

ENVIRONMENTAL COMMISSION MEETING AGENDA

6:00 PM - Wednesday, August 13, 2025

Via Video Conference and In Person

IN-PERSON PARTICIPATION: Members of the public may participate in-person at the Los Altos Community Center in the Sequoia Room located at 97 Hillview Ave., Los Altos, CA.

REMOTE MEETING PARTICIPATION: Members of the public may attend the meeting virtually via the link below, but will not be permitted to provide public comment via Zoom or telephone.

<https://losaltosca.gov.zoom.us/j/84746058434>

Telephone: 1-669-444-9171 / Meeting ID: 847 4605 8434

PUBLIC COMMENT: Public comments can be made verbally, in-person at the public hearing or submitted in writing prior to the meeting. Written comments can be mailed or delivered in person to the Development Services Department or emailed to ECPublicComment@losaltosca.gov.

Correspondence must be received by 2:00 p.m. on the day of the meeting to ensure distribution prior to the meeting. Comments provided after 2:00 p.m. will be distributed the following day and included with public comment in the Environmental Commission packet.

Public comment cannot be taken via Zoom or telephone.

PLEASE NOTE: Chair Humayun and Commissioner Weiden will participate in the meeting via videoconference from the sites listed below. The meeting agenda will be posted at the videoconference sites, which is accessible to the public. Anyone wishing to address the Commission from the videoconference site will be provided with an opportunity to do so.

Location: 3600 Suncadia Trail Dr, Cle Elum, WA 98922

Location: 500 E George Hopper Rd, Burlington, WA 98233

AGENDA

ESTABLISH QUORUM

PUBLIC COMMENTS ON ITEMS NOT ON THE AGENDA

Members of the audience may bring to the Commission's attention any item that is not on the agenda. The Commission Chair will announce the time speakers will be granted before comments begin. Please be advised that, by law, the Planning Commission is unable to discuss or take action on issues presented during the Public Comment Period. According to State Law (also known as "The Brown Act") items must first be noted on the agenda before any discussion or action.

- [1.](#) Public Comments_8.13.25

SPECIAL PRESENTATIONS

- [2.](#) **GreenTown Los Altos Summer Internship Presentation:** Donovan Carlson will showcase the results from the summer project, highlighting key learnings and achievements from the work.
- [3.](#) **Carbon Removal Presentation:** Karl Danz a volunteer with the OpenAir Collective will present on carbon removal solutions, policy, and how Los Altos can help advance the work.

ITEMS FOR CONSIDERATION/ACTION

- [4.](#) **Meeting Minutes:** Approve minutes of the regular meeting of June 11, 2025.
- [5.](#) **Silicon Valley Clean Energy (SVCE) 2025 Model Codes:** Consideration of City staff's recommendation to Adopt the SVCE 2025 Model Building Codes concurrently with the 2025 State Building Codes update.

INFORMATIONAL ITEMS

- [6.](#) **FY25-26 City Commission Support Budget:** Explanation of allocated funds to support Environmental Commission-related projects.

DISCUSSION ITEMS

- [7.](#) **Residential Building Electrification Working Group Update:** Receive update and discuss next steps. (Hecht, Nee, City Staff)
- [8.](#) **Urban Forest & Ecosystem Master Plan Working Group Update:** Receive update and discuss next steps. (van Reis, Lu)
- [9.](#) **Transportation Update:** Receive an update and discuss next steps. (Humayun)
- [10.](#) **General Outreach:** Receive update and discuss next steps. (All)

COMMISSIONERS' REPORTS AND COMMENTS

- [11.](#) **Reports from Council Meetings**
- [12.](#) **Roundtable Progress Updates**

STAFF UPDATES

POTENTIAL FUTURE AGENDA ITEMS

ADJOURNMENT

SPECIAL NOTICES TO PUBLIC

In compliance with the Americans with Disabilities Act and California Law, it is the policy of the City of Los Altos to offer its programs, services and meetings in a manner that is readily accessible to everyone,

including individuals with disabilities. If you are a person with a disability and require information or materials in an appropriate alternative format; or if you require any other accommodation, please contact department staff. Advance notification within this guideline will enable the City to make reasonable arrangements to ensure accessibility.

Agendas, Staff Reports and some associated documents for the Environmental Commission items may be viewed on the Internet at <http://losaltosca.gov/meetings>.

From: [PALLA](#)
To: [Public Comment - EC](#)
Subject: Public Comment Environmental Commission Meeting August 13, 2025: Item 7# Urban Forest & Ecosystem Master Plan
Date: Wednesday, August 13, 2025 1:25:33 PM

Public Comment – Please acknowledge receipt of this email

Environmental Commission Meeting August 13, 2025 Item 7#

Subject: Urban Forest and Ecosystem Master Plan Update – Incorporating Technical and Value-Based Preservation into our Tree Policies and Community Canopy Plan

Dear Commissioners,

The Preservation Action League Los Altos (PALLA) applauds your efforts and renewed focus on developing a comprehensive tree and ecosystem master plan for Los Altos. Your work is an important step toward engaging the community in thoughtful planning and policy-making for our natural resources.

PALLA is a non-profit, volunteer community group focused on preserving and protecting the environment, living heritage and cultural landscapes, and natural resources in our community. We rely on strong relationships with professionals in historic preservation and environmental experts, and maintain a dense database of documentation related to Los Altos and the Bay Area environmental and historic resources.

PALLA members have been involved in natural resource projects in Los Altos for years. Most recently, we have advocated for the restoration, care, and maintenance of the 2.84 acre Los Altos Heritage Orchard, which is part of what may be the last remaining farmstead (house and orchard) in Santa Clara Valley, the “Valley of the Heart’s Delight” that once included 100,000 acres of orchards. That’s 29 million trees, planted at a historically spaced 145 trees per acre.

Although your work to date appears to be largely borne out of the need for fire safety and wildfire planning, the City of Los Altos has a long tradition of recognizing the importance and value of our trees. We urge you to include the previous City tree inventory and analysis work detailed below, and call out specific chapters on **cultural landscapes and preservation priorities and practices** in your Master Plan.

We also suggest you reconsider the title of the draft master plan to more accurately reflect the heritage and residential village character that is Los Altos. The draft project description uses the term “*urban forest*” while cities and towns comparable to Los Altos employ “tree canopy” and “community forest” plans and programs. Ours is more than an “urban” forest

with naturally occurring landscapes in addition to planned ones. We cherish a rich and distinctive **community canopy that includes heritage trees and groves, and a deep understanding of the value of trees.**

Included in our Los Altos community canopy are not only residential and street trees and City-owned park plantings, we also receive the direct and growing benefits of heritage groves located on City-owned lands:

- **Heritage Orchard** – 2.84 acres of Blenheim Apricots planted in 1901 is a living link to our agricultural past,
- **Redwood Grove** – a unique ecological habitat set among a creek with archeological importance,
- **Chinese Pistache Grove** – the downtown parking plazas planted in 1941 provide a heritage and seasonal asset that draws busloads of leaf-peepers each autumn, and evening light keepers through the year.

Trees are our history, and define our common spaces; they are our brand.

In 2017, the City of Los Altos completed a detailed, value-based community canopy resource analysis and an inventory of most city-owned (non-residential) trees and heritage groves. This study quantified the ecological, economic, and livability benefits of our canopy in clear monetary terms—providing a mechanism for valuing our trees and community canopy: an investment that delivers direct, annual returns to the community. *According to this study, the average single tree delivers \$750 in benefits each year. The report establishes an overall value for 6,437 trees studied in 2017 to be a \$21 million working and growing asset with a value likely double that today.*

As you proceed with the Urban Forest and Ecosystem Plan, we urge you to **integrate the findings of the City of Los Altos 2017 (Urban Forest) Tree Resource Analysis and Inventory** into your work, and consider budgeting the same survey to monitor our canopy from the benchmark data grounded in ecological science and economic valuation to strengthen your planning, budgeting, and policy recommendations.

Again, we appreciate your efforts and look forward to working together with you for the future of Los Altos trees and valuable community landscape assets. We welcome you to include PALLA as one of your Community Groups in the Community engagement and outreach phase of your plan.

Sincerely,

Catherine Nunes

Maria Bautista

Preservation Action League, Los Altos

PALLA

Carbon Dioxide Removal

Karl Danz

August 13, 2025

Los Altos Environmental Commission



Agenda Item 3.



Agenda

Agenda Item 3.

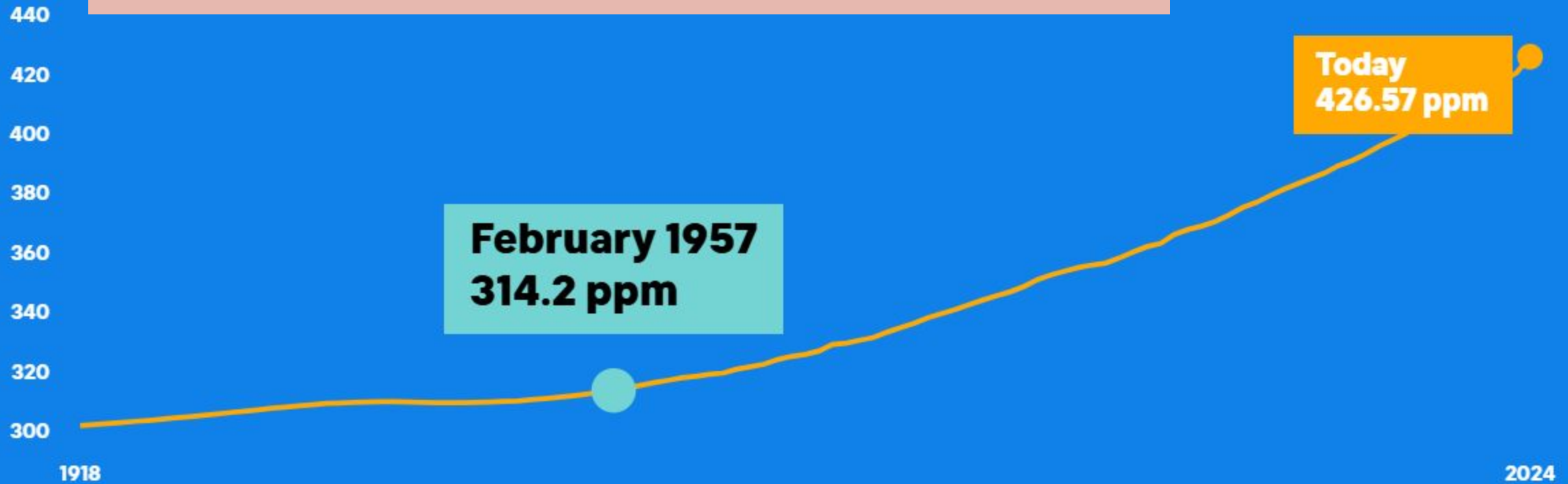
1. Introductions
2. What **Carbon Removal** means (and does not mean)
3. Why we urgently need to **scale up rapidly**
4. Overview of the many possible **solutions**
5. Current state of play with Carbon Removal **policy**
6. Understand how **Los Altos** can help advance the work

A bit about Karl

- Moved to Silicon Valley in 1979
- **Los Altos** resident since 1991 (34 years)
 - BPAC Commissioner for three years
- Learned the science behind “the greenhouse effect” in college
- **Citizens’ Climate Lobby** volunteer since 2013
 - We launched the Silicon Valley North chapter in the old Community Center
 - Paula (wife) and Lisa (daughter) are also very active with CCL
- **OpenAir Collective** volunteer since 2020
 - Sole focus is **Carbon Dioxide Removal** (CDR)



I went to <https://co2.350.org/> and entered my birthday



When you were born in 1957, CO2 in our atmosphere made up around **314.2** parts per million (ppm).

But today, CO2 levels have risen to **426.57** ppm.* That's a **35.76%** increase!

We Can Restore the Climate



Jennifer M. Granholm
Secretary
U.S. Department of Energy

“Carbon dioxide removal is key to restoring our climate—so these extreme weather events don’t just keep getting worse, and so our communities can be safer and healthier.”

"To reach our global climate goals, **gigatons of atmospheric CO2 must be removed every year** by mid-century, alongside aggressive decarbonization."



Both are Required

Emissions Reduction



Carbon Pricing

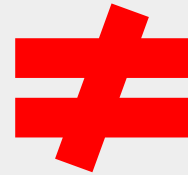


Carbon Removal



CDR

Carbon Dioxide
Removal



CCS

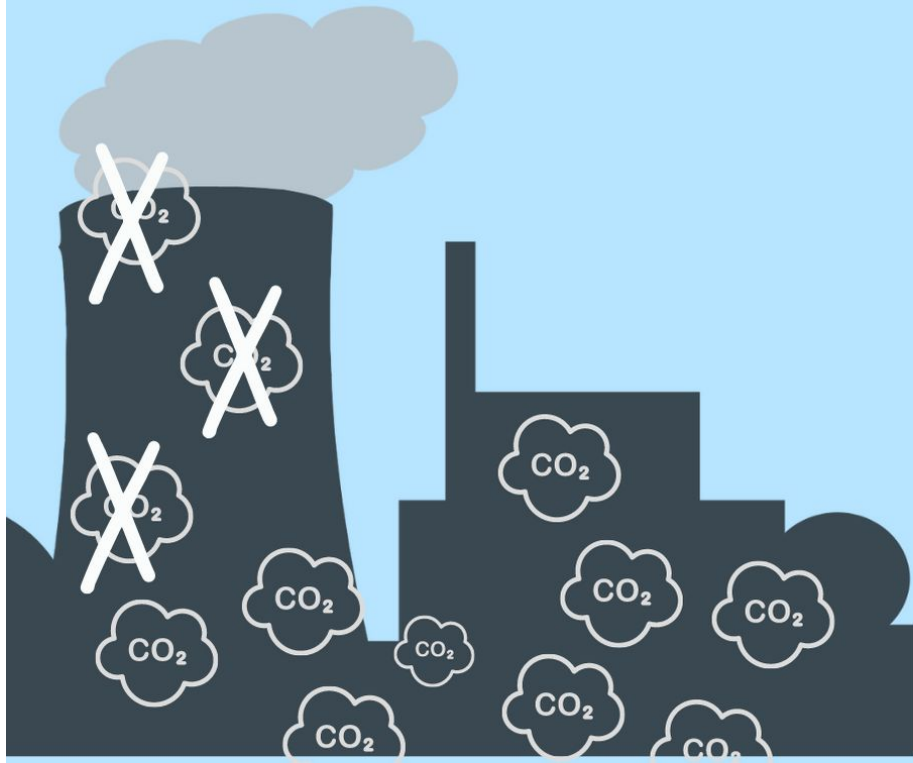
Carbon Capture
& Storage

Activities that remove CO₂ from the atmosphere and durably store it in geological, terrestrial, or ocean reservoirs, or in products

Avoiding emissions by capturing them at industrial sources before they reach the atmosphere

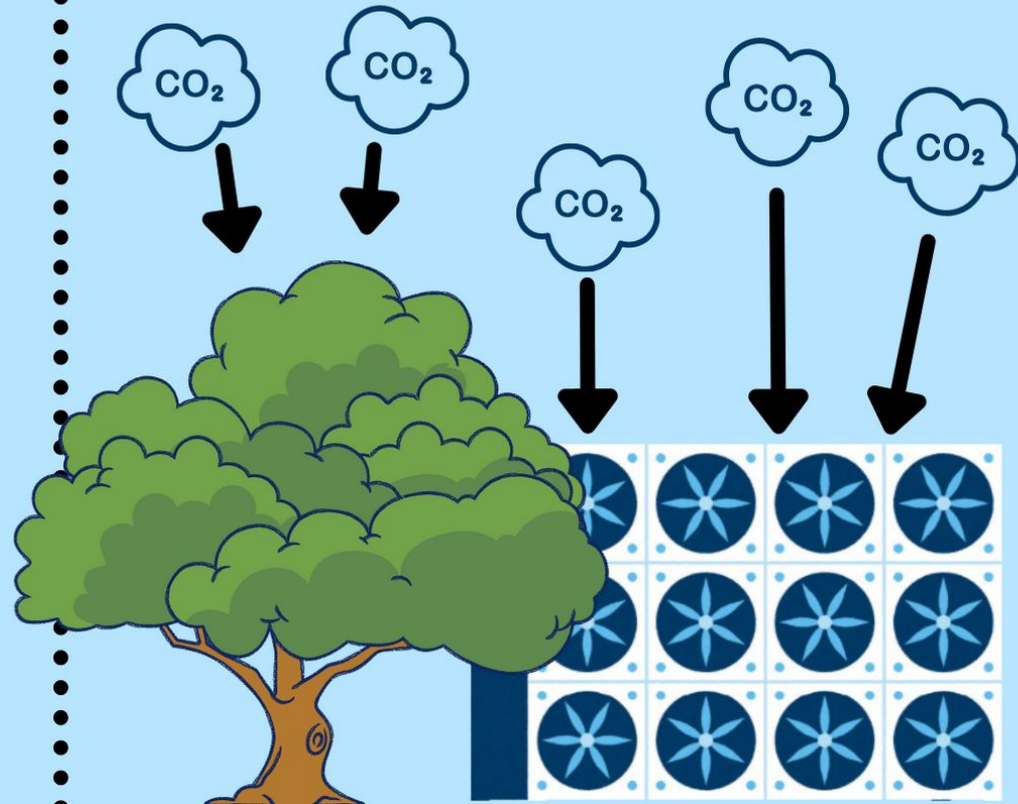
carbon capture

preventing CO₂ from entering the atmosphere



carbon removal

pulling CO₂ out of the atmosphere



The CDR Spectrum

Agenda Item 3.



Natural Sinks

Forests, Soil, Peat,
Mangroves



Bio-Storage

Durable Biochar, Bio-Oil
Injection, Biomass Burial
BiCRS/BECCS, Algae Sinking



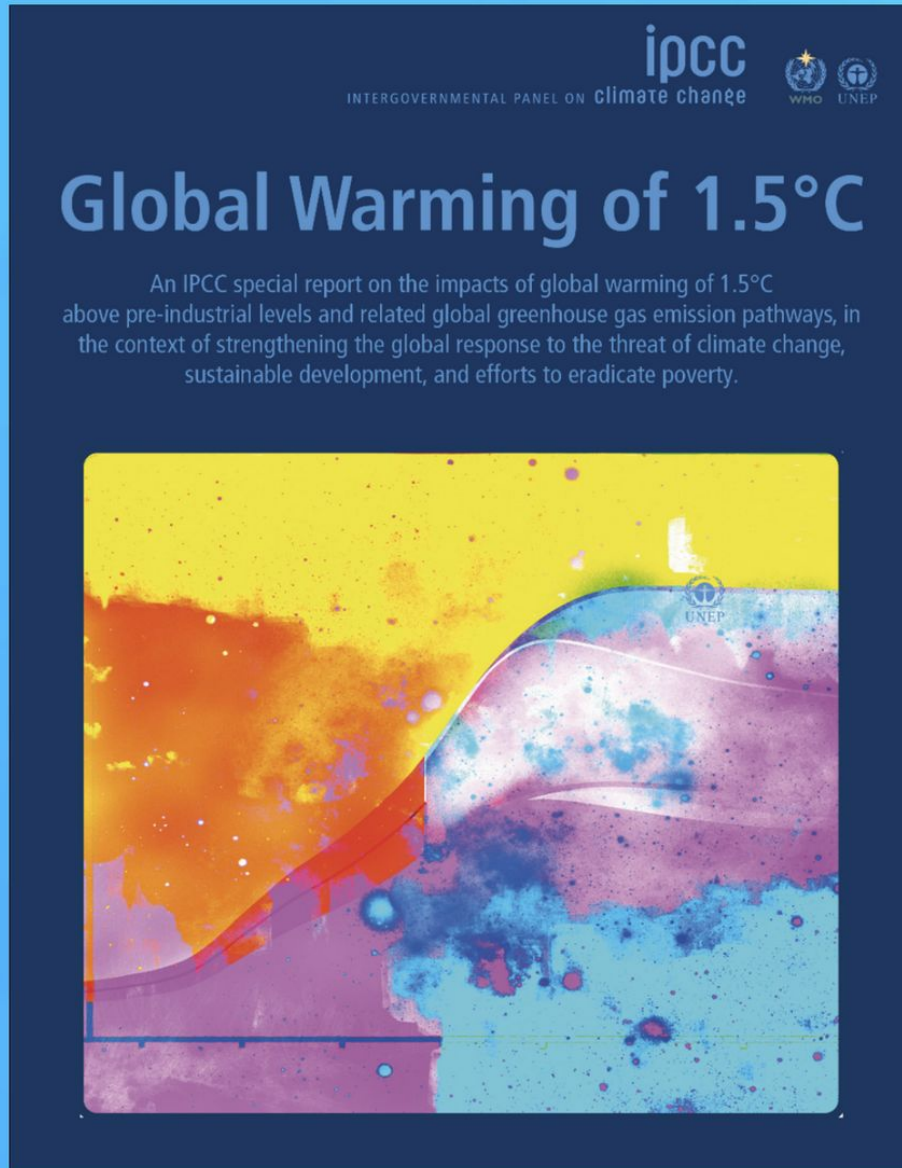
Mineralization

Basalt, Ocean
Alkalinity, Enhanced
Weathering



Direct Air Capture

Thermal, Moisture,
Electrochem



“All pathways that limit warming to 1.5° C require carbon dioxide removal.”

- IPCC AR6 report (2021)

1.5 Trillion Tons of Total CO₂ Emissions

since 1750

~750 Billion
remains in the
Atmosphere
~420 ppm

~50%

~375 Billion
absorbed by
the Ocean
(acidification)

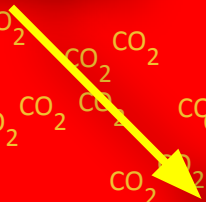
~25%

~375 Billion
absorbed by
Soils &
Plants

~25%

750 Billion tons of
excess CO₂
currently in the atmosphere

At least 40 billion tons added annually



Annual



"Net Zero Emissions"

The Scottish Government has proposed a legally binding target of net-zero greenhouse gas emissions by

2045 at the latest



**NET-ZERO
EMISSIONS**
BY
2050





will happen



What will the climate
look like then?

Worse

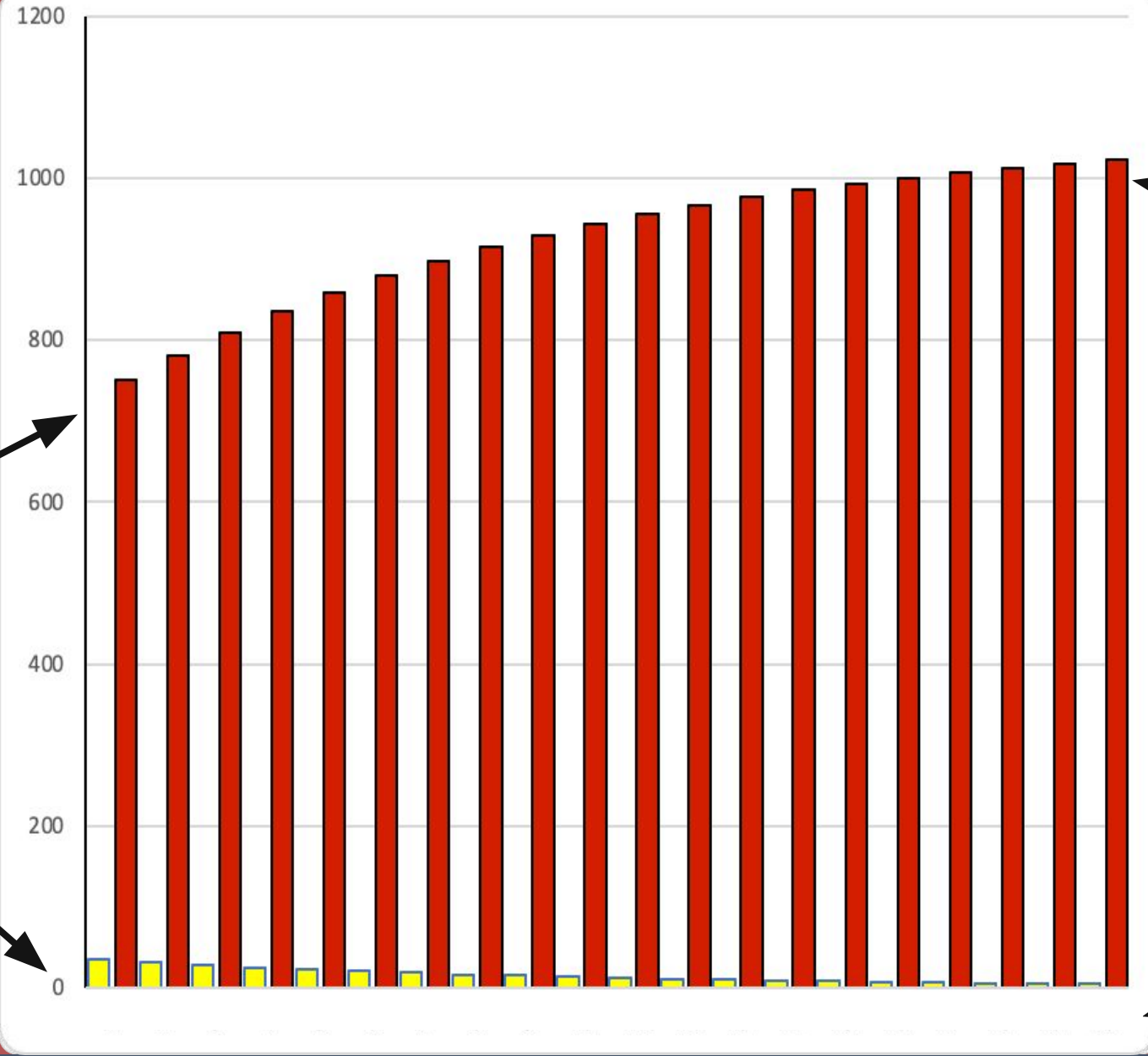
Here's what will happen to cumulative CO₂ emissions if we reduce annual emissions by 10% every year for 20 years.



