill in CPAU, SMUD, and SDG&E territories in addition to Climate Zones 11, 13, 14, and 15. The HPWH measures share many of the same challenges as the HPSH measures to achieving cost-effectiveness including high first costs and utility rates and assumptions. Table 13 shows the impact of utility rates on cost-effectiveness where some HPWH measures are cost-effective under SMUD utility rates but are not cost-effective anywhere under PG&E rates in Climate Zone 12.
    a. Various HPWH locations were also explored, however there are some factors outside of cost-effectiveness that should also be considered.
        i. HPWHs in the conditioned space can provide benefits such as free cooling during the summer, reduced tank losses, and shorter pipe lengths, and in some cases show improved cost-effectiveness over garage located HPWHs. However, there are various design considerations such as noise, comfort concerns, and condensate removal. Ducting the inlet and exhaust air resolves comfort concerns but adds costs and complexity. Split heat pump water heaters address these concerns, but currently there are limited products on the market and there is a cost premium relative to the packaged products.
        ii. Since HPWHs extract heat from the air and transfer it to water in the storage tank, they must have adequate ventilation to operate properly. Otherwise, the space cools down over time, impacting the HPWH operating efficiency. This is not a problem with garage installations but needs to be considered for water heaters located in interior or exterior closets. For the 2025 Title 24 code the CEC is proposing that all HPWH installations meet mandatory ventilation requirements (California Energy Commission, 2023).
5. The contractor surveys revealed overall higher heat pump costs than what has been found in previous analyses. This could be due to incentive availability raising demand for heat pumps and thereby increasing the price. This price increase may be temporary and may come down once the market stabilizes. There are also new initiatives to obtain current costs including the TECH Clean California program[21] that publishes heat pump data and costs; however, at the time of this analysis, the TECH data did not contain incremental costs because it only had the heat pump costs but not the gas base case costs.
6. Table 18 shows how CARE rates and escalation rate assumptions will impact cost-effectiveness.
    a. Applying CARE rates in the IOU territories has the overall impact to increase utility cost savings for an all-electric building compared to a code compliant mixed fuel building, improving On-Bill cost-effectiveness. This is due to the CARE discount on electricity being higher than that on gas. The reverse occurs with efficiency measures where lower utility rates reduce savings and subsequently reduce cost-effectiveness.
    b. If gas tariffs are assumed to increase substantially over time, in-line with the escalation assumption from the 2025 LSC development, cost-effectiveness substantially improves for the heat pump measures over the 30-year analysis period and many cases become cost-effective that were not found to be cost-effective under the CPUC / 2022 TDV escalation scenario. There is much uncertainty surrounding future tariff structures as well as escalation values. While it's clear that gas rates will increase, how much and how quickly is not known. Future electricity tariff structures are expected to evolve over time, and the CPUC has an active proceeding to adopt an income-graduated fixed charge that benefits low-income customers and supports electrification measures for all customers.[22] The CPUC will decide in mid-2024 and the new rates are expected to be in place later that year or in 2025.

[21] TECH Public Reporting Home Page (techcleanca.com)
[22] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/demand-flexibility-rulemaking

While the anticipated impact of this rate change is lower volumetric electricity rates, the rate design is not finalized. While lower volumetric electricity rates provide many benefits, it also will make building efficiency measures harder to justify as cost-effective due to lower utility bill cost savings.

7. Under NBT, utility cost savings for PV are substantially less than what they were under prior net energy metering rules (NEM 2.0); however, savings are sufficient to be On-Bill cost-effective in all climate zones except Climate Zones 1 through 3 and 5 through 6.
    a. Combining a heat pump with PV allows the additional electricity required by the heat pump to be offset by the PV system while also increasing on-site utilization of PV generation rather than exporting the electricity back to the grid at a low rate.
    b. While not evaluated in this study, coupling PV with battery systems can be very advantageous under NBT increasing utility cost savings because of improved on-site utilization of PV generation and fewer exports to the grid.

Recommendations:

1. There are various approaches for jurisdictions who are interested in reach codes for existing buildings. Some potential approaches are listed below along with key considerations.
    a. Prescriptive measures: Non-preempted measures that are found to be cost-effective may be prescriptively required in a reach code. One example of this type or ordinance is a cool roof requirement at time of roof replacement. Another example is requiring specific cost-effective measures for larger remodels, such as high-performance windows when new windows are installed or duct sealing and testing where ducts are in unconditioned space.
    b. Replacement equipment: This flavor of reach code sets certain requirements at time of equipment replacement. This study evaluated space heating and water heating equipment. Where a heat pump measure was found to be cost-effective based on either LSC or On-Bill, this may serve as the basis of a reach code given the following considerations.
        i. Where reach codes reduce energy usage and are not just fuel switching, cost-effectiveness calculations are required and must be based on equipment that does not exceed the federal minimum efficiency requirements.
        ii. Where reach codes are established using cost-effectiveness based on LSC, utility bill impacts and the owner's first cost should also be reviewed and considered.
        iii. A gas path should also be prescriptively allowed to safely satisfy federal preemption requirements considering the CRA v. Berkeley case.[23] Additional requirements may apply to the gas path, as described in Section 3.3, as long as the paths are reasonably energy or cost equivalent.
    c. "Flexible Path", minimum energy savings target: This flexible approach establishes a target for required energy savings based on a measure or a set of measures that were found to be cost-effective based on either LSC or On-Bill. A points menu compares various potential upgrades ranging from efficiency, PV, and fuel substitution measures, based on site or source energy savings. The applicant must select upgrades that individually or in combination meet the minimum energy savings target. The measures used to set the target should be non-preempted measures.
2. Equipment replacement ordinances should consider appropriate exceptions for scenarios where it will be challenging to meet the requirements, such as location of the HPWH, total project cost limitations, or the need for service panel upgrades that wouldn't have been required as part of the proposed scope of work in absence of the reach code.
3. Consider extending relevant proposals made by the CEC for the 2025 Title 24 code (California Energy Commission, 2023) in ordinances that apply under the 2022 Title 24 code, such as the following:
    a. Mandatory ventilation requirements for HPWH installations (Section 110.3(c)7).

[23] https://www.publichealthlawcenter.org/sites/default/files/2024-01/CRA-v-Berkeley-Ninth-Circuit-Opinion-Jan2024.pdf

   b. Requirement for HERS verified refrigerant charge verification for heat pumps in all climate zones (Table 150.1-A[24]).
4. When evaluating reach code strategies, the Reach Codes Team recommends that jurisdictions consider combined benefits of energy efficiency alongside electrification. Efficiency and electrification have symbiotic benefits and are both critical for decarbonization of buildings. As demand on the electric grid is increased through electrification, efficiency can reduce the negative impacts of additional electricity demand on the grid, reducing the need for increased generation and storage capacity, as well as the need to upgrade upstream transmission and distribution equipment.
5. Education and training can play a critical role in ensuring that heat pumps are installed, commissioned, and controlled properly to mitigate grid impacts and maximize occupant satisfaction. Below are select recommended strategies.
   a. The Quality Residential HVAC Services Program[25] is an incentive program to train California contractors in providing quality installation and maintenance while advancing energy-efficient technologies in the residential HVAC industry. Jurisdictions can market this to local contractors to increase the penetration of contractors skilled in heat pump design and installation.
   b. Educate residents and contractors of available incentives, tax credits, and financing opportunities.
   c. Educate contractors on code requirements. Energy Code Ace provides free tools, trainings, and resource to help Californians comply with the energy code. Contractors can access interactive compliance forms, fact sheets, and live and recorded trainings, among other things, on the website: https://energycodeace.com/. Jurisdictions can reach out to Energy Code Ace directly to discuss offerings.
6. Health and safety
   a. Combustion Appliance Safety and Indoor Air Quality: Implementation of some of the recommended measures will affect the pressure balance of the home which can subsequently impact the safe operation of existing combustion appliances as well as indoor air quality. Buildings with older gas appliances can present serious health and safety problems which may not be addressed in a remodel if the appliances are not being replaced. It is recommended that the building department require inspection and testing of all combustion appliances located within the pressure boundary of the building after completion of retrofit work that involves air sealing or insulation measures.
   b. Jurisdictions may consider requiring mechanical ventilation in homes where air sealing has been conducted. In older buildings, outdoor air is typically introduced through leaks in the building envelope. After air sealing a building, it may be necessary to forcefully bring in fresh outdoor air using supply and/or exhaust fans to minimize potential issues associated with indoor air quality.

[24] This requirement does not show up in the Express Terms for alterations in Section 150.2(b)1F, but the Statewide Reach Codes Team expects that it will be added to the next release of the proposed code language in the 45-day language as it aligns with the proposal made by the Codes and Standards Enhancement Team (Statewide CASE Team, 2023).
[25] https://qualityhvac.frontierenergy.com/

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6 Appendices

6.1 Map of California Climate Zones

Climate zone geographical boundaries are depicted in Figure 16. The map in Figure 16 along with a zip-code search directory is available at: https://ww2.energy.ca.gov/maps/renewable/building_climate_zones.html

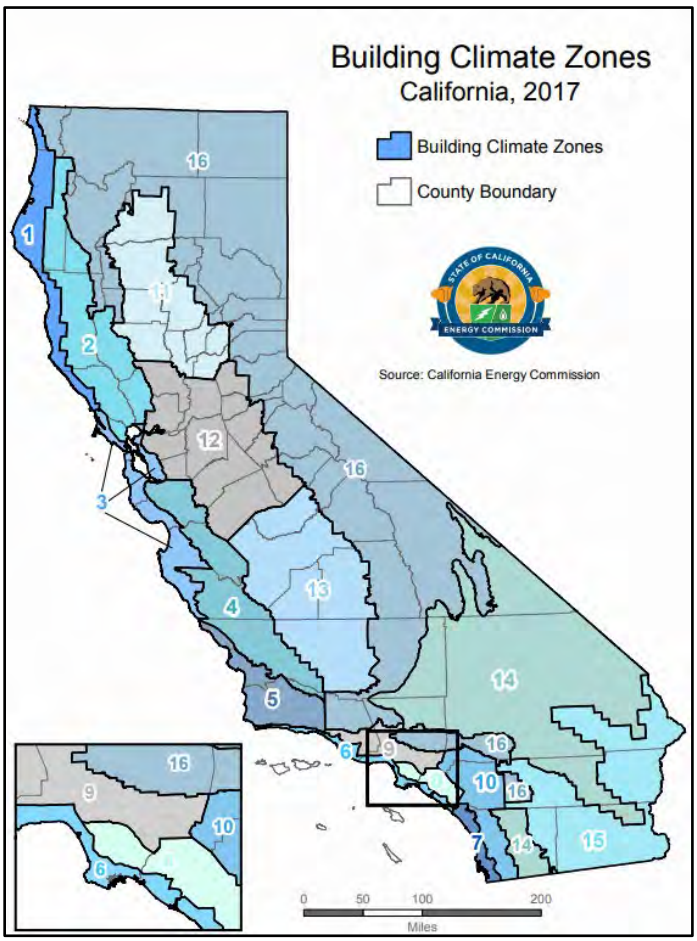

Figure 16. Map of California climate zones.

6.2 Utility Rate Schedules

The Reach Codes Team used the CA IOU and POU rate tariffs detailed below to determine the On-Bill savings for each package. The California Climate Credit was applied for both electricity and natural gas service for the IOUs using the 2023 credits shows below.[26] The credits were applied to reduce the total calculated annual bill, including any fixed fees or minimum bill amounts.

2023 Electric California Climate Credit Schedule

	February or March	April	May	June	July	Aug	Sept	Oct
PG&E	$38.39							$38.39
SCE	$71.00							$71.00
SDG&E	$60.70							$60.70

Residential Natural Gas California Climate Credit

In 2023, the 2023 Natural Gas California Climate Credit will be distributed in February or March instead of April.

	2018‡	2019	2020	2021	2022	2023	Total Value Received Per Household 2018-2023
PG&E	$30	$25	$27	$25	$48	$52.78	**$208**
SDG&E	*	$34	$21	$18	$43	$43.40	**$162**
Southwest Gas	$22	$25	$27	$28	$49	$56.35	**$207**
SoCalGas	*	$50	$26	$22	$44	$50.77	**$194**

Electricity rates reflect the most recently approved tariffs. Monthly gas rates were estimated based on recent gas rates (November 2023) and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from monthly residential tariffs between 2014 and 2023 (between 2017 and 2023 for CPAU). 12-month curves were created from monthly gas rates for each of the ten years (Seven years for CPAU). These annual curves were then averaged to arrive at an average normalized annual curve. This was conducted separately for baseline and excess energy rates. Costs used in this analysis were then derived by establishing the most recent baseline and excess rate from the latest tariff as a reference point (November 2023), and then using the normalized curve to estimate the cost for the remaining months relative to the reference point rate.

[26] https://www.cpuc.ca.gov/industries-and-topics/natural-gas/greenhouse-gas-cap-and-trade-program/california-climate-credit

6.2.1 Pacific Gas & Electric

The following pages provide details on the PG&E electricity and natural gas tariffs applied in this study. Table 20 describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of $0.07051/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between December 2022 and November 2023.

Table 20. PG&E Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ01	V
CZ02	X
CZ03	T
CZ04	X
CZ05	T
CZ11	R
CZ12	S
CZ13	R
CZ16	Y

The PG&E monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in Table 21. These rates are based on applying a normalization curve to the November 2023 tariff based on ten years of historical gas data. Corresponding CARE rates reflect the 20 percent discount per the GL-1 tariff.

Table 21. PG&E Monthly Gas Rate ($/therm)

Month	Total Charge	
	Baseline	Excess
January	$2.05	$2.43
February	$2.08	$2.46
March	$1.92	$2.31
April	$1.80	$2.20
May	$1.77	$2.18
June	$1.78	$2.18
July	$1.80	$2.20
August	$1.85	$2.26
September	$1.92	$2.33
October	$1.99	$2.40
November	$2.06	$2.46
December	$2.05	$2.44

Residential
GAS
Baseline Territories and Quantities [1/]

Effective April 1, 2022 - Present

BASELINE QUANTITIES (Therms **Per Day** Per Dwelling Unit)

Individually Metered			
Baseline Territories	**Summer (April-October) Effective Apr. 1, 2022**	**Winter Off-Peak (Nov, Feb, Mar) Effective Nov. 1, 2022**	**Winter On-Peak (Dec, Jan) Effective Dec. 1, 2022**
P	0.39	1.88	2.19
Q	0.56	1.48	2.00
R	0.36	1.24	1.81
S	0.39	1.38	1.94
T	0.56	1.31	1.68
V	0.59	1.51	1.71
W	0.39	1.14	1.68
X	0.49	1.48	2.00
Y	0.72	2.22	2.58

Master Metered			
Baseline Territories	**Summer (April-October) Effective Apr. 1, 2022**	**Winter Off-Peak (Nov, Feb, Mar) Effective Nov. 1, 2022**	**Winter On-Peak (Dec, Jan) Effective Dec. 1, 2022**
P	0.29	1.01	1.13
Q	0.56	0.67	0.77
R	0.33	0.87	1.16
S	0.29	0.61	0.65
T	0.56	1.01	1.10
V	0.59	1.28	1.32
W	0.26	0.71	0.87
X	0.33	0.67	0.77
Y	0.52	1.01	1.13

Summer Season: Apr-Oct
Winter Off-Peak: Nov, Feb, Mar
Winter On-Peak: Dec, Jan

Advice Letter: 4589-G
Decision 21-11-016
GRC 2020 Ph II [Application 19-11-019]
Filed: Nov 22, 2019

Pacific Gas and Electric Company
U 39 Oakland, California

Revised Cal. P.U.C. Sheet No. 56550-E
Cancelling Revised Cal. P.U.C. Sheet No. 56229-E

ELECTRIC SCHEDULE E-TOU-C Sheet 2
RESIDENTIAL TIME-OF-USE (PEAK PRICING 4 - 9 p.m. EVERY DAY)

RATES: (Cont'd.)

