CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

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

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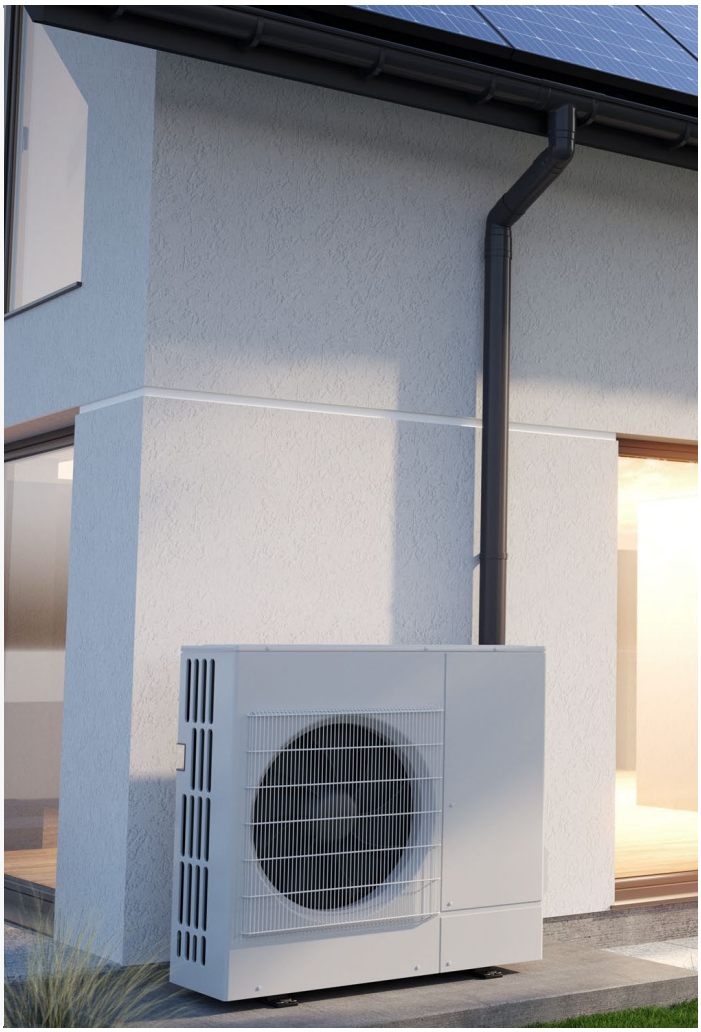