Here's what
reduce ann

Cumulative
CO₂
(750 B tons,
420 ppm)

Annual
CO₂ Emissions
(35 B tons)

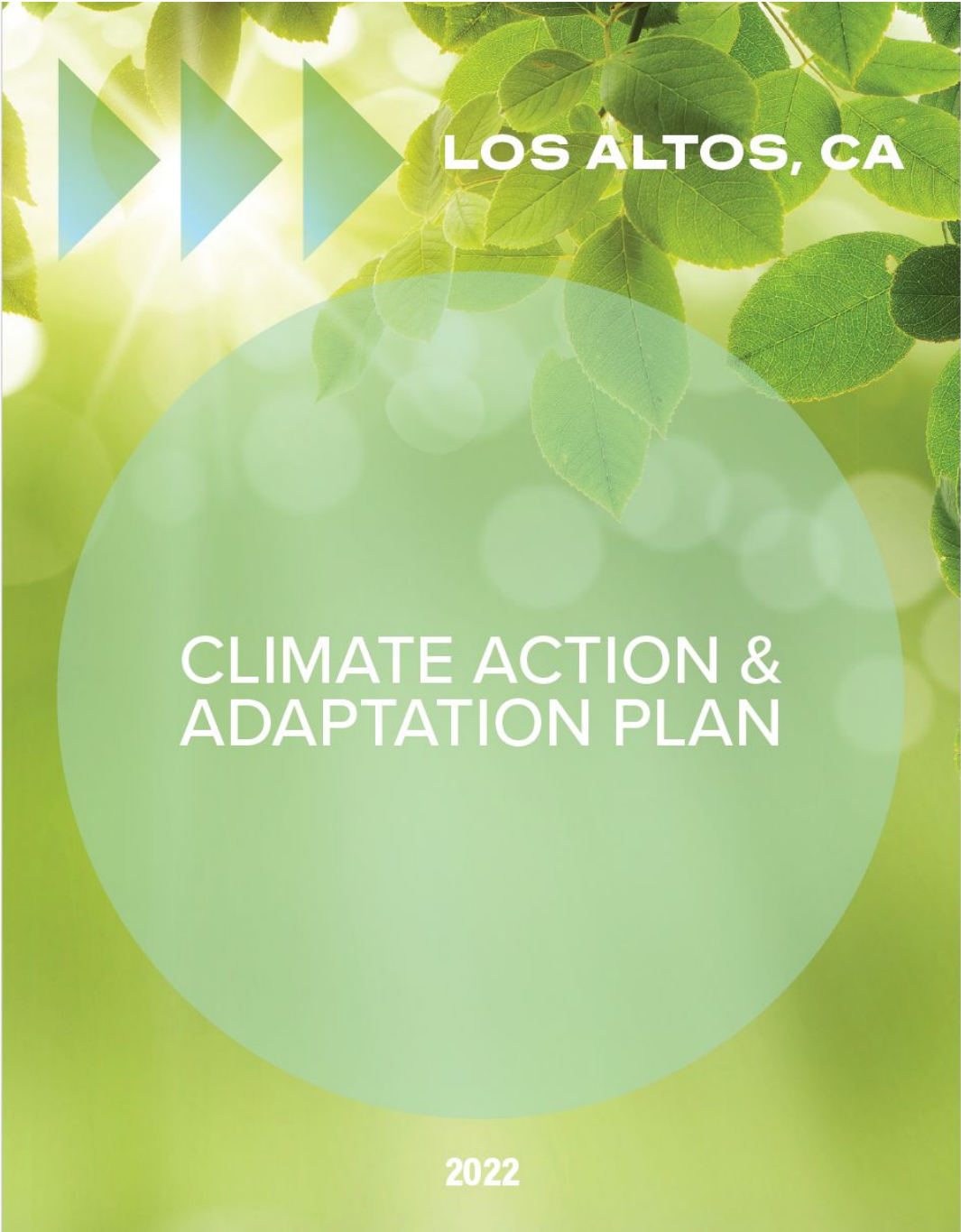


Cumulative
1.022 Trillion tons
(33% increase,
to 558 ppm)

Annual
4.73 Billion tons
(85% reduction)

Carbon Removal Policy

- Federal
 - Billions of dollars during Biden administration
 - Many bills introduced in Congress
- State
 - California state law: We must achieve Net Zero no later than 2045
 - CARB estimates 75M tons/year of “hard to abate” CO2 emissions by then
 - SB 308 [2024] – Sen. Josh Becker – CDR Market Development Act
 - SB 643 [2025] – Sen. Anna Caballero – CDR Purchase Program
- Local
 - Menlo Park – CAP calls for CDR / city staff engaged
 - Los Altos – CAP calls for CDR, with 2035 Net Zero goal



LOS ALTOS, CA

CLIMATE ACTION & ADAPTATION PLAN

2022

Based on the current and forecasted greenhouse gas emissions, implementation of Los Altos' 2013 Climate Action Plan, and guidance from City government and the community, the CAAP is based on pursuing a goal of **Carbon Neutrality by 2035**. Reducing as many GHG emissions produced by the City and its residents as possible and sequestering the remaining emissions through nature-based solutions, innovative carbon sequestration solutions, community-based sequestration projects, and local carbon offsets will be required to reach Carbon Neutrality by 2035.



Driving Carbon Removal Forward. From the Ground Up.

A coast-to-coast, nationwide mobilization to ignite demand for carbon removal across hundreds of cities, towns and counties in all 50 states!

[About](#)[Guide](#)[Suppliers](#)[FAQ](#)

It's on....

In 2025, cities, towns and counties all over the United States are on a mission: build new demand, awareness and support for cutting-edge carbon removal projects from coast to coast through their own collective purchases. It's bold. It's necessary.

And it's happening now.



Objectives

Unleash local interest, support and ideas.

+

Grow and diversify demand for carbon removal.

+

Create a conducive environment for ongoing action.

+

Requests of Los Altos City Council

- Future Agenda item: Carbon Removal Purchasing Challenge
 - Allocate \$5000 to fund local CDR in support of Net Zero 2035 goal
- Engage with other local cities:
 - Palo Alto
 - Menlo Park
- Consider one or more field trips to local CDR startups (partial list):
 - Heirloom Carbon (Brisbane & Tracy)
 - Charm Industrial (San Francisco)
 - Airmyne (Berkeley)
 - Ebb Carbon (San Carlos)
 - Blue Planet (Los Gatos)

References

[Carbon Removal Purchasing Challenge](#)

[CDR Primer](#)

[An Overview of CDR Methods \[Carbon Gap\]](#)

[Carbon180's Carbon Removal Policy Tracker](#)

[Carbon180's Environmental Justice overview](#)

[Indigenous Greenhouse Gas Removal Commission](#)

[Carbon Business Council - Environmental Justice & CDR](#)

[OpenAir Collective](#)

[OpenAir Collective - "This is CDR" Playlist](#)

DRAFT MINUTES OF THE MEETING OF THE ENVIRONMENTAL COMMISSION OF
THE CITY OF LOS ALTOS, HELD ON WEDNESDAY, JUNE 11, 2025, AT 6:00 P.M. IN
PERSON AND TELECONFERENCE

ESTABLISHING QUORUM

PRESENT: Chair Humayun, Vice Chair van Reis, Commissioner Lu, Commissioner Nee
(Virtual), and Commissioner Weiden

ABSENT: Commissioner Hecht

ATTENDEES: Tania Katbi (Management Analyst II)

PUBLIC COMMENTS ON ITEMS NOT ON THE AGENDA

Public comments provided by Chloe Cheung, GreenTown Interns, Gary Hedding, and Glenda Chang.

SPECIAL PRESENTATION

1. **Silicon Valley Clean Energy (SVCE) Presentation**

SVCE presented on the Full Service Home Upgrade Program and other updates followed by Q&A.

2. **GreenTown Los Altos Summer Internship Program:**

Interns from GreenTown's summer internship program presented on the projects they'll be leading.

Action: Interns to come back at a future meeting to report out on their work.

ITEMS FOR CONSIDERATION/ACTION

3. **Environmental Commission Minutes**

Approved minutes of the May 14, 2025, meeting.

Action: Upon a motion by Commissioner Nee, seconded by Vice Chair van Reis, the Environmental Commission approved the meeting minutes with edits.

The motion was approved (5-0) by the following vote:

AYES: Lu, Humayun, Nee, van Reis, Weiden

NOES: None

ABSENT: Hecht

DISCUSSION ITEMS

4. **Urban Forest and Ecosystem Health**

Commissioners presented their preliminary ideas for the plan followed by feedback and discussion by the group.

Public Comment by Gary Hedden, GreenTown.

5. **Residential Building Electrification Updates**

Commissioners presented on their findings for accelerating residential building electrification. The Commission approved recommendations to use FY 24-25 building electrification funds toward retaining a consultant to oversee and coordinate a home electrification speaker series and acquiring portable induction stovetops for community outreach and engagement activities.

COMMISSIONERS' REPORTS AND COMMENTS

6. Reports from Council Meetings

Commissioners shared updates from Council meetings.

7. Roundtable Progress Updates

Commissioners shared project updates.

Group	Topic	Commissioner
Working Pair	Residential Home Electrification	Weiden, Nee
Working Pair	Urban Forest	Lu, van Reis
Individual Work	Electrification Event	van Reis
Individual Work	Transportation	Humayun
Individual Work	Deconstruction	Humayun

STAFF UPDATES

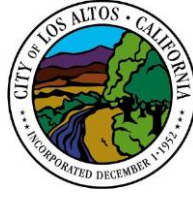
Staff shared updates with the commission.

POTENTIAL FUTURE AGENDA ITEMS

1. CAL Water Update (TBD)
2. GHG Inventory Follow-up (TBD)
3. Workplan Updates (TBD)
4. SVCE Full-Service Program Presentation (June)
5. GreenTown Interns (June)
6. Deconstruction Discussion (June)
7. Residential Electrification Discussion (June)
8. CAAP Updates Discussion (June)
9. Transportation Discussion (June)
10. General Outreach Discussion (June)

ADJOURNMENT

Chair Humayan adjourned the meeting at 8:13 pm.



Meeting Date: August 13, 2025

Subject: SVCE 2025 Model Codes Recommendation

Prepared by: Tania Katbi, Management Analyst II

RECOMMENDATION

Staff recommends Adoption of the Silicon Valley Clean Energy (SVCE) 2025 Model Ordinances, AC to Heat Pump and Electric Readiness, to the City Council for adoption concurrently with the 2025 State Building Code updates.

BACKGROUND

The SVCE Model Codes were developed in partnership with other Community Choice Energy providers and the Statewide Local Energy Codes Program, a team of policy and technical experts funded by the California IOUs: PG&E, SCE, and SDG&E.

SVCE provides comprehensive technical assistance, model ordinance language, and resources to support member jurisdictions through the local amendment adoption process during the Title 24 update, including necessary cost-effectiveness studies required by the California Energy Commission (CEC).

The latest iteration of Title 24 was published on July 1, 2025, and is scheduled to become effective statewide on January 1, 2026.

ANALYSIS

The SVCE 2025 Model Codes are designed to promote all-electric construction through energy performance standards, which aligns with legal interpretations after the Berkeley ruling and avoids prohibition on natural gas infrastructure. Specifically, City staff are proposing to Adopt the AC to HP and Electric Readiness model ordinances.

AC to Heat Pump: The proposed ordinance would require that projects in single-family homes, duplexes, and townhomes involving replacement or alteration of an existing air conditioning system or installation of a new air conditioning system must either include a heat pump space conditioner as the primary heating system or install specific energy efficiency measures. Heat pumps are far more efficient than gas furnaces and result in fewer greenhouse gas emissions.

Key benefits include:

- **Flexibility:** It's a voluntary model for local adoption, with coordinated enhancements to its language, ensuring a well-developed and adaptable framework.

- **Cost-Effectiveness:** Implementation requires cost-effectiveness determination, making it financially viable.
- **Direct Impact on Nonresidential Buildings:** The upcoming 2025 Energy Code will prescriptively require AC-to-HP for smaller nonresidential units, demonstrating precedence.
- **Improved Air Quality:** Helps reduce harmful NOx emissions from gas appliances, which contribute to ozone and particulate matter, addressing critical air quality concerns in regions like the Bay Area and Los Angeles.
- **Future-Proofing:** Adopting this code aligns with anticipated air quality regulations, including restrictions on furnace sales beginning in 2029, preparing the city for future mandates.

Electric Readiness: The proposed ordinance would require electric ready measures such as circuits or conduit to prepare for future electrification during a relevant addition or alteration.

Key benefits include:

- **Prepares for Future Regulations:** Positions the city to comply with upcoming restrictions on gas appliance sales (e.g., water heaters) from 2027 onwards, avoiding last-minute compliance challenges.
- **Reduces Future Retrofit Costs:** Saves money by installing necessary electrical infrastructure upfront, eliminating the need for costly future contractor visits and disruptive demolition during appliance upgrades.
- **Provides Technological Flexibility:** Does not require immediate electric appliance installation but ensures buildings are equipped for future electrification, accommodating a wide range of available 120V electric appliances for various uses.

Note: A cost-effectiveness study is not necessary because it does not require energy conservation or efficiency with the proposed Model Ordinances.

Schedule and Next Steps

Should Council approve staff’s recommendations, work would proceed on the timeline provided in the table below.

Task	Timeframe
First reading of the draft Ordinance	October
Second reading of the draft Ordinance and submittal to the California Energy Commission and California Building Standards Commission	October
Receive approval from the California Energy Commission and California Building Standards Commission approves for filing	November/December
Policy goes into effect	No sooner than 1/1/26

ATTACHMENTS

1. AC to HP Model Ordinance

2. Electric Readiness Model Ordinance
3. 2025 Single Family AC to Heat Pump Cost-Effectiveness Study
4. TRC PPT Slides

Model Ordinance

ORDINANCE AMENDING THE *[CITY/COUNTY OF JURISDICTION]* BUILDING CODE TO REQUIRE ENERGY CONSERVATION MEASURES FOR AIR CONDITIONER ALTERATIONS, REPLACEMENTS AND INSTALLATIONS IN EXISTING SINGLE-FAMILY BUILDINGS

Findings

Amendments to the State Building Code require jurisdictions to make certain express findings; additional findings are required to support amendments to the State Energy Code. Refer to Guide for Local Amendments of Building Standards 2022 for more information. Required findings include:

- *A declaration of the authorities granted by the State to the jurisdiction to amend the code, which include:*
 - *Health and Safety Code sections 17958.7 and 18941.5*
 - *Public Resources Code Section 25402.1(h)(2)*
 - *Section 10-106 of the Building Energy Efficiency Standards*
- *A determination that the amendments are reasonably necessary to address local climatic, geological, or topographical conditions*
- *A determination that the proposed standards are cost-effective and a reference to the supporting analysis*
- *A declaration that the jurisdiction has at a public meeting, adopted its determination that the standards are cost-effective*
- *A determination that the proposed standards are more stringent than the State Energy Code and that they will require buildings to be designed to consume less energy than permitted by the State Energy Code*
- *Any findings, determinations, declarations, or reports, including any negative declaration or environmental impact report, required pursuant to the California Environmental Quality Act*

Sample Amendments

Chapter *[cite local code section]* of the *[local jurisdiction municipal/county code]*, adoption of the 2025 California Green Building Standards Code, Title 24, Part 11, is hereby amended to add the following section as mandatory.

A4.204.1 Energy Efficiency. Alterations to existing residential buildings shall comply with Sections A4.204.1.1 and A4.204.1.2.

A4.204.1.1 Altered Space-Conditioning System Serving Existing Single-Family Dwelling Units – Mechanical Cooling. When a space-conditioning system serving an existing single-family dwelling unit is altered in climate zones 1 through 14 and 16 by installation or replacement of an air conditioner, the altered system shall comply with either a or b below in addition to the requirements for installation specified by Title 24, Part 6, Sections 150.2(b)1E and 150.2(b)1F:

- a. A heat pump shall be the primary heating source and sized according to the system selection requirements specified by Title 24, Part 6 of Section 150.0(h)5. Supplemental heating may be provided by ~~an existing~~ gas furnace or ~~existing~~ electric resistance heating as specified in Title 24, Part 6, Sections 150.0(h)7 and 150.0(i); or
- b. An air conditioner shall meet ~~the following~~ all the requirements in either subsection I or II below:

I. Systems with Existing Duct Distribution Systems:

~~I. R-8 duct insulation for ducts located in unconditioned space; and~~

- A. ~~II.~~ The duct system measured air leakage shall be equal to or less than 510 percent of the system air handler airflow as confirmed through field verification and diagnostic testing, per the requirements in Title 24, Part 6, Reference Residential Appendix Section RA3.1.4.3.1; and

Exception 1 to A4.204.1.1bIA. If it is not possible to meet the duct sealing requirements, all accessible leaks shall be sealed and verified through a visual inspection and a smoke test by a certified ECC-Rater utilizing the methods specified in Reference Residential Appendix Section RA3.1.4.3.5.

Exception 2 to A4.204.1.1bIA: Existing duct systems, constructed, insulated or sealed with asbestos.

- B. ~~III.~~ Demonstrate, in every control mode, airflow greater than or equal to 400-300 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy less than or equal to 0.45 W/CFM. The airflow rate and fan efficacy requirements in this section shall be confirmed through field verification and diagnostic testing, following the procedures outlined in Title 24, Part 6, Reference Residential Appendix RA3.3; and

Exception 1 to A4.204.1.1bIB: Systems unable to comply with the minimum airflow rate and system efficacy requirements shall demonstrate compliance by satisfying all of the following:

1. Following the procedures in Section RA3.3.3.1.5;
2. Installing a system thermostat that conforms to the specifications in Section 110.12;
3. For standard ducted systems (without zoning dampers), meet the applicable minimum total return filter grille nominal area requirements in Table 150.0-B or 150.0-C as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Sections RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements specified by Section 150.0(m)12D for the system air filter(s) shall conform to the requirements given in Tables 150.0-B and 150.0-C.

Exception 2 to Section A4.204.1.1bIB: Multispeed compressor systems or variable speed compressor systems shall verify air flow (cfm/ton) and fan efficacy (Watt/cfm) for system operation at the maximum compressor speed and the maximum air handler fan speed.

Exception 3 to Section A4.204.1.1bIB: Gas furnace air-handling units manufactured prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 W/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.

C. ~~IV.~~ In all climate zones, refrigerant charge verification requirements shall meet the requirements in Title 24, Part 6 Section 150.2(b)1Fiib, including the minimum airflow rate specified in Section 150.2(b)1Fiia; and

D. ~~V.~~ Vented attics shall have insulation installed to achieve a U-factor of 0.020 or insulation installed at the ceiling level shall result in an insulated thermal resistance of R-49 or greater for the insulation alone; luminaires not rated for insulation contact must be replaced or retrofitted with a fireproof cover that allows for insulation to be installed directly over the cover; and

Exception 1 to Section A4.204.1.1(b)ID: Dwelling units with at least R-38 existing insulation installed at the ceiling level.

Exception 2 to Section A4.204.1.1(b)ID: Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.

Exception 3 to Section A4.204.1.1(b)ID: Dwelling units with knob and tube wiring located in the vented attic.

Exception 4 to Section A4.204.1.1(b)ID: Where the accessible space in the attic is not large enough to accommodate the required R-value, the entire accessible space shall be filled with insulation provided such installation does not violate Section 806.3 of Title 24, Part 2.5.

E. ~~VI.~~ Air seal all accessible areas of the ceiling plane between the attic and the conditioned space including all joints, penetrations and other openings that are

potential sources of air leakage by caulking, gasketing, weather-stripping or otherwise sealing to limit infiltration and exfiltration.

Exception 1 to Section A4.204.1.1bIE: Dwelling units with at least R-38 existing insulation installed at the ceiling level.

Exception 2 to Section A4.204.1.1 bIE: Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.

Exception 3 to Section A4.204.1.1bIE: Dwelling units with atmospherically vented space heating or water heating combustion appliances located inside the pressure boundary of the dwelling unit.

II. Entirely New or Complete Replacement Duct Systems:

- A. ~~†~~-R-8 duct insulation shall be installed for all new ducts located in unconditioned space; and
- B. ~~‡~~-The total duct system measured air leakage shall be equal to or less than 5 percent of the system air handler airflow as confirmed through field verification and diagnostic testing, per the requirements in Title 24, Part 6, Reference Residential Appendix Section RA3.1.4.3.1; and
- C. ~~‡‡~~ Demonstrate, in every control mode, airflow greater than or equal to ~~400~~350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy less than or equal to 0.35 W/CFM. The airflow rate and fan efficacy requirements in this section shall be confirmed through field verification and diagnostic testing, following the procedures outlined in Title 24, Part 6, Reference Residential Appendix RA3.3; and
- D. ~~IV~~-In all climate zones, refrigerant charge verification requirements shall meet the requirements in Title 24, Part 6 Section 150.2(b)1Fiib; and
- E. ~~V~~-In Climate Zones 1-4, 6, and 8-16 if the air handler and ducts are located within a vented attic, ~~v~~vented attics shall have insulation installed to achieve a U-factor of 0.020 or insulation installed at the ceiling level shall result in an insulated thermal resistance of R-49 or greater for the insulation alone; luminaires not rated for insulation contact must be replaced or retrofitted with a fireproof cover that allows for insulation to be installed directly over the cover; and

Exception 1 to Section A4.204.1.1bIIE: In Climate Zones 1, 3, and 6, dwelling units with at least R-19 existing insulation installed at the ceiling level.

Exception 2 to Section A4.204.1.1bIIE: Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.

Exception 3 to Section A4.204.1.1bII E: Dwelling units with knob and tube wiring located in the vented attic.

Exception 4 to Section A4.204.1.1bII E: Where the accessible space in the attic is not large enough to accommodate the required R-value, the entire accessible space shall be filled with insulation provided such installation does not violate Section 806.3 of Title 24, Part 2.5.

- F. ~~VI-~~ In Climate Zones 2, 4, and 8-16, aAir seal all accessible areas of the ceiling plane between the attic and the conditioned space including all joints, penetrations and other openings that are potential sources of air leakage by caulking, gasketing, weather-stripping or otherwise sealing to limit infiltration and exfiltration.

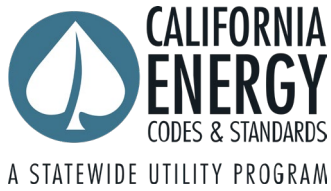
Exception 1 to Section A4.204.1.1bII F: Dwelling units with at least R-19 existing insulation installed at the ceiling level.

Exception 2 to Section A4.204.1.1bII F: Dwelling units where the alteration would directly cause the disturbance of asbestos unless the alteration is made in conjunction with asbestos abatement.

Exception 3 to Section A4.204.1.1bII F: Dwelling units with atmospherically vented space heating or water heating combustion appliances located inside the pressure boundary of the dwelling unit.

Exception 1 to Section A4.204.1.1: Where the capacity of the existing main electrical service panel is insufficient to supply the electrical capacity of a heat pump and where the existing main electrical service panel is sufficient to supply a new or replacement air conditioner, as calculated according to the requirements of California Electrical Code Article 220.83 or Article 220.87. Documentation of electrical load calculations in accordance with Article 220 must be submitted to the enforcement agency prior to permitting for both the heat pump and proposed air conditioner.

Exception 2 to Section A4.204.1.1: Where the required capacity of a heat pump to meet the system selection requirements of Section 150.0(h)5 is greater than or equal to 12,000 Btu/h more than the greater of the required capacity of an air conditioner to meet the design cooling load OR the capacity of the existing air conditioner. Documentation of heating and cooling load calculations in accordance with 150.0(h) must be submitted to the enforcement agency prior to permitting for both the heat pump and proposed air conditioner.



2025 Cost-Effectiveness Study: Single Family AC to Heat Pump Replacement

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Revision: 1.0

Last modified: 2025/06/09

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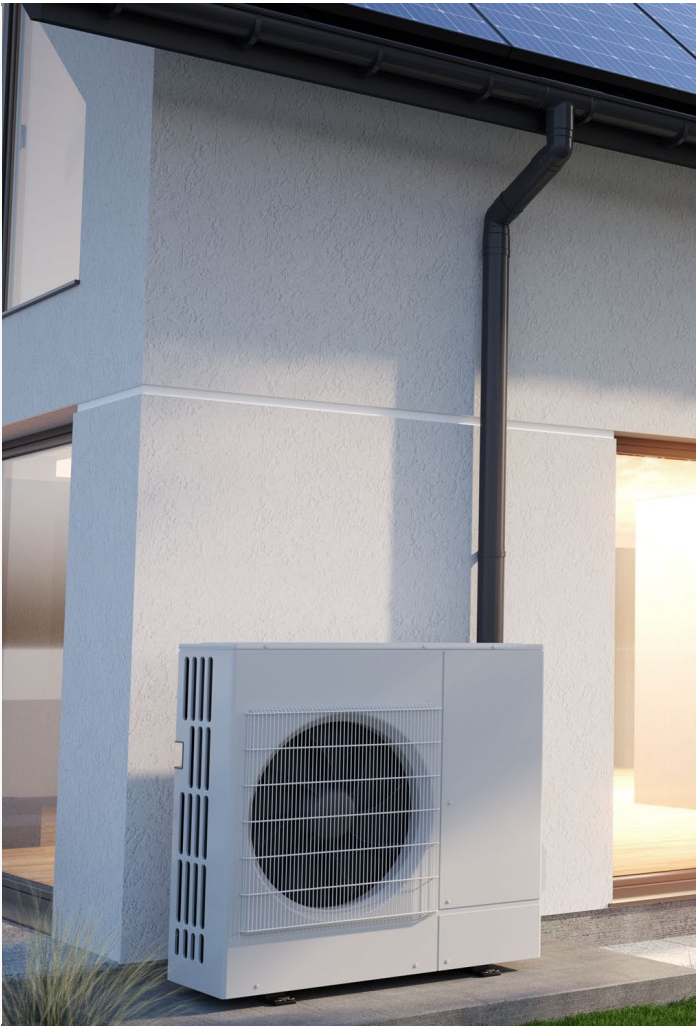


Table 1. Summary of Revisions

Date	Description	Reference (page or section)
6/09/2025	Original Release	N/A

Acronym List

AC – Air conditioner	EER – Energy Efficiency Ratio	SoCalGas – Southern California Gas Company
ACH50 – Air Changes per Hour at 50 pascals pressure differential	EF – Energy Factor	TDV – Time Dependent Valuation
AFUE – Annual Fuel Utilization Efficiency	GHG – Greenhouse Gas	Therm – Unit for quantity of heat that equals 100,000 British thermal units
B/C – Lifecycle Benefit-to-Cost Ratio	HPWH – Heat Pump Water Heater	Title 24 – Title 24, Part 6
BSC – Building Standards Commission	HSPF – Heating Seasonal Performance Factor	TOU – Time-Of-Use
CA IOUs – California Investor-Owned Utilities	HVAC – Heating, Ventilation, and Air Conditioning	UEF – Uniform Energy Factor
CARE – California Alternate Rates for Energy	IOU – Investor Owned Utility	
CASE – Codes and Standards Enhancement	kBtu – kilo-British thermal unit	
CBECC-Res – Computer program developed by the California Energy Commission for demonstrating compliance with the California Residential Building Energy Efficiency Standards	kWh – Kilowatt Hour	
CFM – Cubic Feet per Minute	LCC – Lifecycle Cost	
CO ₂ – Carbon Dioxide	LLAHU – Low Leakage Air Handler Unit	
CPAU – City of Palo Alto Utilities	VLLDCS – Verified Low Leakage Ducts in Conditioned Space	
CPUC – California Public Utilities Commission	NEEA – Northwest Energy Efficiency Alliance	
CZ – California Climate Zone	NEM – Net Energy Metering	
DFHP – Dual Fuel Heat Pump	NPV – Net Present Value	
DHW – Domestic Hot Water	PG&E – Pacific Gas and Electric Company	
DOE – Department of Energy	PV – Photovoltaic	
EDR – Energy Design Rating	SCE – Southern California Edison	
	SDG&E – San Diego Gas and Electric	
	SEER – Seasonal Energy Efficiency Ratio	
	SF – Single Family	
	SMUD – Sacramento Municipal Utility District	

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Executive Summary

The California Codes and Standards (C&S) Reach Codes program, also known as the Local Energy 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.

It is important to note that there is a voluntary measure in the 2025 CALGreen for replacing an air conditioner with a heat pump at time of air conditioner replacement, which can be adopted as is. This report seeks to provide options to modify the heat pump measure, and demonstrate the cost-effectiveness of these options.

This analysis used two different metrics to assess the cost-effectiveness of the proposed upgrades for a 1,665 square foot single family home prototype with an attached garage. 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 an occupant-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. To reflect how natural gas prices fluctuate with seasonal supply and demand, a normalized curve was used to estimate the cost for the remaining months relative to today's rates. Long-term Systemwide Cost (LSC) is the California Energy Commission's metric for determining cost-effectiveness of efficiency measures in the 2025 Energy Code. This metric 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.

Local jurisdictions may 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 California Building Code (the Energy 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 and do not require the Energy Commission approval. Although a cost-effectiveness study is only required to amend Part 6 of the California Building Code, this study provides valuable context for jurisdictions pursuing other ordinance paths to understand the economic impacts of the 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.