E-TOU-C TOTAL BUNDLED RATES

Total Energy Rates ($ per kWh)	PEAK		OFF-PEAK	
Summer				
Total Usage	$0.53933	(I)	$0.45589	(I)
Baseline Credit (Applied to Baseline Usage Only)	($0.08851)	(R)	($0.08851)	(R)
Winter				
Total Usage	$0.43662	(I)	$0.40827	(I)
Baseline Credit (Applied to Baseline Usage Only)	($0.08851)	(R)	($0.08851)	(R)
Delivery Minimum Bill Amount ($ per meter per day)	$0.37612			
California Climate Credit (per household, per semi-annual payment occurring in the March* and October bill cycles)	($38.39)			

Total bundled service charges shown on customer's bills are unbundled according to the component rates shown below. Where the delivery minimum bill amount applies, the customer's bill will equal the sum of (1) the delivery minimum bill amount plus (2) for bundled service, the generation rate times the number of kWh used. For revenue accounting purposes, the revenues from the delivery minimum bill amount will be assigned to the Transmission, Transmission Rate Adjustments, Reliability Services, Public Purpose Programs, Nuclear Decommissioning, Competition Transition Charges, Energy Cost Recovery Amount, Wildfire Fund Charge, and New System Generation Charges based on kWh usage times the corresponding unbundled rate component per kWh, with any residual revenue assigned to Distribution.

* Pursuant to D.23-02-014, disbursement of the April 2023 residential Climate Credit shall begin by March 1, 2023.

(Continued)

Advice 7009-E
Decision

Issued by
Meredith Allen
Vice President, Regulatory Affairs

Submitted August 25, 2023
Effective September 1, 2023
Resolution

Pacific Gas and Electric Company
U 39 Oakland, California

Revised Cal. P.U.C. Sheet No. 56551-E
Cancelling Revised Cal. P.U.C. Sheet No. 56230-E

ELECTRIC SCHEDULE E-TOU-C Sheet 3
RESIDENTIAL TIME-OF-USE (PEAK PRICING 4 - 9 p.m. EVERY DAY)

RATES: (Cont'd.)

UNBUNDLING OF E-TOU-C TOTAL RATES

Energy Rates by Component ($ per kWh)	PEAK		OFF-PEAK	
Generation:				
Summer (all usage)	$0.19776		$0.13432	
Winter (all usage)	$0.14916		$0.12413	
Distribution:**				
Summer (all usage)	$0.17029	(I)	$0.15029	(I)
Winter (all usage)	$0.11618	(I)	$0.11286	(I)
Conservation Incentive Adjustment (Baseline Usage)			($0.02216)	(I)
Conservation Incentive Adjustment (Over Baseline Usage)			$0.06635	(I)
Transmission* (all usage)			$0.05254	
Transmission Rate Adjustments* (all usage)			$0.00059	
Reliability Services* (all usage)			$0.00069	
Public Purpose Programs (all usage)			$0.02578	
Nuclear Decommissioning (all usage)			$0.00135	
Competition Transition Charges (all usage)			$0.00030	
Energy Cost Recovery Amount (all usage)			($0.00071)	
Wildfire Fund Charge (all usage)			$0.00530	
New System Generation Charge (all usage)**			$0.00346	
Wildfire Hardening Charge (all usage)			$0.00254	
Recovery Bond Charge (all usage)			$0.00528	(R)
Recovery Bond Credit (all usage)			($0.00528)	(I)
Bundled Power Charge Indifference Adjustment (all usage)***			$0.01309	

* Transmission, Transmission Rate Adjustments and Reliability Service charges are combined for presentation on customer bills.
** Distribution and New System Generation Charges are combined for presentation on customer bills.
*** Direct Access, Community Choice Aggregation and Transitional Bundled Service Customers pay the applicable Vintaged Power Charge Indifference Adjustment. Generation and Bundled PCIA are combined for presentation on bundled customer bills.

(Continued)

Advice 7009-E
Decision

Issued by
Meredith Allen
Vice President, Regulatory Affairs

Submitted August 25, 2023
Effective September 1, 2023
Resolution

Pacific Gas and Electric Company
U 39 Oakland, California

Revised Cal. P.U.C. Sheet No. 56547-E
Cancelling Revised Cal. P.U.C. Sheet No. 56226-E

ELECTRIC SCHEDULE E-ELEC Sheet 2
RESIDENTIAL TIME-OF-USE (ELECTRIC HOME)
SERVICE FOR CUSTOMERS WITH QUALIFYING ELECTRIC TECHNOLOGIES

RATES:(Cont'd.)

TOTAL BUNDLED RATES

Base Services Charge ($ per meter per day)	$0.49281

Total Energy Rates ($ per kWh)	PEAK		PART-PEAK		OFF-PEAK	
Summer Usage	$0.56589	(I)	$0.40401	(I)	$0.34733	(I)
Winter Usage	$0.33438	(I)	$0.31229	(I)	$0.29843	(I)

California Climate Credit (per household, per semi-annual payment occurring in the March† and October bill cycles)	($38.39)

Total bundled service charges shown on a customer's bills are unbundled according to the component rates shown below.

UNBUNDLING OF TOTAL RATES

Energy Rates by Component ($ per kWh)	PEAK		PART-PEAK		OFF-PEAK	
Generation:						
Summer Usage	$0.28164		$0.18253		$0.13743	
Winter Usage	$0.11951		$0.09954		$0.08619	
Distribution:**						
Summer Usage	$0.17932	(I)	$0.11655	(I)	$0.10497	(I)
Winter Usage	$0.10994	(I)	$0.10782	(I)	$0.10731	(I)
Transmission* (all usage)	$0.05254		$0.05254		$0.05254	
Transmission Rate Adjustments* (all usage)	$0.00059		$0.00059		$0.00059	
Reliability Services* (all usage)	$0.00069		$0.00069		$0.00069	
Public Purpose Programs (all usage)	$0.02578		$0.02578		$0.02578	
Nuclear Decommissioning (all usage)	$0.00135		$0.00135		$0.00135	
Competition Transition Charges (all usage)	$0.00030		$0.00030		$0.00030	
Energy Cost Recovery Amount (all usage)	($0.00071)		($0.00071)		($0.00071)	
Wildfire Fund Charge (all usage)	$0.00530		$0.00530		$0.00530	
New System Generation Charge (all usage)**	$0.00346		$0.00346		$0.00346	
Wildfire Hardening Charge (all usage)	$0.00254		$0.00254		$0.00254	
Recovery Bond Charge (all usage)	$0.00528	(R)	$0.00528	(R)	$0.00528	(R)
Recovery Bond Credit (all usage)	($0.00528)	(I)	($0.00528)	(I)	($0.00528)	(I)
Bundled Power Charge Indifference Adjustment (all usage)***	$0.01309		$0.01309		$0.01309	

* Transmission, Transmission Rate Adjustments and Reliability Service charges are combined for presentation on customer bills.
** Distribution and New System Generation Charges are combined for presentation on customer bills.
*** Direct Access, Community Choice Aggregation and Transitional Bundled Service Customers pay the applicable Vintaged Power Charge Indifference Adjustment. Generation and Bundled PCIA are combined for presentation on bundled customer bills.
† Pursuant to D.23-02-014, disbursement of the April 2023 residential Climate Credit shall begin by March 1, 2023.

(Continued)

Advice 7009-E
Decision

Issued by
Meredith Allen
Vice President, Regulatory Affairs

Submitted August 25, 2023
Effective September 1, 2023
Resolution

Pacific Gas and Electric Company
U 39 San Francisco, California

Original Cal. P.U.C. Sheet No. 54738-E

ELECTRIC SCHEDULE E-ELEC Sheet 3 (N)
RESIDENTIAL TIME-OF-USE (ELECTRIC HOME) (N)
SERVICE FOR CUSTOMERS WITH QUALIFYING ELECTRIC TECHNOLOGIES

SPECIAL CONDITIONS:

1. TIME PERIODS: Times of the year and times of the day are defined as follows: (N)

   All Year:

   Peak: 4:00 p.m. to 9:00 p.m. every day including weekends and holidays.

   Partial-Peak: 3:00 p.m. to 4:00 p.m. and 9:00 p.m. to 12:00 a.m. every day including weekends and holidays.

   Off-Peak: All other hours.

2. SEASONAL CHANGES: The summer season is June 1 through September 30 and the winter season is October 1 through May 31. When billing includes use in both the summer and winter periods, charges will be prorated based upon the number of days in each period.

3. ADDITIONAL METERS: If a residential dwelling unit is served by more than one electric meter, the customer must designate which meter is the primary meter and which is (are) the additional meter(s).

4. BILLING: A customer's bill is calculated based on the option applicable to the customer.

   Bundled Service Customers receive generation and delivery services solely from PG&E. The customer's bill is based on the Unbundling of Total Rates set forth above.

   Transitional Bundled Service (TBS) Customers take TBS as prescribed in Rules 22.1 and 23.1, or take PG&E bundled service prior to the end of the six (6) month advance notice period required to elect PG&E bundled service as prescribed in Rules 22.1 and 23.1. TBS customers shall pay all charges shown in the Unbundling of Total Rates except for the Bundled Power Charge Indifference Adjustment and the generation charge. TBS customers shall also pay for their applicable Vintaged Power Charge Indifference Adjustment provided in the table below, and the short-term commodity prices as set forth in Schedule TBCC. (N)

(Continued)

Advice	6768-E	*Issued by*	*Submitted*	November 18, 2022
Decision	D.21-11-016	***Meredith Allen***	*Effective*	December 1, 2022
		Vice President, Regulatory Affairs	*Resolution*	

Pacific Gas and Electric Company
U 39 San Francisco, California

Revised Cal. P.U.C. Sheet No. 54734-E
Cancelling Revised Cal. P.U.C. Sheet No. 53424-E

ELECTRIC SCHEDULE D-CARE Sheet 1
LINE-ITEM DISCOUNT FOR CALIFORNIA ALTERNATE RATES FOR ENERGY (CARE) CUSTOMERS

APPLICABILITY: This schedule is applicable to single-phase and polyphase residential service in single-family dwellings and in flats and apartments separately metered by PG&E and domestic submetered tenants residing in multifamily accommodations, mobilehome parks and to qualifying recreational vehicle parks and marinas and to farm service on the premises operated by the person whose residence is supplied through the same meter, where the applicant qualifies for California Alternate Rates for Energy (CARE) under the eligibility and certification criteria set forth in Electric Rule 19.1. CARE service is available on Schedules E-1, E-6, E-TOU-B, E-TOU-C, E-TOU-D, EV2, E-ELEC, EM, ES, ESR, ET and EM-TOU. (T)

TERRITORY: This rate schedule applies everywhere PG&E provides electric service.

RATES: Customers taking service on this rate schedule whose otherwise applicable rate schedule has no Delivery Minimum Bill Amount (Schedule E-ELEC) will receive a CARE percentage discount of 35.000% on their total bundled charges (except for the California Climate Credit, which will not be discounted). Customers taking service on this rate schedule whose otherwise applicable rate schedule has a Delivery Minimum Bill Amount (all other schedules) will receive a CARE percentage discount ("A" or "C" below) on their total bundled charges on their otherwise applicable rate schedule (except for the California Climate Credit, which will not be discounted) and also will receive a percentage discount ("B" or "D" below) on the delivery minimum bill amount, if applicable. The CARE discount will be calculated for direct access and community choice aggregation customers based on the total charges as if they were subject to bundled service rates. Discounts will be applied as a residual reduction to distribution charges, after D-CARE customers are exempted from the Wildfire Fund Charge, Recovery Bond Charge, Recovery Bond Credit, and the CARE surcharge portion of the public purpose program charge used to fund the CARE discount. These conditions also apply to master-metered customers and to qualified sub-metered tenants where the master-meter customer is jointly served under PG&E's Rate Schedule D-CARE and either Schedule EM, ES, ESR, ET, or EM-TOU. (N) | | (N) (T) | (T) (T)

For master-metered customers where one or more of the submetered tenants qualifies for CARE rates under the eligibility and certification criteria set forth in Rule 19.1, 19.2, or 19.3, the CARE discount is equal to a percentage ("C" below) of the total bundled charges, multiplied by the number of CARE units divided by the total number of units. In addition, master-metered customers eligible for D-CARE will receive a percentage discount ("D" below) on the delivery minimum bill amount, if applicable.

It is the responsibility of the master-metered customer to advise PG&E within 15 days following any change in the number of dwelling units and/or any decrease in the number of qualifying CARE applicants that results when such applicants move out of their submetered or non-submetered dwelling unit, or submetered permanent-residence RV or permanent-residence boat. (L) | (L)

(Continued)

Pacific Gas and Electric Company
U 39 San Francisco, California

Revised Cal. P.U.C. Sheet No. 56208-E
Cancelling Revised Cal. P.U.C. Sheet No. 56020-E

ELECTRIC SCHEDULE D-CARE Sheet 2
LINE-ITEM DISCOUNT FOR CALIFORNIA ALTERNATE RATES FOR ENERGY (CARE) CUSTOMERS

RATES: (Cont'd)

A.	D-CARE Discount:	34.965	% (Percent)	(I)
B.	Delivery Minimum Bill Discount:	50.000	% (Percent)	
C.	Master-Meter D-CARE Discount:	34.965	% (Percent)	(I)
D.	Master-Meter Delivery Minimum Bill Discount:	50.000	% (Percent)	

SPECIAL CONDITIONS:

1. OTHERWISE APPLICABLE SCHEDULE: The Special Conditions of the Customer's otherwise applicable rate schedule will apply to this schedule.

2. ELIGIBILITY: To be eligible to receive D-CARE the applicant must qualify under the criteria set forth in PG&E's Electric Rules 19.1, 19.2, and 19.3 and meet the certification requirements thereof to the satisfaction of PG&E. Qualifying Direct Access, Community Choice Aggregation Service, and Transitional Bundled Service customers are also eligible to take service on Schedule D-CARE. Applicants may qualify for D-CARE at their primary residence only. Customers or sub-metered tenants participating in the Family Electric Rate Assistance (FERA) program cannot concurrently participate in the CARE program.