The following summarizes key results:

1. Heat pumps are significantly more efficient than gas furnaces, requiring less than half the energy to meet the heating load. However, despite this reduction in heating energy use, the cost of heating a home using electricity (heat pump) could be higher than the cost to heat that same home with natural gas (furnace), depending on the electricity tariffs relative to the gas tariffs. Therefore, while a heat pump measure could be deemed as cost-effective over its lifecycle, installing a heat pump could result in a decrease *or* an increase in utility costs in the first years relative to a gas furnace and AC system.
2. The study assumes utility rates escalate over time. Because it is very difficult to predict how the rates will change, the analysis presents two escalation scenarios (modest and high gas escalation) to represent a range of outcomes.
3. The LSC metric most often produces more favorable cost-effectiveness results relative to the results produced using actual utility costs (On-Bill). When the analysis assumes a higher escalation rate for natural gas costs relative to electricity in future years (high gas escalation), the On-Bill results are more favorable in some cases.
 - a. In the oldest (pre-1978) vintage, all three measures (dual fuel heat pump with existing furnace, standard heat pump space heater, and high efficiency heat pump space heater) are cost-effective using the LSC metric in all climate zones. When using the On-Bill metric, the measures remain cost-effective in most climate zones.
 - b. In the newer (1978-1991 and 1992-2010) vintages, the dual fuel heat pump (DFHP Existing Furnace) and the standard efficiency HPSH are cost-effective based on LSC in all cases except for Climate Zone 15 when using both the standard and California Alternate Rates for Energy (CARE) tariff.
4. Using the CARE tariff results in higher cost savings and cost-effectiveness relative to standard rates, with almost all cases yielding first year utility cost savings. The DFHP Existing Furnace is On-Bill cost-effective based on the high gas escalation scenario in all cases in the pre-1978 vintage, and almost all cases in the 1978-1991 and 1992-2010 vintage. It is also On-Bill cost-effective in most climate zones for the modest gas escalation scenario across all vintages. In Climate Zones 5, 8, 9, 10, 14, and 15, cost-effectiveness declines relative to other areas, and in some cases is not cost-effective from an On-Bill perspective. This is the case for both the CARE tariff and the standard rate.
5. The analysis also modeled the cost impact of using a standard time-of-use electricity tariff versus switching to a newer electrification tariff, designed to reduce costs in homes with heat pumps and/or electric vehicles. Older homes tend to be the least efficient and achieve the most savings from improving equipment efficiency. In most of the state, because older homes tend to use more electricity than a similarly sized, newer vintage home, they realize more costs savings under the electrification tariff. Newer homes tend to use less electricity and therefore do not realize the same cost

savings from switching tariffs; they generally perform better under the standard tariff. This trend is different in milder climate zones in SCE territory (excluding CZ 15), where newer homes realize more cost savings. Both the standard and electrification tariffs in SCE territory include a daily allocation of lower-cost baseline electricity and a second, higher-priced tier when the baseline is exceeded. In many newer homes, a higher percentage of overall electricity use is within the baseline allocation, resulting in greater cost savings.

6. Higher efficiency equipment reduces utility costs in all cases and improves cost-effectiveness in many climate zones in the oldest vintage relative to standard efficiency equipment. However, in more efficient newer homes, where cost-effectiveness is generally lower, the savings are insufficient to offset the roughly \$3,000 increase in incremental cost.
7. Given the adopted Bay Area Air Quality Management District (BAAD) Zero NOx rule, and the proposed California Air Resource Board or South Coast Air Quality Management District (SCAQMD) Zero-NOx rules, and gas furnaces are no longer available or less available to be installed in 2030, a sensitivity analysis was performed for the Zero NOx scenario and found that cost-effectiveness declines in many cases except in Climate Zones 8-10, some results improve enough to become cost-effective. The improved cost-effectiveness in Climate Zones 8-10 is due to the higher baseline cost when a HPSH must be installed at year 10 when the furnace must be replaced. However, the overall magnitude of 30-year On-Bill cost-effectiveness is lower because there are only 10 years of utility cost savings. After year 10 the base case and upgrade measures are both heat pumps.

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

The California Codes and Standards Reach Codes program, also known as the Local Energy Codes program, provides technical support to local governments considering adopting a local ordinance 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.

Local jurisdictions may 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 California Building Code (the Energy Code) (CEC, 2025) 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 and do not require the Energy Commission approval. Although a cost-effectiveness study is only required to amend Part 6 of the California Building Code, this study provides valuable context for jurisdictions pursuing other ordinance paths to understand the economic impacts of the 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 is an update to the [2022 Single Family Retrofit Cost-effectiveness Study](#) (Statewide Reach Codes Team, 2024) focused on an ordinance structure that encourages air conditioner (AC) to heat pump replacement. The methodology, prototype characteristics, and relevant measure packages are retained from the main study referenced above. The study includes updated utility rates, revised costs based on the TECH Clean California¹ incremental cost study data, estimated costs for the AC path, updated and expanded AC path options, and a new cost-effectiveness scenario that considers upcoming proposed zero-NOx emission regulations (SCAQMD, 2025) (California Air Resources Board, 2022) (BAAD, 2025).

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.

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

¹ <https://techcleanca.com/>

decision regarding which code to amend will determine the specific requirements that must be followed for an ordinance to be legally enforceable. Although a cost-effectiveness study is only required to amend Part 6 of the CA Building Code, it is important 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 local leadership, residents, and other stakeholders make informed policy decisions.

This report was developed in coordination with the California Statewide Investor-Owned Utilities (IOUs) Codes and Standards Program, the California Energy Commission (CEC), key consultants, and engaged cities—collectively known as the Statewide Reach Codes Team. 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 Methodology and Assumptions

This study evaluates a potential reach code that encourages a heat pump or dual fuel system that includes a heat pump combined with a furnace when an air conditioner is replaced or installed new in existing single family homes. The ordinance structure and this analysis is based on the voluntary requirements adopted in 2025 Title 24, Part 11 California Green Building Standards Code (CALGreen), Section A4.204.1.1 for heat pump space conditioning alterations in single family homes (California Energy Commission, 2025). The proposed reach code also defines pathways for air conditioning equipment to be installed combined with additional efficiency measures. The heat pump path requires the heat pump as the primary heat source, with backup heating allowable either provided by electric resistance or natural gas. In cases where the existing furnace remains, the heat pump is installed alongside the existing furnace with integrated controls to allow for the furnace to provide backup heating. In alignment with the 2025 Energy Code requirements the heat pump must be sized to satisfy the heating load at the design heating temperature without the use of backup heat.

All methodology and assumptions are consistent with prior statewide analysis (Statewide Reach Codes Team, 2024) with the following exceptions:

1. Updated utility rates to January 2025
2. Equipment costs based on TECH data where available; the original report was based on Statewide contractor survey costs
3. Cost estimates were obtained for the AC path
4. Expanded AC path options
5. Cost-effectiveness results for the scenario if gas furnaces are no longer available for sale in California in 2030

2.1 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 includes updated weather files, metrics, and 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. Note that at the time of this report, the Energy Commission was working on integrating a new heat pump model into the CBECC-Res software to better reflect the actual energy use of heat pumps. The updated model results in lower heating energy use than is currently estimated. Once the revised software is released, the reach codes team plans to update this analysis.

Three unique building vintages are included: pre-1978, 1978-1991, and 1992-2010. The vintages were defined based on review of historic building code requirements and defining periods with distinguishing features. The proposed measures were modeled to determine the projected site energy (therm and kWh), source energy, GHG emissions, and long-term systemwide cost (LSC) impacts. Annual utility costs were calculated using hourly data

output from CBECC, and updated (as of 1/1/2025) electricity and natural gas tariffs for each of the investor-owned utilities (IOUs) as appropriate for that climate zone.

Site energy results are similar between CBECC-Res 2022 and 2025. The 2025 compliance metrics include assumptions that more appliances will be electric in the future. This is predicted to result in higher natural gas retail rates as a result of gas utilities continuing to maintain safe and reliable infrastructure amidst declining natural gas use.

Equivalent CO₂ 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 pounds of CO₂-equivalent (CO₂e) emissions.

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

2.2 Prototype Characteristics

The Energy Commission defines building prototypes which it uses to evaluate the cost-effectiveness of proposed changes to Energy Code requirements. Average home size has steadily increased over time, 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 2 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 the Energy Code. In the 2025 Energy Code heat pumps are prescriptively required for space and water heating for additions (California Energy Commission, 2023).

Table 2. Residential Prototype Characteristics

Climate Zone	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 the building code that were in effect or standard construction practice during that time period. For example, 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 3 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.
- Gas cooktop, oven, and clothes dryer.

The methodology applied in the analyses begins with a design that matches the specifications as described in Table 3 for each of the three vintages. Heat pump space conditioning measures were modeled to determine the projected energy performance and utility cost impacts relative to the baseline vintage.

Table 3. Efficiency Characteristics for Three Vintage Cases

Building Component Efficiency Feature	Pre-1978 Vintage	1978-1991 Vintage	1992-2010 Vintage
Envelope			
Exterior Walls	2x4, 16-inch on center wood frame, R-0 ²	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 ³	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

² Pre-1978 wall modeled with R-5 cavity insulation to better align wall system performance with monitored field data and not overestimate energy use.

³ 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

2.3 Cost-Effectiveness Approach

2.3.1 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:

- **On-Bill:** Customer-based lifecycle cost approach that values energy based upon estimated site energy usage and customer On-Bill savings using electricity and natural gas utility rate schedules over a 30-year duration, accounting for a three percent discount rate and energy cost inflation per Appendix 6.3.7.
- **Long-term Systemwide Cost (LSC):** Formerly known as Time Dependent Valuation (TDV) energy cost savings, LSC reflects the Energy Commission's current lifecycle cost (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 measures in the 2025 Energy Code.

Energy simulations were completed using the 2025 research version of the Residential California Building Energy Code Compliance software (CBECC).

2.3.2 Costs

The Reach Codes Team assessed the incremental costs and savings of the packages over the lifecycle of 30-years. Incremental costs represent the equipment, installation, replacement, and maintenance costs of the proposed measure relative to the 2025 Energy Code minimum requirements or standard industry practices.

In February 2024, the TECH Clean California statewide program completed an incremental cost study from cost data collected from 64 contractor participants (Opinion Dynamics, 2024). This report directly uses the TECH costs for all the scenarios for which there was TECH cost data available. These costs were supplemented with measure costs the Reach Codes Team obtained from a contractor survey conducted in the summer of 2023. Additional detail on the contractor cost survey is available in the prior existing building statewide study (Statewide Reach Codes Team, 2024). The following summarizes key assumptions in this costing approach.

- Average statewide costs from the TECH Study were used, no regional specific costs were applied.
- Costs for 3-ton and 4-ton units were scaled for smaller and larger systems based on linear interpolation between the 3-ton and 4-ton costs.

- The TECH study provided cost for a minimum efficiency 60,000 Btu/h gas furnace. However, beginning in 2028, newly installed residential gas furnaces must comply with updated federal efficiency standards requiring a minimum of 95% AFUE⁴. Because the TECH study did not include cost estimates for a 95% AFUE condensing furnace, an adjustment was made using data from the statewide contractor cost survey. For systems requiring larger furnace capacities, cost estimates were derived as follows:
 - **80,000 Btu/h furnaces** (serving systems sized 3 tons): The cost difference between the minimum efficiency and 95% AFUE versions of the 80,000 Btu/h furnace and the cost difference between the minimum efficiency 80,000 Btu/h furnace and the minimum efficiency 60,000 Btu/h furnace, as reported in the contractor survey, was added to the TECH cost for the 60,000 Btu/h unit.
 - **100,000 Btu/h furnaces** (serving systems 4 tons and larger): The same method was applied using the corresponding cost differential for 100,000 Btu/h units.
- At time of replacement for the heat pump, based on heating loads and contractor feedback it is assumed an electric resistance backup coil would be installed with the air handler for Climate Zones 1 and 16. The CBECC-Res software applies back up electric resistance heating for all climate zones whenever it is assumed that the heat pump cannot meet the heating load based on the performance of currently available products (Heinemeier, 2025). The TECH costs did not include this option. The \$819 incremental cost from the statewide study was added in this case.
- At the time of replacement for a furnace when it fails, the statewide study assumed a fan motor replacement. The TECH costs did not include this option. A \$1,200 incremental cost was added to the TECH cost.
- At time of replacement for high efficiency heat pump, the sum of the TECH cost for standard efficiency heat pump and the incremental cost difference from the statewide study for high efficiency and standard efficiency heat pump was applied.

Costs were applied based on the system capacity from heating and cooling load calculations in CBECC-Res as presented in Table 4. 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 revealed that Climate Zones 2 through 15 were cooling-dominated, whereas Climate Zones 1 and 16 were heating-dominated. In these heating-

⁴ <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.>

dominated zones, the heat pump was upsized compared to an air conditioner designed solely for cooling to ensure adequate heating performance.

Table 4. 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

2.3.3 Metrics

Cost-effectiveness is presented using net present value (NPV).

- NPV: The Reach Codes Team uses net savings (NPV benefits minus NPV costs) as the cost-effectiveness metric. If the net savings of a measure or package is positive, it is considered cost effective. Negative net savings represent net costs to the consumer. A measure that has negative energy cost benefits (energy cost increase) can still be cost effective if the costs to implement the measure are even more negative (i.e., construction and maintenance cost savings).

Improving the energy performance of a building often requires an initial investment. In most cases the benefit is represented by annual On-Bill utility or LSC savings, and the cost by incremental first cost and replacement costs. However, some packages result in initial construction cost savings (negative incremental cost), 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).

2.3.4 Utility Rates

In coordination with the CA IOU rates 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 Table 5 and Table 6 with details in Section 6.2.26.2.2, were determined based on the appropriate rate for each. 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.

First-year utility costs were calculated using hourly electricity and natural gas output from CBECC-Res and applying the utility tariffs summarized in Table 5 and Table 6. Homes with a heat pump in IOU territory are eligible for either the electrification or the standard tariff. Utility costs were calculated under both tariffs with results presented using the one that yielded the lower annual utility cost. The electrification tariff resulted in better utility costs savings when there was high kWh usage, typically in older, less efficient homes. Conversely, newer homes which are more efficient, tend to benefit more under the standard tariff. However, in SCE's milder climate zones, older homes benefit more under the standard tariff. Annual costs were also estimated for IOU customers eligible for the CARE tariff discounts on both electricity and natural gas bills.

Table 5. Investor-Owned Utility Tariffs Used Based on Climate Zone

Climate Zones	Electric / Gas Utility	Electricity Tariff: Standard Rate	Electricity Tariff: Electrification Rate	Natural Gas Tariff
1-5,11-13,16	PG&E / PG&E	E-TOU-C	E-ELEC	G1
5	PG&E / SoCalGas	E-TOU-C	E-ELEC	GR
6, 8-10, 14, 15	SCE / SoCalGas	TOU-D-4-9	TOU-D-PRIME	GR
7, 10, 14	SDG&E / SDG&E	TOU-DR-1	EV-TOU-5	GR

Table 6. Publicly Owned Utility Tariffs Used Based on Climate Zone

Climate Zones	Electric / Gas Utility Electricity Tariff: Standard Rate	Electricity Tariff: Electrification Rate	Natural Gas Tariff
4	CPAU / CPAU	E-1	G1
12	SMUD / PG&E	R-TOD	G1

Utility rates are assumed to escalate over time. Because it is very difficult to predict how rates will change, two escalation scenarios are presented in this study to represent a range of outcomes. See Appendix 6.3.7 Fuel Escalation Assumptions for details.

- 1) Modest Gas Escalation: This scenario is based on assumptions from the CPUC 2021 En Banc hearings on utility costs through 2030 (California Public Utilities Commission, 2021a). Escalation rates throughout the remainder of the 30-year evaluation period are based on the escalation rate assumptions within the 2022 Energy Code TDV factors developed by the Energy Commission (California Energy Commission, 2021b).
- 2) High Gas Escalation: This scenario is based on escalation rates developed by the Energy Commission and used within the 2025 Energy Code LSC factors (LSC replaces TDV in the 2025 Energy Code) which assumed steep increases in gas rates in the latter half of the analysis period.

Electricity tariff structures will evolve over time. Most recently, the CPUC approved an income-graduated fixed charge intended to benefit low-income customers and support electrification measures.⁵ The IOUs are currently developing tariffs that meet the direction given by the CPUC in this proceeding. These tariffs were not available at the time of this study, but this analysis may be re-evaluated later in 2025 once the rates are finalized.

⁵ <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/demand-flexibility-rulemaking>

2.4 Measure Details and Cost

This section describes the details of the measures and documents incremental costs. All measure costs were obtained from the TECH cost survey and contractor survey unless otherwise noted. These surveys reflect the cost to the customer and include equipment, labor, permit fees, and required HERS testing.

The following heat pump space heater (HPSH) measures were evaluated as described below. All included HERS verified refrigerant charge, 10% duct sealing, and 300 CFM/ton airflow, aligned with the proposed code requirements for the 2025 Title 24 code.

- 1) **Dual Fuel Heat Pump (DFHP Existing Furnace):** Replace existing ducted AC with an electric heat pump and install controls to operate the heat pump as the primary space conditioning source and to use the existing gas furnace (78 AFUE) for backup heat when heating demands cannot be met by the heat pump. In this report, dual fuel heat pumps were modeled to disable furnace operation above an outdoor temperature of 35°F in compliance with Energy Code Section 150.0(h)7, which requires this lockout for any heat pump with supplemental heating. 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). A new evaporator coil is assumed to be installed with the AC system.
- 2) **HPSH:** Replace existing ducted AC and natural gas furnace with an electric heat pump and air handler. Minimum federal efficiency (14.3 SEER2, 11.7 EER2, 7.5 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).
- 3) **High Efficiency HPSH:** Replace existing ducted AC and natural gas furnace with an electric heat pump and air handler. 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).

Over the 30-year analysis period, certain changes are assumed when the equipment is replaced that impact both lifetime costs and energy use. Table 7 and Table 8 present the lifetime scenario for the DFHP Existing Furnace and HPSH measures, respectively. 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 AFUE⁶. Five years later the air conditioner reaches the end of its life and is replaced with a new air conditioner.

⁶ <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.>

For the DFHP upgrade case, after 10 years when the furnace fails it's expected that the furnace is 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 is replaced with a new aftermarket unit and operates another five years until the heat pump fails and is replaced with a new heat pump and air handler. Table 7 through Table 8 present the lifecycle incremental cost breakdown for a 4-ton system. The heat pump is sized for each climate zone based on the heating and cooling load as shown in Table 4, and the 4-ton system was selected as an example to show the lifecycle cost breakdown.

Table 7. Lifecycle Incremental Cost Breakdown for a 4-Ton DFHP Existing Furnace

Calendar Year	Baseline AC Replacement Schedule	Baseline Future Cost	Baseline Present Value Cost	Heat Pump	Heat Pump Future Cost	Heat Pump Present Value Cost
2026	AC fails, install new AC, keep existing furnace	\$10,431	\$10,431	AC fails, install new HP, keep existing furnace	\$12,347	\$12,347
2036	Furnace fails, install new 95AFUE furnace	\$7,476	\$5,563	Furnace fails, replace fan motor	\$1,200	\$893
2041	AC fails, install new AC	\$10,431	\$6,695	HP fails, install new HP and air handler	\$14,529	\$9,326
Total			\$22,689			\$22,566
Incremental Cost				-\$123		

Table 8. Lifecycle Incremental Cost Breakdown for 4-Ton HPSH

Calendar Year	Baseline AC Replacement Schedule	Baseline Future Cost	Baseline Present Value Cost	Heat Pump	Heat Pump Future Cost	Heat Pump Present Value Cost
2026	AC fails, install new AC & furnace	\$13,808	\$13,808	AC fails, install new HP & AHU	\$14,529	\$14,529
2041	AC fails, install new AC	\$10,431	\$6,695	HP fails, install new HP & AHU	\$13,529	\$8,684
2046	Furnace fails, install new 95AFUE furnace	\$7,476	\$4,139	-	-	-
2056	Remaining useful life for furnace	-	-\$1,540	-	-	-
Total			\$23,103			\$23,213
Incremental Cost				\$110		

Table 9 presents estimated first and lifetime costs for the 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 9. HVAC Measure Cost Assumptions – 4-Ton Electric Replacements

Measure Case	AC + Evaporator Coil	Gas Furnace /AC	DFHP Existing Furnace	HPSH	High Efficiency HPSH
Base Case	-	-	AC + Evaporator Coil	Gas Furnace /AC	Gas Furnace /AC
First Cost	\$10,431	\$13,808	\$12,347	\$14,529	\$17,506
Replacement Cost (Future Value)	\$17,907	\$17,907	\$15,729	\$13,529	\$16,506
Replacement Cost (Present Value)	\$12,258	\$11,639	\$10,219	\$8,684	\$10,594
Remaining Value at Year 30	\$0	-\$1,540	\$0	\$0	\$0
Total Lifecycle Cost	\$22,689	\$23,103	\$22,566	\$23,213	\$28,100
Incremental Cost	-	-	-\$123	\$110	\$4,997

2.4.1 Lifecycle Cost Assuming Zero-NOx Standards for Space Heating After 2030

The California Air Resource Board proposed a strategy for reducing emissions in their 2022 Scoping Plan for Achieving Carbon Neutrality that includes a zero-emission standard for space and water heaters sold in California that would go into effect in 2030 (California Air Resources Board, 2022).

The South Coast Air Quality Management District (SCAQMD) proposed Rule 1111 for the Reduction of NOx Emissions from Natural Gas-Fired Furnaces. This rule applies to furnaces less than 175,000 Btu/hr and sets compliance goals for manufacturers with the proposed dates in Table 10. The sale of gas furnaces above the compliance target will incur a mitigation fee (SCAQMD, 2025).

Table 10. SCAQMD Rule 1111 Proposed Manufacturer Compliance Targets

Target Dates	2027-2028	2029-2032	2033-2035	2036 and after
NOx Emitting Units (e.g. gas)	70%	50%	25%	10%
Zero-Emission Units	30%	50%	75%	90%

The Bay Area Air Quality Management District (BAAD) adopted Rule 9-4 that similarly requires zero NOx standards for space heating systems sold in the Bay Area. Implementation for residential furnaces will begin January 2029 (BAAD, 2025).

The BAAD Rule 9-4 has been adopted, but both the California Air Resources Board and SCAQMD Rule 1111 are proposed rules that have not yet been adopted, but given the implications these rulings would have on the 30-year cost-effectiveness if gas furnaces were very limited or no longer available in 2030, a sensitivity analysis for this scenario is included in this study for the DFHP Existing Furnace scenario. The other heat pump measures would also be impacted by this ruling; however, for simplicity the team selected one measure to give a sense of the impact on the results. The following costs reflect the scenario where gas furnaces are not available in 2030. This 30-year lifecycle analysis assumes that in 10 years when the furnace reaches the end of its useful life and needs to be replaced, it will be subjected to the SCAQMD Rule 1111 or California Air Resources Board proposal and will be replaced with a heat pump.

Table 11. Lifecycle Incremental Cost Breakdown for 4-Ton System with no Gas Furnaces after 2030

Calendar Year	Baseline AC Replacement Schedule	Baseline Future Cost	Baseline Present Value Cost	Heat Pump	Heat Pump Future Cost	Heat Pump Present Value Cost
2026	AC fails, install new AC, keep existing furnace	\$10,431	\$10,431	AC fails, install new HP, keep existing furnace	\$12,347	\$12,347
2036	Furnace fails, install new HP	\$14,529	\$10,811	Furnace fails, replace fan motor	\$1,200	\$893
2041	-	-	-	HP fails, install new HP and air handler	\$14,529	\$9,326
2051	HP fails, install new HP	\$13,529	\$6,462	-	-	-
2056	Remaining useful life for HP	-	-\$4,459	-	-	-
Total			\$23,244			\$22,566
Incremental Cost						-\$679

3 Results

The primary objective of the evaluation is to identify cost-effective HPSH upgrade measures for existing single family buildings, to support the design of local ordinances encouraging installation of a heat pump when replacing an air conditioner. While this section focuses primarily on the results of the cost-effectiveness analysis, it is important to highlight that the associated greenhouse gas (GHG) emissions savings are significant – averaging a 25% annual reduction across the climate zones and vintages. A full dataset of all results, including site energy, source energy, LSC and GHG emissions, 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

Table 12 through Table 14 present results across the 16 climate zones for the 1992-2010 vintage using standard tariffs and Table 15 through Table 17 present results across the 16 climate zones and three vintages using CARE tariffs. Results show the incremental cost and utility bill savings for the first year along with cost effectiveness results for LSC and On-Bill under both the modest and high gas escalation scenarios. Results for additional vintages using standard tariffs are in Appendix 6.2 Cost-Effectiveness Results.