Advice 6968-E
Decision

Issued by
Meredith Allen
Vice President, Regulatory Affairs

Submitted June 23, 2023
Effective July 1, 2023
Resolution

6.2.2 Southern California Edison

The following pages provide details on the SCE electricity tariffs applied in this study. Table 22 describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of $ 0.06030/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between December 2022 and November 2023

Table 22: SCE Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ06	6
CZ08	8
CZ09	9
CZ10	10
CZ14	14
CZ15	15

Summer Daily Allocations (June through September)

Baseline Region Number	Daily kWh Allocation	All-Electric Allocation
5	17.2	17.9
6	11.4	8.8
8	12.6	9.8
9	16.5	12.4
10	18.9	15.8
13	22.0	24.6
14	18.7	18.3
15	46.4	24.1
16	14.4	13.5

Winter Daily Allocations (October through May)

Baseline Region Number	Daily kWh Allocation	All-Electric Allocation
5	18.7	29.1
6	11.3	13.0
8	10.6	12.7
9	12.3	14.3
10	12.5	17.0
13	12.6	24.3
14	12.0	21.3
15	9.9	18.2
16	12.6	23.1

Schedule TOU-D
TIME-OF-USE
DOMESTIC
(Continued)

Sheet 12 (T)

SPECIAL CONDITIONS

1. Applicable rate time periods are defined as follows:

Option 4-9 PM, Option 4-9 PM-CPP, Option PRIME, Option PRIME-CPP : (T)

TOU Period	Weekdays		Weekends and Holidays	
	Summer	Winter	Summer	Winter
On-Peak	4 p.m. - 9 p.m.	N/A	N/A	N/A
Mid-Peak	N/A	4 p.m. - 9 p.m.	4 p.m. - 9 p.m.	4 p.m. - 9 p.m.
Off-Peak	All other hours	9 p.m. - 8 a.m.	All other hours	9 p.m. - 8 a.m.
Super-Off-Peak	N/A	8 a.m. - 4 p.m.	N/A	8 a.m. - 4 p.m.
CPP Event Period	4 p.m. - 9 p.m.	4 p.m. - 9 p.m.	N/A	N/A

Southern California Edison
Rosemead, California (U 338-E)

Revised Cal. PUC Sheet No. 85111-E
Cancelling Revised Cal. PUC Sheet No. 74502-E

Schedule TOU-D
TIME-OF-USE
DOMESTIC
(Continued)

Sheet 2

RATES

Customers receiving service under this Schedule will be charged the applicable rates under Option 4-9 PM, Option 4-9 PM-CPP, Option 5-8 PM, Option 5-8 PM-CPP, Option PRIME, Option PRIME-CPP Option A, Option A-CPP, Option B, or Option B-CPP, as listed below. CPP Event Charges will apply to all energy usage during CPP Event Energy Charge periods and CPP Non-Event Energy Credits will apply as a reduction on CPP Non-Event Energy Credit Periods during Summer Season days, 4:00 p.m. to 9:00 p.m., as described in Special Conditions 1 and 3, below:

	Delivery Service Total[1]	Generation[2] UG***	Generation[2] DWREC[3]
Option 4-9 PM / Option 4-9 PM-CPP			
Energy Charge - $/kWh			
Summer Season - On-Peak	0.28829 (R)	0.28543 (I)	0.00000
Mid-Peak	0.28829 (R)	0.17707 (I)	0.00000
Off-Peak	0.24482 (R)	0.11382 (I)	0.00000
Winter Season - Mid-Peak	0.28829 (R)	0.21752 (I)	0.00000
Off-Peak	0.24482 (R)	0.13851 (I)	0.00000
Super-Off-Peak	0.22919 (R)	0.11890 (I)	0.00000
Baseline Credit**** - $/kWh	(0.09759) (I)	0.00000	
Fixed Recovery Charge - $/kWh	0.00090 (R)		
Basic Charge - $/day			
Single-Family Residence	0.031		
Multi-Family Residence	0.024		
Minimum Charge** - $/day			
Single Family Residence	0.346		
Multi-Family Residence	0.346		
Minimum Charge (Medical Baseline)** - $/day			
Single Family Residence	0.173		
Multi-Family Residence	0.173		
California Climate Credit[4]	(71.00) (I)		
California Alternate Rates for			
Energy Discount - %	100.00*		
Family Electric Rate Assistance Discou	100.00		
Option 4-9 PM-CPP			
CPP Event Energy Charge - $/kWh		0.80000	
Summer CPP Non-Event Credit			
On-Peak Energy Credit - $/kWh		(0.15170)	
Maximum Available Credit - $/kWh*****			
Summer Season		(0.67183) (R)	

* Represents 100% of the discount percentage as shown in the applicable Special Condition of this Schedule.
** The Minimum Charge is applicable when the Delivery Service Energy Charge, plus the applicable Basic Charge is less than the Minimum Charge.
*** The ongoing Competition Transition Charge CTC of ($0.00003) per kWh is recovered in the UG component of Generation. (I)
**** The Baseline Credit applies up to 100% of the Baseline Allocation, regardless of Time-of-Use time period. Additional Baseline Allocations apply for Customers with Heat Pump Water Heaters served under this Option. The Baseline Allocations are set forth in Preliminary Statement, Part H.
***** The Maximum Available Credit is the capped credit amount for CPP Customers dual participating in other demand response programs.
1 Total = Total Delivery Service rates are applicable to Bundled Service, Direct Access (DA) and Community Choice Aggregation Service (CCA Service) Customers, except DA and CCA Service Customers are not subject to the DWRBC rate component of this Schedule but instead pay the DWRBC as provided by Schedule DA-CRS or Schedule CCA-CRS.
2 Generation = The Gen rates are applicable only to Bundled Service Customers. See Special Condition below for PCIA recovery.
3 DWREC = Department of Water Resources (DWR) Energy Credit – For more information on the DWR Energy Credit, see the Billing Calculation Special Condition of this Schedule.
4 Applied on an equal basis, per household, semi-annually. See the Special Conditions of this Schedule for more information.

(Continued)

(To be inserted by utility)
Advice 4929-E
Decision

Issued by
Michael Backstrom
Vice President

(To be inserted by Cal. PUC)
Date Submitted Dec 28, 2022
Effective Jan 1, 2023
Resolution E-5217

2H13

Southern California Edison
Rosemead, California (U 338-E)

Revised Cal. PUC Sheet No. 86132-E
Cancelling Revised Cal. PUC Sheet No. 85624-E

Schedule TOU-D
TIME-OF-USE
DOMESTIC
(Continued)

Sheet 6

RATES (Continued)

Option PRIME / Option PRIME-CPP	Delivery Service Total[1]	Generation[2] UG**	Generation[2] DWREC[3]
Energy Charge - $/kWh/Meter/Day			
Summer Season			
On-Peak	0.22789 (I)	0.42769 (I)	0.00000
Mid-Peak	0.22789 (I)	0.15221 (I)	0.00000
Off-Peak	0.15191 (I)	0.10162 (I)	0.00000
Winter Season			
Mid-Peak	0.23353 (I)	0.36028 (I)	0.00000
Off-Peak	0.14530 (I)	0.08630 (I)	0.00000
Super-Off-Peak	0.14530 (I)	0.08630 (I)	0.00000
Fixed Recovery Charge - $/kWh	0.00260 (I)		
Basic Charge - $/Meter/Day	0.427 (I)		
EV Meter Credit (Separately Metered E	(0.323) (N)		
EV Submeter Credit - $/Meter/Day	(0.111) (R)		
California Climate Credit[10]	(71.00)		
California Alternate Rates for Energy Discount - %	100.00*		
Family Electric Rate Assistance Discou	100.00		
Medical Line Item Discount - %	100.000		
Option PRIME-CPP			
CPP Event Energy Charge - $/kWh		0.80000	
Summer CPP Non-Event Credit			
On-Peak Energy Credit - $/kWh		(0.15170)	
Maximum Available Credit - $/kWh****			
Summer Season		(0.71812) (R)	

* Represents 100% of the discount percentage as shown in the applicable Special Condition of this Schedule.
** The ongoing Competition Transition Charge (CTC) of ($0.00003) per kWh is recovered in the UG component of Generation.
**** The Maximum Available Credit is the capped credit amount for CPP Customers dual participating in other demand response programs.
1 Total = Total Delivery Service rates are applicable to Bundled Service, Direct Access (DA) and Community Choice Aggregation Service (CCA Service) Customers, except DA and CCA Service Customers are not subject to the DWRBC rate component of this Schedule but instead pay the DWRBC as provided by Schedule DA-CRS or Schedule CCA-CRS.
2 Generation = The Gen rates are applicable only to Bundled Service Customers. See Special Condition below for PCIA recovery.
3 DWREC = Department of Water Resources (DWR) Energy Credit – For more information on the DWR Energy Credit, see the Billing Calculation Special Condition of this Schedule.
4 Applied on an equal basis, per household, semi-annually. See the Special Conditions of this Schedule for more information.

(Continued)

(To be inserted by utility)
Advice 5041-E
Decision
6H9

Issued by
Michael Backstrom
Vice President

(To be inserted by Cal. PUC)
Date Submitted May 30, 2023
Effective Jun 1, 2023
Resolution

EDISON

Southern California Edison — Revised Cal. PUC Sheet No. 85618-E
Rosemead, California (U 338-E) — Cancelling Revised Cal. PUC Sheet No. 85109-E

Schedule D-CARE — Sheet 1
CALIFORNIA ALTERNATE RATES FOR ENERGY
DOMESTIC SERVICE

APPLICABILITY

Applicable to domestic service to CARE households residing in a permanent Single-Family Accommodation or Multifamily Accommodation where the customer meets all the Special Conditions of this Schedule. Customers enrolled in the CARE program are not eligible for the Family Electric Rate Assistance (FERA) program.

Pursuant to Special Condition 12 herein, customers receiving service under this Schedule are eligible to receive the California Climate Credit as shown in the Rates section below.

TERRITORY

Within the entire territory served.

RATES

The applicable charges set forth in Schedule D shall apply to Customers served under this Schedule.

CARE Discount:

A 29.8 percent discount is applied to a CARE Customer's bill prior to the application of the Public Utilities Commission Reimbursement Fee (PUCRF) and any applicable user fees, taxes, and late payment charges. CARE Customers are required to pay the PUCRF and any applicable user fees, taxes, and late payment charges in full. In addition, CARE Customers are exempt from paying the CARE Surcharge of $0.00888 per kWh and the Wildfire Fund Non-Bypassable Charge of $0.00530 per kWh. (R)
The 29.8 percent discount, in addition to these exemptions result in an average effective CARE Discount of 32.5 percent.

(Continued)

(To be inserted by utility)
Advice 4977-E
Decision 23-01-002
1H12 22-12-031

Issued by
Michael Backstrom
Vice President

(To be inserted by Cal. PUC)
Date Submitted Feb 27, 2023
Effective Mar 1, 2023
Resolution

6.2.3 Southern California Gas

Following are the SoCalGas natural gas tariffs applied in this study. Table 23 describes the baseline territories that were assumed for each climate zone.

Table 23. SoCalGas Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ05	2
CZ06	1
CZ08	1
CZ09	1
CZ10	1
CZ14	2
CZ15	1

The SoCalGas monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in Table 24. These rates are based on applying a normalization curve to the November 2023 tariff based on ten years of historical gas data. Long-term historical natural gas rate data was only available for SoCalGas' procurement charges.[27] The baseline and excess transmission charges were found to be consistent over the course of a year and applied for the entire year based on 2023 rates. CARE rates reflect the 20 percent discount per the GR tariff.

Table 24. SoCalGas Monthly Gas Rate ($/therm)

Month	Procurement Charge	Transportation Charge		Total Charge	
		Baseline	Excess	Baseline	Excess
January	$0.72	$0.86	$1.31	$1.92	$2.36
February	$0.50	$0.86	$1.31	$1.57	$2.02
March	$0.44	$0.86	$1.31	$1.48	$1.93
April	$0.39	$0.86	$1.31	$1.39	$1.84
May	$0.41	$0.86	$1.31	$1.43	$1.87
June	$0.46	$0.86	$1.31	$1.49	$1.93
July	$0.47	$0.86	$1.31	$1.51	$1.96
August	$0.51	$0.86	$1.31	$1.58	$2.03
September	$0.46	$0.86	$1.31	$1.52	$1.96
October	$0.45	$0.86	$1.31	$1.48	$1.92
November	$0.48	$0.86	$1.31	$1.54	$1.99
December	$0.57	$0.86	$1.31	$1.63	$2.08

Southern California Gas Company
Residential Rates
Nov-23

Customer Type / Rate Schedule	Commodity Charge	Rate Type	Procurement Charge ¢/therm	Transportation Charge ¢/therm	New Rate Effective 11/1/2023	New Rate Effective 10/1/2023	Absolute Rate Change	% Change
Residential Individually Metered								
Schedule No. GR	GR	Baseline	67.806	86.490	154.296	125.096	29.200	23.3%
Res. Service	GR	Non Baseline	67.806	131.037	198.843	169.726	29.117	17.2%
	GT-R	Baseline	00.000	86.490	86.490	87.038	-00.548	-0.6%
	GT-R	Non Baseline	00.000	131.037	131.037	131.668	-00.631	-0.5%

[27] The SoCalGas procurement and transmission charges were obtained from the following site: https://www.socalgas.com/for-your-business/energy-market-services/gas-prices RES2023.xlsx (live.com)

6.2.4 San Diego Gas & Electric

Following are the SDG&E electricity and natural gas tariffs applied in this study. Table 25 describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of $0.04542/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between December 2022 and November 2023.

Table 25. SDG&E Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ07	Coastal
CZ10	Inland
CZ14	Mountain

The SDG&E monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in Table 26. These rates are based on applying a normalization curve to the November 2023 tariff based on ten years of historical gas data. CARE rates reflect the 20 percent discount per the G-CARE tariff.

Table 26. SDG&E Monthly Gas Rate ($/therm)

Month	Total Charge	
	Baseline	Excess
January	$2.34	$2.63
February	$2.28	$2.57
March	$2.21	$2.51
April	$2.14	$2.45
May	$2.18	$2.48
June	$2.23	$2.55
July	$2.26	$2.57
August	$2.32	$2.62
September	$2.26	$2.59
October	$2.21	$2.55
November	$2.24	$2.57
December	$2.38	$2.70

Baseline Usage: The following quantities of gas used in individually metered residences are to be billed at the baseline rates:

All Customers:	Daily Therm Allowance
Summer (May to Oct)	0.359
Winter On-Peak (Dec, Jan & Feb)	1.233
Winter Off-Peak (Nov, Mar, & Apr)	0.692

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San Diego, California

Revised Cal. P.U.C. Sheet No. 37022-E
Canceling Revised Cal. P.U.C. Sheet No. 36337-E

SCHEDULE TOU-DR1

Sheet 2

RESIDENTIAL TIME-OF-USE

RATES

Total Rates:

Description – TOU DR1	UDC Total Rate		DWR BC + WF-NBC		EECC Rate + DWR Credit		Total Rate	
Summer:								
On-Peak	0.25752	R	0.00530	I	0.57043	I	0.83325	I
Off-Peak	0.25752	R	0.00530	I	0.25697	I	0.51979	I
Super Off-Peak	0.25752	R	0.00530	I	0.09233	I	0.35515	I
Winter:								
On-Peak	0.43809	I	0.00530	I	0.19307	I	0.63646	I
Off-Peak	0.43809	I	0.00530	I	0.10855	I	0.55194	I
Super Off-Peak	0.43809	I	0.00530	I	0.08402	I	0.52741	I
Summer Baseline Adjustment Credit up to 130% of Baseline	(0.11724)	R					(0.11724)	R
Winter Baseline Adjustment Credit up to 130% of Baseline	(0.11724)	R					(0.11724)	R
Minimum Bill ($/day)	0.380	I					0.380	I

Description – TOU DR1-CARE	UDC Total Rate		DWR BC + WF-NBC		EECC Rate + DWR Credit		Total Rate		Total Effective Care Rate	
Summer – CARE Rates:										
On-Peak	0.25682	R	0.00000		0.57043	I	0.82725	I	0.55366	I
Off-Peak	0.25682	R	0.00000		0.25697	I	0.51379	I	0.33965	I
Super Off-Peak	0.25682	R	0.00000		0.09233	I	0.34915	I	0.22725	I
Winter – CARE Rates:										
On-Peak	0.43739	I	0.00000		0.19307	I	0.63046	I	0.41930	I
Off-Peak	0.43739	I	0.00000		0.10855	I	0.54594	I	0.36160	I
Super Off-Peak	0.43739	I	0.00000		0.08402	I	0.52141	I	0.34485	I
Summer Baseline Adjustment Credit up to 130% of Baseline	(0.11724)	R					(0.11724)	R	(0.08004)	R
Winter Baseline Adjustment Credit up to 130% of Baseline	(0.11724)	R					(0.11724)	R	(0.08004)	R
Minimum Bill ($/day)	0.190	I					0.190	I	0.190	I

Note:
(1) Total Rates consist of UDC, Schedule DWR-BC (Department of Water Resources Bond Charge), Schedule WF-NBC (CA Wildfire Fund charge) and Schedule EECC (Electric Energy Commodity Cost) rates, with the EECC rates reflecting a DWR Credit. EECC rates are applicable to bundled customers only. See Special Condition 16 for PCIA (Power Charge Indifference Adjustment) recovery.
(2) Total Rates presented are for customers that receive commodity supply and delivery service from Utility.
(3) DWR-BC and WF-NBC charges do not apply to CARE customers.
(4) As identified in the rates tables, customer bills will also include line-item summer and winter credits for usage up to 130% of baseline to provide the rate capping benefits adopted by Assembly Bill 1X and Senate Bill 695.
(5) WF-NBC rate is 0.00530 + DWR-BC Bond Charge is 0.00000 .

R, I

(Continued)

2C8
Advice Ltr. No. 4129-E
Decision No.

Issued by
Dan Skopec
Senior Vice President
Regulatory Affairs

Submitted Dec 30, 2022
Effective Jan 1, 2023
Resolution No. E-5217

Time Periods

All time periods listed are applicable to local time. The definition of time will be based upon the date service is rendered.