3.1.1 Cost Effectiveness Results Using Standard Tariffs

Table 12. [1992-2010] DFHP Existing Furnace

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	\$2,405	\$60	\$10,843	\$5,471	\$21,616
CZ02	PGE	\$1,670	(\$86)	\$8,387	\$2,238	\$12,692
CZ03	PGE	\$1,178	\$15	\$8,383	\$4,891	\$13,958
CZ04	PGE	\$1,670	(\$68)	\$7,322	\$1,880	\$10,049
CZ04	CPAU	\$1,670	(\$9)	\$7,322	\$2,132	\$7,104
CZ05	PGE	\$1,424	(\$12)	\$6,848	\$3,425	\$11,150
CZ05	PGE/SCG	\$1,424	(\$195)	\$6,848	(\$1,864)	\$2,099
CZ06	SCE/SCG	\$1,424	(\$34)	\$2,647	\$675	\$1,468
CZ07	SDGE	\$1,424	(\$36)	\$2,691	\$599	\$1,734
CZ08	SCE/SCG	\$1,916	(\$65)	\$1,879	(\$811)	\$162
CZ09	SCE/SCG	\$1,916	(\$90)	\$2,600	(\$1,186)	\$288
CZ10	SCE/SCG	\$1,916	(\$79)	\$2,295	(\$982)	\$394
CZ10	SDGE	\$1,916	\$54	\$2,295	\$2,201	\$4,708
CZ11	PGE	\$2,162	\$68	\$7,597	\$4,639	\$14,675
CZ12	PGE	\$1,916	\$44	\$8,317	\$4,702	\$15,222
CZ12	SMUD/PGE	\$1,916	\$353	\$8,317	\$11,622	\$22,364
CZ13	PGE	\$2,162	\$76	\$5,244	\$3,897	\$11,138
CZ14	SCE/SCG	\$1,916	(\$179)	\$4,654	(\$2,364)	\$1,340
CZ14	SDGE	\$1,916	(\$22)	\$4,654	\$1,282	\$7,058
CZ15	SCE/SCG	\$2,408	(\$133)	(\$271)	(\$3,438)	(\$3,209)
CZ16	PGE	\$2,243	(\$66)	\$8,842	\$1,260	\$11,982

Table 13. [1992-2010] Standard Efficiency HPSH

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	\$3,067	(\$145)	\$10,949	(\$34)	\$17,899
CZ02	PGE	\$652	(\$229)	\$9,362	(\$702)	\$11,825
CZ03	PGE	\$514	(\$62)	\$8,244	\$2,373	\$11,665
CZ04	PGE	\$652	(\$205)	\$8,680	(\$572)	\$10,753
CZ04	CPAU	\$652	(\$85)	\$8,680	\$556	\$7,194
CZ05	PGE	\$583	(\$113)	\$6,957	\$752	\$9,206
CZ05	PGE/SCG	\$583	(\$316)	\$6,957	(\$5,101)	(\$811)
CZ06	SCE/SCG	\$583	(\$37)	\$2,134	(\$63)	\$716
CZ07	SDGE	\$583	(\$39)	\$2,156	(\$149)	\$981
CZ08	SCE/SCG	\$721	(\$79)	\$1,812	(\$1,356)	(\$371)
CZ09	SCE/SCG	\$721	(\$118)	\$2,589	(\$2,038)	(\$524)
CZ10	SCE/SCG	\$721	(\$103)	\$2,311	(\$1,723)	(\$259)
CZ10	SDGE	\$721	\$34	\$2,311	\$1,533	\$4,218
CZ11	PGE	\$790	(\$35)	\$8,817	\$2,833	\$14,504
CZ12	PGE	\$721	(\$94)	\$9,199	\$1,812	\$13,563
CZ12	SMUD/PGE	\$721	\$363	\$9,199	\$12,027	\$24,107
CZ13	PGE	\$790	\$6	\$5,948	\$2,558	\$10,687
CZ14	SCE/SCG	\$721	(\$412)	\$6,635	(\$6,964)	(\$1,073)
CZ14	SDGE	\$721	(\$107)	\$6,635	\$166	\$10,249
CZ15	SCE/SCG	\$859	(\$139)	(\$112)	(\$3,434)	(\$3,186)
CZ16	PGE	\$2,095	(\$385)	\$13,600	(\$2,842)	\$19,424

Table 14. [1992-2010] High Efficiency HPSH

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	\$5,998	\$56	\$9,783	(\$350)	\$17,727
CZ02	PGE	\$3,606	(\$94)	\$7,527	(\$2,544)	\$10,080
CZ03	PGE	\$3,422	\$59	\$5,701	\$312	\$9,692
CZ04	PGE	\$3,606	(\$61)	\$6,961	(\$2,193)	\$9,235
CZ04	CPAU	\$3,606	\$0	\$6,961	(\$2,389)	\$4,310
CZ05	PGE	\$3,514	\$4	\$4,176	(\$1,450)	\$7,088
CZ05	PGE/SCG	\$3,514	(\$199)	\$4,176	(\$7,303)	(\$2,929)
CZ06	SCE/SCG	\$3,514	(\$14)	(\$2,162)	(\$4,367)	(\$3,567)
CZ07	SDGE	\$3,514	(\$12)	(\$2,090)	(\$4,312)	(\$3,191)
CZ08	SCE/SCG	\$3,698	\$13	(\$1,660)	(\$4,217)	(\$3,149)
CZ09	SCE/SCG	\$3,698	(\$26)	(\$750)	(\$4,883)	(\$3,284)
CZ10	SCE/SCG	\$3,698	(\$4)	(\$844)	(\$4,418)	(\$2,864)
CZ10	SDGE	\$3,698	\$132	(\$844)	(\$1,068)	\$1,587
CZ11	PGE	\$3,789	\$186	\$7,738	\$2,845	\$14,675
CZ12	PGE	\$3,698	\$88	\$7,575	\$996	\$12,879
CZ12	SMUD/PGE	\$3,698	\$422	\$7,575	\$8,459	\$20,580
CZ13	PGE	\$3,789	\$208	\$4,419	\$2,165	\$10,439
CZ14	SCE/SCG	\$3,698	(\$219)	\$5,760	(\$7,575)	(\$1,506)
CZ14	SDGE	\$3,698	\$77	\$5,760	(\$424)	\$9,604
CZ15	SCE/SCG	\$3,881	\$50	(\$2,144)	(\$4,209)	(\$3,786)
CZ16	PGE	\$5,071	(\$97)	\$14,557	(\$1,291)	\$21,181

3.1.2 Cost Effectiveness Results Using CARE Tariffs

Table 15. [1992-2010] DFHP Existing Furnace 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	\$2,405	\$153	\$10,843	\$6,436	\$19,266
CZ02	PGE	\$1,670	\$18	\$8,387	\$3,842	\$12,159
CZ03	PGE	\$1,178	\$73	\$8,383	\$5,574	\$12,777
CZ04	PGE	\$1,670	\$14	\$7,322	\$3,143	\$9,641
CZ04	CPAU	\$1,670	\$0	\$7,322	\$711	\$711
CZ05	PGE	\$1,424	\$47	\$6,848	\$4,198	\$10,337
CZ05	PGE/SCG	\$1,424	(\$98)	\$6,848	\$23	\$3,191
CZ06	SCE/SCG	\$1,424	(\$18)	\$2,647	\$967	\$1,600
CZ07	SDGE	\$1,424	(\$16)	\$2,691	\$1,000	\$1,887
CZ08	SCE/SCG	\$1,916	(\$38)	\$1,879	(\$285)	\$495
CZ09	SCE/SCG	\$1,916	(\$52)	\$2,600	(\$450)	\$731
CZ10	SCE/SCG	\$1,916	(\$45)	\$2,295	(\$331)	\$771
CZ10	SDGE	\$1,916	\$51	\$2,295	\$1,998	\$3,963
CZ11	PGE	\$2,162	\$115	\$7,597	\$4,993	\$12,965
CZ12	PGE	\$1,916	\$103	\$8,317	\$5,287	\$13,643
CZ12	SMUD/PGE	\$1,916	\$418	\$8,317	\$12,339	\$20,922
CZ13	PGE	\$2,162	\$100	\$5,244	\$3,939	\$9,686
CZ14	SCE/SCG	\$1,916	(\$98)	\$4,654	(\$849)	\$2,119
CZ14	SDGE	\$1,916	\$23	\$4,654	\$2,007	\$6,528
CZ15	SCE/SCG	\$2,408	(\$88)	(\$271)	(\$2,456)	(\$2,260)
CZ16	PGE	\$2,243	\$33	\$8,842	\$2,737	\$11,267

Table 16. [1992-2010] Standard Efficiency HPSH 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	\$3,067	\$33	\$10,949	\$2,703	\$16,973
CZ02	PGE	\$652	(\$59)	\$9,362	\$2,211	\$12,188
CZ03	PGE	\$514	\$25	\$8,244	\$3,685	\$11,074
CZ04	PGE	\$652	(\$53)	\$8,680	\$2,048	\$11,067
CZ04	CPAU	\$652	\$0	\$8,680	\$255	\$255
CZ05	PGE	\$583	(\$13)	\$6,957	\$2,389	\$9,117
CZ05	PGE/SCG	\$583	(\$173)	\$6,957	(\$2,232)	\$1,208
CZ06	SCE/SCG	\$583	(\$20)	\$2,134	\$249	\$872
CZ07	SDGE	\$583	(\$18)	\$2,156	\$279	\$1,161
CZ08	SCE/SCG	\$721	(\$47)	\$1,812	(\$728)	\$62
CZ09	SCE/SCG	\$721	(\$70)	\$2,589	(\$1,094)	\$122
CZ10	SCE/SCG	\$721	(\$61)	\$2,311	(\$892)	\$281
CZ10	SDGE	\$721	\$39	\$2,311	\$1,509	\$3,612
CZ11	PGE	\$790	\$60	\$8,817	\$4,141	\$13,421
CZ12	PGE	\$721	\$22	\$9,199	\$3,592	\$12,940
CZ12	SMUD/PGE	\$721	\$471	\$9,199	\$13,622	\$23,292
CZ13	PGE	\$790	\$61	\$5,948	\$3,234	\$9,693
CZ14	SCE/SCG	\$721	(\$241)	\$6,635	(\$3,632)	\$1,098
CZ14	SDGE	\$721	(\$5)	\$6,635	\$1,996	\$9,885
CZ15	SCE/SCG	\$859	(\$91)	(\$112)	(\$2,414)	(\$2,201)
CZ16	PGE	\$2,095	(\$92)	\$13,600	\$2,163	\$19,892

Table 17. [1992-2010] High Efficiency HPSH 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	\$5,998	\$164	\$9,783	\$813	\$15,177
CZ02	PGE	\$3,606	\$28	\$7,527	(\$683)	\$9,357
CZ03	PGE	\$3,422	\$104	\$5,701	\$674	\$8,120
CZ04	PGE	\$3,606	\$41	\$6,961	(\$703)	\$8,383
CZ04	CPAU	\$3,606	\$0	\$6,961	(\$4,595)	(\$4,595)
CZ05	PGE	\$3,514	\$62	\$4,176	(\$727)	\$6,056
CZ05	PGE/SCG	\$3,514	(\$98)	\$4,176	(\$5,348)	(\$1,853)
CZ06	SCE/SCG	\$3,514	(\$5)	(\$2,162)	(\$4,219)	(\$3,583)
CZ07	SDGE	\$3,514	(\$0)	(\$2,090)	(\$4,112)	(\$3,235)
CZ08	SCE/SCG	\$3,698	\$15	(\$1,660)	(\$4,248)	(\$3,401)
CZ09	SCE/SCG	\$3,698	(\$8)	(\$750)	(\$4,603)	(\$3,330)
CZ10	SCE/SCG	\$3,698	\$6	(\$844)	(\$4,300)	(\$3,065)
CZ10	SDGE	\$3,698	\$103	(\$844)	(\$1,892)	\$191
CZ11	PGE	\$3,789	\$203	\$7,738	\$2,425	\$11,808
CZ12	PGE	\$3,698	\$141	\$7,575	\$1,351	\$10,784
CZ12	SMUD/PGE	\$3,698	\$471	\$7,575	\$8,735	\$18,405
CZ13	PGE	\$3,789	\$192	\$4,419	\$1,255	\$7,809
CZ14	SCE/SCG	\$3,698	(\$111)	\$5,760	(\$5,632)	(\$783)
CZ14	SDGE	\$3,698	\$115	\$5,760	(\$98)	\$7,755
CZ15	SCE/SCG	\$3,881	\$36	(\$2,144)	(\$4,549)	(\$4,220)
CZ16	PGE	\$5,071	\$95	\$14,557	\$1,460	\$19,324

3.2 Zero-NOx Scenario Results

This section presents cost-effectiveness results for the DFHP Existing Furnace under the scenario where proposed air quality district zero-NOx rules go into effect over the next 10 years. In the base case, at time of replacement of the gas furnace at year 10 a heat pump is installed. The energy profile between the base case and the heat pump upgrade case are subsequently identical for the remaining 20 years of the 30-year analysis period. As a result, energy and cost savings only persist for the first 10 years.

Table 18 shows the On-Bill NPV cost-effectiveness results and Table 19 the LSC cost-effectiveness results for all three vintages. 2025 LSC savings were calculated using individual year multipliers for the first 10 years, 2026 through 2035.

Table 18. DFHP Existing Furnace On-Bill NPV (Zero-NOx Rule)

Climate Zone	Electric/ Gas Utility	On-Bill NPV		
		Pre-1978	1978-1991	1992-2010
CZ01	PGE	\$5,473	\$4,136	\$2,349
CZ02	PGE	\$1,785	\$1,031	\$1,101
CZ03	PGE	\$2,863	\$2,097	\$2,052
CZ04	PGE	\$2,133	\$1,162	\$1,019
CZ04	CPAU	\$2,340	\$1,599	\$1,213
CZ05	PGE	\$1,918	\$1,486	\$1,576
CZ05	PGE/SCG	(\$1,308)	(\$834)	(\$491)
CZ06	SCE/SCG	\$401	\$605	\$635
CZ07	SDGE	\$1,473	\$999	\$641
CZ08	SCE/SCG	(\$125)	\$99	\$195
CZ09	SCE/SCG	(\$563)	(\$183)	\$22
CZ10	SCE/SCG	(\$259)	\$53	\$110
CZ10	SDGE	\$2,985	\$2,261	\$1,430
CZ11	PGE	\$3,287	\$2,866	\$2,279
CZ12	PGE	\$2,935	\$2,578	\$2,202
CZ12	SMUD/PGE	\$7,877	\$5,978	\$5,040
CZ13	PGE	\$2,927	\$2,556	\$2,053
CZ14	SCE/SCG	(\$864)	(\$943)	(\$543)
CZ14	SDGE	\$2,204	\$1,655	\$1,064
CZ15	SCE/SCG	\$1,338	\$396	(\$688)
CZ16	PGE	\$1,192	\$1,071	\$1,096

Table 19. DFHP Existing Furnace LSC Savings (Zero-NOx Rule)

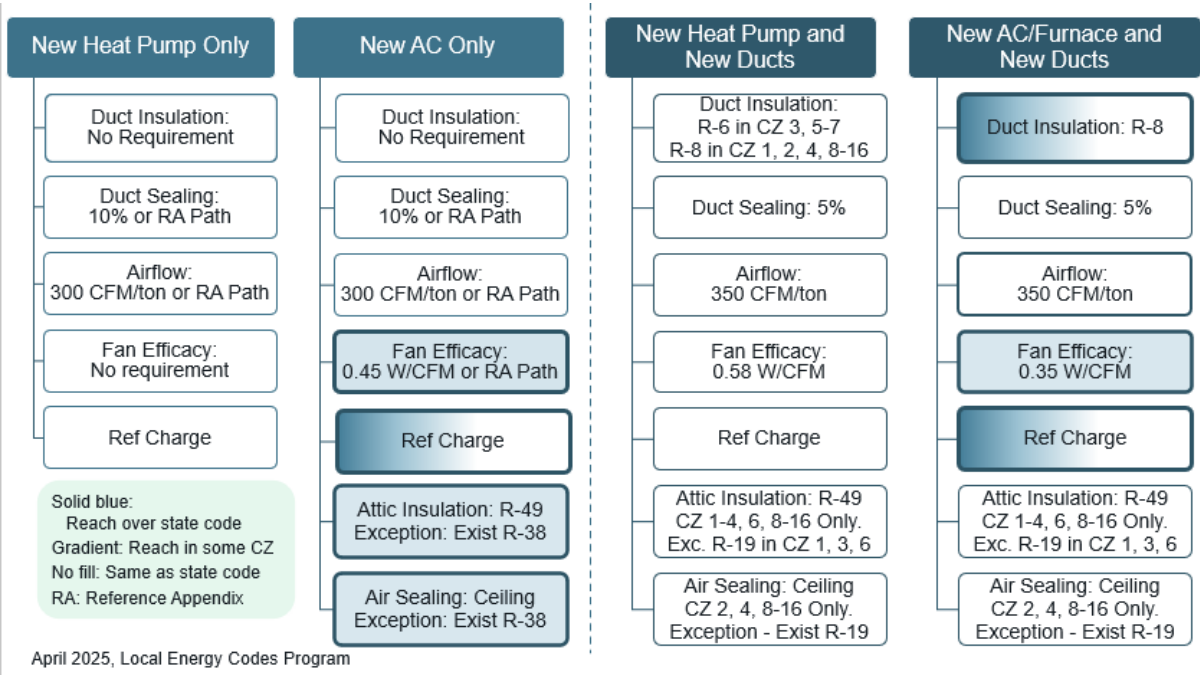
Climate Zone	Electric/ Gas Utility	LSC NPV		
		Pre-1978	1978-1991	1992-2010
CZ01	PGE	\$3,019	\$2,510	\$1,558
CZ02	PGE	\$1,256	\$1,025	\$1,006
CZ03	PGE	\$1,460	\$1,120	\$1,036
CZ04	PGE	\$1,242	\$949	\$887
CZ04	CPAU	\$1,242	\$949	\$887
CZ05	PGE	\$1,127	\$816	\$820
CZ05	PGE/SCG	\$1,127	\$816	\$820
CZ06	SCE/SCG	\$545	\$318	\$251
CZ07	SDGE	\$639	\$403	\$314
CZ08	SCE/SCG	\$428	\$279	\$244
CZ09	SCE/SCG	\$608	\$424	\$372
CZ10	SCE/SCG	\$469	\$320	\$293
CZ10	SDGE	\$469	\$320	\$293
CZ11	PGE	\$1,871	\$1,475	\$1,263
CZ12	PGE	\$1,924	\$1,539	\$1,356
CZ12	SMUD/PGE	\$1,375	\$1,090	\$939
CZ13	PGE	(\$206)	(\$186)	\$50
CZ14	SCE/SCG	(\$206)	(\$186)	\$50
CZ14	SDGE	\$127	\$60	\$38
CZ15	SCE/SCG	(\$185)	(\$12)	\$77
CZ16	PGE	\$3,019	\$2,510	\$1,558

3.3 AC Pathways for Heat Pump Replacements

Many jurisdictions are interested in seeing alternative pathways for residents who may prefer to replace an air conditioner with similar equipment, rather than migrating to a heat pump system. Alternative packages analyzed to support this request include air conditioning equipment combined with additional efficiency measures resulting in options that are reasonably energy or LSC cost equivalent to a heat pump system, to the extent feasible.

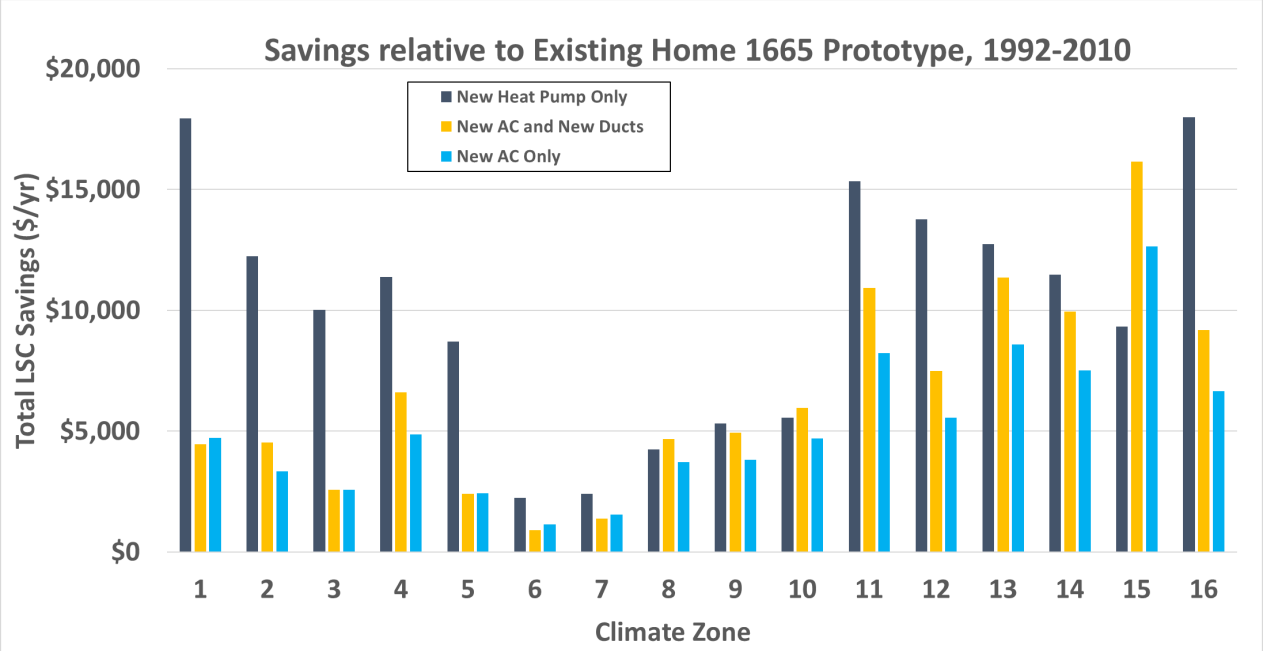
Figure 1 shows two AC pathways, one with an existing duct system and another path with a new duct system, alongside the heat pump pathways. The figure presents the proposed efficiency upgrade measures that would be part of a reach code (solid blue) along with the relevant requirements from Title 24, Part 6 that are triggered as part of equipment replacements (white or gradient blue). 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 AC as long as the performance measures listed below are met.

Figure 1. AC vs. Heat Pump Pathway Requirements



The heat pump only and two AC pathways are presented in Figure 2 comparing total LSC energy use relative to the existing home for the 1992-2010 vintage. The heat pump path is represented by the DFHP Existing Furnace scenario. In most climate zones, the heat pump path results in higher energy savings, in the milder climates the AC and new ducts and New AC Only paths save marginally more energy.

Figure 2. AC vs. Heat Pump Energy Comparison



Though the AC path does not need to meet cost-effectiveness criteria to be adopted as a reach code since it's an alternative path, in order to understand the implications of the AC path on the customer, Table 20 and Table 21 present estimated costs for the new AC only and the new AC + new ducts paths respectively.

Table 20. New AC Only Path Cost Estimates

New AC Only Path	Pre-1978	1978-1991	1992-2010
Fan Efficacy: 0.45 W/CFM	-	-	-
Refrigerant Charge Verification	\$100	\$100	\$100 ⁷
R-49 Attic Insulation	\$5,483	\$3,612	\$1,827
Air Sealing	\$1,963	\$1,963	\$1,963
Total	\$7,546	\$5,675	\$3,790

Table 21. New AC/Furnace and New Ducts Path Cost Estimates

New AC and New Ducts Path	Pre-1978	1978-1991	1992-2010
New R-8 Ducts	\$6,311	\$6,311	\$6,311
Furnace	\$5,951	\$5,951	\$5,951
Fan Efficacy: 0.35 W/CFM	\$500	\$500	\$500
Refrigerant Charge Verification	\$100	\$100	\$100
Total	\$12,862	\$12,862	\$12,862

⁷ This is an incremental cost and in some climate zones, refrigerant charge verification is required so there is no incremental cost added.

4 Recommendations and Discussion

This analysis evaluated the feasibility and cost-effectiveness of AC to heat pump measures in California existing homes built before 2010. To meet the needs of jurisdictions evaluating this option, Statewide Reach Codes Team used both On-Bill and LSC-based lifecycle cost 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. Heat pumps are significantly more efficient than gas furnaces, requiring less than half the energy to meet the heating load. However, despite this reduction in heating energy use, the cost of heating a home using electricity (heat pump) could be higher than the cost to heat that same home with natural gas (furnace), depending on the electricity tariffs relative to the gas tariffs. Therefore, while a heat pump measure could be deemed as cost-effective over its lifecycle, installing a heat pump could result in a decrease *or* an increase in utility costs in the first years relative to a gas furnace and AC system. For example, the heat pump space heater measure in climate zone 12 in the newest vintage results in the customer saving money on their utility bill in SMUD territory but paying more on their utility bill in PG&E territory. Both PG&E and SMUD territory use PG&E gas rates, but SMUD has lower electricity rates than PG&E. With fuel switching measures like the AC to HP measure, the electricity to gas ratio has a significant impact on the savings or costs the customer will see by switching from gas to an electric heat pump space heater.
2. The LSC metric most often produces more favorable cost-effectiveness results relative to the results produced using actual utility costs (On-Bill). When the analysis assumes a higher escalation rate for natural gas costs relative to electricity in future years (high gas escalation), the On-Bill results are more favorable in some cases.
 - a. In the oldest (pre-1978) vintage, all three measures (dual fuel heat pump with existing furnace, standard heat pump space heater, and high efficiency heat pump space heater) are cost-effective using the LSC metric in all climate zones. When using the On-Bill metric, the measures remain cost-effective in most climate zones.
 - b. In the newer (1978-1991 and 1992-2010) vintages, the dual fuel heat pump (DFHP Existing Furnace) and the standard efficiency HPSH are cost-effective based on LSC in all cases except for Climate Zone 15 when using both the standard and California Alternative Rates for Energy (CARE) tariff.
3. Using the CARE tariff results in higher cost savings and cost-effectiveness relative to standard rates, with almost all cases yielding first year utility cost savings. The DFHP Existing Furnace is On-Bill cost-effective based on the high gas escalation scenario in all cases in the pre-1978 vintage, and almost all cases in the 1978-1991 and 1992-2010 vintage. It is also On-Bill cost-effective in most climate zones for the

modest gas escalation scenario across all vintages. In Climate Zones 5, 8, 9, 10, 14, and 15, cost-effectiveness declines relative to other areas, and in some cases is not cost-effective from an On-Bill perspective. This is the case for both the CARE tariff and the standard rate.

4. The analysis also modeled the cost impact of using a standard time-of-use electricity tariff versus switching to a newer electrification tariff, designed to reduce costs in homes with heat pumps and/or electric vehicles. Older homes tend to be the least efficient and achieve the most savings from improving equipment efficiency. In most of the state, because older homes tend to use more electricity than a similarly sized, newer vintage home, they realize more costs savings under the electrification tariff. Newer homes tend to use less electricity and therefore do not realize the same cost savings from switching tariffs; they generally perform better under the standard tariff. This trend is different in milder climate zones in SCE territory (excluding CZ 15), where newer homes realize more cost savings than older homes. Both the standard and electrification tariffs in SCE territory include a daily allocation of lower-cost baseline electricity and a second, higher-priced tier when the baseline is exceeded. In many newer homes, a higher percentage of overall electricity use is within the baseline allocation, resulting in greater cost savings.
5. Higher efficiency equipment reduces utility costs in all cases and improves cost-effectiveness in many climate zones in the oldest vintage relative to standard efficiency equipment. However, in more efficient newer homes, where cost-effectiveness is generally lower, the savings are insufficient to offset the roughly \$3,000 increase in incremental cost.
6. Given the adopted Bay Area Air Quality Management District Zero NOx rule, and the proposed California Air Resource Board or South Coast Air Quality Management District (SCAQMD) Zero-NOx rules, and gas furnaces may not be available to be installed in 2030, a sensitivity analysis was performed for the Zero NOx scenario and found that cost-effectiveness decreases in many cases except in Climate Zones 8-10, some results improve enough to become cost-effective. The improved cost-effectiveness in Climate Zones 8-10 is due to the higher baseline cost when a HPSH must be installed at year 10 when the furnace must be replaced. However, the overall magnitude of 30-year On-Bill cost-effectiveness is lower because there are only 10 years of utility cost savings. After year 10 the base case and upgrade measures are both heat pumps.
7. While not evaluated in this report, the [2022 Single Family Retrofit Cost-effectiveness Study](#) (Statewide Reach Codes Team, 2024) shows it is beneficial to combine a heat pump space conditioning system with photovoltaics (PV) because the additional electricity required by the heat pump can be met by the PV system and result in reduced utility bills.
8. In this study the dual fuel heat pump is evaluated with an existing furnace, however the homeowner could choose to replace the existing furnace with a new furnace at

this time as well. This measure (DFHP New Furnace) was evaluated in the [2022 Single Family Retrofit Cost-effectiveness Study](#) (Statewide Reach Codes Team, 2024) but found to be less cost-effective than the DFHP Existing Furnace case.

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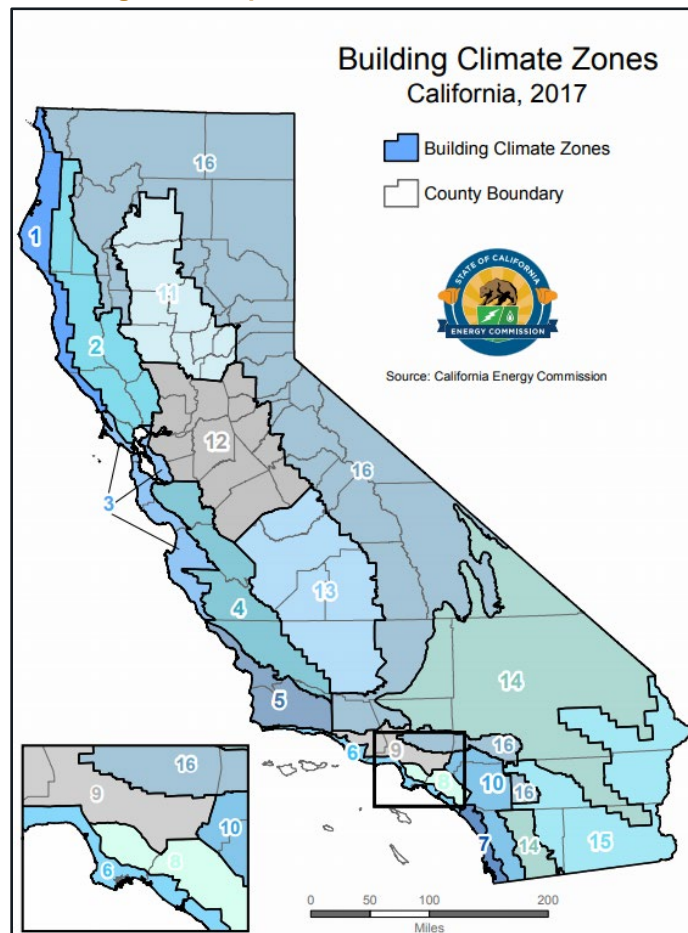
6 Appendices

6.1 Map of California Climate Zones

Climate zone geographical boundaries are depicted in Figure 3. The map in Figure 3 along with a zip-code search directory is available at:

https://ww2.energy.ca.gov/maps/renewable/building_climate_zones.html

Figure 3. Map of California climate zones.



6.2 Cost-Effectiveness Results

6.2.1 Standard Rates

The following tables present results across the 16 climate zones for the pre-1978 (Table 22 through Table 24) and the 1978-1991 (Table 25 through Table 27) vintages supplementing the results in Section 3.

Table 22. [Pre-1978] DFHP Existing Furnace

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	\$2,405	\$155	\$25,223	\$14,524	\$51,831
CZ02	PGE	\$1,670	(\$81)	\$11,551	\$4,316	\$20,806
CZ03	PGE	\$1,178	\$39	\$11,680	\$7,248	\$21,906
CZ04	PGE	\$1,670	(\$7)	\$10,574	\$4,948	\$18,321
CZ04	CPAU	\$1,670	\$63	\$10,574	\$5,177	\$14,531
CZ05	PGE	\$1,424	(\$29)	\$9,462	\$4,574	\$16,955
CZ05	PGE/SCG	\$1,424	(\$314)	\$9,462	(\$3,674)	\$2,838
CZ06	SCE/SCG	\$1,424	(\$70)	\$4,223	\$179	\$1,795
CZ07	SDGE	\$1,424	\$41	\$4,278	\$2,725	\$5,055
CZ08	SCE/SCG	\$1,916	(\$111)	\$3,216	(\$1,507)	\$375
CZ09	SCE/SCG	\$1,916	(\$168)	\$4,238	(\$2,500)	\$125
CZ10	SCE/SCG	\$1,916	(\$133)	\$3,755	(\$1,774)	\$774
CZ10	SDGE	\$1,916	\$201	\$3,755	\$6,175	\$10,683
CZ11	PGE	\$2,162	\$93	\$11,970	\$7,593	\$24,951
CZ12	PGE	\$1,916	\$46	\$12,302	\$6,948	\$24,190
CZ12	SMUD/PGE	\$1,916	\$584	\$12,302	\$18,997	\$36,626
CZ13	PGE	\$2,162	\$112	\$8,180	\$6,374	\$18,740
CZ14	SCE/SCG	\$1,916	(\$244)	\$6,646	(\$2,926)	\$3,332
CZ14	SDGE	\$1,916	\$65	\$6,646	\$4,203	\$13,297
CZ15	SCE/SCG	\$2,408	\$80	\$401	\$1,506	\$2,532
CZ16	PGE	\$2,243	(\$199)	\$17,538	\$2,333	\$25,276

Table 23. [Pre-1978] Standard Efficiency HPSH

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	\$3,067	(\$127)	\$27,155	\$7,800	\$48,445
CZ02	PGE	\$652	(\$242)	\$13,342	\$1,420	\$21,282
CZ03	PGE	\$514	(\$46)	\$11,946	\$4,614	\$19,670
CZ04	PGE	\$652	(\$139)	\$13,059	\$3,274	\$21,888
CZ04	CPAU	\$652	(\$48)	\$13,059	\$3,194	\$15,372
CZ05	PGE	\$583	(\$131)	\$9,998	\$2,045	\$15,648
CZ05	PGE/SCG	\$583	(\$449)	\$9,998	(\$7,152)	(\$94)
CZ06	SCE/SCG	\$583	(\$76)	\$3,860	(\$652)	\$931
CZ07	SDGE	\$583	\$35	\$3,876	\$1,901	\$4,218
CZ08	SCE/SCG	\$721	(\$128)	\$3,305	(\$2,112)	(\$199)
CZ09	SCE/SCG	\$721	(\$219)	\$4,415	(\$3,839)	(\$1,141)
CZ10	SCE/SCG	\$721	(\$188)	\$3,982	(\$3,168)	(\$483)
CZ10	SDGE	\$721	\$166	\$3,982	\$5,200	\$10,049
CZ11	PGE	\$790	(\$74)	\$14,045	\$4,727	\$24,836
CZ12	PGE	\$721	(\$179)	\$13,850	\$2,374	\$21,622
CZ12	SMUD/PGE	\$721	\$601	\$13,850	\$19,845	\$39,654
CZ13	PGE	\$790	(\$14)	\$9,394	\$3,998	\$17,858
CZ14	SCE/SCG	\$721	(\$450)	\$10,103	(\$6,294)	\$4,015
CZ14	SDGE	\$721	(\$66)	\$10,103	\$2,757	\$18,994
CZ15	SCE/SCG	\$859	\$68	\$643	\$1,364	\$2,430
CZ16	PGE	\$2,095	(\$484)	\$27,492	\$2,918	\$49,419

Table 24. [Pre-1978] High Efficiency HPSH

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	\$5,998	\$249	\$30,518	\$11,401	\$52,316
CZ02	PGE	\$3,606	(\$24)	\$13,354	\$1,431	\$21,449
CZ03	PGE	\$3,422	\$100	\$10,768	\$3,122	\$18,282
CZ04	PGE	\$3,606	\$118	\$13,537	\$4,185	\$22,984
CZ04	CPAU	\$3,606	\$101	\$13,537	\$1,665	\$13,950
CZ05	PGE	\$3,514	\$10	\$8,416	\$384	\$14,087
CZ05	PGE/SCG	\$3,514	(\$308)	\$8,416	(\$8,814)	(\$1,654)
CZ06	SCE/SCG	\$3,514	\$3	\$380	(\$3,709)	(\$2,052)
CZ07	SDGE	\$3,514	\$114	\$430	(\$1,063)	\$1,230
CZ08	SCE/SCG	\$3,698	\$31	\$1,065	(\$3,478)	(\$1,420)
CZ09	SCE/SCG	\$3,698	(\$40)	\$2,358	(\$4,759)	(\$1,897)
CZ10	SCE/SCG	\$3,698	\$6	\$2,191	(\$3,746)	(\$882)
CZ10	SDGE	\$3,698	\$344	\$2,191	\$4,481	\$9,276
CZ11	PGE	\$3,789	\$283	\$15,614	\$7,801	\$28,167
CZ12	PGE	\$3,698	\$152	\$14,490	\$4,899	\$24,385
CZ12	SMUD/PGE	\$3,698	\$708	\$14,490	\$17,350	\$37,236
CZ13	PGE	\$3,789	\$326	\$10,164	\$6,697	\$20,802
CZ14	SCE/SCG	\$3,698	(\$173)	\$11,876	(\$5,041)	\$5,522
CZ14	SDGE	\$3,698	\$244	\$11,876	\$5,111	\$21,254
CZ15	SCE/SCG	\$3,881	\$335	\$393	\$2,323	\$3,635
CZ16	PGE	\$5,071	\$45	\$34,043	\$9,856	\$56,737

Table 25. [1978-1991] DFHP Existing Furnace

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	\$2,405	\$99	\$20,184	\$10,746	\$40,368
CZ02	PGE	\$1,670	(\$114)	\$9,142	\$2,185	\$14,361
CZ03	PGE	\$1,178	\$3	\$9,033	\$5,101	\$15,624
CZ04	PGE	\$1,670	(\$68)	\$8,160	\$2,319	\$11,818
CZ04	CPAU	\$1,670	\$18	\$8,160	\$3,161	\$9,418
CZ05	PGE	\$1,424	(\$32)	\$7,070	\$3,268	\$11,902
CZ05	PGE/SCG	\$1,424	(\$238)	\$7,070	(\$2,666)	\$1,747
CZ06	SCE/SCG	\$1,424	(\$39)	\$2,941	\$614	\$1,557
CZ07	SDGE	\$1,424	\$1	\$3,046	\$1,512	\$2,837
CZ08	SCE/SCG	\$1,916	(\$78)	\$2,145	(\$1,026)	\$145
CZ09	SCE/SCG	\$1,916	(\$116)	\$2,978	(\$1,655)	\$122
CZ10	SCE/SCG	\$1,916	(\$89)	\$2,606	(\$1,096)	\$571
CZ10	SDGE	\$1,916	\$139	\$2,606	\$4,321	\$7,320
CZ11	PGE	\$2,162	\$103	\$9,118	\$6,239	\$18,777
CZ12	PGE	\$1,916	\$60	\$9,604	\$5,770	\$18,506
CZ12	SMUD/PGE	\$1,916	\$430	\$9,604	\$14,059	\$27,062
CZ13	PGE	\$2,162	\$111	\$6,237	\$5,242	\$14,247
CZ14	SCE/SCG	\$1,916	(\$230)	\$4,931	(\$3,277)	\$1,039
CZ14	SDGE	\$1,916	\$35	\$4,931	\$2,793	\$9,271
CZ15	SCE/SCG	\$2,408	(\$17)	(\$99)	(\$807)	(\$310)
CZ16	PGE	\$2,243	(\$161)	\$14,397	\$1,740	\$20,318

Table 26. [1978-1991] Standard Efficiency HPSH

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	\$3,067	(\$128)	\$21,427	\$5,043	\$37,346
CZ02	PGE	\$652	(\$235)	\$10,428	(\$90)	\$14,711
CZ03	PGE	\$514	(\$67)	\$8,999	\$2,767	\$13,608
CZ04	PGE	\$652	(\$164)	\$9,984	\$1,062	\$14,605
CZ04	CPAU	\$652	(\$66)	\$9,984	\$1,535	\$9,914
CZ05	PGE	\$583	(\$132)	\$7,290	\$703	\$10,264
CZ05	PGE/SCG	\$583	(\$361)	\$7,290	(\$5,939)	(\$1,104)
CZ06	SCE/SCG	\$583	(\$43)	\$2,450	(\$151)	\$775
CZ07	SDGE	\$583	(\$3)	\$2,539	\$747	\$2,065
CZ08	SCE/SCG	\$721	(\$96)	\$2,111	(\$1,658)	(\$472)
CZ09	SCE/SCG	\$721	(\$152)	\$3,022	(\$2,659)	(\$831)
CZ10	SCE/SCG	\$721	(\$121)	\$2,672	(\$2,017)	(\$239)
CZ10	SDGE	\$721	\$114	\$2,672	\$3,568	\$6,801
CZ11	PGE	\$790	(\$46)	\$10,682	\$3,545	\$18,156
CZ12	PGE	\$721	(\$110)	\$10,747	\$2,278	\$16,574
CZ12	SMUD/PGE	\$721	\$445	\$10,747	\$14,697	\$29,392
CZ13	PGE	\$790	\$1	\$7,141	\$3,112	\$13,232
CZ14	SCE/SCG	\$721	(\$398)	\$7,556	(\$6,191)	\$1,058
CZ14	SDGE	\$721	(\$53)	\$7,556	\$1,909	\$13,834
CZ15	SCE/SCG	\$859	(\$25)	\$71	(\$848)	(\$322)
CZ16	PGE	\$2,095	(\$445)	\$22,236	\$708	\$37,873

Table 27. [1978-1991] High Efficiency HPSH

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	\$5,998	\$169	\$23,092	\$6,895	\$39,412
CZ02	PGE	\$3,606	(\$75)	\$9,242	(\$1,370)	\$13,547
CZ03	PGE	\$3,422	\$53	\$6,872	\$675	\$11,602
CZ04	PGE	\$3,606	\$26	\$9,114	\$463	\$14,143
CZ04	CPAU	\$3,606	\$43	\$9,114	(\$868)	\$7,590
CZ05	PGE	\$3,514	(\$16)	\$4,859	(\$1,522)	\$8,122
CZ05	PGE/SCG	\$3,514	(\$246)	\$4,859	(\$8,164)	(\$3,246)
CZ06	SCE/SCG	\$3,514	(\$1)	(\$1,546)	(\$4,024)	(\$3,059)
CZ07	SDGE	\$3,514	\$47	(\$1,407)	(\$2,879)	(\$1,576)
CZ08	SCE/SCG	\$3,698	\$37	(\$828)	(\$3,608)	(\$2,300)
CZ09	SCE/SCG	\$3,698	(\$17)	\$232	(\$4,573)	(\$2,623)
CZ10	SCE/SCG	\$3,698	\$20	\$82	(\$3,764)	(\$1,856)
CZ10	SDGE	\$3,698	\$251	\$82	\$1,869	\$5,060
CZ11	PGE	\$3,789	\$259	\$10,685	\$5,452	\$20,283
CZ12	PGE	\$3,698	\$138	\$10,023	\$2,954	\$17,430
CZ12	SMUD/PGE	\$3,698	\$525	\$10,023	\$11,609	\$26,363
CZ13	PGE	\$3,789	\$289	\$6,612	\$4,624	\$14,951
CZ14	SCE/SCG	\$3,698	(\$188)	\$7,697	(\$6,429)	\$1,012
CZ14	SDGE	\$3,698	\$182	\$7,697	\$2,525	\$14,378
CZ15	SCE/SCG	\$3,881	\$193	(\$1,111)	(\$992)	(\$267)
CZ16	PGE	\$5,071	(\$30)	\$26,407	\$5,118	\$42,581

6.2.2 CARE tariffs

Table 28. [Pre-1978] DFHP Existing Furnace 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	\$2,405	\$364	\$25,223	\$16,641	\$46,300
CZ02	PGE	\$1,670	\$64	\$11,551	\$6,432	\$19,553
CZ03	PGE	\$1,178	\$128	\$11,680	\$8,248	\$19,898
CZ04	PGE	\$1,670	\$90	\$10,574	\$6,198	\$16,835
CZ04	CPAU	\$1,670	\$0	\$10,574	\$711	\$711
CZ05	PGE	\$1,424	\$69	\$9,462	\$5,901	\$15,746
CZ05	PGE/SCG	\$1,424	(\$157)	\$9,462	(\$613)	\$4,598
CZ06	SCE/SCG	\$1,424	(\$37)	\$4,223	\$776	\$2,067
CZ07	SDGE	\$1,424	\$42	\$4,278	\$2,609	\$4,434
CZ08	SCE/SCG	\$1,916	(\$63)	\$3,216	(\$595)	\$911
CZ09	SCE/SCG	\$1,916	(\$97)	\$4,238	(\$1,132)	\$972
CZ10	SCE/SCG	\$1,916	(\$75)	\$3,755	(\$660)	\$1,379
CZ10	SDGE	\$1,916	\$160	\$3,755	\$4,963	\$8,500
CZ11	PGE	\$2,162	\$183	\$11,970	\$8,415	\$22,212
CZ12	PGE	\$1,916	\$152	\$12,302	\$8,126	\$21,834
CZ12	SMUD/PGE	\$1,916	\$686	\$12,302	\$20,080	\$34,172
CZ13	PGE	\$2,162	\$160	\$8,180	\$6,595	\$16,418
CZ14	SCE/SCG	\$1,916	(\$126)	\$6,646	(\$779)	\$4,233
CZ14	SDGE	\$1,916	\$101	\$6,646	\$4,530	\$11,652
CZ15	SCE/SCG	\$2,408	\$60	\$401	\$982	\$1,788
CZ16	PGE	\$2,243	\$34	\$17,538	\$5,963	\$24,236

Table 29. [Pre-1978] Standard Efficiency HPSH 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	\$3,067	\$205	\$27,155	\$12,440	\$44,777
CZ02	PGE	\$652	(\$16)	\$13,342	\$5,095	\$20,910
CZ03	PGE	\$514	\$76	\$11,946	\$6,319	\$18,293
CZ04	PGE	\$652	\$41	\$13,059	\$6,031	\$20,843
CZ04	CPAU	\$652	\$0	\$13,059	\$255	\$255
CZ05	PGE	\$583	\$12	\$9,998	\$4,285	\$15,110
CZ05	PGE/SCG	\$583	(\$240)	\$9,998	(\$2,978)	\$2,679
CZ06	SCE/SCG	\$583	(\$42)	\$3,860	(\$7)	\$1,259
CZ07	SDGE	\$583	\$37	\$3,876	\$1,837	\$3,652
CZ08	SCE/SCG	\$721	(\$75)	\$3,305	(\$1,076)	\$457
CZ09	SCE/SCG	\$721	(\$131)	\$4,415	(\$2,095)	\$72
CZ10	SCE/SCG	\$721	(\$110)	\$3,982	(\$1,649)	\$504
CZ10	SDGE	\$721	\$139	\$3,982	\$4,305	\$8,106
CZ11	PGE	\$790	\$94	\$14,045	\$7,108	\$23,108
CZ12	PGE	\$721	\$20	\$13,850	\$5,506	\$20,829
CZ12	SMUD/PGE	\$721	\$772	\$13,850	\$22,326	\$38,189
CZ13	PGE	\$790	\$89	\$9,394	\$5,347	\$16,369
CZ14	SCE/SCG	\$721	(\$241)	\$10,103	(\$2,418)	\$5,836
CZ14	SDGE	\$721	\$62	\$10,103	\$4,832	\$17,541
CZ15	SCE/SCG	\$859	\$52	\$643	\$930	\$1,769
CZ16	PGE	\$2,095	\$16	\$27,492	\$10,883	\$47,907

Table 30. [Pre-1978] High Efficiency HPSH 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	\$5,998	\$450	\$30,518	\$13,096	\$45,609
CZ02	PGE	\$3,606	\$126	\$13,354	\$3,405	\$19,322
CZ03	PGE	\$3,422	\$172	\$10,768	\$3,678	\$15,720
CZ04	PGE	\$3,606	\$209	\$13,537	\$4,926	\$19,859
CZ04	CPAU	\$3,606	\$0	\$13,537	(\$4,595)	(\$4,595)
CZ05	PGE	\$3,514	\$103	\$8,416	\$1,521	\$12,412
CZ05	PGE/SCG	\$3,514	(\$148)	\$8,416	(\$5,742)	(\$19)
CZ06	SCE/SCG	\$3,514	\$11	\$380	(\$3,634)	(\$2,319)
CZ07	SDGE	\$3,514	\$89	\$430	(\$1,774)	\$25
CZ08	SCE/SCG	\$3,698	\$33	\$1,065	(\$3,586)	(\$1,955)
CZ09	SCE/SCG	\$3,698	(\$10)	\$2,358	(\$4,304)	(\$2,027)
CZ10	SCE/SCG	\$3,698	\$21	\$2,191	(\$3,628)	(\$1,354)
CZ10	SDGE	\$3,698	\$255	\$2,191	\$2,127	\$5,893
CZ11	PGE	\$3,789	\$327	\$15,614	\$7,382	\$23,549
CZ12	PGE	\$3,698	\$236	\$14,490	\$5,437	\$20,914
CZ12	SMUD/PGE	\$3,698	\$772	\$14,490	\$17,439	\$33,302
CZ13	PGE	\$3,789	\$310	\$10,164	\$5,378	\$16,558
CZ14	SCE/SCG	\$3,698	(\$54)	\$11,876	(\$3,161)	\$5,265
CZ14	SDGE	\$3,698	\$263	\$11,876	\$4,651	\$17,300
CZ15	SCE/SCG	\$3,881	\$232	\$393	(\$35)	\$970
CZ16	PGE	\$5,071	\$360	\$34,043	\$13,682	\$50,953

Table 31. [1978-1991] DFHP Existing Furnace 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	\$2,405	\$273	\$20,184	\$12,619	\$36,168
CZ02	PGE	\$1,670	\$12	\$9,142	\$4,166	\$13,857
CZ03	PGE	\$1,178	\$76	\$9,033	\$6,011	\$14,375
CZ04	PGE	\$1,670	\$23	\$8,160	\$3,702	\$11,261
CZ04	CPAU	\$1,670	\$0	\$8,160	\$711	\$711
CZ05	PGE	\$1,424	\$40	\$7,070	\$4,285	\$11,150
CZ05	PGE/SCG	\$1,424	(\$122)	\$7,070	(\$400)	\$3,130
CZ06	SCE/SCG	\$1,424	(\$21)	\$2,941	\$952	\$1,705
CZ07	SDGE	\$1,424	\$9	\$3,046	\$1,631	\$2,667
CZ08	SCE/SCG	\$1,916	(\$45)	\$2,145	(\$395)	\$544
CZ09	SCE/SCG	\$1,916	(\$67)	\$2,978	(\$712)	\$712
CZ10	SCE/SCG	\$1,916	(\$50)	\$2,606	(\$357)	\$976
CZ10	SDGE	\$1,916	\$110	\$2,606	\$3,472	\$5,826
CZ11	PGE	\$2,162	\$155	\$9,118	\$6,542	\$16,502
CZ12	PGE	\$1,916	\$128	\$9,604	\$6,434	\$16,553
CZ12	SMUD/PGE	\$1,916	\$506	\$9,604	\$14,879	\$25,269
CZ13	PGE	\$2,162	\$135	\$6,237	\$5,170	\$12,318
CZ14	SCE/SCG	\$1,916	(\$128)	\$4,931	(\$1,351)	\$2,112
CZ14	SDGE	\$1,916	\$65	\$4,931	\$3,123	\$8,195
CZ15	SCE/SCG	\$2,408	(\$9)	(\$99)	(\$653)	(\$256)
CZ16	PGE	\$2,243	\$28	\$14,397	\$4,676	\$19,471

Table 32. [1978-1991] Standard Efficiency HPSH 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	\$3,067	\$146	\$21,427	\$8,941	\$34,641
CZ02	PGE	\$652	(\$47)	\$10,428	\$3,076	\$14,864
CZ03	PGE	\$514	\$33	\$8,999	\$4,259	\$12,882
CZ04	PGE	\$652	(\$10)	\$9,984	\$3,558	\$14,338
CZ04	CPAU	\$652	\$0	\$9,984	\$255	\$255
CZ05	PGE	\$583	(\$18)	\$7,290	\$2,586	\$10,196
CZ05	PGE/SCG	\$583	(\$199)	\$7,290	(\$2,659)	\$1,219
CZ06	SCE/SCG	\$583	(\$24)	\$2,450	\$215	\$956
CZ07	SDGE	\$583	\$6	\$2,539	\$898	\$1,929
CZ08	SCE/SCG	\$721	(\$57)	\$2,111	(\$896)	\$57
CZ09	SCE/SCG	\$721	(\$91)	\$3,022	(\$1,455)	\$13
CZ10	SCE/SCG	\$721	(\$71)	\$2,672	(\$1,035)	\$390
CZ10	SDGE	\$721	\$96	\$2,672	\$2,939	\$5,474
CZ11	PGE	\$790	\$74	\$10,682	\$5,209	\$16,830
CZ12	PGE	\$721	\$30	\$10,747	\$4,418	\$15,794
CZ12	SMUD/PGE	\$721	\$573	\$10,747	\$16,567	\$28,332
CZ13	PGE	\$790	\$72	\$7,141	\$4,003	\$12,047
CZ14	SCE/SCG	\$721	(\$224)	\$7,556	(\$2,880)	\$2,930
CZ14	SDGE	\$721	\$42	\$7,556	\$3,476	\$12,809
CZ15	SCE/SCG	\$859	(\$13)	\$71	(\$639)	(\$219)
CZ16	PGE	\$2,095	(\$25)	\$22,236	\$7,529	\$37,120

Table 33. [1978-1991] High Efficiency HPSH 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	\$5,998	\$339	\$23,092	\$8,460	\$34,300
CZ02	PGE	\$3,606	\$57	\$9,242	\$547	\$12,409
CZ03	PGE	\$3,422	\$111	\$6,872	\$1,228	\$9,907
CZ04	PGE	\$3,606	\$113	\$9,114	\$1,472	\$12,340
CZ04	CPAU	\$3,606	\$0	\$9,114	(\$4,595)	(\$4,595)
CZ05	PGE	\$3,514	\$58	\$4,859	(\$544)	\$7,120
CZ05	PGE/SCG	\$3,514	(\$124)	\$4,859	(\$5,789)	(\$1,857)
CZ06	SCE/SCG	\$3,514	\$5	(\$1,546)	(\$3,963)	(\$3,196)
CZ07	SDGE	\$3,514	\$39	(\$1,407)	(\$3,143)	(\$2,122)
CZ08	SCE/SCG	\$3,698	\$32	(\$828)	(\$3,800)	(\$2,766)
CZ09	SCE/SCG	\$3,698	(\$0)	\$232	(\$4,336)	(\$2,784)
CZ10	SCE/SCG	\$3,698	\$25	\$82	(\$3,803)	(\$2,290)
CZ10	SDGE	\$3,698	\$184	\$82	\$124	\$2,631
CZ11	PGE	\$3,789	\$272	\$10,685	\$4,725	\$16,488
CZ12	PGE	\$3,698	\$191	\$10,023	\$3,148	\$14,639
CZ12	SMUD/PGE	\$3,698	\$573	\$10,023	\$11,680	\$23,445
CZ13	PGE	\$3,789	\$259	\$6,612	\$3,262	\$11,441
CZ14	SCE/SCG	\$3,698	(\$82)	\$7,697	(\$4,629)	\$1,311
CZ14	SDGE	\$3,698	\$195	\$7,697	\$2,166	\$11,452
CZ15	SCE/SCG	\$3,881	\$133	(\$1,111)	(\$2,349)	(\$1,794)
CZ16	PGE	\$5,071	\$245	\$26,407	\$8,685	\$38,470

6.3 Utility Rate Schedules

6.3.1 Pacific Gas & Electric

The following pages provide details on the PG&E electricity and natural gas tariffs applied in this study. Table 34 describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of \$ 0.03396/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between February 2024 and January 2025.

Table 34. 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 35. The gas rates were developed based on the latest available gas rate for January 2025 and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from PG&E's monthly residential tariffs between 2015 and 2024. 12-month curves were created from monthly gas rates for each of the ten years. The ten annual curves were then averaged to arrive at an average normalized annual curve. 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 January 2025 rates. The costs presented in Table 35 were then derived by establishing the baseline and excess rates from the latest January 2025 tariff as a reference point, and then using the normalized curve to estimate the cost for the remaining months relative to the January rates. Corresponding CARE tariffs reflect the 20 percent discount per the GL-1 tariff.

Table 35. PG&E Monthly Gas Rate (\$/therm)

Month	Total Charge	
	Baseline	Excess
January	\$2.63	\$3.15
February	\$2.64	\$3.16
March	\$2.41	\$2.94
April	\$2.24	\$2.77
May	\$2.21	\$2.74
June	\$2.23	\$2.77
July	\$2.26	\$2.80
August	\$2.36	\$2.90
September	\$2.42	\$2.98
October	\$2.52	\$3.07
November	\$2.63	\$3.17
December	\$2.70	\$3.23

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

Cancelling

Revised
Revised

Cal. P.U.C. Sheet No.

59120-E

Cal. P.U.C. Sheet No.

58758-E

ELECTRIC SCHEDULE E-TOU-C
RESIDENTIAL TIME-OF-USE (PEAK PRICING 4 - 9 p.m. EVERY DAY)

Sheet 2

RATES:
(Cont'd.)

E-TOU-C TOTAL BUNDLED RATES

Total Energy Rates (\$ per kWh)	PEAK		OFF-PEAK	
<i>Summer</i>				
Total Usage	\$0.60729	(R)	\$0.50429	(R)
Baseline Credit (Applied to Baseline Usage Only)	(\$0.10135)	(R)	(\$0.10135)	(R)
<i>Winter</i>				
Total Usage	\$0.49312	(R)	\$0.46312	(R)
Baseline Credit (Applied to Baseline Usage Only)	(\$0.10135)	(R)	(\$0.10135)	(R)
Delivery Minimum Bill Amount (\$ per meter per day)	\$0.39167			
California Climate Credit (per household, per semi-annual payment occurring in the April and October bill cycles)	(\$58.23)	(R)		

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.