TOU Periods – Weekdays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	6:00 a.m. – 4:00 p.m.; 9:00 p.m. - midnight	6:00 a.m. – 4:00 p.m. Excluding 10:00 a.m. – 2:00 p.m. in March and April; 9:00 p.m. - midnight
Super Off-Peak	Midnight – 6:00 a.m.	Midnight – 6:00 a.m. 10:00 a.m. – 2:00 p.m. in March and April
TOU Period – Weekends and Holidays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	2:00 p.m. – 4:00 p.m.; 9:00 p.m. - midnight	2:00 p.m. – 4:00 p.m.; 9:00 p.m. - midnight
Super Off-Peak	Midnight – 2:00 p.m.	Midnight – 2:00 p.m.

Seasons: Summer June 1 – October 31
Winter November 1 – May 31

15. Baseline Usage: The following quantities of electricity are used to calculate the baseline adjustment credit.

	Baseline Allowance For Climatic Zones*			
	Coastal	Inland	Mountain	Desert
Basic Allowance				
Summer (June 1 to October 31)	9.0	10.4	13.6	15.9
Winter (November 1 to May 31)	9.2	9.6	12.9	10.9
All Electric**				
Summer (June 1 to October 31)	6.0	8.7	15,2	17.0
Winter (November 1 to May 31)	8.8	12.2	22.1	17.1

* Climatic Zones are shown on the Territory Served, Map No. 1.
** All Electric allowances are available upon application to those customers who have permanently installed space heating or who have electric water heating and receive no energy from another source.

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 37217-E
Canceling Revised Cal. P.U.C. Sheet No. 37016-E

SCHEDULE EV-TOU-5

Sheet 1

COST-BASED DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES

APPLICABILITY

Service under this schedule is specifically limited to customers who require service for charging of a currently registered Motor Vehicle, as defined by the California Motor Vehicle Code, which is: 1) a battery electric vehicle (BEV) or plug-in hybrid electric vehicle (PHEV) recharged via a recharging outlet at the customer's premises; or 2) a natural gas vehicle (NGV) refueled via a home refueling appliance (HRA) at the customer's premises. This schedule is not available to customers with a conventional charge sustaining (battery recharged solely from the vehicle's on-board generator) hybrid electric vehicle (HEV).

Residential customers taking service on Schedule NBT, who are required to utilize EV-TOU-5 as their otherwise applicable schedule (OAS) for electric service, do not require a qualifying motor vehicle, as described above to participate on Schedule EV-TOU-5. N N N

Customers on this schedule may also qualify for a semi-annual California Climate Credit $(60.70) per Schedule GHG-ARR.

TERRITORY

Within the entire territory served by the utility.

RATES

Total Rates:

Description – EV-TOU-5 Rates	UDC Total Rate		DWR BC + WF-NBC		EECC Rate + DWR Credit		Total Rate	
Basic Service Fee	16.00						16.00	
Summer								
On-Peak	0.28032	I	0.00530	I	0.53067	I	0.81629	I
Off-Peak	0.28032	I	0.00530	I	0.19567	I	0.48129	I
Super Off-Peak	0.05588	I	0.00530	I	0.09233	I	0.15351	I
Winter								
On-Peak	0.28032	I	0.00530	I	0.22587	I	0.51149	I
Off-Peak	0.28032	I	0.00530	I	0.16213	I	0.44775	I
Super Off-Peak	0.05588	I	0.00530	I	0.08402	I	0.14520	I

(Continued)

1C5 Issued by Submitted Jan 30, 2023
Advice Ltr. No. 4154-E Effective Mar 1, 2023
Decision No. D.22-12-056 Resolution No.

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 37019-E
Canceling Revised Cal. P.U.C. Sheet No. 35912-E

SCHEDULE EV-TOU-5

Sheet 4

COST-BASED DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES

Notes: Transmission Energy charges include the Transmission Revenue Balancing Account Adjustment (TRBAA) of $(0.00242) per kWh and the Transmission Access Charge Balancing Account Adjustment (TACBAA) of $(0.01631) per kWh. PPP Energy charges includes Low Income PPP rate (LI-PPP) $0.01669/kWh, Non-low Income PPP rate (Non-LI-PPP) $0.00333/kWh (pursuant to PU Code Section 399.8, the Non-LI-PPP rate may not exceed January 1, 2000 levels), Procurement Energy Efficiency Surcharge Rate of $0.00422 /kWh, California Solar Initiative rate (CSI) of $0.00000/kWh and Self-Generation Incentive Program rate (SGIP) $0.00122/kWh. The basic service fee of $16 per month is applied to a customer's bill and a 50% discount is applied for CARE, Medical Baseline, or Family Electric Rate Assistance Program (FERA) customers resulting in their basic service fees to be $8 per month. R, R I R I I

Rate Components
The Utility Distribution Company Total Rates (UDC Total) shown above are comprised of the following components (if applicable): (1) Transmission (Trans) Charges, (2) Distribution (Distr) Charges, (3) Public Purpose Program (PPP) Charges, (4) Nuclear Decommissioning (ND) Charge, (5) Ongoing Competition Transition Charges (CTC), (6) Local Generation Charge (LGC), (7) Reliability Services (RS), and (8) the Total Rate Adjustment Component (TRAC).

Certain Direct Access customers are exempt from the TRAC, as defined in Rule 1 – Definitions.

Franchise Fee Differential
A Franchise Fee Differential of 5.78% will be applied to the monthly billings calculated under this schedule for all customers within the corporate limits of the City of San Diego. Such Franchise Fee Differential shall be so indicated and added as a separate item to bills rendered to such customers.

Time Periods:

All time periods listed are applicable to actual "clock" time)

TOU Period – Weekdays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	6:00 a.m. – 4:00 p.m.; 9:00 p.m. – midnight	6:00 a.m. – 4:00 p.m. Excluding 10:00 a.m.–2:00 p.m.in March and April; 9:00 p.m. - midnight
Super-Off-Peak	Midnight – 6:00 a.m.	Midnight – 6:00 a.m. 10:00 a.m. – 2:00 p.m. in March and April

TOU Period – Weekends and Holidays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	2:00 p.m. – 4:00 p.m.; 9:00 p.m. – midnight	2:00 p.m. – 4:00 p.m. 9:00 p.m. - midnight
Super-Off-Peak	Midnight – 2:00 p.m.	Midnight – 2:00 p.m.

Seasons:

Summer June 1 – October 31
Winter November 1 – May 31

(Continued)

4C8
Issued by
Dan Skopec
Senior Vice President
Regulatory Affairs

Submitted Dec 30, 2022
Effective Jan 1, 2023
Resolution No. E-5217

Advice Ltr. No. 4129-E
Decision No.

SDGE
San Diego Gas & Electric Company
San Diego, California

Original Cal. P.U.C. Sheet No. 37195-E
Canceling Cal. P.U.C. Sheet No.

SCHEDULE TOU-ELEC

Sheet 1

N
N

DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES, ENERGY STORAGE, OR ELECTRIC HEAT PUMPS

APPLICABILITY N

Service under this schedule is available on a voluntary basis for all residential customers who meet one or more of the following criteria: 1) require service for charging of a currently registered Motor Vehicle, as defined by the California Motor Vehicle Code, which is: a) a battery electric vehicle (BEV) or plug-in hybrid electric vehicle (PHEV) recharged via a recharging outlet at the customer's premises; or b) a natural gas vehicle (NGV) refueled via a home refueling appliance (HRA) at the customer's premises; 2) have a behind-the-meter energy storage device that is interconnected through Electric Rule 21; or 3) have an electric heat pump for water heating or climate control. This schedule is not available to customers with a conventional charge sustaining (battery recharged solely from the vehicle's on-board generator) hybrid electric vehicle (HEV).

This schedule is also available to customers who meet the above criteria as well as qualify for the California Alternate Rates for Energy (CARE) Program as outlined in Schedule E-CARE, and/or Medical Baseline as outlined in Special Condition (SC) 5. The rates for CARE customers and/or Medical Baseline are identified in the rate tables below as TOU-ELEC-CARE and TOU-ELEC-MB rates, respectively.

There is a cap of 10,000 customers who may take service on this rate, as defined in SC 10.

Pursuant to D.22-11-022, customers that opt-in to schedule TOU-ELEC within its first year of being offered have the option to return to their previous rate schedule prior to the 12-month requirement. See SC4 Terms of Service for all requirements.

Customers on this schedule may also qualify for a semi-annual California Climate Credit $(60.70) per Schedule GHG-ARR.

TERRITORY

Within the entire territory served by the utility.

RATES

Total Rates:

Description – TOU-ELEC Rates	UDC Total Rate	DWR BC + WF-NBC	EECC Rate	Total Rate
Monthly Service Fee	16.00			16.00
Summer				
On-Peak	0.22228	0.00530	0.51568	0.74326
Off-Peak	0.22228	0.00530	0.14844	0.37402
Super Off-Peak	0.22228	0.00530	0.09785	0.32543
Winter				
On-Peak	0.22228	0.00530	0.27460	0.50218
Off-Peak	0.22228	0.00530	0.13323	0.36081
Super Off-Peak	0.22228	0.00530	0.08905	0.31663

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1H6 Issued by Submitted Jan 31, 2023
Advice Ltr. No. 4152-E Effective Jan 31, 2023
Decision No. D.22-11-022 Resolution No.

SDGE
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San Diego, California

Original Cal. P.U.C. Sheet No. 37196-E
Canceling Cal. P.U.C. Sheet No.

SCHEDULE TOU-ELEC

Sheet 2

DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES, ENERGY STORAGE, OR ELECTRIC HEAT PUMPS

RATES (Continued)

Description – TOU-ELEC CARE Rates	UDC Total Rate	DWR BC + WF-NBC	EECC Rate	Total Rate	Total Effective CARE Rate
Monthly Service Fee	16.00			16.00	16.00
Summer – CARE Rates:					
On-Peak	0.22158	0.00000	0.51568	0.73726	0.49222
Off-Peak	0.22158	0.00000	0.14644	0.36802	0.24013
Super Off-Peak	0.22156	0.00000	0.09785	0.31943	0.20896
Winter – CARE Rates:					
On-Peak	0.22158	0.00000	0.27460	0.49618	0.32763
Off-Peak	0.22158	0.00000	0.13323	0.35481	0.23111
Super Off-Peak	0.22158	0.00000	0.08905	0.31063	0.20095

Description – TOU-ELEC MB Rates	UDC Total Rate	DWR BC + WF-NBC	EECC Rate	Total Rate	Total Effective MB Rate
Monthly Service Fee	16.00			16.00	16.00
Summer – MB Rates:					
On-Peak	0.22228	0.00000	0.51568	0.73796	0.59037
Off-Peak	0.22228	0.00000	0.14644	0.36872	0.29498
Super Off-Peak	0.22228	0.00000	0.09785	0.32013	0.25610
Winter – MB Rates:					
On-Peak	0.22228	0.00000	0.27460	0.49688	0.39750
Off-Peak	0.22228	0.00000	0.13323	0.35551	0.28441
Super Off-Peak	0.22228	0.00000	0.08905	0.31133	0.24908

Note:
(1) Total Rates consist of UDC, Schedule DWR-BC (Department of Water Resources Bond Charge), Schedule WF-NBC (CA Wildfire Fund charge) and Schedule EECC (Electric Energy Commodity Cost) rates. EECC rates are applicable to bundled customers only. See Special Condition 9 for PCIA (Power Charge Indifference Adjustment) recovery.
(2) Total Rates presented are for customers that receive commodity supply and delivery service from Utility. Differences in total rates paid by Direct Access (DA) and Community Choice Aggregation (CCA) customers are identified in Schedule DA-CRS and CCA-CRS, respectively.
(3) DWR-BC and WF-NBC charges do not apply to CARE or Medical Baseline customers.
(4) WF-NBC rate is 0.00530 + DWR-BC Bond Charge is 0.00000

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2H5 Issued by Submitted Jan 31, 2023
Advice Ltr. No. 4152-E Effective Jan 31, 2023
Decision No. D.22-11-022 Resolution No.

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San Diego, California

Original Cal. P.U.C. Sheet No. 37197-E
Canceling Cal. P.U.C. Sheet No.

SCHEDULE TOU-ELEC

Sheet 3 N

N

DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES, ENERGY STORAGE, OR ELECTRIC HEAT PUMPS

RATES (CONTINUED) N

UDC Rates

Description – TOU-ELEC	Transm	Distr	PPP	ND	CTC	LGC	RS	TRAC	UDC Total
Monthly Service Fee ($/Mo)		16.00							16.00
Summer:									
On-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Super Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Winter:									
On-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Super Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228

Description – TOU-ELEC – CARE Rates	**Transm**	**Distr**	**PPP**	**ND**	**CTC**	**LGC**	**RS**	**TRAC**	**UDC Total**
Monthly Service Fee ($/Mo		16.00							16.00
Summer CARE Rates:									
On-Peak	0.07340	0.10726	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22158
Off-Peak	0.07340	0.10726	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22158
Super Off-Peak	0.07340	0.10726	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22158
Winter CARE Rates:									
On-Peak	0.07340	0.10726	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22158
Off-Peak	0.07340	0.10726	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22158
Super Off-Peak	0.07340	0.10726	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22158

Description – TOU-ELEC – MB Rates	**Transm**	**Distr**	**PPP**	**ND**	**CTC**	**LGC**	**RS**	**TRAC**	**UDC Total**
Monthly Service Fee ($/Mo))		16.00							16.00
Summer – MB Rates									
On-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Super Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Winter – MB Rates									
On-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228
Super Off-Peak	0.07340	0.10796	0.02546	0.00007	0.00153	0.01383	0.00003	0.00000	0.22228

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(Continued)

3H11 Issued by Submitted Jan 31, 2023
Advice Ltr. No. 4152-E Effective Jan 31, 2023
Decision No. D.22-11-022 Resolution No.

San Diego Gas & Electric Company
San Diego, California

Original Cal. P.U.C. Sheet No. 37198-E
Canceling _____ Cal. P.U.C. Sheet No. _____

SCHEDULE TOU-ELEC

Sheet 4 N

DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES, ENERGY STORAGE, OR ELECTRIC HEAT PUMPS N

Notes: Transmission Energy charges include the Transmission Revenue Balancing Account Adjustment (TRBAA) of $(0.00242) per kWh and the Transmission Access Charge Balancing Account Adjustment (TACBAA) of $(0.01631) per kWh. PPP Energy charges includes Low Income PPP rate (LI-PPP) $0.01669/kWh, Non-low Income PPP rate (Non-LI-PPP) $0.00333/kWh (pursuant to PU Code Section 399.8, the Non-LI-PPP rate may not exceed January 1, 2000 levels). Procurement Energy Efficiency Surcharge Rate of $0.00422 /kWh, California Solar Initiative rate (CSI) of $0.00000/kWh and Self-Generation Incentive Program rate (SGIP) $0.00122/kWh. N

Rate Components
The Utility Distribution Company Total Rates (UDC Total) shown above are comprised of the following components (if applicable): (1) Transmission (Trans) Charges, (2) Distribution (Distr) Charges, (3) Public Purpose Program (PPP) Charges, (4) Nuclear Decommissioning (ND) Charge, (5) Ongoing Competition Transition Charges (CTC), (6) Local Generation Charge (LGC), (7) Reliability Services (RS), and (8) the Total Rate Adjustment Component (TRAC).

Certain Direct Access customers are exempt from the TRAC, as defined in Rule 1 – Definitions.

Franchise Fee Differential
A Franchise Fee Differential of 5.78% will be applied to the monthly billings calculated under this schedule for all customers within the corporate limits of the City of San Diego. Such Franchise Fee Differential shall be so indicated and added as a separate item to bills rendered to such customers.

Time Periods:

All time periods listed are applicable to actual "clock" time)

TOU Period – Weekdays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	6:00 a.m. – 4:00 p.m.; 9:00 p.m. – midnight	6:00 a.m. – 4:00 p.m. Excluding 10:00 a.m.–2:00 p.m.in March and April; 9:00 p.m. - midnight
Super-Off-Peak	Midnight – 6:00 a.m.	Midnight – 6:00 a.m. 10:00 a.m. – 2:00 p.m. in March and April

TOU Period – Weekends and Holidays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	2:00 p.m. – 4:00 p.m.; 9:00 p.m. – midnight	2:00 p.m. – 4:00 p.m. 9:00 p.m. - midnight
Super-Off-Peak	Midnight – 2:00 p.m.	Midnight – 2:00 p.m.