(Continued)

Advice	7469-E	Issued by	Submitted	December 30, 2024
Decision		Shilpa Ramaiya	Effective	January 1, 2025
		Vice President	Resolution	
		Regulatory Proceedings and Rates		



**Pacific Gas and
Electric Company**
U 39 Oakland, California

Cancelling Revised
Revised

Cal. P.U.C. Sheet No. 59121-E
Cal. P.U.C. Sheet No. 58759-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)	\$0.24730	(I)	\$0.16430	(I)
Winter (all usage)	\$0.18725	(I)	\$0.16057	(I)
Distribution**:				
Summer (all usage)	\$0.24056	(I)	\$0.22056	(I)
Winter (all usage)	\$0.18645	(I)	\$0.18313	(I)
Conservation Incentive Adjustment (Baseline Usage)		(\$0.03733)	(I)	
Conservation Incentive Adjustment (Over Baseline Usage)		\$0.06402	(I)	
Transmission* (all usage)		\$0.05122	(I)	
Transmission Rate Adjustments* (all usage)		(\$0.01509)	(R)	
Reliability Services* (all usage)		\$0.00032	(I)	
Public Purpose Programs (all usage)		\$0.02644	(R)	
Nuclear Decommissioning (all usage)		(\$0.00013)	(I)	
Competition Transition Charges (all usage)		(\$0.00072)	(R)	
Energy Cost Recovery Amount (all usage)		\$0.00001	(I)	
Wildfire Fund Charge (all usage)		\$0.00595	(I)	
New System Generation Charge (all usage)**		\$0.00574	(R)	
Wildfire Hardening Charge (all usage)		\$0.00494		
Recovery Bond Charge (all usage)		\$0.00650		
Recovery Bond Credit (all usage)		(\$0.00650)		
Bundled Power Charge Indifference Adjustment (all usage)***		(\$0.02327)	(R)	

* 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	7469-E	Issued by	Submitted	December 30, 2024
Decision		Shilpa Ramaiya	Effective	January 1, 2025
		Vice President	Resolution	
		Regulatory Proceedings and Rates		



Pacific Gas and Electric Company
U 39 Oakland, California

Cancelling Revised Cal. P.U.C. Sheet No. 59109-E
Revised Cal. P.U.C. Sheet No. 58755-E

ELECTRIC SCHEDULE E-ELEC Sheet 2
RESIDENTIAL TIME-OF-USE (ELECTRIC HOME)
SERVICE FOR CUSTOMERS WITH QUALIFYING ELECTRIC TECHNOLOGIES

RATES:(Cont'd.)

Direct Access (DA) and Community Choice Aggregation (CCA) charges shall be calculated in accordance with the paragraph in this rate schedule titled Billing.

TOTAL BUNDLED RATES

Base Services Charge (\$ per meter per day)	\$0.49281		
Total Energy Rates (\$ per kWh)	PEAK	PART-PEAK	OFF-PEAK
Summer Usage	\$0.60728 (R)	\$0.44540 (R)	\$0.38872 (R)
Winter Usage	\$0.37577 (R)	\$0.35368 (R)	\$0.33982 (R)
California Climate Credit (per household, per semi-annual payment occurring in the April and October bill cycles)	(\$58.23)	(R)	

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	\$0.31659	(I)	\$0.21748	(I)	\$0.17238	(I)
Winter Usage	\$0.15446	(I)	\$0.13449	(I)	\$0.12114	(I)
Distribution**:						
Summer Usage	\$0.23528	(I)	\$0.17251	(I)	\$0.16093	(I)
Winter Usage	\$0.16590	(I)	\$0.16378	(I)	\$0.16327	(I)
Transmission* (all usage)	\$0.05122	(I)	\$0.05122	(I)	\$0.05122	(I)
Transmission Rate Adjustments* (all usage)	(\$0.01509)	(R)	(\$0.01509)	(R)	(\$0.01509)	(R)
Reliability Services* (all usage)	\$0.00032	(I)	\$0.00032	(I)	\$0.00032	(I)
Public Purpose Programs (all usage)	\$0.02644	(R)	\$0.02644	(R)	\$0.02644	(R)
Nuclear Decommissioning (all usage)	(\$0.00013)	(I)	(\$0.00013)	(I)	(\$0.00013)	(I)
Competition Transition Charges (all usage)	(\$0.00072)	(R)	(\$0.00072)	(R)	(\$0.00072)	(R)
Energy Cost Recovery Amount (all usage)	\$0.00001	(I)	\$0.00001	(I)	\$0.00001	(I)
Wildfire Fund Charge (all usage)	\$0.00595	(I)	\$0.00595	(I)	\$0.00595	(I)
New System Generation Charge (all usage)**	\$0.00574	(R)	\$0.00574	(R)	\$0.00574	(R)
Wildfire Hardening Charge (all usage)	\$0.00494		\$0.00494		\$0.00494	
Recovery Bond Charge (all usage)	\$0.00650		\$0.00650		\$0.00650	
Recovery Bond Credit (all usage)	(\$0.00650)		(\$0.00650)		(\$0.00650)	
Bundled Power Charge Indifference Adjustment (all usage)***	(\$0.02327)	(R)	(\$0.02327)	(R)	(\$0.02327)	(R)

* 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	7469-E	Issued by	Submitted	December 30, 2024
Decision		Shilpa Ramaiya	Effective	January 1, 2025
		Vice President	Resolution	
		Regulatory Proceedings and Rates		



**Pacific Gas and
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San Francisco, California

Original Cal. P.U.C. Sheet No. 54738-E

ELECTRIC SCHEDULE E-ELEC
RESIDENTIAL TIME-OF-USE (ELECTRIC HOME)
SERVICE FOR CUSTOMERS WITH QUALIFYING ELECTRIC TECHNOLOGIES

Sheet 3 (N)
(N)

**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)

<i>Advice</i>	6768-E	<i>Issued by</i>	<i>Submitted</i>	November 18, 2022
<i>Decision</i>	D.21-11-016	Meredith Allen	<i>Effective</i>	December 1, 2022
		<i>Vice President, Regulatory Affairs</i>	<i>Resolution</i>	



**Pacific Gas and
Electric Company**

Oakland, California

Cancelling Revised Cal. P.U.C. Sheet No. 59329-E
Revised Cal. P.U.C. Sheet No. 59086-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-TOU-B, E-TOU-C, E-TOU-D, EV2, E-ELEC, EM, ES, ESR, ET and EM-TOU.

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 38.351% (R) 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 less charges from which they are exempt (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) 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 reduction to distribution charges. 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.

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.

(Continued)

Advice Decision	7516-E	Issued by Shilpa Ramaiya Vice President Regulatory Proceedings and Rates	Submitted Effective Resolution	February 26, 2025 March 1, 2025
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**Pacific Gas and
Electric Company**

U 39

Oakland, California

Cancelling Revised Cal. P.U.C. Sheet No. 59087-E
Revised Cal. P.U.C. Sheet No. 58198-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:	35.000	% (Percent)	(I)
	B. Delivery Minimum Bill Discount:	50.000	% (Percent)	
	C. Master-Meter D-CARE Discount:	35.000	% (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 7469-E
Decision

Issued by
Shilpa Ramaiya
Vice President
Regulatory Proceedings and Rates

Submitted December 30, 2024
Effective January 1, 2025
Resolution

6.3.2 Southern California Edison

The following pages provide details on the SCE electricity tariffs applied in this study. Table describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of \$ 0.01532/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between February 2024 and January 2025.

Table 36. 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

- Applicable rate time periods are defined as follows:

Option 4-9 PM, Option 4-9 PM-CPP, Option PRIME, Option PRIME-CPP :

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)

Cancelling Revised
Revised Cal. PUC Sheet No. 89278-E
Cal. PUC Sheet No. 88856-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:

Option 4-9 PM / Option 4-9 PM-CPP		Delivery Service Total ¹	Generation ²	
			UG ³	DWREC ⁴
Energy Charge - \$/kWh	Summer Season - On-Peak	0.35546 (I)	0.24264 (R)	0.00000
	Mid-Peak	0.35546 (I)	0.12948 (R)	0.00000
	Off-Peak	0.30374 (I)	0.06976 (R)	0.00000
	Winter Season - Mid-Peak	0.35546 (I)	0.17237 (R)	0.00000
	Off-Peak	0.30374 (I)	0.09602 (R)	0.00000
	Super-Off-Peak	0.28513 (I)	0.07779 (R)	0.00000
Baseline Credit**** - \$/kWh		(0.09514) (I)	0.00000	
Fixed Recovery Charge - \$/kWh		0.00198 (I)		
MCAM Charge ⁵ - \$/kWh		0.00160 (I)		
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 ⁶		(56.00) (R)		
California Alternate Rates for Energy Discount - %		100.00*		
Family Electric Rate Assistance Discount - %		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		(0.54821) (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 (\$0.00056) per kWh is recovered in the UG component of Generation. (R)
- **** 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 PCA 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.
- 5 The Modified Cost Allocation Mechanism (MCAM) charge recovers the net cost associated with system reliability procurement ordered by the CPUC that SCE has procured on behalf of customers whose generation services are provided by certain Electric Service Providers or Community Choice Aggregators.

(Continued)

(To be inserted by utility)

Advice 5449-E
Decision _____

2C7

Issued by
Michael Backstrom
Vice President

(To be inserted by Cal. PUC)

Date Submitted Dec 30, 2024
Effective Jan 1, 2025
Resolution E-5217



Southern California Edison
Rosemead, California (U 338-E)

Revised Cal. PUC Sheet No. 89282-E
Cancelling Revised Cal. PUC Sheet No. 88860-E

Schedule TOU-D
TIME-OF-USE
DOMESTIC
(Continued)

Sheet 6

RATES (Continued)

Option PRIME / Option PRIME-CPP	Delivery Service		Generation ²	
	Total ¹		UG**	DWREC ³
Energy Charge - \$/kWh/Meter/Day				
Summer Season				
	On-Peak	0.28716 (I)	0.28317 (R)	0.00000
	Mid-Peak	0.28716 (I)	0.10077 (R)	0.00000
	Off-Peak	0.20039 (I)	0.06728 (R)	0.00000
Winter Season				
	Mid-Peak	0.29246 (I)	0.24759 (R)	0.00000
	Off-Peak	0.19215 (I)	0.05686 (R)	0.00000
	Super-Off-Peak	0.19215 (I)	0.05686 (R)	0.00000
Fixed Recovery Charge - \$/kWh		0.00198 (I)		
MCAM Charge ⁵ - \$/kWh		0.00160 (I)		
Basic Charge - \$/Meter/Day		0.539 (R)		
EV Meter Credit (Separately Metered EV Option) - \$/Meter/Day		(0.408) (I)		
EV Submeter Credit - \$/Meter/Day		(0.139) (I)		
California Climate Credit ⁴		(56.00) (R)		
California Alternate Rates for				
Energy Discount - %		100.00*		
Family Electric Rate Assistance Discount - %		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			(0.54821) (R)	

- * Represents 100% of the discount percentage as shown in the applicable Special Condition of this Schedule.
 ** The ongoing Competition Transition Charge (CTC) of (\$0.00058) per kWh is recovered in the UG component of Generation. (R)
 **** 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.
 5 The Modified Cost Allocation Mechanism (MCAM) charge recovers the net cost associated with system reliability procurement ordered by the CPUC that SCE has procured on behalf of customers whose generation services are provided by certain Electric Service Providers or Community Choice Aggregators.

(Continued)

(To be inserted by utility)

Advice 5449-E
Decision _____

6C9

Issued by
Michael Backstrom
Vice President

(To be inserted by Cal. PUC)

Date Submitted Dec 30, 2024
Effective Jan 1, 2025
Resolution E-5217



Southern California Edison
Rosemead, California (U 338-E)

Cancelling Revised Cal. PUC Sheet No. 89277-E
Revised Cal. PUC Sheet No. 88502-E

Schedule D-CARE
CALIFORNIA ALTERNATE RATES FOR ENERGY
DOMESTIC SERVICE

Sheet 1

APPLICABILITY

Applicable to domestic service to California Alternate Rates for Energy (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 32.5 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 \$0.01435 per kWh, the Wildfire Fund Non-Bypassable Charge of \$0.00595 per kWh, and the Fixed Recovery Charge of \$0.00198 per kWh.. (l)
(l)
(l)

(Continued)

(To be inserted by utility)

Advice 5449-E
Decision _____

1H14

Issued by
Michael Backstrom
Vice President

(To be inserted by Cal. PUC)

Date Submitted Dec 30, 2024
Effective Jan 1, 2025
Resolution E-5217

6.3.3 Southern California Gas

Following are the SoCalGas natural gas tariffs applied in this study. Table 37 describes the baseline territories that were assumed for each climate zone.

Table 37. 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 applied in this analysis is shown in Table 38. The gas rates were developed based on the latest available gas rate for January 2025 and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from SoCalGas’s monthly residential tariffs between 2015 and 2024. 12-month curves were created from monthly gas rates for each of the ten years. The ten annual curves were then averaged to arrive at an average normalized annual curve. Long-term historical natural gas rate data was only available for SoCalGas’ procurement charges.⁸ 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 January 2025 rates. The costs presented in Table 38 were then derived by establishing the baseline and excess rates from the latest January 2025 tariff as a reference point, and then using the normalized curve to estimate the cost for the remaining months relative to the January rates. CARE tariffs reflect the 20 percent discount per the GR tariff.

⁸ 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)

Table 38. SoCalGas Monthly Gas Rate (\$/therm)

Month	Procurement Charge	Transportation Charge		Total Charge	
		Baseline	Excess	Baseline	Excess
January	\$0.45	\$0.98	\$1.40	\$1.43	\$1.85
February	\$0.31	\$0.98	\$1.40	\$1.29	\$1.71
March	\$0.26	\$0.98	\$1.40	\$1.24	\$1.66
April	\$0.21	\$0.98	\$1.40	\$1.19	\$1.62
May	\$0.22	\$0.98	\$1.40	\$1.20	\$1.62
June	\$0.25	\$0.98	\$1.40	\$1.23	\$1.65
July	\$0.26	\$0.98	\$1.40	\$1.24	\$1.66
August	\$0.29	\$0.98	\$1.40	\$1.27	\$1.70
September	\$0.27	\$0.98	\$1.40	\$1.25	\$1.67
October	\$0.26	\$0.98	\$1.40	\$1.24	\$1.66
November	\$0.29	\$0.98	\$1.40	\$1.27	\$1.69
December	\$0.33	\$0.98	\$1.40	\$1.31	\$1.73

6.3.4 San Diego Gas & Electric

Following are the SDG&E electricity and natural gas tariffs applied in this study. Table 39 describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of \$ 0.01837/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between February 2024 and January 2025.

Table 39. 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 40. The gas rates were developed based on the latest available gas rate for January 2025 and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from SDG&E's monthly residential tariffs between 2015 and 2024. 12-month curves were created from monthly gas rates for each of the ten years. The ten annual curves were then averaged to arrive at an average normalized annual curve. 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 January 2025 rates. The costs presented in Table 40 were then derived by establishing the baseline and excess rates from the latest January 2025 tariff as a reference point, and then using the normalized curve to estimate the cost for the remaining months relative to the January rates. CARE tariffs reflect the 20 percent discount per the G-CARE tariff.

Table 40. SDG&E Monthly Gas Rate (\$/therm)

Month	Total Charge	
	Baseline	Excess
January	\$2.07	\$2.36
February	\$2.01	\$2.30
March	\$1.93	\$2.22
April	\$1.86	\$2.16
May	\$1.88	\$2.18
June	\$1.94	\$2.24
July	\$1.95	\$2.25
August	\$2.02	\$2.32
September	\$1.97	\$2.27
October	\$1.94	\$2.24
November	\$1.97	\$2.27
December	\$2.07	\$2.37

Baseline Usage: The following quantities of gas used in individually metered residences are to be billed at the baseline rates:

<u>All Customers:</u>	<u>Daily Therm Allowance</u>
Summer (May to Oct)	0.359
Winter On-Peak (Dec, Jan & Feb)	1.233
Winter Off-Peak (Nov, Mar, & Apr)	0.692



San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 62556-E

Canceling Revised Cal. P.U.C. Sheet No. 62360-E

Sheet 2

SCHEDULE TOU-DR1

RESIDENTIAL TIME-OF-USE

RATES

Total Rates:

Description – TOU DR1	UDC Total Rate	DWR BC + WF-NBC	EECC Rate	Total Rate
Summer:				
On-Peak	0.28222	0.00561	0.41736	0.70519
Off-Peak	0.28222	0.00561	0.18792	0.47575
Super Off-Peak	0.28222	0.00561	0.06741	0.35524
Winter:				
On-Peak	0.41439	0.00561	0.14115	0.56115
Off-Peak	0.41439	0.00561	0.07928	0.49928
Super Off-Peak	0.41439	0.00561	0.06133	0.48133
Summer Baseline Adjustment Credit up to 130% of Baseline	(0.10543)			(0.10543)
Winter Baseline Adjustment Credit up to 130% of Baseline	(0.10543)			(0.10543)
Minimum Bill (\$/day)	0.392			0.392

Description – TOU DR1-CARE	UDC Total Rate	DWR BC + WF-NBC	EECC Rate	Total Rate	Total Effective Care Rate
Summer – CARE Rates:					
On-Peak	0.28222	0.00000	0.41736	0.69958	0.46249 R
Off-Peak	0.28222	0.00000	0.18792	0.47014	0.30762 R
Super Off-Peak	0.28222	0.00000	0.06741	0.34963	0.22627 R
Winter – CARE Rates:					
On-Peak	0.41439	0.00000	0.14115	0.55554	0.36526 R
Off-Peak	0.41439	0.00000	0.07928	0.49367	0.32350 R
Super Off-Peak	0.41439	0.00000	0.06133	0.47572	0.31138 R
Summer Baseline Adjustment Credit up to 130% of Baseline	(0.10543)			(0.10543)	(0.07117) I
Winter Baseline Adjustment Credit up to 130% of Baseline	(0.10543)			(0.10543)	(0.07117) I
Minimum Bill (\$/day)	0.196			0.196	0.196

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 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 0.00561 + DWR-BC Bond Charge is 0.00000 .

(Continued)

2H10

Advice Ltr. No. 4582-E

Decision No. D 24-05-028

Issued by

Dan Skopec

Senior Vice President

Regulatory Affairs

Submitted Dec 30, 2024

Effective Jan 1, 2025

Resolution No. _____

SCHEDULE TOU-DR1
RESIDENTIAL TIME-OF-USE

Sheet 5

Minimum Bill

The minimum bill to recover Distribution and TRAC costs is calculated as the minimum bill charge of \$0.402 per day times the number of days in the billing cycle with a 50% discount applied for CARE or Family Electric Rate Assistance Program (FERA) customers resulting in a minimum bill charge of \$0.201 per day.

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).

Customers taking service under this Schedule may be eligible for a California Alternate Rates for Energy (CARE) discount on their bill, if they qualify to receive service under the terms and conditions of Schedule E-CARE. In addition, qualified CARE customers are exempt from paying the CARE surcharge of \$0.01230 Per kWh. Customers that are eligible and receive both CARE and medical baseline will be given the additional medical baseline allotment for which they qualify and will receive the total effective CARE and medical baseline discounts identified in Schedule E-CARE.

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 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

Cost-effectiveness Analysis: Single Family AC to Heat Pump Replacement

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Schedule EV-TOU-5 - DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH ELECTRIC VEHICLES provides domestic residential service for customers who own qualifying electric vehicles. Effective 10/1/2024

SCHEDULE EV-TOU-5										Schedule WF-NBC + DWR-BC Rate	Schedule EECC Rate	Total Electric Rate
Energy Charges (\$/kWh)	Transm	Distr	PPP	ND	CTC	LGC	RS	TRAC	UDC Total			
Summer												
On-Peak	0.05840	0.18330	0.01654	0.00007	0.00054	0.02516	0.00001	0.00000	0.28402	0.00561	0.38826	0.67789
Off-Peak	0.05840	0.18330	0.01654	0.00007	0.00054	0.02516	0.00001	0.00000	0.28402	0.00561	0.14305	0.43268
Super Off-Peak	0.00000	0.01496	0.01654	0.00007	0.00054	0.02516	0.00001	0.00000	0.05728	0.00561	0.06741	0.13030
Winter												
On-Peak	0.05840	0.18330	0.01654	0.00007	0.00054	0.02516	0.00001	0.00000	0.28402	0.00561	0.16516	0.45479
Off-Peak	0.05840	0.18330	0.01654	0.00007	0.00054	0.02516	0.00001	0.00000	0.28402	0.00561	0.11850	0.40813
Super Off-Peak	0.00000	0.01496	0.01654	0.00007	0.00054	0.02516	0.00001	0.00000	0.05728	0.00561	0.06133	0.12422
Other Charges/Discounts												
Basic Service Fee (\$/month)	0.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00			16.00
Notes: 1) The total rates presented reflect the UDC rates associated with service under Schedule EV-TOU-5 and the generation rates associated with Schedule EECC, in addition to the rates associated with Schedules DWR-BC and WF-NBC. The UDC rate-by-rate components presented are associated with service under Schedule EV-TOU-5 as presented in the utility's tariff book. 2) Unbundled customers are those who take generation from other providers, such as Direct Access (DA) or Community Choice Aggregation (CCA). Unbundled customers do not pay SDG&E's commodity rates. The Total Energy Charge for an unbundled customer includes UDC, WF-NBC, DWR-BC and Power Charge Indifference Adjustment (PCIA) rates. PCIA rates by vintage are included below. Please see Schedules DA-CRS or CCA-CRS for more information regarding PCIA rates.												

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 \$(0.00289) per kWh and the Transmission Access Charge Balancing Account Adjustment (TACBAA) of \$(0.01656) per kWh. PPP Energy charges includes Low Income PPP rate (LI-PPP) \$0.01515/kWh, Non-low Income PPP rate (Non-LI-PPP) \$0.00031/kWh (pursuant to PU Code Section 399.8, the Non-LI-PPP rate may not exceed January 1, 2000 levels), and California Solar Initiative rate (CSI) of \$(0.00075)/kWh and Self-Generation Incentive Program rate (SGIP) \$0.00149/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.

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



San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 62755-E

Canceling Revised Cal. P.U.C. Sheet No. 35718-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:

Pursuant to D.24-05-028, the applicable CARE discount rate is to be between 30% and 35%, with the intended CARE discount rate to be 35% for SDG&E, specifically, applied as a fixed CARE line-item discount.

In addition to the CARE line-item discount, the total effective CARE discount consists of: (a) exemptions from paying the CARE Surcharge, Department of Water Resources Bond Charge (DWR-BC), California Wildfire Fund Charge (WF-NBC), Vehicle-Grid Integration (VGI) costs, and California Solar Initiative (CSI) and (b) a 50% minimum bill relative to Non-CARE.

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(Continued)

1H6

Advice Ltr. No. 4572-E-A

Decision No. D.24-05-028

Issued by

Dan Skopec

Senior Vice President
Regulatory Affairs

Submitted Jan 24, 2025

Effective Jan 1, 2025

Resolution No.

6.3.5 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 41. The gas rates were developed based on the latest available gas rate for January 2025 and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from CPAU's monthly residential tariffs between 2018 and 2024. 12-month curves were created from monthly gas rates for each of the seven years. The seven annual curves were then averaged to arrive at an average normalized annual curve. 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 January 2025 rates. The costs presented in Table 41 were then derived by establishing the baseline and excess rates from the latest January 2025 tariff as a reference point and then using the normalized curve to estimate the cost for the remaining months relative to the January rates. The monthly service charge applied was \$16.93 per month per the January 2025 G-1 tariff.

Table 41. CPAU Monthly Gas Rate (\$/therm)

Month	G1 Volumetric Total Baseline	G1 Volumetric Total Excess
January	\$1.74	\$3.02
February	\$1.33	\$2.53
March	\$1.24	\$2.43
April	\$1.21	\$2.39
May	\$1.21	\$2.39
June	\$1.23	\$2.42
July	\$1.31	\$2.64
August	\$1.37	\$2.71
September	\$1.36	\$2.71
October	\$1.38	\$2.72
November	\$1.45	\$2.80
December	\$1.57	\$2.96

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:

<u>Per kilowatt-hour (kWh)</u>	<u>Commodity</u>	<u>Distribution</u>	<u>Public Benefits</u>	<u>Total</u>
Tier 1 usage	\$ 0.10270	\$ 0.08642	\$ 0.00549	\$ 0.19461
Tier 2 usage	0.13240	0.08079	0.00549	0.21868
Any usage over Tier 1				
<u>Customer Charge</u> <u>(\$/month)</u>				4.64

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 15 kWh per day, prorated by Meter reading days of Service. As an example, for a 30-day bill, the Tier 1 level would be 450 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

*Supersedes Sheet No E-1-1
dated 7-1-2023*



**CITY OF
PALO ALTO
UTILITIES**

Sheet No **E-1-1**
Effective 7-1-2024

6.3.6 Sacramento Municipal Utilities District (Electric Only)

Following are the SMUD electricity tariffs applied in this study. The rates effective January 2025 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 <i>per month per meter</i>	\$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 <i>per month per meter</i>	\$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

- Energy Assistance Program Rate.** Refer to Rate Schedule EAPR.
- Medical Equipment Discount Program.** Refer to Rate Schedule MED.
- Joint Participation in Medical Equipment Discount and Energy Assistance Program Rate.** Refer to Rate Schedule MED.

V. Conditions of Service

A. Time-of-Day Billing Periods

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

6.3.7 Fuel Escalation Assumptions

The average annual escalation rates in Table 42 and Table 43 were used in this study. Table 42 rates 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 43 rates are based on the escalation rate assumptions within the 2025 LSC factors from 2026 through 2055.⁹ 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 year 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.

⁹<https://www.energy.ca.gov/files/2025-energy-code-hourly-factors>. (California Energy Commission, 2023). Actual escalation factors were provided by consultants E3.

Table 42. 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
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%
2054	1.8%	0.6%	0.6%	0.6%
2055	1.8%	0.6%	0.6%	0.6%

Table 43. 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)
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%
2054	-0.6%	1.1%
2055	-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.



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Contact

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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: 2025/06/09

Template for Electric Readiness Model Ordinance Language V1.1 (6/24/2025)

ORDINANCE NO. _____

**AN ORDINANCE OF THE [GOVERNING BODY]
OF THE [CITY/TOWN/COUNTY] OF [JURISDICTION]**

**AMENDING [IDENTIFY SUBPARTS, INCLUDING CHAPTERS, DIVISIONS, ETC. _____] AND
_____ OF THE [JURISDICTION] CODE] TO ADOPT A LOCAL “REACH” CODE AND ADOPTING
FINDINGS JUSTIFYING THE LOCAL AMENDMENTS TO THE [2025 CALIFORNIA ENERGY CODE]**

WHEREAS, California Health and Safety Code section 17958 requires that cities adopt building regulations that are substantially the same as those adopted by the California Building Standards Commission and contained in the 2025 California Building Standards Code; and

WHEREAS, the 2025 California Energy Code is Part 6 of the 2025 California Building Standards Code which implements minimum energy efficiency standards in buildings through mandatory requirements, prescriptive standards, and performance standards; and

WHEREAS, California Health and Safety Code Sections 17958.5, 17958.7 and 18941.5 provide that the [Jurisdiction] may make changes or modifications to the building standards contained in the 2025 California Building Standards Code based upon express findings that such changes or modifications are reasonably necessary because of local climatic, geological or topographical conditions; and

WHEREAS, human activities that release greenhouse gasses into the atmosphere contribute to the increase of the worldwide average temperature, drought conditions, and duration of fire seasons; and

WHEREAS, according to the California Department of Forestry and Fire Protection, nine of the ten largest wildfires in California history have occurred since 2017, destroying nearly 10,000 structures and burning of more than 4.5 million acres; and

WHEREAS, the [Jurisdiction] is situated along a wildland-urban interface and as a result is extremely vulnerable to wildfires and firestorms; and

WHEREAS, this Chapter is reasonably necessary because of health and safety concerns as [Jurisdiction] residents suffer from asthma and other health conditions associated with poor indoor and outdoor air quality exacerbated by the combustion of methane gas; and

WHEREAS, removing gas appliances from indoor environments reduces the risk of asthma associated with gas appliances, and removing combustible gas from structures aids in fire hardening and removes a known hazard during firefighting efforts; and

WHEREAS, on or about September 20, 2016, the State of California enacted Senate Bill (SB) 32, which added Health and Safety Code Section 38566 to require greenhouse gas emissions to be reduced to 40 percent below 1990 levels by no later than December 31, 2030; and

WHEREAS, on [date], the [Governing Body] adopted the [Jurisdiction's] Climate Action Plan which included [relevant CAP details around green reduction in buildings]; and

WHEREAS, consistent with the Climate Action Plan, the local amendments to the 2025 California Energy Code establish requirements for [single-family, multifamily, and nonresidential] structures which will reduce demands for local energy resources, reduce regional pollution, and promote a lower contribution to greenhouse gas emissions; and

WHEREAS, Public Resources Code Section 25402.1(h)2 and Section 10-106 of the 2025 California Administrative Code establish a process which allows local adoption of energy standards that are more stringent than the statewide Standards, provided that a determination that the standards are cost effective is adopted at a public meeting and subsequently filed with the California Energy Commission, and the California Energy Commission finds that the standards will require buildings to be designed to consume less energy than permitted by the 2025 California Energy Code; and

WHEREAS, the content and details of this ordinance were the subject of a public stakeholder workshop conducted on [Date], which included attendees such as architects, energy modelers, designers, builders, developers, and residents; and

WHEREAS, because of the [Jurisdiction's] unique local climatic, geologic and topographic conditions, the [Jurisdiction] finds amendment and additions to the code are reasonably necessary; and

WHEREAS, scientific evidence has established that methane gas combustion, procurement and transportation produce significant greenhouse gas emissions that contribute to global warming and climate change; and

WHEREAS, using electric appliances in buildings fueled by less greenhouse gas intensive electricity is linked to significantly lower greenhouse gas emissions and is cost competitive because of the cost savings associated with avoiding new gas infrastructure; and

WHEREAS, the most cost-effective time to integrate electrical infrastructure into existing buildings is during significant alterations and additions, allowing for electrical infrastructure that is installed alongside other significant improvements; and

WHEREAS, that, pursuant to the Public Resources Code section 25402.1(h)(2) and Section 10-106 of the 2025 California Administrative Code, the [Governing Body] of [Jurisdiction] finds and determines the following the locally adopted electric readiness standards contained in this ordinance will require buildings to be designed to consume less energy compared to the 2025 California Energy Code; and

THEREFORE, BE IT ORDAINED, by the [Governing Body] of [Jurisdiction] as follows:

Section 1. Incorporation of Recitals. The foregoing recitals are found to be true and correct, and are incorporated by this reference into this action;

Section 2. Purpose. It is the purpose and intent of this Ordinance to [establish electric readiness standards for single-family residential retrofits including major additions and alterations] that exceed minimum 2025 Title 24 Part 6 requirements. [alternate description: In addition to all requirements of the California Energy Code applicable to Single Family building additions and alterations, the electric readiness measures specified in Section 150.0(w) shall be required for certain single family additions and alterations.]

Section 3. Adoption. The local amendments to the [chapter, section, or part of local Building Code] as specified below are hereby adopted by the [Governing Body] of [Jurisdiction] to be codified under [relevant municipal statutes]. The [Governing Body] of [Jurisdiction] adopts the Recitals herein as separate and additional findings of fact in support of adoption of the ordinance.

Section 4. Severability. If any word, phrase, sentence part, section, subsection or other portion of this amendment or any application thereof to any person or circumstance is declared void, unconstitutional, or invalid for any reason, then such word, phrase, sentence, part, section, subsection, or other portion, or the prescribed application thereof, shall be severable, and the remaining provisions of this amendment, and all applications thereof, not having been declared void, unconstitutional or invalid, shall remain in full force and effect.

Section 5. Findings. The [Governing Body] of [Jurisdiction] finds that each of the changes or modifications to measures referred to therein are reasonably necessary because of local

climatic, geological, or topographical conditions in the area encompassed by the boundaries of the [Jurisdiction], and the [Governing Body] adopts the following findings in support of local necessity for the changes or modifications:

1. [Jurisdiction] is along a wildland-urban interface which experiences more fire fueled by greenhouse gas emissions from humans.
2. [Jurisdiction] has a history of flooding disasters that occurred in YYYY, YYYY, and YYYY and decreasing greenhouse gas emissions will prevent increases in severity or duration of flooding disasters.
3. During flooding events, stormwater inundated the wastewater treatment system in YYYY and YYYY. To the extent that climate change has the potential to make these conditions worse, more restrictive Energy Code requirements to achieve reduced greenhouse gas emissions are necessary.
4. [Jurisdiction] has a history of wildfire disasters that occurred in YYYY, YYYY, and YYYY and decreasing greenhouse gas emissions will prevent increases in severity or duration of wildfire disasters. Therefore, the above-described findings support the imposition of measures to increase the efficiency of existing buildings in the [Jurisdiction] to reduce greenhouse gas emissions.
5. Failure to address and substantially reduce greenhouse gas emissions creates an increased risk to the health, safety, and welfare of [Jurisdiction] residents.
6. The standards imposed by this Ordinance are necessary because of local climatic, geological, or topographical conditions evidenced above.

Section 6. CEQA. This ordinance is categorically exempt from CEQA because it is an action taken by a regulatory agency for the purpose of protecting the environment (CEQA Guidelines Section 15308). In addition, this ordinance is exempt from CEQA under the general rule, 15061(b)(3), on the grounds that these standards are more stringent than the State energy standards, there are no reasonably foreseeable adverse impacts, and there is no possibility that the activity in question may have a significant effect on the environment. The following findings are made in support of these determinations:

1. The purpose of the implementation of a Reach Code is to reduce the amount of greenhouse gas emissions in the [Jurisdiction] that are produced from buildings.
2. The Reach Code approval process requires that the [Jurisdiction] determines that the local standards will require buildings to be designed to consume less energy than current statewide requirements. Furthermore, the California Energy Commission approval process requires that the [Jurisdiction] make the findings as part of its approval process. Therefore, the Reach Code standards can only go into effect if they protect the environment by making buildings more efficient.

Section 7. Violations. Violation of the requirements of this Ordinance shall be considered, at the [Jurisdiction's] election, an infraction of the [Jurisdiction's Municipal Code] punishable

by all sanctions prescribed in [Chapter Y], or an administrative violation punishable as provided under [Chapter X].

Section 8. Effective Date. This ordinance shall become effective as of January 1, 2026, upon approval of the California Energy Commission, or upon the date the California Building Standards Commission (CBSC) accepts the ordinance for filing, whichever is later.

Section 9. Ordinance Summary. A summary of this ordinance, together with the names of [Governing Body] members voting for and against, shall be published at least XX days prior to its final passage, in [local publication], a newspaper published and circulated in [Jurisdiction]. This ordinance shall go into effect at the expiration of [thirty (30) days] after its final passage.

THEREFORE, the [Governing Body] of [Jurisdiction] adopts the California Energy Code, 2025 Edition, Title 24, Part 6 of the California Code of Regulations in its full form with the following local amendments:

Section 100.0 is modified to add a 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 Single Family building additions and alterations, the electric readiness measures specified in Sections 150.0(w) shall be required for certain single family additions and alterations.

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

LEVEL 2 ELECTRIC VEHICLE (EV) CHARGING RECEPTACLE is a 208/240-volt 40-ampere minimum branch circuit and a receptacle.

LOW POWER LEVEL 2 ELECTRIC VEHICLE (EV) CHARGING RECEPTACLE is a 208/240-volt 20-ampere minimum branch circuit and a receptacle

A new Section, (w), is added to Section 150.0 as follows:

(w) Electric Readiness for Alterations

1. **Electric range.** Where branch circuits or receptacles are added or altered in a kitchen and the work requires an electrical permit, install electrical components in accordance with the California Electrical Code. The electrical components shall include either of the following:
 - A. **A 125 volt, 20 amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor branch circuit rated at 50 amps minimum, within 3 feet from**

the appliance and accessible to the appliance with no obstructions. Both ends of the unused conductor shall be labeled with the word "spare" and be electrically isolated. Space shall be reserved for a single pole circuit breaker in the electrical panel adjacent to the circuit breaker for the branch circuit and labeled with the words "Future Use".

- B. A pathway for a future 240 volt 50 amp minimum branch circuit that shall consist of either conductors or raceway from the main electrical service panel. The main electric panel shall have space reserved to allow for the installation of a double pole circuit breaker for a future electric range installation. The reserved space shall be permanently marked as "For Future 240V use". The raceway or conductors shall terminate at a junction box within three feet of the appliance. The blank cover shall be identified as "240V ready".

- 2. **Electric dryer.** Where a branch circuit is added or altered within three feet of a gas or propane clothes dryer and the work requires an electrical permit, install electrical components in accordance with the California Electrical Code. The electrical components shall include either of the following:

- A. A dedicated 125 volt, 20 amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor branch circuit rated at 30 amps minimum, within 3 feet from the appliance and accessible to the appliance with no obstructions. Both ends of the unused conductor shall be labeled with the word "spare" and be electrically isolated. Space shall be reserved for a single pole circuit breaker in the electrical panel adjacent to the circuit breaker for the branch circuit and labeled with the words "Future Use"; or,
- B. A pathway for a future 240 volt 30 amp minimum branch circuit that shall consist of either conductors or raceway from the main electrical service panel. The main electric panel shall have space reserved to allow for the installation of a double pole circuit breaker for a future heat pump dryer installation. The reserved space shall be permanently marked as "For Future 240V use". The raceway or conductors shall terminate at a junction box within three feet of the appliance. The blank cover shall be identified as "240V ready".

- 3. **Heat pump water heater.**

- A. If wall framing is removed or replaced within three feet of a gas or propane water heating appliance, space suitable for the future installation of a heat pump water heater (HPWH) shall be provided. The space shall be at least 2.5 feet by 2.5 feet wide and 7 feet tall and shall include a condensate drain that is no more than 2 inches higher than the base of an installed water heater and allows natural draining without pump assistance or installed piping or tubing within three feet of the water heater location to a

condensate drain or exterior location. If pump assistance is needed, a receptacle on a 120 volt, minimum 15 amp branch circuit for a condensate pump must be available within 3 feet of the water heater location.

- B. Where branch circuits are altered or added within three feet of an existing gas or propane water heater or within 10 feet of the designated future location of a heat pump water heater as required under Section 150.0(w)3A, and the work requires an electrical permit, install electrical components in accordance with the California Electrical Code. The electrical components shall include either of the following:

- (i) A dedicated 125 volt, 20 amp electrical receptacle that is connected to the electric panel with a 120/240 volt 3 conductor, 10 AWG copper branch circuit rated at 30 amps minimum, within 3 feet from the water heater and accessible to the water heater with no obstructions. Both ends of the unused conductor shall be labeled with the word "spare" and be electrically isolated. Space shall be reserved for a single pole circuit breaker space in the electrical panel adjacent to the circuit breaker for the branch circuit and labeled with the words "Future 240V Use"; or
- (ii) A pathway for a future 240 volt 30 amp minimum branch circuit that shall consist of either conductors or raceway from the main electrical service panel. The main electric panel shall have space reserved to allow for the installation of a double pole circuit breaker for a future HPWH installation. The reserved space shall be permanently marked as "For Future 240V use". The pathway shall terminate at a junction box within three feet of the appliance. The blank cover shall be identified as "240V ready".

4. **Outdoor gas appliances.** Where a gas line is added or extended to any pool water heater, spa water heater, sauna, fireplace, outdoor cooking appliance, or outdoor heating system, install infrastructure and reserve physical space to accommodate future installation of an electric equivalent of that system that serves the same function, as certified by a registered design professional or licensed electrical contractor.

- A. Install conduit designed to serve a future electric appliance(s) with the same function, including the appropriate voltage, phase, minimum amperage, and an electrical receptacle or junction box within five feet of the appliance that is accessible with no obstructions, in accordance with manufacturer requirements and the California Electrical Code. In lieu of or in addition to conduit, electrically isolated branch circuit wiring may be installed; and

- B. Label both ends of the unused conduit or conductors "For Future Electrical Appliance"; and

- C. Reserve circuit breakers in the electrical panel(s) for each branch circuit, appropriately labeled; and
- D. Designate physical space for future electric appliances, including equipment footprint, on the construction drawings. The footprint necessary for future electric appliances may overlap with the location of currently designed combustion equipment.

Exception to Section 150.0(w)4: Generator systems used for emergency power generation.

5. **Electrical Power Upgrades.** Increases in the electrical power infrastructure capacity serving a building shall only be permitted when all the following are documented and submitted to the building official:
 - A. Calculations in accordance with California Electrical Code Article 220.83 determining future loads will exceed the capacity of the current electrical power infrastructure.
 - B. Where data is available, calculations in accordance with California Electrical Code Article 220.87 determining that future loads exceed the capacity of the current electrical service infrastructure.
 - C. Calculations for item (A) and item (B) above shall include at least one of the following:
 - i. At least one power management or circuit controlling device, serving electric-only appliances such as:
 - a. Water heater(s)
 - b. Clothes dryer(s)
 - c. Range(s)
 - d. Level 2 EV Charging Receptacle or
 - e. Low Power Level 2 EV Charging Receptacle
 - ii. At least one of the following electric-only appliances operating on 120V:
 - a. Water heater(s)
 - b. Clothes dryers(s)
 - c. Range(s)
 - iii. Circuit control between whole home load and Level 2 EV Charging Receptacle or Low Power Level 2 EV Charging Receptacle

Exception 1 to Section 150.0(w)7: The upgrade is solely the result of a project proposing electrical improvements supporting loads related to devices and uses not regulated by 150.0(w)7.

6. **Battery Storage.** As a measure qualifying the Solar PV credit under a FlexPath ordinance, meet requirements A through D below.
 - A. At least one of the following shall be provided:
 - i. ESS ready interconnection equipment with a minimum backed up capacity of 60 amps and a minimum of four ESS supplied branch circuits, or

- ii. A dedicated raceway from the main service to a panelboard (subpanel) that supplies the branch circuits in 150.0(s)2. All branch circuits are permitted to be supplied by the main service panel prior to the installation of an ESS. The trade size of the raceway shall be not less than one inch. The panelboard that supplies the branch circuits (subpanel) must be labeled "Subpanel shall include all backed-up load circuits."
 - B. A minimum of four branch circuits shall be identified and have their source of supply collocated at a single panelboard suitable to be supplied by the ESS. At least one circuit shall supply the refrigerator, one lighting circuit shall be located near the primary egress, and at least one circuit shall supply a sleeping room receptacle outlet.
 - C. The main panelboard shall have a minimum busbar rating of 225 amps or sufficient capacity a battery storage system and circuits in paragraphs A and B above. Panel upgrades shall comply with the requirements of Section 150.0(x)5.
 - D. Sufficient space shall be reserved to allow future installation of a system isolation equipment/transfer switch within 3 feet of the main panelboard. Raceways shall be installed between the panelboard and the system isolation equipment/transfer switch location to allow the connection of backup power source.
7. **All-Electric Plan.** Provide a plan, including single line diagrams and calculations consistent with Section 150.0(w)5, for electrification of the following equipment:
- A. All appliances with gas stub outs including space conditioning, water heating, range, and clothes dryer;
 - B. Low Power Level 2 EV charger; and
 - C. Battery storage system rated at 240 volts, 60 amp minimum.

Exception 1 to Section 150.0(w): The project is the result of a repair as defined by Title 24 Part 2 Section 202.

Exception 2 to Section 150.0(w): If an electrical permit is not otherwise required for the project other than compliance with this section.

Exception 3 to Section 150.0(w): Where upgrades to the existing electrical panel or utility service are not proposed, electrical panel capacity shall not be required to exceed the existing utility electrical service to the building to meet compliance with this section. Capacity and overcurrent protection spaces shall be reserved to the extent allowable under the existing electrical panel capacity using the methodology in Section 150(w)5. Tandem overcurrent protection devices shall be used to the extent permissible under the California Electrical Code.

Exception 4 to Section 150.0(w): The project is the result of a safety improvement to remove a known hazard.

Exception 5 to Section 150.0(w): 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).

Exception 6 to Section 150.0(w): Emergency Housing pursuant to Appendix P of the California Building Code.

Exception 7 to Section 150.0(w): Creation of a new accessory dwelling unit or junior accessory dwelling unit that is within the existing space of a single family dwelling or accessory structure and includes an expansion of not more than 150 square feet beyond the same physical dimensions as the existing accessory structure. An expansion beyond the physical dimensions of the existing accessory structure shall be limited to accommodating ingress and egress. Or, if the project would not otherwise be a Covered Single Family Project were it not for the inclusion of an accessory dwelling unit or junior accessory dwelling unit that meets the criteria above.

Existing Buildings Reach Code Working Group #1: Single Family Policy Review for Adoption Consideration

AC to HP

Electric Readiness

FlexPath

Agenda Item 5.



Agenda

Introductions

Existing Building Reach Code Policy Sessions

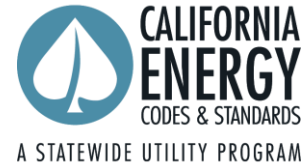
AC to Heat Pump

Electric Readiness

Single Family FlexPath

Open Q&A





Project Partners

TRC is grateful for the collaboration and support of many partners who helped develop these codes and resources.

Thank you to our Community Choice Aggregator partners and the Statewide Local Energy Codes team, an initiative funded by the California IOUs: PG&E, SCE, and SDG&E.

Meet the Speakers



Tim Mensalvas

Tim Mensalvas is a Program Manager with over 7 years of experience in clean energy



Farhad Farahmand

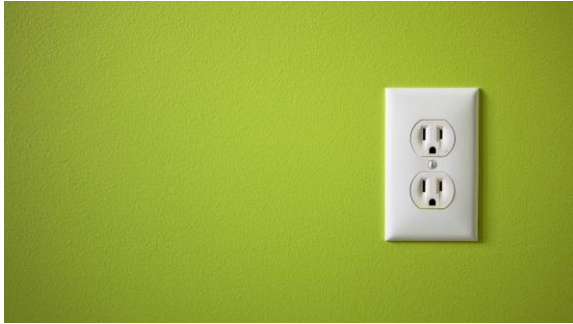
Farhad Farahmand is a Director with 15 years of experience, and leads the codes team at TRC



Mayra Vega

Mayra Vega is an Engineering Manager with 12 years of experience in energy efficiency

Overview

Single Family			Multifamily and Nonresidential
AC to Heat Pump	Electric Readiness	FlexPath	Similar Options
			
› <i>“Time of Installation”</i> › Requires property owners installing AC to install either: 1. A heat pump 2. Efficiency measures › CALGreen Voluntary Pathway	› <i>“Time of Renovation”</i> › Targeted to permit applicants completing a relevant addition or alteration. › Requires electric readiness (circuits or conduit).	› <i>“Time of Renovation”</i> › Applies to projects completing major additions or alterations to select 1-3: 1. Energy efficiency measures 2. Electrification measures 3. Solar PV	Available late 2025 and early 2026

Who has adopted?

AC to Heat Pump	Electric Readiness	FlexPath
California (nonresidential) Portola Valley (previous) San Mateo (previous)	Atherton Fairfax Mountain View Portola Valley San Anselmo San Luis Obispo San Mateo	Carlsbad Corte Madera Encinitas Fairfax Marin County Piedmont San Anselmo Santa Cruz San Luis Obispo San Rafael

Air-Conditioning to Heat Pump

Background, Policy Description, Resources, Discussion

Ordinance Objectives

When **replacing or adding space cooling** require energy upgrades by either installing:

- › A **heat pump** space conditioner (cooling + heating) and comply with State Code;

OR

- › An **air-conditioner** (cooling only) alongside a ducted gas furnace and make other energy improvements above the State Code



Policy Context

2025 CALGreen (Part 11) Tier 1

- › Offers AC-to-HP as voluntary model for local adoption
- › Energy Commission, utility consultants, and volunteers have coordinated enhancements to the language, and an Energy Code version (Part 6) soon
- › Requires cost-effectiveness determination

2025 Energy Code (Part 6) Nonresidential

- › Prescriptively requires AC-to-HP for units up to 65 kBtu/h (5 tons)

Air Quality Regulations

- › Bay Area and Los Angeles are in “non-attainment” for ozone and particulate matter (PM)
- › Gas appliances generate NOx emissions, which create ozone and PM2.5
- › Beginning in 2029 furnace sales will be restricted by California Air Resources Board, Bay Area Air District, and (possibly) South Coast Air Quality Management District

Policy Requirements

Code language structure

Trigger: Altered space-conditioning system serving existing single-family dwelling

1. Furnace-only replacement → no reach requirement
2. All CA Climate Zones except 15 (Palm Springs, Coachella)
3. Installing **new or replacement** air-conditioner
 - a. Install a heat pump. Supplemental heating from gas or electric resistance allowed.
OR;
 - b. Install an AC
 - › Reuse **existing ductwork** + efficiency measures
 - › Replace or install new **ductwork and furnace** + efficiency measures

Energy equivalency test for **unducted** systems (e.g. wall furnaces) not yet performed.

New Heat Pump Only

Duct Insulation:
No Requirement

Duct Sealing:
10% or RA Path

Airflow:
300 CFM/ton or RA
Path

Fan Efficacy:
No requirement

Ref Charge

Solid blue:

Reach over state code

Gradient: Reach in some
CZ

No fill: Same as state code

RA: Reference Appendix

New AC Only

Duct Insulation:
No Requirement

Duct Sealing:
10% or RA Path

Airflow:
300 CFM/ton or RA
Path

Fan Efficacy:
0.45 W/CFM or RA
Path

Ref Charge

Attic Insulation: R-49
Exception: Exist R-38

Air Sealing: Ceiling
Exception: Exist R-38

New Heat Pump and New Ducts

Duct Insulation:
R-6 in CZ 3, 5-7
R-8 in CZ 1, 2, 4, 8-16

Duct Sealing: 5%

Airflow:
350 CFM/ton

Fan Efficacy:
0.58 W/CFM

Ref Charge

Attic Insulation: R-49
CZ 1-4, 6, 8-16 Only.
Exc. R-19 in CZ 1, 3, 6

Air Sealing: Ceiling
CZ 2, 4, 8-16 Only.
Exception - Exist R-19

New AC/Furnace New Ducts

Duct Insulation: R-8

Duct Sealing: 5%

Airflow:
350 CFM/ton

Fan Efficacy:
0.35 W/CFM

Ref Charge

Attic Insulation: R-49
CZ 1-4, 6, 8-16 Only.
Exc. R-19 in CZ 1, 3, 6

Air Sealing: Ceiling
CZ 2, 4, 8-16 Only.
Exception - Exist R-

AC to HP exceptions allow for the following



Lower efficiency levels

- Existing levels of ceiling insulation
- Small attics
- Inaccessible ducts for sealing
- Furnace fans manufactured before July 2019



Avoiding hazardous conditions

- Asbestos disturbances
- Atmospherically vented combustion appliances



Avoiding large electrical upgrades

- Knob and tube wiring disturbances
- Electrical service upgrades



Avoiding high costs

- Where the heating load is 12 kBtuh greater than the cooling load

Relevant Resources

Cost Estimates

Equipment, over 30-years, accounting for Zero-NOx regulations

- › AC + furnace: \$23,100
- › Heat pump: \$23,200

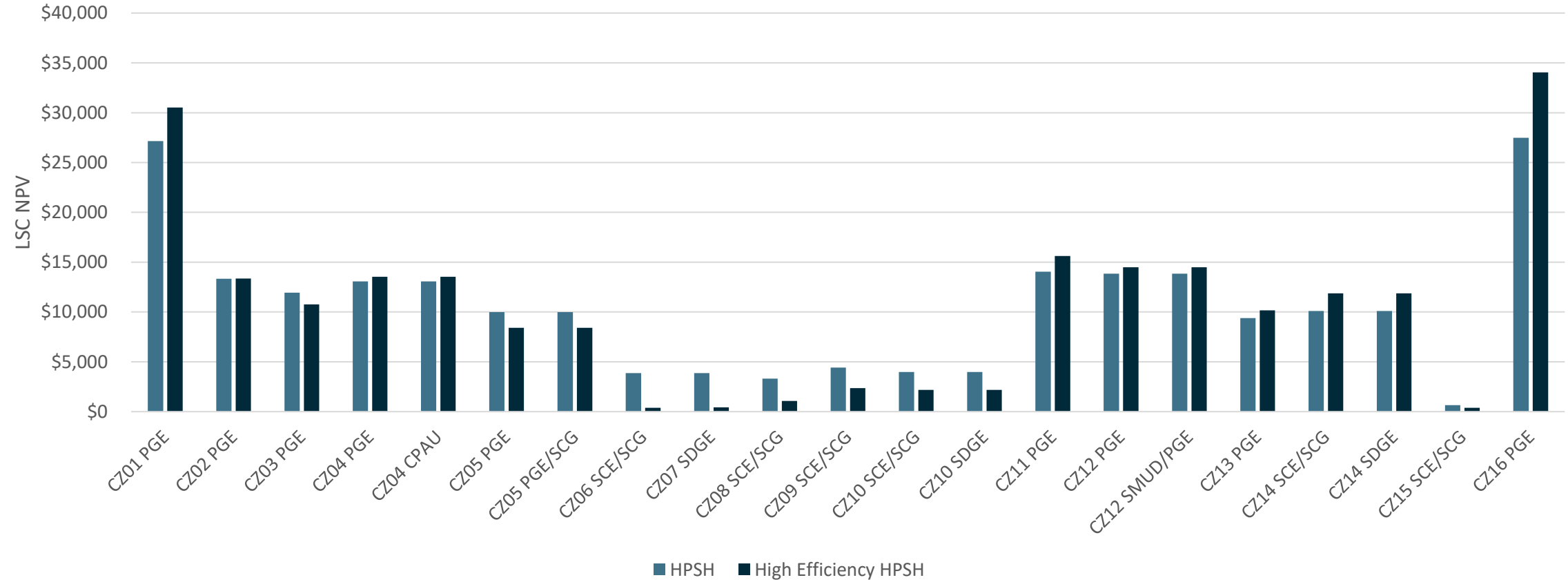
Efficiency measures, upfront, over the state energy code

- › **AC only:** \$3,800 - \$7,500 depending on existing attic insulation
 - › Refrigerant charge, R-49 attic insulation, air sealing
- › **AC, furnace and ductwork,** all vintages:
 - › Assuming homeowner is already planning to replace their old ducts
 - › CZs 3, 5, 6, 7: \$2,100 including R-6 to R-8 duct insulation
 - › Other CZs: \$600 for fan efficacy, refrigerant charge verification

Source: Statewide IOUs C&S: Single Family Air Conditioner Replacements (AC to HP), Cost Effectiveness Study

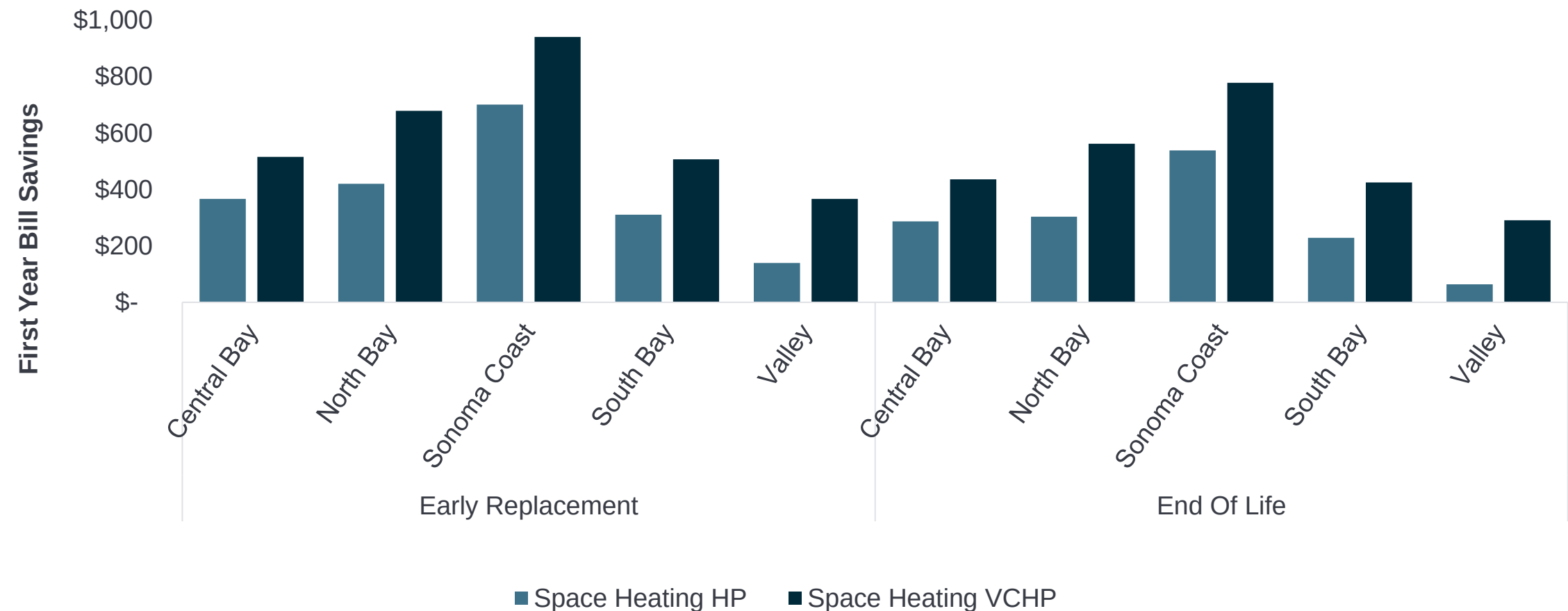
AC-HP is widely cost-effective

Pre-1978 LSC NPV (30-Year Lifecycle Savings)