Seasons:

Summer June 1 – October 31
Winter November 1 – May 31 N

(Continued)

4H7 Issued by Submitted Jan 31, 2023
Advice Ltr. No. 4152-E Effective Jan 31, 2023
Decision No. D.22-11-022 Resolution No. _____

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 35718-E
Canceling Revised Cal. P.U.C. Sheet No. 32576-E

SCHEDULE E-CARE

Sheet 1

CALIFORNIA ALTERNATE RATES FOR ENERGY

APPLICABILITY

This schedule provides a California Alternate Rates for Energy (CARE) discount to each of the following types of customers listed below that meet the requirements for CARE eligibility as defined in Rule 1, Definitions, and herein, and is taken in conjunction with the customer's otherwise applicable service schedule.

1) Customers residing in a permanent single-family accommodation, separately metered by the Utility.

2) Multi-family dwelling units and mobile home parks supplied through one meter on a single premises where the individual unit is submetered.

3) Non-profit group living facilities.

4) Agricultural employee housing facilities.

TERRITORY

Within the entire territory served by the Utility.

DISCOUNT

1) **Residential CARE**: Qualified residential CARE customers will receive a total effective discount according to the following:

	2015	2016	2017	2018	2019	2020 and beyond
Effective Discount	**40%**	**39%**	**38%**	**38%**	**36% R**	**35%**

Pursuant to Commission Decision (D.) 15-07-001, the average effective CARE discount for residential customers will decrease 1% each year until an average effective discount of 35% is reached in 2020.

The average effective CARE discount consists of: (a) exemptions from paying the CARE Surcharge, Department of Water Resources Bond Charge (DWR-BC), Vehicle-Grid Integration (VGI) costs, and California Solar Initiative (CSI); (b) a 50% minimum bill relative to Non-CARE; (c) the California Wildfire Fund Charge (WF-NBC) and (d) a separate line-item bill discount for all qualified residential CARE customers with the exclusion of CARE Medical Baseline customers taking service on tiered rates schedules. D.15-07-001 retained the rate subsidies in Non-CARE Medical Baseline tiered rates and thereby a separate line-item discount is provided for these CARE Medical Baseline customers T

(Continued)

1C5
Advice Ltr. No. 3928-E

Issued by
Dan Skopec
Vice President

Submitted Dec 30, 2021
Effective Jan 1, 2022

6.2.5 City of Palo Alto Utilities

Following are the CPAU electricity and natural gas tariffs applied in this study. The CPAU monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in Table 27. These rates are based on applying a normalization curve to the October 2023 tariff based on seven years of historical gas data. The monthly service charge applied was $14.01 per month per the November 2023 G-1 tariff.

Table 27. CPAU Monthly Gas Rate ($/therm)

Month	G1 Volumetric Total Baseline	G1 Volumetric Total Excess
January	$1.83532	$3.35639
February	$1.38055	$2.59947
March	$1.32506	$2.47695
April	$1.29680	$2.44038
May	$1.29511	$2.43804
June	$1.32034	$2.45406
July	$1.35688	$2.61519
August	$1.40696	$2.67944
September	$1.42130	$2.70301
October	$1.42310	$2.48300
November	$1.46286	$2.45547
December	$1.62415	$2.62128

RESIDENTIAL ELECTRIC SERVICE

UTILITY RATE SCHEDULE E-1

A. APPLICABILITY:

This Rate Schedule applies to separately metered single-family residential dwellings receiving Electric Service from the City of Palo Alto Utilities.

B. TERRITORY:

This rate schedule applies everywhere the City of Palo Alto provides Electric Service.

C. UNBUNDLED RATES:

Per kilowatt-hour (kWh)	Commodity	Distribution	Public Benefits	Total
Tier 1 usage	$ 0.09999	$ 0.06954	$ 0.00568	$ 0.17521
Tier 2 usage Any usage over Tier 1	0.13873	0.10225	0.00568	0.24666
Minimum Bill ($/day)				0.4181

D. SPECIAL NOTES:

1. Calculation of Cost Components

The actual bill amount is calculated based on the applicable rates in Section C above and adjusted for any applicable discounts, surcharges and/or taxes. On a Customer's bill statement, the bill amount may be broken down into appropriate components as calculated under Section C.

2. Calculation of Usage Tiers

Tier 1 Electricity usage shall be calculated and billed based upon a level of 11 kWh per day, prorated by Meter reading days of Service. As an example, for a 30-day bill, the Tier 1 level would be 330 kWh. For further discussion of bill calculation and proration, refer to Rule and Regulation 11.

{End}

CITY OF PALO ALTO UTILITIES
Issued by the City Council

CITY OF PALO ALTO UTILITIES

Supersedes Sheet No E-1-1 dated 7-1-2022

Sheet No **E-1-1**
Effective 7-1-2023

6.2.6 Sacramento Municipal Utilities District (Electric Only)

Following are the SMUD electricity tariffs applied in this study. The rates effective January 2023 were used.

Residential Time-of-Day Service
Rate Schedule R-TOD

II. Firm Service Rates

A. Time-of-Day (5-8 p.m.) Rate

	Effective as of January 1, 2023	Effective as of January 1, 2024	Effective as of May 1, 2024	Effective as of January 1, 2025	Effective as of May 1, 2025
Time-of-Day (5-8 p.m.) Rate (RT02)					
Non-Summer Season (October - May)					
System Infrastructure Fixed Charge *per month per meter*	$23.50	$24.15	$24.80	$25.50	$26.20
Electricity Usage Charge					
Peak *$/kWh*	$0.1547	$0.1590	$0.1633	$0.1678	$0.1724
Off-Peak *$/kWh*	$0.1120	$0.1151	$0.1183	$0.1215	$0.1248
Summer Season (June - September)					
System Infrastructure Fixed Charge *per month per meter*	$23.50	$24.15	$24.80	$25.50	$26.20
Electricity Usage Charge					
Peak *$/kWh*	$0.3279	$0.3369	$0.3462	$0.3557	$0.3655
Mid-Peak *$/kWh*	$0.1864	$0.1914	$0.1967	$0.2021	$0.2077
Off-Peak *$/kWh*	$0.1350	$0.1387	$0.1425	$0.1464	$0.1505

B. Optional Critical Peak Pricing Rate

1. The CPP Rate base prices per time-of-day period are the same as the prices per time-of-day period for TOD (5-8 p.m.).
2. The CPP Rate provides a discount per kWh on the Mid-Peak and Off-Peak prices during summer months.
3. During CPP Events, customers will be charged for energy used at the applicable time-of-day period rate plus the CPP Rate Event Price per kWh as shown on www.smud.org.
4. During CPP Events, energy exported to the grid will be compensated at the CPP Rate Event Price per kWh as shown on www.smud.org.
5. The CPP Rate Event Price and discount will be updated annually at SMUD's discretion and posted on www.smud.org.

C. Plug-In Electric Vehicle Credit (rate categories RT02 and RTC1)

This credit is for residential customers who have a licensed passenger battery electric plug-in or plug-in hybrid electric vehicle.
Credit applies to all electricity usage charges from midnight to 6:00 a.m. daily.
Electric Vehicle Credit..... -$0.0150/kWh

III. Electricity Usage Surcharges

Refer to the following rate schedules for details on these surcharges.

A. Hydro Generation Adjustment (HGA). Refer to Rate Schedule HGA.

IV. Rate Option Menu

A. Energy Assistance Program Rate. Refer to Rate Schedule EAPR.
B. Medical Equipment Discount Program. Refer to Rate Schedule MED.
C. Joint Participation in Medical Equipment Discount and Energy Assistance Program Rate. Refer to Rate Schedule MED.

SACRAMENTO MUNICIPAL UTILITY DISTRICT Sheet No. **R-TOD-2**
Resolution No. 23-09-09 adopted September 21, 2023 Effective: **September 22, 2023**

A. Time-of-Day (5-8 p.m.) Rate (rate category RT02)

1. The TOD (5-8 p.m.) Rate is the standard rate for SMUD's residential customers. Eligible customers can elect the Fixed Rate under Rate Schedule R as an alternative rate.

2. The TOD (5-8 p.m.) Rate is an optional rate for customers who have an eligible renewable electrical generation facility under Rate Schedule NEM1 that was approved for installation by SMUD prior to January 1, 2018.

3. This rate has five kilowatt-hour (kWh) prices, depending on the time-of-day and season as shown below. Holidays are detailed in Section V. Conditions of Service.

Summer (Jun 1 - Sept 30)	**Peak**	Weekdays between 5:00 p.m. and 8:00 p.m.
	Mid-Peak	Weekdays between noon and midnight except during the Peak hours.
	Off-Peak	All other hours, including weekends and holidays[1].
Non-Summer (Oct 1 - May 31)	**Peak**	Weekdays between 5:00 p.m. and 8:00 p.m.
	Off-Peak	All other hours, including weekends and holidays[1].

[1] See Section V. Conditions of Service

6.2.7 Fuel Escalation Assumptions

The average annual escalation rates in Table 28 were used in this study. These are based on assumptions from the CPUC 2021 En Banc hearings on utility costs through 2030 (California Public Utilities Commission, 2021a). Escalation rates through the remainder of the 30-year evaluation period are based on the escalation rate assumptions within the 2022 TDV factors. No data was available to estimate electricity escalation rates for CPAU and SMUD, therefore electricity escalation rates for PG&E and statewide natural gas escalation rates were applied. Table 29 presents the average annual escalation rates used in the utility rate escalation sensitivity analysis shown in Section 3.2.4. Rates were applied for the same 30-year period and are based on the escalation rate assumptions within the 2025 LSC factors from 2027 through 2053.[28] These rates were developed for electricity use statewide (not utility-specific) and assume steep increases in gas rates in the latter half of the analysis period. Data was not available for the years 2024, 2025, and 2026 and so the CPUC En Banc assumptions were applied for those years using the average rate across the three IOUs for statewide electricity escalation.

Table 28: Real Utility Rate Escalation Rate Assumptions, CPUC En Banc and 2022 TDV Basis

	Statewide Natural Gas Residential Average Rate (%/year, real)	Electric Residential Average Rate (%/year, real)		
		PG&E	SCE	SDG&E
2024	4.6%	1.8%	1.6%	2.8%
2025	4.6%	1.8%	1.6%	2.8%
2026	4.6%	1.8%	1.6%	2.8%
2027	4.6%	1.8%	1.6%	2.8%
2028	4.6%	1.8%	1.6%	2.8%
2029	4.6%	1.8%	1.6%	2.8%
2030	4.6%	1.8%	1.6%	2.8%
2031	2.0%	0.6%	0.6%	0.6%
2032	2.4%	0.6%	0.6%	0.6%
2033	2.1%	0.6%	0.6%	0.6%
2034	1.9%	0.6%	0.6%	0.6%
2035	1.9%	0.6%	0.6%	0.6%
2036	1.8%	0.6%	0.6%	0.6%
2037	1.7%	0.6%	0.6%	0.6%
2038	1.6%	0.6%	0.6%	0.6%
2039	2.1%	0.6%	0.6%	0.6%
2040	1.6%	0.6%	0.6%	0.6%
2041	2.2%	0.6%	0.6%	0.6%
2042	2.2%	0.6%	0.6%	0.6%
2043	2.3%	0.6%	0.6%	0.6%
2044	2.4%	0.6%	0.6%	0.6%
2045	2.5%	0.6%	0.6%	0.6%
2046	1.5%	0.6%	0.6%	0.6%
2047	1.3%	0.6%	0.6%	0.6%
2048	1.6%	0.6%	0.6%	0.6%
2049	1.3%	0.6%	0.6%	0.6%
2050	1.5%	0.6%	0.6%	0.6%
2051	1.8%	0.6%	0.6%	0.6%
2052	1.8%	0.6%	0.6%	0.6%
2053	1.8%	0.6%	0.6%	0.6%

[28] https://www.energy.ca.gov/files/2025-energy-code-hourly-factors. Actual escalation factors were provided by consultants E3.

Table 29: Real Utility Rate Escalation Rate Assumptions, 2025 LSC Basis

Year	Statewide Natural Gas Residential Average Rate (%/year, real)	Statewide Electricity Residential Average Rate (%/year, real)
2024	4.6%	2.1%
2025	4.6%	2.1%
2026	4.6%	2.1%
2027	4.2%	0.6%
2028	3.2%	1.9%
2029	3.6%	1.6%
2030	6.6%	1.3%
2031	6.7%	1.0%
2032	7.7%	1.2%
2033	8.2%	1.1%
2034	8.2%	1.1%
2035	8.2%	0.9%
2036	8.2%	1.1%
2037	8.2%	1.1%
2038	8.2%	1.0%
2039	8.2%	1.1%
2040	8.2%	1.1%
2041	8.2%	1.1%
2042	8.2%	1.1%
2043	8.2%	1.1%
2044	8.2%	1.1%
2045	8.2%	1.1%
2046	8.2%	1.1%
2047	3.1%	1.1%
2048	-0.5%	1.1%
2049	-0.6%	1.1%
2050	-0.5%	1.1%
2051	-0.6%	1.1%
2052	-0.6%	1.1%
2053	-0.6%	1.1%

Get In Touch

The adoption of reach codes can differentiate jurisdictions as efficiency leaders and help accelerate the adoption of new equipment, technologies, code compliance, and energy savings strategies.

As part of the Statewide Codes & Standards Program, the Reach Codes Subprogram is a resource available to any local jurisdiction located throughout the state of California.

Our experts develop robust toolkits as well as provide specific technical assistance to local jurisdictions (cities and counties) considering adopting energy reach codes. These include Cost-effectiveness research and analysis, model ordinance language and other code development and implementation tools, and specific technical assistance throughout the code adoption process.

If you are interested in finding out more about local energy reach codes, the Reach Codes Team stands ready to assist jurisdictions at any stage of a reach code project.

Visit LocalEnergyCodes.com to access our resources and sign up for newsletters.

Contact info@localenergycodes.com for no-charge assistance from expert Reach Code advisors

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CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Application of the 2022 Studies to the 2025 Energy Code:
Existing Single Family Building Upgrades

Prepared by:
Frontier Energy, Inc
Misti Bruceri & Associates, LLC

Prepared for:
Kelly Cunningham, Codes and Standards Program, Pacific Gas and Electric

Revision: 1.0
Last modified: 2025/08/15

SDGE™ SOUTHERN CALIFORNIA EDISON® Energy for What's Ahead® Pacific Gas and Electric Company®

ATTACHMENT D

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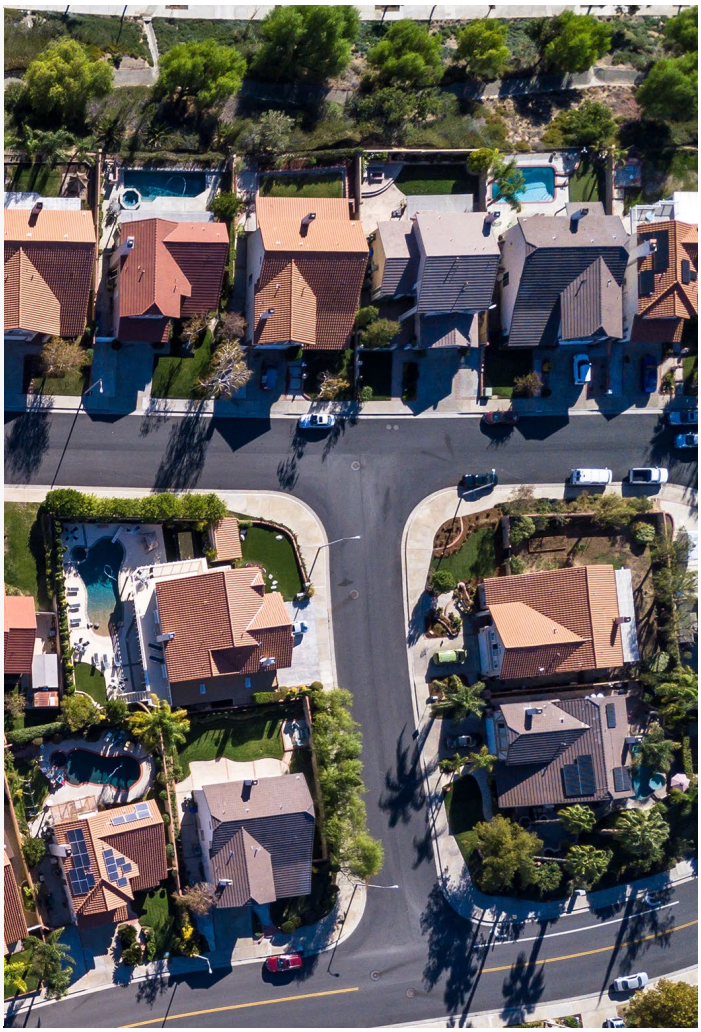

Table 1 Summary of Revisions

Date	Description	Reference (page or section)
8/15/2025	Original Release	N/A

Acronym List

B/C – Lifecycle Benefit-to-Cost Ratio

CASE – Codes and Standards Enhancement

CFL – Compact Fluorescent Lamps

CPAU – City of Palo Alto Utilities

CPUC – California Public Utilities Commission

CZ – California Climate Zone

kWh – Kilowatt Hour

NPV – Net Present Value

PG&E – Pacific Gas and Electric Company

PV – Photovoltaic

SCE – Southern California Edison

SDG&E – San Diego Gas and Electric

SMUD – Sacramento Municipal Utility District

SoCalGas – Southern California Gas Company

Therm – Unit for quantity of heat that equals 100,000 British thermal units

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1 Summary

The California Codes and Standards (C&S) Reach Codes program provides technical support to local governments considering adopting a local ordinance (reach code) intended to support meeting local and/or statewide energy efficiency and greenhouse gas reduction goals. The program facilitates adoption and implementation of the code when requested by local jurisdictions by providing resources such as cost-effectiveness studies, model language, sample findings, and other supporting documentation.