Source: Statewide IOUs C&S: Single Family Air Conditioner Replacements (AC to HP), May 28, 2025

AC-HP saves \$ today



Source: Peninsula Clean Energy / Silicon Valley Clean Energy On-Bill Analysis for CZs 1, 2, 3, 4, 12

Resources

Ready Today

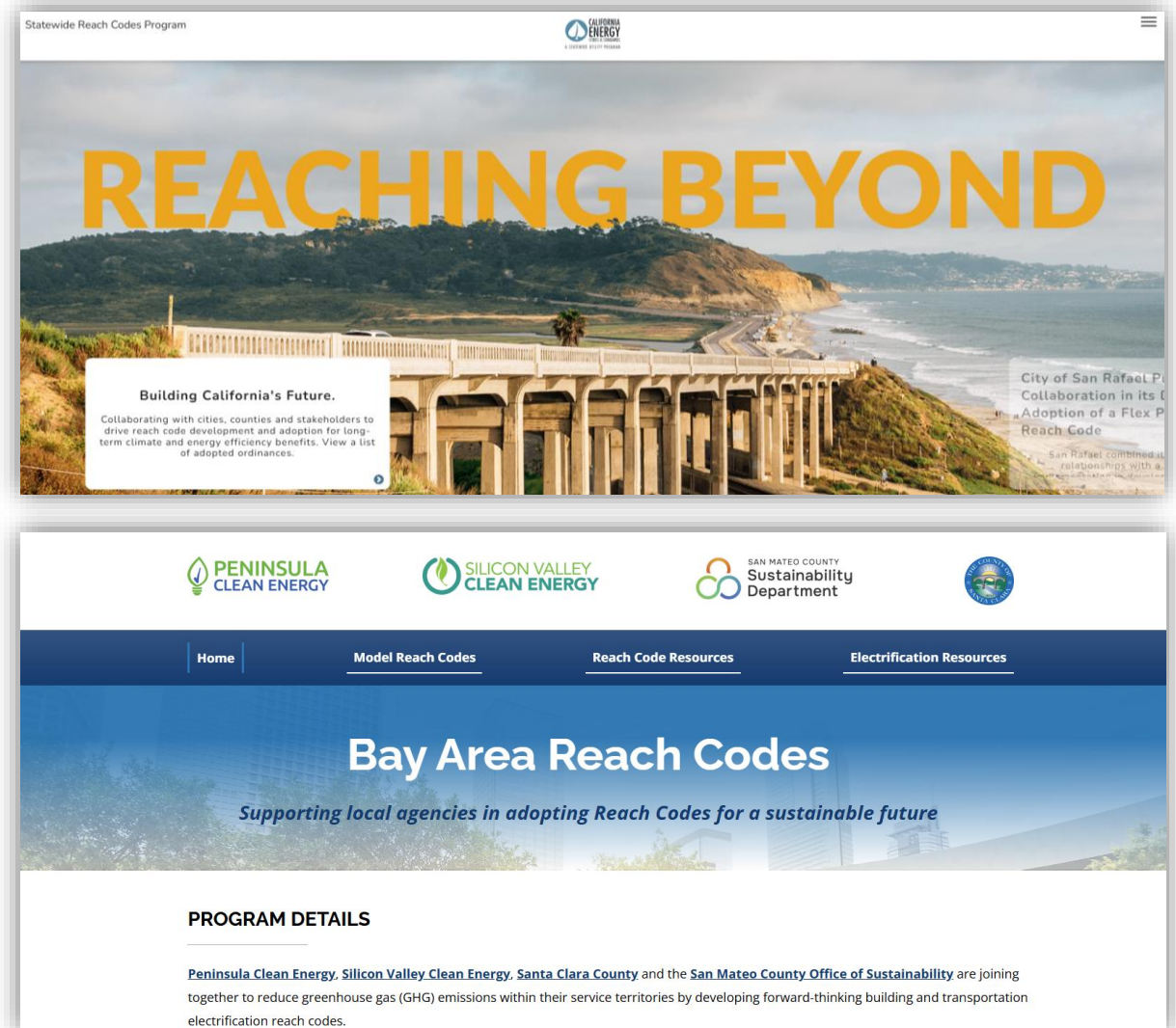
- › [Part 11 version](#)
- › [Cost effectiveness study](#)

Coming Soon

- › Ordinance Part 6 version
- › Cost effectiveness study full data
- › Model staff report
- › Slides

Cross-posted and customized

- › BayAreaReachCodes.org
- › CentralCoastReachCodes.org
- › CPAReachCodes.org



Electric Readiness

Background, Policy Description, Resources, Discussion

Ordinance Objectives

Require some **electrical infrastructure** during major projects to eliminate rework and cost later

- › Options for all gas appliances
- › Two methods
 - › Extra unused conductor
 - › Conduit



Policy Context

Air Quality Regulations

- › Beginning in 2027, water heater sales will be restricted by various regional and state agencies

Cost-effectiveness

- › **Unnecessary** as it does not require energy conservation or efficiency
- › **Cost savings** from an extra contractor visit and repeated demolition

Technology

- › Does not require electric appliances
- › **120V appliances** are available for almost all end-uses, needs flexibility

Local Adoption

- › Atherton
- › Fairfax
- › Mountain View
- › Portola Valley
- › San Anselmo
- › San Luis Obispo
- › San Mateo

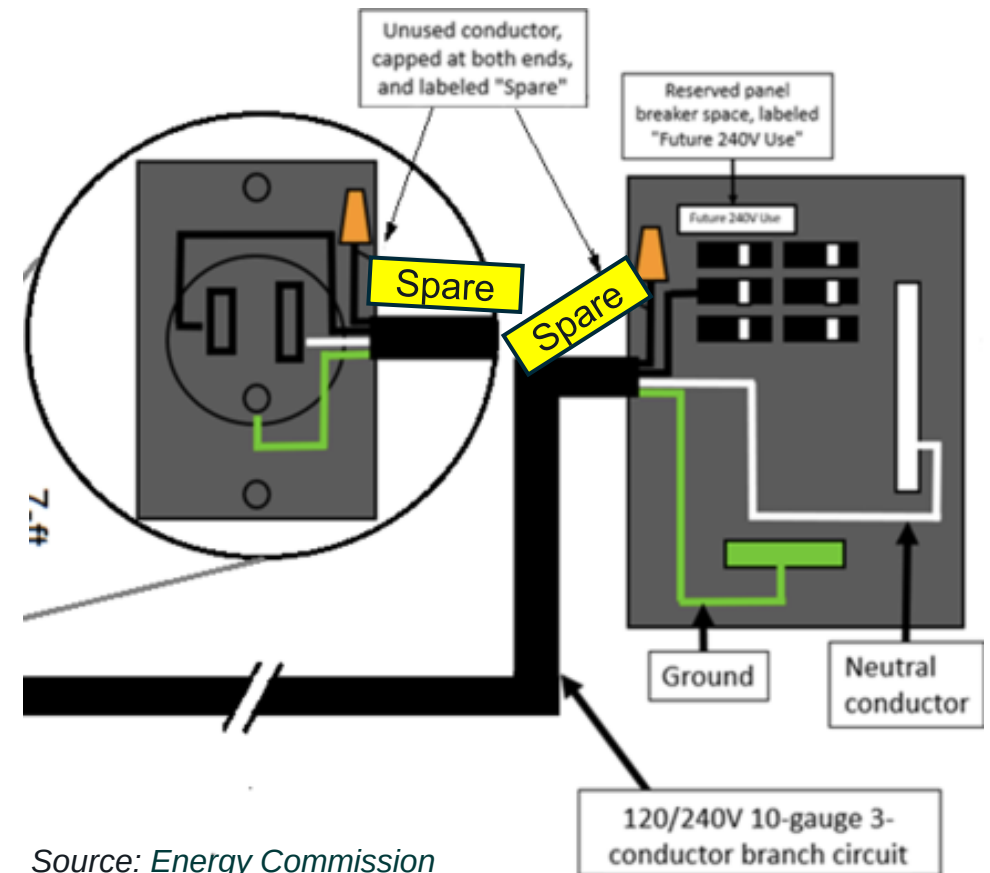
Policy Requirements and Exceptions

Electric Readiness - General Concept

Feature	120V circuits	240V circuits
# of "hot" wires	1	2
Neutral wire	Always	Sometimes
Ground wire	Always	Always
Amperage	15-20	20-50

Two compliance pathways:

1. 120-volt receptacle that is upgradable to 240 volts by installing an extra (unused) "hot" conductor, each at 120V;
OR
2. Empty conduit



Source: [Energy Commission](#)

Electric Readiness for Kitchens

Trigger: Electrical permit scope includes circuits or receptacles in the kitchen

Install:

- › Reserved breaker space, AND
- › Either
 - » 120-volt, 20-amp receptacle with three conductors (1 unused) at 50 amps within 3 feet of the appliance; OR
 - » Pathway for raceway/conduit for 240V / 50-amp circuit from the main electrical service panel to the appliance



Electric Readiness for Dryers

Trigger: Electrical permit scope includes circuits or receptacles within 3' of a gas clothes dryer

Install:

- › Reserved breaker space, AND
- › Either
 - » 120-volt, 20-amp receptacle with three conductors (1 unused) at 30 amps within 3 feet of the appliance; OR
 - » Pathway for raceway/conduit for 240V / 30-amp circuit from the main electrical service panel to the appliance



Electric Readiness for Water Heating

Trigger #1: Wall framing is removed or replaced within 3' of a gas water heater

- › **Install:** Space suitable for future heat pump water heater (2.5' x 2.5' x 7') + condensate drain

Trigger #2: Electrical permit scope includes circuits or receptacles within 3' of existing water heater or 10' of a future HPWH location above

- › **Install:**
 - › Reserved breaker space, AND
 - › Either
 - 120-volt, 20-amp receptacle with three conductors (1 unused) at 30 amps within 3 feet of the appliance;
 - OR
 - Pathway for raceway/conduit for 240V / 30 amp circuit from the main electrical service panel to the appliance



Electric Readiness for Space Heater

Trigger: If a gas space heater is replaced

Install:

- › Nothing!
- › But, do designate location for future heat pump outdoor unit (compressor)



Electric Readiness for Outdoor Appliances

Trigger: When a gas line is extended to outdoor appliances (pools, spas, fireplaces, BBQ)

Install:

- › Reserved circuit breakers
- › Conduit to serve future electrical appliances



Readiness for Electric Power Upgrades

Trigger: Electrical permit increasing capacity to the building

Requirements

Calculate electrical panel size according to *both* 220.83 and 220.87 of the Electrical Code

and include one of

1. A power management or circuit controlling device serving

- › Water heater
- › Clothes dryer
- › Range
- › EV Charger

or

2. At least one 120-volt electric appliance

- › Water heater
- › Clothes dryer
- › Range

or

3. Circuit control between whole home load and EV charger

Rationale

- › Contractors may not consider both electrical code calculation options
- › Panel upgrades are often unnecessary and expensive
- › Alternatives can reduce cost of electrification and reduce coincident peak load



Electric Readiness Exceptions

1. No electrical permit otherwise required for the project
2. Reach measures trigger electrical service upgrades
3. Repairs, safety improvements
4. New attached ADUs
5. Mobile homes, manufactured housing



Cost Estimates

› Reserved Breakers or Space:

- › \$0 for physical space
- › \$50 for breaker

› Circuits:

- › ~\$150 for extra conductor incremental if already running a circuit
- › \$500 - \$1,000 if running a dedicated circuit

› Conduits:

- › \$500 - \$1,000 installed without significant demolition necessary



Thank You

We appreciate your time and commitment to better buildings in California

Get in Touch

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tmensalvas@trccompanies.com

Central California and 3CE member agencies:

Mayra Vega

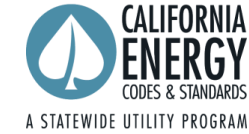
mvega@trccompanies.com

All others (will be redirected as appropriate):

Farhad Farahmand

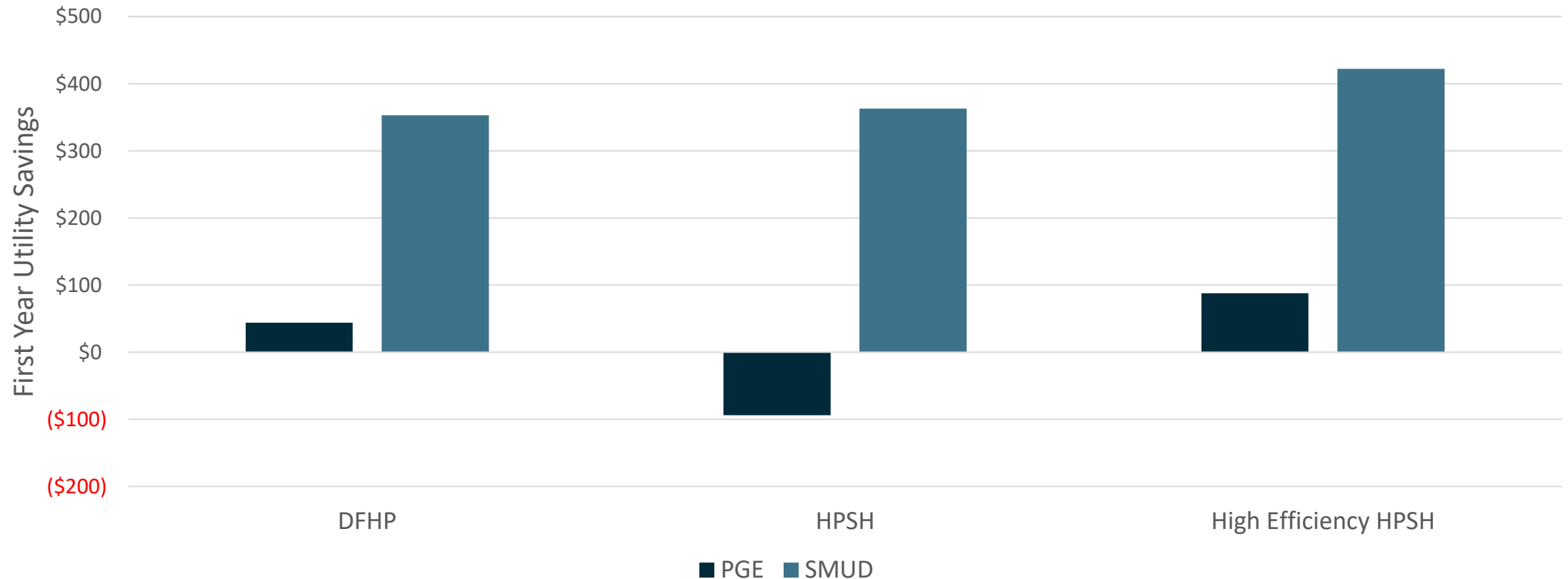
ffarahmand@trccompanies.com

Agenda Item 5.



On-bill savings are possible

CZ 12 First Year Utility Savings
[1992-2010 Vintage]



Source: Statewide IOUs C&S: Single Family Air Conditioner Replacements (AC to HP), May 28, 2025

Agency & Rule	Status	Appliance	2026	2027	2028	2029	2031	2033	2036
 CARB	In-Process	Boilers and Water Heaters		< 75 kbtu/hr		< 400 kbtu/hr	< 2000 kbtu/hr		
		Tankless Water Heaters				< 400 kbtu/hr	< 2000 kbtu/hr		
		Other/ Specialty				Furnaces < 175 kbtu/hr	Pool heaters < 2000 kbtu/hr	High-temp boilers and water heaters	
 Rule 9-4	Adopted	Furnaces				All furnaces			
 Rule 9-6		Boilers and Water Heaters		< 75 kbtu/hr				Large commercial	
 SCAQMD Rule 1111	In-Process	Furnaces		New construction: res furnaces OR: 30% sales target		Existing buildings: residential furnaces OR: 50% sales target		75% sales target	90% sales target
 SCAQMD Rule 1121		Residential Water Heaters		New construction: res furnaces OR: 30% sales target		Existing buildings: residential furnaces OR: 50% sales target		75% sales target	90% sales target
 SCAQMD Rule 1146.2	Adopted	Large Water Heaters, Small Boilers and Process Heaters	New construction: Boilers, storage water heaters, and process heaters ≤ 400 kbtu/hr; tankless ≤ 200 kbtu/hr		New construction: boilers, storage water heaters, and process heaters ≤ 2000 kbtu/hr; tankless > 200 kbtu/hr; pool heaters ≤ 400 kbtu/hr	New buildings: high temperature units Existing buildings: apply 2026 new construction rule	Existing buildings: apply 2028 new construction rules	Existing buildings: high temperature units	

Cost Threshold Analysis

- › Identify the appropriate cost burden threshold based on:
 - › Typical project cost and project valuation
 - › Estimated cost of compliance
 - › Expected number of exemption request
- › From permit data

Cost Burden Threshold - Project Valuation	Number of Permits that Apply for Cost Burden per Year*	Median Project Valuation	Maximum Cost of Compliance	Estimated Project Cost	Cost Burden Threshold- Estimated Project Cost**
20%	1	\$131,000	\$26,200	\$227,500	11.5%
15%	3	\$131,000	\$19,700	\$227,500	8.7%
12.5%	5	\$131,000	\$16,400	\$227,500	7.2%
10%	11	\$131,000	\$13,100	\$227,500	5.7%
5%	24	\$131,000	\$6,600	\$227,500	2.9%

*Using the expected cost of compliance \$6,600

** Based on an estimated construction cost of \$650/sf. Construction costs can range.



MEMORANDUM

DATE: 8/13/2025
TO: Environmental Commission
FROM: Tania Katbi, Sustainability Management Analyst II
SUBJECT: COMMISSION SUPPORT BUDGET

The City Council adopted the FY 25-26 budget in June 2025. This budget includes dedicated funding for Environmental Commission-related projects. The following allocations have been made for the fiscal year:

- Electrification Rebate: \$75,000
- Reach Code Cost Effectiveness Study: \$50,000
- Urban Forest Masterplan: \$200,000

Explanation of Allocated Funds

The \$75,000 allocated for Electrification Rebates is designated for direct-to-consumer rebates to promote the electrification of items that reduce greenhouse gas (GHG) emissions. The City Council has directed that this funding be used for rebates that directly support residents. The Environmental Commission's role is to determine the specific rebates to be offered to the community. Examples could include rebates for converting existing gas appliances to electric heat pumps or switching from gas-powered to electric landscaping equipment.

The \$50,000 allocated for a Reach Code Cost-Effectiveness Study is to prepare for a potential requirement from the California Energy Commission (CEC) if the City is to adopt amendments to the State Building Codes. It will allow the City to conduct a cost-effective study tailored specifically to Los Altos, building upon the data provided by Silicon Valley Clean Energy (SVCE). This funding is a proactive measure to ensure the city is in compliance with CEC regulations.

The \$200,000 allocated for the Urban Forest Masterplan will be used to develop a comprehensive plan for managing and enhancing the city's trees and other components needed to ensure a strategic and impactful outcome.

This memo addresses the clarification requested regarding the funding allocations for the fiscal year. The city looks forward to the effective utilization of this budget to advance sustainability initiatives.

Electrification Working Group Suggestions

August 2025

Tom Hecht/Colm Nee



Overview

- Federal tax credits expire EOY 2025 leaving gap in electrification incentives
- Local gov has authority and tools to partially fill the gap
- Los Altos can and should:
 - Offer straight \$ incentives for electrification (\$75K approved thru June 26)
 - Consider removing/decreasing permit fees where possible (self certification)
 - Offer FAR variances for remodels and new builds that are all electric
- As a whole, these would be powerful and partially fill the Federal gap



Monetary Incentives

- City Council approved \$75,000 for explicit and sole purpose of incenting electrification.
- **Recommendation:**
 - Start offering upon expiration of Fed Tax Credits (1/1/2026)
 - Work with city staff to come up with appropriate structure to a) reward any appliance electrification (heating/cooling, water heater, stove top, HP dryer) and b) provide bonus for full electrification.



Permitting Fees

- Permitting fees (or elimination of those fees) are another potential source of incentive for electrification
- However, staff recently prepared comprehensive study and revamped permit fee structures
- One potential option is to identify permits where self certification is possible, eliminating need for inspector visit (and associated costs)
- **Recommendation:** work with staff to identify any electrification actions that could appropriately be self certified



Electrification Building Variances - Overview

- Primary objectives
 - Encourage homeowners to research / understand benefits of electrification
 - Promote electrification with limited city cash cost/budget impact
- Drives strong positive environmental benefits
 - Would apply to new builds and significant remodels
 - Significant operational vs. embodied CO2 advantages
 - Minor up-front costs / potential drawbacks which can be mitigated
- Precedent exists in local, CA and US cities



Electrification Building Variances

- Provide increased FAR for new builds/significant remodels that are all electric
 - Modest: 2-3% of FAR, or 200-400 ft adder <need to structure>
 - Capped and potentially limited to *second-story additions* to prevent runoff or massing concerns
- Does **not mandate** electrification
- **Why offer variances?**
 - Encourages residents to research and adopt electric appliances
 - Helps overcome **cost and design barriers** to electrification in remodels
 - Aligns with the City's **Climate Action and Adaptation Plan (CAAP)**
 - Provides a **carrot instead of a stick** — voluntary participation
 - Reinforces state climate targets (SB 100, AB 3232, AB 2446)



Cost/Benefits Evaluation

Benefits:

- 50–100 tCO₂ avoided over 30 years
- Improved indoor air quality
- Aligns with CA and regional climate goals

Costs:

- 1.5–4 tCO₂ embodied carbon (one-time)
- Possible local runoff, neighbor concerns of added space

Mitigations:

- Cap bonus space as part of structure
- 2nd+ stories only for added additional FAR?
- Require permeable landscaping
- Design review filters for massing, shading, etc.



Environmental Benefits of Electrification

Significant CO₂ Benefit

~50–80 kg CO₂e per sq ft for standard residential construction
200ft addition = 10-16 metric tons CO₂ embodied in build
All electric house saves ~ 50 – 100 metric tons of CO₂ over lifetime of house (30 years, improves if grid increases renewables)

Reduced Indoor Pollution

Reduces NO₂ and other pollutants that can cause health problems.

Sources: Embodied CO₂ in building - **The Hidden Climate Impact of Residential Construction**, RMI March 2023



Environmental Costs of Electrification significantly outweigh impact of larger home (Variance bonus)

Category	Gas Home	All-Electric (PG&E Grid)	All-Electric (SVCE Grid)
Embodied CO ₂ (Bonus Space)	0 t	3 t	3 t
Operational CO ₂ (30 yrs)	90 t	30 t	5 t
Net CO ₂ Savings vs. Gas Home	—	57 t saved	85 t saved
CO ₂ Payback (x times)	—	19x	28x

Electrifying in Los Altos is more powerful than other PGE/CA areas due to SVCE renewable sourcing.



Example Cities with FAR/Density Incentives

City	Bonus Type	What It Incentivizes	Status
Los Angeles, CA	Up to 55% FAR / 120% density bonus	Affordable housing, mixed-use, community benefits	Active
San Diego, CA	Up to 10% FAR bonus	Sustainable Development Areas, TOD housing	Active
Mountain View, CA	Public Benefit Bonus (FAR & height)	Green roofs, LEED, affordable housing	Active in Plan Areas
Los Altos Hills, CA	Up to 500 sq ft (historic)	Rooftop solar (2006-2018 program)	Discontinued
Temple City, CA	FAR bonus	Preservation of mature trees	Active



Example Cities with FAR/Density Incentives

City	Bonus Type	What It Incentivizes	Status
Portland, OR	FAR & height bonuses	Ecoroofs, energy efficiency, stormwater design	Active
Bellevue, WA	FAR bonus (+0.25)	LEED/Built Green certification	Active
Redmond, WA	Incentive Zoning Program	Environmental/public amenities	Active
Newcastle, WA	FAR bonus (up to +0.6)	Green building / public environmental benefit	Active
Seattle, WA	Bonus FAR / height	Child care, green space, public open space	Active



Subcommittee Request to Environmental Commission

- Authorize subcommittee to work with staff to finalize recommendations on
 - Structure of \$75K Los Altos electrification subsidies starting Jan 1, 2026
 - Identifying self certification options for certain electrification permits
 - Implementing FAR variances for all electric new builds and significant remodels
- Authorize committee to take final recommendation to the council



Sources

- E3 (2019): Electrification reduces CA home GHG emissions by 30–90 t CO₂ (30 yr)
- RMI (2023): Embodied carbon = ~17 kg CO₂/ft²; 100 ft² = ~1.7 t CO₂
- NRDC (2019): Confirms up to 90% residential emissions reduction through electrification :



Urban Forest & Ecosystem Health Plan

Working Pair Update

City of Los Altos Environmental Commission

August 13th, 2025

Consultant Goals

- Assess the existing ecological conditions and health of Los Altos' ecosystems using appropriate scientific methodologies
 - Areas of investigation may include stream water quality, soil health, species richness+abundance, habitat connectivity, and vegetative cover analysis
- Conduct outreach to people spanning a wide range of experiences in Los Altos (different housing types, proximity to different prominent natural features, different cultural perspectives, etc.) and develop a survey to the community to gather insights from their observations
- Create a plan that will:
 - Guide the city and residents on how to support the long term health and resiliency of the ecosystems in Los Altos through the appropriate mix of policy recommendations, educational materials, and other approaches
 - Protect and expand habitat connectivity within and along city boundaries, taking water systems and parks into consideration

Consultant Objectives

- Recommend a desirable canopy structure and density for Los Altos to improve ecological health
- Provide vegetation management guidance to maintain resiliency to wildfire and other climate-related hazards
- Suggest optimal spacing to dedicate to natural habitats in light of housing mandates and other urban infrastructure
- Describe the pre-European settlement ecosystems of the area for ecological reference
- Collaborate with the Indigenous Ohlone populations and descendants from the general region, raise their voices, and include their traditional ecological knowledge (TEK) into the plan wherever possible
- Offer ecological solutions to water concerns (Drought, Flood Risk), such as native tree-mediated species assemblages that may lessen their severity
- Identify any missing or weak food web links of concern and how to address these deficiencies
- Provide adaptive management strategies so that the plan is able to adjust with changing climate projections, habitat ranges, and migration patterns

EC Outreach and Public Engagement – DRAFT for discussion

	<u>Description</u>	<u>Resources/Responsibility</u>
Town Crier articles	1x quarterly article covering major ec initiative (from work plan) or other mutually agreed topic	Rotating EC member/subcommittee
Community group engagement	Identify 3-5 community groups and assign liaison to ensure regular updates/feedback of EC activities	1 EC member per group (Rotary, Chamber of Commerce, GreenTown, etc.)
Quarterly EC Newsletter	Prepare quarterly newsletter highlighting EC initiatives and other simple enviro topics	EC leader, EC members + city staff?
Other	Regular public comment/attendance to council (either EC supported or individual); city manager updates email; better notification/signage for meetings	