In April 2024, the Statewide Reach Codes Team published the 2022 Cost-Effectiveness Study: Existing Single Family Building Upgrades. This study focuses on existing single family buildings identifying cost-effective measures and measure package upgrades in all 16 California climate zones. The study was conducted to complement Part 6 of the California Building Code (the Energy Code) for the 2022 code cycle, effective January 1, 2023. In the 2019 code cycle the 2019 Cost-Effectiveness Study: Existing Single Family Residential Building Upgrades study included outdoor lighting and a water heater package that was discontinued in the 2022 study but has been brought back in this memo by request from jurisdictions. The studies document the estimated costs, benefits, energy impacts and greenhouse gas emission reductions that may result from implementing an ordinance to help local leadership, residents, and other stakeholders make informed policy decisions.

The Statewide Reach Codes Team reviewed the cost-effectiveness study for impacts of code changes implemented in the 2025 Energy Code. Measures that are now required by code may alter the results presented in the 2022 study. Below is a summary of the changes to the additions and alterations for residential buildings sections of the 2025 Energy Code.

- Mandatory wall insulation R-value has been increased from R-13 to R-15. [Section 150.2(a) of the Energy Code]
- Prescriptive window U-factor has decreased from 0.30 to 0.27 in Climate Zones 1-5, 11-14, and 16. [Section 150.2(b)1B of the Energy Code]

The wall insulation measure has been re-evaluated with R-15 instead of R-13. There is generally a slight increase in utility cost savings as expected with the increase in efficiency. However, there is not a substantial impact on the cost-effectiveness results.

For the prescriptive window U-factor, the original study modeled U-0.28 in all climate zones. This updated memo drops the U-factor from 0.28 to 0.27 in all climate zones. The SHGC is maintained at 0.23 for climate zone 2, 4, and 6-15 and 0.35 for CZ 1, 3, 5, 16. There is minimal impact on the cost-effectiveness results due to this update. However, there are two instances in the 1978-1991 vintage where cost-effectiveness flips from cost-effective to not cost-effective. Climate zone 4 in PGE territory utilizing standard rates and the modest gas escalation is no longer cost-effective on-bill by the smallest margin. Climate zone 10 in SDGE territory utilizing CARE rates and the modest gas escalation has also become no longer cost-effective on-bill.

The 2022 study included a whole building air sealing measure defined as a 30% reduction in air leakage. A new measure – air sealing of the ceiling floor, representing a 14% reduction in air leakage – is added in this memo. Further details and cost-effectiveness results are provided in Section 2.

Lighting measures were previously presented in the 2019 Cost-Effectiveness Study: Existing Single Family Residential Building Upgrades study but were not analyzed in the 2022 study. Updated cost-effectiveness analysis for this measure is presented in Section 3.

The water heating package measure was previously presented in 2019 Cost-Effectiveness Study: Existing Single Family Residential Building Upgrades study. Updated cost-effectiveness analysis for this measure is presented in Section 4.

The 3 kW PV measure from the 2022 study is revised here with an updated cost-effectiveness analysis that accounts for the elimination of the Federal Solar tax credit December 31, 2025. Additional details and analysis are provided in Section 5.

The 2022 report, model ordinance language and other resources are posted on the C&S Reach Codes Program website at LocalEnergyCodes.com. Local jurisdictions that are considering adopting an ordinance may contact the program for further technical support at info@localenergycodes.com.

2 Air Sealing at the Ceiling

Unlike full air sealing, which has previously been presented, air sealing of the ceiling floor may be an attractive measure for an attic remodel project. The whole building air sealing measure estimated a 30% reduction in air leakage, while air sealing at the ceiling measure results in a 14% reduction in air leakage.

Table 2 through Table 7 present the cost-effectiveness results for the air sealing at the ceiling plane measure. The estimated incremental cost for air sealing at the ceiling plane is $1,963 which is from the 2022 Residential Additions and Alterations CASE Report (Statewide CASE Team, 2020).

Table 2. [Pre-1978] Air Sealing at the Ceiling (Std)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	First-year Utility Savings	Lifecycle NPV Savings		
				2025 LSC NPV	On-Bill NPV Modest Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$1,963	$33	($465)	($997)	($432)
CZ02	PGE	$1,963	$18	($1,114)	($1,433)	($1,118)
CZ03	PGE	$1,963	$17	($1,180)	($1,463)	($1,171)
CZ04	PGE	$1,963	$25	($1,081)	($1,290)	($979)
CZ04	CPAU	$1,963	$21	($1,081)	($1,379)	($1,069)
CZ05	PGE	$1,963	$16	($1,230)	($1,500)	($1,235)
CZ05	PGE/SCG	$1,963	$14	($1,230)	($1,555)	($1,325)
CZ06	SCE/SCG	$1,963	($2)	($1,797)	($1,987)	($1,937)
CZ07	SDGE	$1,963	($3)	($1,813)	($2,008)	($1,934)
CZ08	SCE/SCG	$1,963	$7	($1,680)	($1,775)	($1,703)
CZ09	SCE/SCG	$1,963	$10	($1,597)	($1,693)	($1,592)
CZ10	SCE/SCG	$1,963	$17	($1,497)	($1,540)	($1,420)
CZ10	SDGE	$1,963	$23	($1,497)	($1,366)	($1,237)
CZ11	PGE	$1,963	$32	($1,014)	($1,120)	($816)
CZ12	PGE	$1,963	$22	($1,147)	($1,348)	($1,064)
CZ12	SMUD/PGE	$1,963	$17	($1,147)	($1,468)	($1,190)
CZ13	PGE	$1,963	$31	($1,114)	($1,162)	($918)
CZ14	SCE/SCG	$1,963	$32	($897)	($1,130)	($832)
CZ14	SDGE	$1,963	$42	($897)	($845)	($519)
CZ15	SCE/SCG	$1,963	$40	($1,297)	($1,041)	($946)
CZ16	PGE	$1,963	$30	($581)	($1,071)	($551)

Table 3. [1978-1991] Air Sealing at the Ceiling (Std)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	First-year Utility Savings	Lifecycle NPV Savings		
				2025 LSC NPV	On-Bill NPV Modest Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$1,963	$23	($931)	($1,292)	($903)
CZ02	PGE	$1,963	$13	($1,364)	($1,570)	($1,341)
CZ03	PGE	$1,963	$10	($1,480)	($1,668)	($1,496)
CZ04	PGE	$1,963	$16	($1,330)	($1,522)	($1,292)
CZ04	CPAU	$1,963	$13	($1,330)	($1,575)	($1,356)
CZ05	PGE	$1,963	$11	($1,447)	($1,649)	($1,466)
CZ05	PGE/SCG	$1,963	$10	($1,447)	($1,684)	($1,522)
CZ06	SCE/SCG	$1,963	($1)	($1,830)	($1,967)	($1,934)
CZ07	SDGE	$1,963	($4)	($1,896)	($2,040)	($1,991)
CZ08	SCE/SCG	$1,963	$4	($1,797)	($1,860)	($1,813)
CZ09	SCE/SCG	$1,963	$5	($1,747)	($1,823)	($1,764)
CZ10	SCE/SCG	$1,963	$10	($1,663)	($1,722)	($1,652)
CZ10	SDGE	$1,963	$14	($1,663)	($1,603)	($1,517)
CZ11	PGE	$1,963	$25	($1,264)	($1,320)	($1,096)
CZ12	PGE	$1,963	$16	($1,380)	($1,520)	($1,314)
CZ12	SMUD/PGE	$1,963	$12	($1,380)	($1,604)	($1,402)
CZ13	PGE	$1,963	$23	($1,364)	($1,373)	($1,199)
CZ14	SCE/SCG	$1,963	$22	($1,230)	($1,397)	($1,182)
CZ14	SDGE	$1,963	$28	($1,230)	($1,212)	($974)
CZ15	SCE/SCG	$1,963	$32	($1,463)	($1,225)	($1,154)
CZ16	PGE	$1,963	$21	($1,014)	($1,357)	($1,001)

Table 4. [1992-2010] Air Sealing at the Ceiling (Std)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	First-year Utility Savings	Lifecycle NPV Savings		
				2025 LSC NPV	On-Bill NPV Modest Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$1,963	$14	($1,314)	($1,550)	($1,309)
CZ02	PGE	$1,963	$9	($1,530)	($1,687)	($1,529)
CZ03	PGE	$1,963	$7	($1,613)	($1,744)	($1,618)
CZ04	PGE	$1,963	$11	($1,530)	($1,653)	($1,501)
CZ04	CPAU	$1,963	$9	($1,530)	($1,701)	($1,557)
CZ05	PGE	$1,963	$7	($1,613)	($1,759)	($1,637)
CZ05	PGE/SCG	$1,963	$6	($1,613)	($1,788)	($1,686)
CZ06	SCE/SCG	$1,963	$1	($1,863)	($1,936)	($1,911)
CZ07	SDGE	$1,963	$0	($1,896)	($1,944)	($1,911)
CZ08	SCE/SCG	$1,963	$3	($1,830)	($1,885)	($1,851)
CZ09	SCE/SCG	$1,963	$3	($1,780)	($1,892)	($1,853)
CZ10	SCE/SCG	$1,963	$6	($1,763)	($1,814)	($1,767)
CZ10	SDGE	$1,963	$8	($1,763)	($1,741)	($1,681)
CZ11	PGE	$1,963	$14	($1,530)	($1,581)	($1,437)
CZ12	PGE	$1,963	$10	($1,580)	($1,693)	($1,560)
CZ12	SMUD/PGE	$1,963	$8	($1,580)	($1,737)	($1,606)
CZ13	PGE	$1,963	$12	($1,580)	($1,643)	($1,531)
CZ14	SCE/SCG	$1,963	$12	($1,530)	($1,639)	($1,503)
CZ14	SDGE	$1,963	$16	($1,530)	($1,537)	($1,382)
CZ15	SCE/SCG	$1,963	$17	($1,680)	($1,572)	($1,532)
CZ16	PGE	$1,963	$14	($1,314)	($1,556)	($1,314)

Table 5. [Pre-1978] Air Sealing at the Ceiling (CARE)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	First-year Utility Savings	Lifecycle NPV Savings		
				2025 LSC NPV	On-Bill NPV Modest Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$1,963	$26	($465)	($1,212)	($766)
CZ02	PGE	$1,963	$14	($1,114)	($1,550)	($1,302)
CZ03	PGE	$1,963	$13	($1,180)	($1,574)	($1,343)
CZ04	PGE	$1,963	$18	($1,081)	($1,459)	($1,216)
CZ04	CPAU	$1,963	$0	($1,081)	($1,963)	($1,963)
CZ05	PGE	$1,963	$12	($1,230)	($1,604)	($1,395)
CZ05	PGE/SCG	$1,963	$11	($1,230)	($1,648)	($1,467)
CZ06	SCE/SCG	$1,963	($1)	($1,797)	($1,969)	($1,928)
CZ07	SDGE	$1,963	($1)	($1,813)	($1,976)	($1,918)
CZ08	SCE/SCG	$1,963	$5	($1,680)	($1,824)	($1,768)
CZ09	SCE/SCG	$1,963	$8	($1,597)	($1,764)	($1,686)
CZ10	SCE/SCG	$1,963	$12	($1,497)	($1,659)	($1,566)
CZ10	SDGE	$1,963	$16	($1,497)	($1,546)	($1,443)
CZ11	PGE	$1,963	$23	($1,014)	($1,353)	($1,116)
CZ12	PGE	$1,963	$17	($1,147)	($1,503)	($1,279)
CZ12	SMUD/PGE	$1,963	$11	($1,147)	($1,623)	($1,406)
CZ13	PGE	$1,963	$22	($1,114)	($1,394)	($1,205)
CZ14	SCE/SCG	$1,963	$23	($897)	($1,352)	($1,120)
CZ14	SDGE	$1,963	$30	($897)	($1,163)	($905)
CZ15	SCE/SCG	$1,963	$27	($1,297)	($1,334)	($1,266)
CZ16	PGE	$1,963	$24	($581)	($1,270)	($859)

Table 6. [1978-1991] Air Sealing at the Ceiling (CARE)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	First-year Utility Savings	Lifecycle NPV Savings		
				2025 LSC NPV	On-Bill NPV Modest Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$1,963	$18	($931)	($1,442)	($1,135)
CZ02	PGE	$1,963	$10	($1,364)	($1,658)	($1,477)
CZ03	PGE	$1,963	$8	($1,480)	($1,734)	($1,598)
CZ04	PGE	$1,963	$12	($1,330)	($1,627)	($1,446)
CZ04	CPAU	$1,963	$0	($1,330)	($1,963)	($1,963)
CZ05	PGE	$1,963	$8	($1,447)	($1,719)	($1,575)
CZ05	PGE/SCG	$1,963	$7	($1,447)	($1,746)	($1,619)
CZ06	SCE/SCG	$1,963	($0)	($1,830)	($1,959)	($1,933)
CZ07	SDGE	$1,963	($2)	($1,896)	($2,003)	($1,964)
CZ08	SCE/SCG	$1,963	$3	($1,797)	($1,886)	($1,848)
CZ09	SCE/SCG	$1,963	$4	($1,747)	($1,859)	($1,813)
CZ10	SCE/SCG	$1,963	$7	($1,663)	($1,790)	($1,736)
CZ10	SDGE	$1,963	$10	($1,663)	($1,710)	($1,641)
CZ11	PGE	$1,963	$18	($1,264)	($1,500)	($1,325)
CZ12	PGE	$1,963	$12	($1,380)	($1,631)	($1,469)
CZ12	SMUD/PGE	$1,963	$8	($1,380)	($1,716)	($1,558)
CZ13	PGE	$1,963	$16	($1,364)	($1,545)	($1,411)
CZ14	SCE/SCG	$1,963	$16	($1,230)	($1,545)	($1,378)
CZ14	SDGE	$1,963	$20	($1,230)	($1,422)	($1,233)
CZ15	SCE/SCG	$1,963	$22	($1,463)	($1,460)	($1,410)
CZ16	PGE	$1,963	$16	($1,014)	($1,491)	($1,211)

Table 7. [1991-2010] Air Sealing at the Ceiling (CARE)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	First-year Utility Savings	Lifecycle NPV Savings		
				2025 LSC NPV	On-Bill NPV Modest Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$1,963	$11	($1,314)	($1,642)	($1,452)
CZ02	PGE	$1,963	$7	($1,530)	($1,749)	($1,625)
CZ03	PGE	$1,963	$6	($1,613)	($1,793)	($1,693)
CZ04	PGE	$1,963	$8	($1,530)	($1,729)	($1,609)
CZ04	CPAU	$1,963	$0	($1,530)	($1,963)	($1,963)
CZ05	PGE	$1,963	$5	($1,613)	($1,804)	($1,708)
CZ05	PGE/SCG	$1,963	$5	($1,613)	($1,827)	($1,747)
CZ06	SCE/SCG	$1,963	$1	($1,863)	($1,940)	($1,920)
CZ07	SDGE	$1,963	$0	($1,896)	($1,944)	($1,918)
CZ08	SCE/SCG	$1,963	$2	($1,830)	($1,905)	($1,879)
CZ09	SCE/SCG	$1,963	$2	($1,780)	($1,908)	($1,878)
CZ10	SCE/SCG	$1,963	$4	($1,763)	($1,855)	($1,819)
CZ10	SDGE	$1,963	$6	($1,763)	($1,805)	($1,758)
CZ11	PGE	$1,963	$10	($1,530)	($1,685)	($1,572)
CZ12	PGE	$1,963	$7	($1,580)	($1,759)	($1,654)
CZ12	SMUD/PGE	$1,963	$5	($1,580)	($1,802)	($1,700)
CZ13	PGE	$1,963	$9	($1,580)	($1,732)	($1,644)
CZ14	SCE/SCG	$1,963	$9	($1,530)	($1,722)	($1,615)
CZ14	SDGE	$1,963	$11	($1,530)	($1,652)	($1,529)
CZ15	SCE/SCG	$1,963	$12	($1,680)	($1,696)	($1,667)
CZ16	PGE	$1,963	$11	($1,314)	($1,645)	($1,454)

3 Lighting Measures

LED lighting and exterior lighting control measures were previously evaluated in the 2019 Cost-Effectiveness Study: Existing Single Family Residential Building Upgrades study. These measures are not included in the 2022 Cost-Effectiveness Study: Existing Single Family Building Upgrades study, but have been re-evaluated and included in this memo. The updated analysis follows the same methodology as the 2019 study, but with updated costs for equipment and updated utility rates.

The three measures evaluated are LED lighting, exterior photosensor, and LED lighting plus photosensor. Table 8 through Table 10 show the results for the different lighting measures evaluated. Each measure is explained in more detail below.

LED Lighting: Replace screw-in (A-based for lamps) incandescent lamps and compact fluorescent lamps (CFLs) with light-emitting diode (LED) A-lamps. This analysis was conducted external to the energy model and evaluated replacement of a 13 W CFL lamp with an 9.6 W LED lamp operating 620 hours annually. Annual hour estimates were based on whole building average hours of operation from a 2010 lighting study by KEMA (KEMA, 2010). Lifetime assumptions were 10,000 hours for CFLs and 25,000 hours for LED lamps. For incremental cost calculations it was assumed CFLs have a lifetime of 15 years, are installed five years prior to the retrofit, and would need to be replaced at year ten and 25.

Exterior Lighting Controls/Photosensor: Evaluation of exterior lighting controls was completed on a per-luminaire basis external to the energy model and assumes a screw-in photosensor control is installed in outdoor lighting luminaires. Energy savings of 12.1 kWh per year was applied based on analysis done by the Consortium for Energy Efficiency, assuming LED lamps, 2.6 hours per day of operation, and that photosensor controls reduce operating hours on average 20 percent each day (CEE, 2014). Energy savings will be higher for incandescent or CFL luminaires.

Exterior Lighting Controls/Photosensor+LED: An additional evaluation was completed for exterior lighting controls on a per-luminaire basis external to the energy model and assumes a screw-in photosensor control is installed in outdoor lighting luminaires and incandescent lamps CFLs are replaced with light-emitting diode (LED) A-lamps. Energy savings of 14.3 kWh per year was applied based on the sum of the LED lighting and Exterior Lighting Controls with Photosensor kWh energy savings.

For the measures including a LED, a cost of $3.49 for LED dimmable A19 lamp 60 W equivalent is used. A cost of $1.74 is used for an equivalent CFL product which was used to estimate total replacement costs at years 10 and 25. Costs are based on a single LED lamp replacement. For the photosensor, an incremental cost of $12.62, based on a screw-in photosensor control, was obtained from an on-line product search of available products. A five-year lifetime for this type of control was assumed.

Table 8. [All Vintages] LED Lamp vs. CFL

Climate Zone	Electric/ Gas Utility	Measure Cost	Electricity Savings	First Year Utility Cost Savings	Customer On-Bill Modest Gas Escalation		Customer On-Bill High Gas Escalation	
					B/C Ratio	NPV	B/C Ratio	NPV
CZ01	PGE	$1.75	2.2	$0.77	10.05	$15.82	10.58	$16.74
CZ02	PGE	$1.75	2.2	$0.86	11.26	$17.94	11.85	$18.98
CZ03	PGE	$1.75	2.2	$0.78	10.14	$15.99	10.68	$16.92
CZ04	PGE	$1.75	2.2	$0.80	10.39	$16.42	10.94	$17.38
CZ04	CPAU	$1.75	2.2	$0.41	5.32	$7.56	5.60	$8.05
CZ05	PGE	$1.75	2.2	$0.78	10.14	$15.99	10.67	$16.92
CZ05	PGE/SCG	$1.75	2.2	$0.78	10.14	$15.99	10.67	$16.92
CZ06	SCE/SCG	$1.75	2.2	$0.66	8.44	$13.01	8.99	$13.97
CZ07	SDGE	$1.75	2.2	$0.95	13.15	$21.24	13.03	$21.04
CZ08	SCE/SCG	$1.75	2.2	$0.74	9.51	$14.89	10.14	$15.98
CZ09	SCE/SCG	$1.75	2.2	$0.71	9.17	$14.29	9.77	$15.33
CZ10	SCE/SCG	$1.75	2.2	$0.73	9.38	$14.65	9.99	$15.72
CZ10	SDGE	$1.75	2.2	$1.07	14.86	$24.24	14.74	$24.02
CZ11	PGE	$1.75	2.2	$0.85	11.05	$17.57	11.63	$18.59
CZ12	PGE	$1.75	2.2	$0.79	10.32	$16.29	10.86	$17.24
CZ12	SMUD/PGE	$1.75	2.2	$0.47	6.08	$8.88	6.40	$9.44
CZ13	PGE	$1.75	2.2	$0.86	11.27	$17.96	11.86	$19.00
CZ14	SCE/SCG	$1.75	2.2	$0.74	9.58	$15.00	10.21	$16.10
CZ14	SDGE	$1.75	2.2	$1.06	14.68	$23.93	14.56	$23.71
CZ15	SCE/SCG	$1.75	2.2	$0.78	10.01	$15.75	10.66	$16.90
CZ16	PGE	$1.75	2.2	$0.77	9.98	$15.71	10.51	$16.62

Table 9. [All Vintages] Exterior Photosensor

Climate Zone	Electric/ Gas Utility	Measure Cost	Electricity Savings	First Year Utility Cost Savings	Customer On-Bill Modest Gas Escalation		Customer On-Bill High Gas Escalation	
					B/C Ratio	NPV	B/C Ratio	NPV
CZ01	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ02	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ03	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ04	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ04	CPAU	$54.03	12.1	$2.12	0.89	($5.69)	0.94	($3.15)
CZ05	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ05	PGE/SCG	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ06	SCE/SCG	$54.03	12.1	$3.48	1.45	$24.36	1.55	$29.48
CZ07	SDGE	$54.03	12.1	$5.07	2.27	$68.58	2.25	$67.53
CZ08	SCE/SCG	$54.03	12.1	$3.48	1.45	$24.36	1.55	$29.48
CZ09	SCE/SCG	$54.03	12.1	$3.48	1.45	$24.36	1.55	$29.48
CZ10	SCE/SCG	$54.03	12.1	$3.48	1.45	$24.36	1.55	$29.48
CZ10	SDGE	$54.03	12.1	$5.07	2.27	$68.58	2.25	$67.53
CZ11	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ12	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ12	SMUD/PGE	$54.03	12.1	$1.46	0.62	($20.73)	0.65	($18.98)
CZ13	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74
CZ14	SCE/SCG	$54.03	12.1	$3.48	1.45	$24.36	1.55	$29.48
CZ14	SDGE	$54.03	12.1	$5.07	2.27	$68.58	2.25	$67.53
CZ15	SCE/SCG	$54.03	12.1	$3.48	1.45	$24.36	1.55	$29.48
CZ16	PGE	$54.03	12.1	$4.16	1.75	$40.75	1.85	$45.74

Table 10. [All Vintages] LED and Photosensor

Climate Zone	Electric/ Gas Utility	Measure Cost	Electricity Savings	First Year Utility Cost Savings	Customer On-Bill Modest Gas Escalation		Customer On-Bill High Gas Escalation	
					B/C Ratio	NPV	B/C Ratio	NPV
CZ01	PGE	$55.77	14.3	$4.93	2.01	$56.57	2.12	$62.48
CZ02	PGE	$55.77	14.3	$5.02	2.05	$58.70	2.16	$64.72
CZ03	PGE	$55.77	14.3	$4.94	2.02	$56.74	2.12	$62.66
CZ04	PGE	$55.77	14.3	$4.95	2.03	$57.17	2.13	$63.12
CZ04	CPAU	$55.77	14.3	$2.53	1.03	$1.87	1.09	$4.90
CZ05	PGE	$55.77	14.3	$4.94	2.02	$56.74	2.12	$62.66
CZ05	PGE/SCG	$55.77	14.3	$4.94	2.02	$56.74	2.12	$62.66
CZ06	SCE/SCG	$55.77	14.3	$4.13	1.67	$37.37	1.78	$43.45
CZ07	SDGE	$55.77	14.3	$6.02	2.61	$89.82	2.59	$88.57
CZ08	SCE/SCG	$55.77	14.3	$4.22	1.70	$39.25	1.82	$45.46
CZ09	SCE/SCG	$55.77	14.3	$4.19	1.69	$38.65	1.80	$44.82
CZ10	SCE/SCG	$55.77	14.3	$4.21	1.70	$39.01	1.81	$45.20
CZ10	SDGE	$55.77	14.3	$6.14	2.66	$92.82	2.64	$91.55
CZ11	PGE	$55.77	14.3	$5.00	2.05	$58.33	2.15	$64.33
CZ12	PGE	$55.77	14.3	$4.95	2.02	$57.05	2.13	$62.98
CZ12	SMUD/PGE	$55.77	14.3	$1.93	0.79	($11.85)	0.83	($9.54)
CZ13	PGE	$55.77	14.3	$5.02	2.05	$58.71	2.16	$64.73
CZ14	SCE/SCG	$55.77	14.3	$4.22	1.71	$39.37	1.82	$45.58
CZ14	SDGE	$55.77	14.3	$6.13	2.66	$92.51	2.64	$91.24
CZ15	SCE/SCG	$55.77	14.3	$4.26	1.72	$40.12	1.83	$46.38
CZ16	PGE	$55.77	14.3	$4.92	2.01	$56.46	2.12	$62.36

4 Water Heating Package

This package includes the following:

- R-6 water heater blanket
- R-3 hot water pipe insulation
- Low flow fixtures: two low flow showerheads and three sink aerators.

This analysis assumes the homeowner installs these measures themselves and therefore no labor costs. Costs are based on Home Depot prices from August of 2025. The water heater package is evaluated over a 15-year analysis period and assumes the modest gas escalation rate.

Table 11. [All Vintages] Water Heating Package

Climate Zone	Electric/ Gas Utility	Measure Cost	Gas Savings (therms)	First Year Utility Cost Savings	Customer On-Bill	
					B/C Ratio	NPV
CZ01	PGE	$125.68	14.69	$31.11	3.96	$371.76
CZ02	PGE	$125.68	15.60	$35.20	4.48	$437.15
CZ03	PGE	$125.68	15.70	$31.43	4.00	$376.88
CZ04	PGE	$125.68	16.05	$32.62	4.15	$395.78
CZ04	CPAU	$125.68	16.05	$31.99	4.07	$385.77
CZ05	PGE	$125.68	15.83	$31.37	3.99	$375.88
CZ05	PGE/SCG	$125.68	15.83	$28.29	3.60	$326.59
CZ06	SCE/SCG	$125.68	16.67	$29.18	3.71	$340.84
CZ07	SDGE	$125.68	16.75	$37.25	4.74	$469.81
CZ08	SCE/SCG	$125.68	16.78	$29.36	3.74	$343.80
CZ09	SCE/SCG	$125.68	16.66	$29.27	3.72	$342.34
CZ10	SCE/SCG	$125.68	16.58	$28.99	3.69	$337.73
CZ10	SDGE	$125.68	16.58	$37.77	4.80	$478.19
CZ11	PGE	$125.68	15.87	$32.96	4.19	$401.32
CZ12	PGE	$125.68	15.90	$32.85	4.18	$399.47
CZ12	SMUD/PGE	$125.68	15.90	$32.85	4.18	$399.47
CZ13	PGE	$125.68	16.32	$33.00	4.20	$401.93
CZ14	SCE/SCG	$125.68	16.11	$29.79	3.79	$350.57
CZ14	SDGE	$125.68	16.11	$39.23	4.99	$501.49
CZ15	SCE/SCG	$125.68	17.40	$30.16	3.84	$356.50
CZ16	PGE	$125.68	15.14	$31.75	4.04	$381.87

5 PV

The results for 3 kW PV have been updated from the 2022 study to remove the federal solar tax credit from the cost-effectiveness calculations. The removal of the solar tax credit has a substantial impact on many climate zones across all vintages and will impact the FlexPath.

The following describes the impacts and changes to cost-effectiveness from the 2022 study. These observations are utilizing standard rates. Previously, with the solar tax credit, the 3 kW PV measure in the pre-1978 vintage was on-bill cost effective in all climate zones using both the modest and high gas escalation rates. However, with the credit removed, Climate Zones 1-3, 5, 6, and 12 are no longer cost effective on-bill for both the modest and high gas escalations.

Previously for the 1978-1991 vintage the only cases that were not on-bill cost effective were climate zones 2 and 6 utilizing the modest gas escalation. Now, with the credit removed, many more climate zones are no longer cost effective. Using the modest gas escalation, climate zones 1-3, 5, 6, 12, and 16 are not cost effective on-bill. Using the high gas escalation, climate zones 1-3, 5, 6, and 12 (SMUD) are not cost effective on-bill.

Previously for the 1992-2010 vintage the following cases were not cost effective on-bill: climate zones 1-3, 5, and 6 utilizing the modest gas escalation and climate zone 6 using the high gas escalation. With the credit removed an increased number of climate zones are no longer cost effective. Using the modest gas escalation, climate zones 1-3, 4 (PGE) 5-9, 10 (SCE/SCG),12, and 16 are not cost effective on-bill. Using the high gas escalation, climate zones 1-3, 4 (PGE), 5-7, 9, 12, and 16 are not cost effective on-bill.

The cost-effectiveness results are presented in Table 12 through Table 1717.

Table 12. [Pre-1978] 3 kW PV without Solar Tax Credit (Std)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	On-Bill Savings			
			On-Bill B/C Modest Gas Escalation	On-Bill NPV Modest Gas Escalation	On-Bill B/C High Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$13,726	0.80	($3,074)	0.85	($2,410)
CZ02	PGE	$13,726	0.80	($3,072)	0.85	($2,409)
CZ03	PGE	$13,726	0.77	($3,567)	0.81	($2,930)
CZ04	PGE	$13,726	1.11	$1,652	1.16	$2,564
CZ04	CPAU	$13,726	1.38	$5,983	1.45	$7,123
CZ05	PGE	$13,726	0.78	($3,431)	0.82	($2,786)
CZ05	PGE/SCG	$13,726	0.78	($3,431)	0.82	($2,786)
CZ06	SCE/SCG	$13,726	0.87	($2,118)	0.92	($1,231)
CZ07	SDGE	$13,726	1.31	$4,886	1.30	$4,711
CZ08	SCE/SCG	$13,726	1.30	$4,655	1.38	$5,984
CZ09	SCE/SCG	$13,726	1.18	$2,821	1.26	$4,030
CZ10	SCE/SCG	$13,726	1.29	$4,622	1.38	$5,948
CZ10	SDGE	$13,726	1.99	$15,550	1.97	$15,284
CZ11	PGE	$13,726	1.55	$8,684	1.64	$9,967
CZ12	PGE	$13,726	1.07	$1,117	1.13	$2,002
CZ12	SMUD/PGE	$13,726	0.93	($1,109)	0.98	($342)
CZ13	PGE	$13,726	1.80	$12,597	1.90	$14,085
CZ14	SCE/SCG	$13,726	1.58	$9,098	1.68	$10,717
CZ14	SDGE	$13,726	2.15	$17,983	2.13	$17,695
CZ15	SCE/SCG	$13,726	2.24	$19,477	2.39	$21,774
CZ16	PGE	$13,726	1.04	$579	1.09	$1,435

Table 13. [1978-1991] 3 kW PV without Solar Tax Credit (Std)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	On-Bill Savings			
			On-Bill B/C Modest Gas Escalation	On-Bill NPV Modest Gas Escalation	On-Bill B/C High Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$13,726	0.77	($3,570)	0.81	($2,932)
CZ02	PGE	$13,726	0.71	($4,549)	0.75	($3,963)
CZ03	PGE	$13,726	0.74	($4,106)	0.78	($3,497)
CZ04	PGE	$13,726	1.00	$7	1.05	$833
CZ04	CPAU	$13,726	1.35	$5,517	1.42	$6,633
CZ05	PGE	$13,726	0.75	($3,985)	0.79	($3,369)
CZ05	PGE/SCG	$13,726	0.75	($3,985)	0.79	($3,369)
CZ06	SCE/SCG	$13,726	0.73	($4,249)	0.78	($3,501)
CZ07	SDGE	$13,726	1.17	$2,623	1.16	$2,466
CZ08	SCE/SCG	$13,726	1.20	$3,086	1.27	$4,313
CZ09	SCE/SCG	$13,726	1.09	$1,487	1.17	$2,609
CZ10	SCE/SCG	$13,726	1.18	$2,884	1.26	$4,097
CZ10	SDGE	$13,726	1.85	$13,356	1.84	$13,108
CZ11	PGE	$13,726	1.41	$6,420	1.48	$7,583
CZ12	PGE	$13,726	0.97	($512)	1.02	$287
CZ12	SMUD/PGE	$13,726	0.93	($1,109)	0.98	($342)
CZ13	PGE	$13,726	1.63	$9,953	1.72	$11,302
CZ14	SCE/SCG	$13,726	1.42	$6,655	1.52	$8,115
CZ14	SDGE	$13,726	2.00	$15,653	1.98	$15,386
CZ15	SCE/SCG	$13,726	1.94	$14,686	2.06	$16,670
CZ16	PGE	$13,726	0.95	($737)	1.00	$49

Table 1414. [1992-2010] 3 kW PV without Solar Tax Credit (Std)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	On-Bill Savings			
			On-Bill B/C Modest Gas Escalation	On-Bill NPV Modest Gas Escalation	On-Bill B/C High Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$13,726	0.71	($4,475)	0.75	($3,885)
CZ02	PGE	$13,726	0.73	($4,198)	0.77	($3,593)
CZ03	PGE	$13,726	0.72	($4,411)	0.76	($3,817)
CZ04	PGE	$13,726	0.80	($3,121)	0.84	($2,459)
CZ04	CPAU	$13,726	1.16	$2,477	1.22	$3,433
CZ05	PGE	$13,726	0.73	($4,299)	0.76	($3,700)
CZ05	PGE/SCG	$13,726	0.73	($4,299)	0.76	($3,700)
CZ06	SCE/SCG	$13,726	0.61	($6,143)	0.65	($5,520)
CZ07	SDGE	$13,726	0.94	($931)	0.93	($1,057)
CZ08	SCE/SCG	$13,726	0.98	($242)	1.05	$767
CZ09	SCE/SCG	$13,726	0.88	($1,890)	0.94	($988)
CZ10	SCE/SCG	$13,726	0.96	($676)	1.02	$305
CZ10	SDGE	$13,726	1.51	$8,054	1.50	$7,852
CZ11	PGE	$13,726	1.10	$1,569	1.16	$2,477
CZ12	PGE	$13,726	0.80	($3,169)	0.84	($2,510)
CZ12	SMUD/PGE	$13,726	0.93	($1,109)	0.98	($342)
CZ13	PGE	$13,726	1.27	$4,170	1.33	$5,215
CZ14	SCE/SCG	$13,726	1.15	$2,295	1.22	$3,470
CZ14	SDGE	$13,726	1.66	$10,386	1.65	$10,164
CZ15	SCE/SCG	$13,726	1.37	$5,788	1.46	$7,191
CZ16	PGE	$13,726	0.81	($3,006)	0.85	($2,338)

Table 1515. [Pre-1978] 3 kW PV without Solar Tax Credit (CARE)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	On-Bill Savings			
			On-Bill B/C Modest Gas Escalation	On-Bill NPV Modest Gas Escalation	On-Bill B/C High Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$13,726	0.62	($6,030)	0.65	($5,522)
CZ02	PGE	$13,726	0.64	($5,707)	0.67	($5,182)
CZ03	PGE	$13,726	0.60	($6,344)	0.63	($5,853)
CZ04	PGE	$13,726	0.83	($2,725)	0.87	($2,042)
CZ05	PGE	$13,726	0.60	($6,266)	0.63	($5,771)
CZ05	PGE/SCG	$13,726	0.60	($6,266)	0.63	($5,771)
CZ06	SCE/SCG	$13,726	0.71	($4,578)	0.75	($3,852)
CZ07	SDGE	$13,726	0.71	($4,508)	0.71	($4,604)
CZ08	SCE/SCG	$13,726	0.97	($483)	1.03	$510
CZ09	SCE/SCG	$13,726	0.90	($1,530)	0.96	($605)
CZ10	SCE/SCG	$13,726	0.97	($465)	1.03	$530
CZ10	SDGE	$13,726	1.19	$3,032	1.18	$2,872
CZ11	PGE	$13,726	1.07	$1,150	1.13	$2,036
CZ12	PGE	$13,726	0.79	($3,324)	0.83	($2,673)
CZ13	PGE	$13,726	1.23	$3,587	1.29	$4,601
CZ14	SCE/SCG	$13,726	1.17	$2,662	1.25	$3,861
CZ14	SDGE	$13,726	1.28	$4,436	1.27	$4,264
CZ15	SCE/SCG	$13,726	1.57	$8,962	1.67	$10,572
CZ16	PGE	$13,726	0.79	($3,342)	0.83	($2,692)

Table 1616. [1978-1991] 3 kW PV without Solar Tax Credit (CARE)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	On-Bill Savings			
			On-Bill B/C Modest Gas Escalation	On-Bill NPV Modest Gas Escalation	On-Bill B/C High Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$13,726	0.60	($6,343)	0.63	($5,851)
CZ02	PGE	$13,726	0.56	($6,845)	0.59	($6,380)
CZ03	PGE	$13,726	0.57	($6,757)	0.60	($6,287)
CZ04	PGE	$13,726	0.76	($3,715)	0.80	($3,085)
CZ05	PGE	$13,726	0.57	($6,686)	0.60	($6,213)
CZ05	PGE/SCG	$13,726	0.57	($6,686)	0.60	($6,213)
CZ06	SCE/SCG	$13,726	0.61	($6,195)	0.64	($5,575)
CZ07	SDGE	$13,726	0.62	($6,004)	0.61	($6,087)
CZ08	SCE/SCG	$13,726	0.91	($1,483)	0.96	($555)
CZ09	SCE/SCG	$13,726	0.85	($2,368)	0.90	($1,497)
CZ10	SCE/SCG	$13,726	0.90	($1,597)	0.96	($676)
CZ10	SDGE	$13,726	1.10	$1,560	1.09	$1,413
CZ11	PGE	$13,726	0.98	($295)	1.03	$515
CZ12	PGE	$13,726	0.72	($4,320)	0.76	($3,722)
CZ13	PGE	$13,726	1.12	$1,893	1.18	$2,818
CZ14	SCE/SCG	$13,726	1.07	$1,051	1.14	$2,144
CZ14	SDGE	$13,726	1.18	$2,878	1.17	$2,719
CZ15	SCE/SCG	$13,726	1.37	$5,735	1.45	$7,135
CZ16	PGE	$13,726	0.74	($4,126)	0.78	($3,517)

Table 1717. [1992-2010] 3 kW PV without Solar Tax Credit (CARE)

Climate Zone	Electric/ Gas Utility	First Incremental Cost	On-Bill Savings			
			On-Bill B/C Modest Gas Escalation	On-Bill NPV Modest Gas Escalation	On-Bill B/C High Gas Escalation	On-Bill NPV High Gas Escalation
CZ01	PGE	$13,726	0.56	($6,963)	0.59	($6,504)
CZ02	PGE	$13,726	0.26	($11,640)	0.20	($12,611)
CZ03	PGE	$13,726	0.55	($6,997)	0.58	($6,540)
CZ04	PGE	$13,726	0.62	($5,900)	0.66	($5,385)
CZ05	PGE	$13,726	0.56	($6,932)	0.59	($6,471)
CZ05	PGE/SCG	$13,726	0.56	($6,932)	0.59	($6,471)
CZ06	SCE/SCG	$13,726	0.51	($7,652)	0.55	($7,127)
CZ07	SDGE	$13,726	0.48	($8,115)	0.48	($8,180)
CZ08	SCE/SCG	$13,726	0.78	($3,430)	0.83	($2,629)
CZ09	SCE/SCG	$13,726	0.72	($4,462)	0.76	($3,728)
CZ10	SCE/SCG	$13,726	0.76	($3,748)	0.81	($2,968)
CZ10	SDGE	$13,726	0.86	($2,225)	0.85	($2,340)
CZ11	PGE	$13,726	0.79	($3,259)	0.83	($2,605)
CZ12	PGE	$13,726	0.63	($5,876)	0.66	($5,359)
CZ13	PGE	$13,726	0.89	($1,678)	0.94	($941)
CZ14	SCE/SCG	$13,726	0.89	($1,676)	0.95	($761)
CZ14	SDGE	$13,726	0.95	($838)	0.94	($964)
CZ15	SCE/SCG	$13,726	0.99	($142)	1.06	$873
CZ16	PGE	$13,726	0.63	($5,850)	0.66	($5,333)

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The adoption of reach codes can differentiate jurisdictions as efficiency leaders and help accelerate the adoption of new equipment, technologies, code compliance, and energy savings strategies.

As part of the Statewide Codes & Standards Program, the Reach Codes Subprogram is a resource available to any local jurisdiction located throughout the state of California.

Our experts develop robust toolkits as well as provide specific technical assistance to local jurisdictions (cities and counties) considering adopting energy reach codes. These include cost-effectiveness research and analysis, model ordinance language and other code development and implementation tools, and specific technical assistance throughout the code adoption process.

If you are interested in finding out more about local energy reach codes, the Reach Codes Team stands ready to assist jurisdictions at any stage of a reach code project.

Visit

LocalEnergyCodes.com to access our resources and sign up for newsletters

Contact

info@localenergycodes.com for no-charge assistance from expert Reach Code advisors

Explore

The Cost-Effectiveness Explorer is a free resource to help California local governments and stakeholders develop energy policies for buildings.

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Revision: 1.0
Last modified: 2025/08/15

Green Building Chapter Summary / FAQs

What are Green Building Codes:

The state sets certain minimum building code standards every 3 years, which local jurisdictions must adopt and enforce. The Town Council adopts these codes by reference and they are generally contained in Fairfax Municipal Code. The 2025 state building code update will go into effect on January 1, 2026.

Green building codes are a certain type of building code that are designed to reduce environmental impacts. These requirements encourage practices such as:

- Using less energy and water,
- Reducing reliance on fossil fuels,
- Recycling construction waste,
- Improving indoor air quality, and
- Supporting healthier, more resilient communities.

California's statewide green building code, known as CALGreen (Title 24, Part 11), was first adopted in 2010 and is updated every three years.

In addition to "green" building codes, "reach" codes, may be adopted locally to go beyond the state regulations to reflect local priorities, such as wildfire risk, seismic safety, or climate action goals.

Tier 1 of the Green Building Code

In 2019 and 2022, Fairfax has adopted Tier 1 of the Green Building Code. Tier 1 are voluntary measures that the state publishes that jurisdictions can opt-into and enforce. They go above and beyond at encouraging electrification, efficiency, and resilience.

AB 130 – A pause on all Green Building Code Updates Until 2031

Until recently, local jurisdictions have been authorized to adopt local amendments to the state building codes based on localized conditions and priorities. However, effective October 1, 2025, AB 130 pauses local jurisdictions' ability to modify building codes (including green building and reach codes) in order to encourage housing development.

What can the town still do given AB 130?

As referenced in the staff report, there are a few exceptions to AB 130 like if jurisdictions have had similar codes in place before the October 1st deadline. Legal review has determined that adopting Tier 1 of the 2025 Code is substantially similar to the adoption of Tier 1 completed in 2022 and Town is implementing that exception to the assembly bill.

Flexible Compliance Options:

In 2022, Fairfax adopted local green building standards and reach codes including Marin County's Flexible Compliance Pathway (FlexPath) for remodels. FlexPath allows projects to achieve a target score by selecting from a menu of energy efficiency and electrification measures, giving builders and homeowners flexibility to implement measures that best suit their project.

Feedback from the building community and building department staff since adoption in 2022 indicates that the Flex Path is reasonable to comply with and to enforce. In a recent meeting, Marin Builders Association expressed appreciation for the flexibility the policy offers, valuing that it lets homeowners and builders choose what measures make the most sense for the home, as opposed to prescriptive requirements that may not make sense within the project scope. Flex Path offers cost-effective options that contribute to Fairfax's Town Council adopted climate goals.

All remodel projects over 200 square feet are required to go through the Flexible Compliance Pathway, EXCEPT certain hardship and infeasibility variables such as:

- Compliance disproportionate to overall project cost;
- Strict compliance with the standards would create or maintain a hazardous condition(s) and present a life safety risk to the occupants;
- Conflicts with State standards;
- Measures impair a listed historic structure.

What's in the Flex Path Code:

The Flex Path menu contains a mix of energy efficiency and electrification measures. Generally, the electrification measures such as heat pump water heater or heat pump HVAC conversion from gas have a high point value and can be a simple way to achieve the target score. The policy has proven to be an effective tool to encourage home appliance electrification, in conjunction with the Electrify Marin rebate program. Bay Area Air District zero-NOx appliance rules are scheduled to ban the sale of gas water heaters and furnaces in 2027 and 2029, respectively, so the Flex Path's encouragement of heat pumps makes Marin homeowners and building professionals better prepared for the transition.

What's in the 2025 Tier 1 Code:

- EV-ready wiring for single-family homes
- Electric Vehicle Supply Equipment (EVSE) requirements for multifamily and nonresidential buildings
- Embodied carbon compliance for large projects
- Bicycle parking (multifamily & nonresidential)
- Heat pump and photovoltaic baselines in the energy code

Comparison to other Marin Jurisdictions

Jurisdiction	***2022 CALGreen Tier 1 Adopted?***	***Flexible Compliance Pathway adopted pre 2025?***	***Planning to adopt 2025 Tier 1?***	***Readopt FlexPath?***
Unincorporated Marin	*Yes*	*Yes*	*Yes, only non-energy and EV measures*	*Yes*
Corte Madera	*No, just some EV reach codes*	*Yes*	*No*	*Yes*
San Anselmo	*Yes*	*Yes*	*No*	*Yes*
Larkspur	*Yes*	*No*	*Yes*	—
Mill Valley	*Yes*	*No*	*Yes*	*Yes*
Novato	*Yes*	*No*	*Yes*	—
San Rafael	*No*	*Yes*	*No*	*Yes*
Sausalito	*No*	*No*	*In conversation*	—
Tiburon	*Yes*	*Yes but never enforced*	*Yes*	*Yes*