Table 1. Summary of Revisions

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

Acronym List

AC – Air conditioner

ACH50 – Air Changes per Hour at 50 pascals pressure differential

AFUE – Annual Fuel Utilization Efficiency

B/C – Lifecycle Benefit-to-Cost Ratio

BSC – Building Standards Commission

CA IOUs – California Investor-Owned Utilities

CARE – California Alternate Rates for Energy

CASE – Codes and Standards Enhancement

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

CFM – Cubic Feet per Minute

CO_2 – Carbon Dioxide

CPAU – City of Palo Alto Utilities

CPUC – California Public Utilities Commission

CZ – California Climate Zone

DFHP – Dual Fuel Heat Pump

DHW – Domestic Hot Water

DOE – Department of Energy

EDR – Energy Design Rating

EER – Energy Efficiency Ratio

EF – Energy Factor

GHG – Greenhouse Gas

HPWH – Heat Pump Water Heater

HSPF – Heating Seasonal Performance Factor

HVAC – Heating, Ventilation, and Air Conditioning

IOU – Investor Owned Utility

kBtu – kilo-British thermal unit

kWh – Kilowatt Hour

LCC – Lifecycle Cost

LLAHU – Low Leakage Air Handler Unit

VLLDCS – Verified Low Leakage Ducts in Conditioned Space

NEEA – Northwest Energy Efficiency Alliance

NEM – Net Energy Metering

NPV – Net Present Value

PG&E – Pacific Gas and Electric Company

PV – Photovoltaic

SCE – Southern California Edison

SDG&E – San Diego Gas and Electric

SEER – Seasonal Energy Efficiency Ratio

SF – Single Family

SMUD – Sacramento Municipal Utility District

SoCalGas – Southern California Gas Company

TDV – Time Dependent Valuation

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

Title 24 – Title 24, Part 6

TOU – Time-Of-Use

UEF – Uniform Energy Factor

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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 California[1] 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 CO_2 emission reductions were calculated based on outputs from the CBECC-Res simulation software. Electricity emissions vary by region and by hour of the year. CBECC-Res applies two distinct hourly profiles, one for Climate Zones 1 through 5 and 11 through 13 and another for Climate Zones 6 through 10 and 14 through 16. Natural gas emissions do not vary hourly. To compare the mixed-fuel and all-electric cases side-by-side, GHG emissions are presented as pounds of CO_2-equivalent (CO_2e) 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 CO_2 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% AFUE[4]. 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 AFUE[6]. 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)

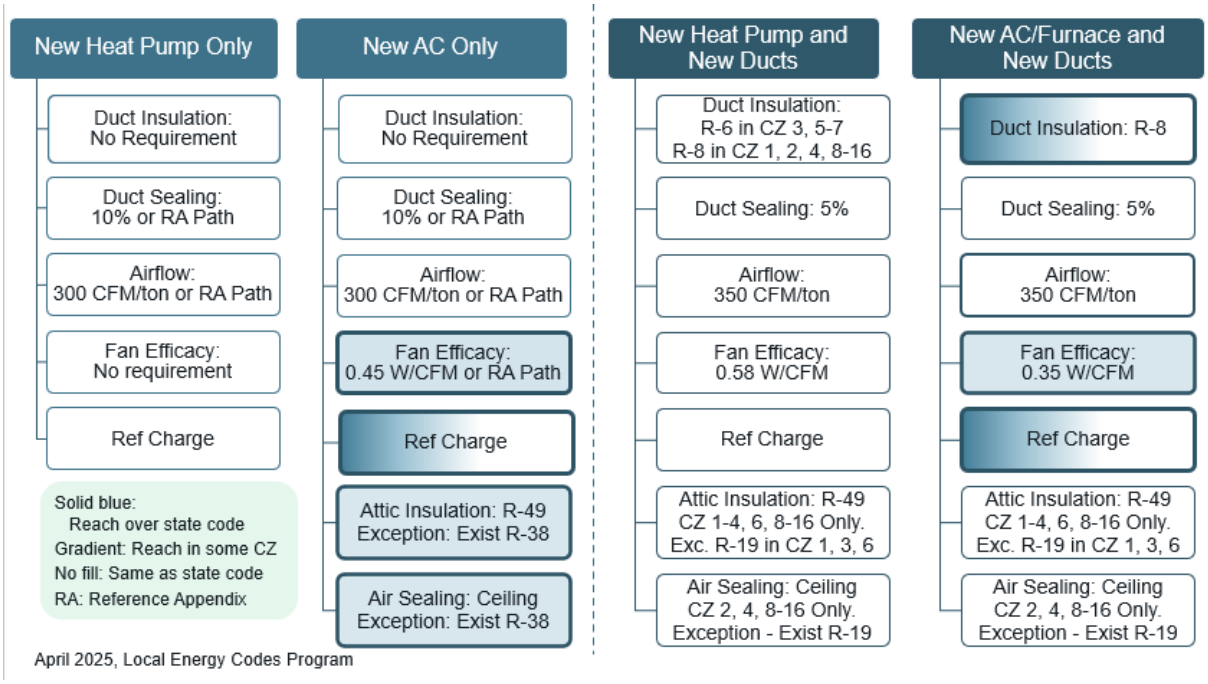
Climate Zone	Electric/ Gas Utility	LSC NPV		
		Pre-1978	1978-1991	1992-2010
CZ01	PGE	$3,019	$2,510	$1,558
CZ02	PGE	$1,256	$1,025	$1,006
CZ03	PGE	$1,460	$1,120	$1,036
CZ04	PGE	$1,242	$949	$887
CZ04	CPAU	$1,242	$949	$887
CZ05	PGE	$1,127	$816	$820
CZ05	PGE/SCG	$1,127	$816	$820
CZ06	SCE/SCG	$545	$318	$251
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.

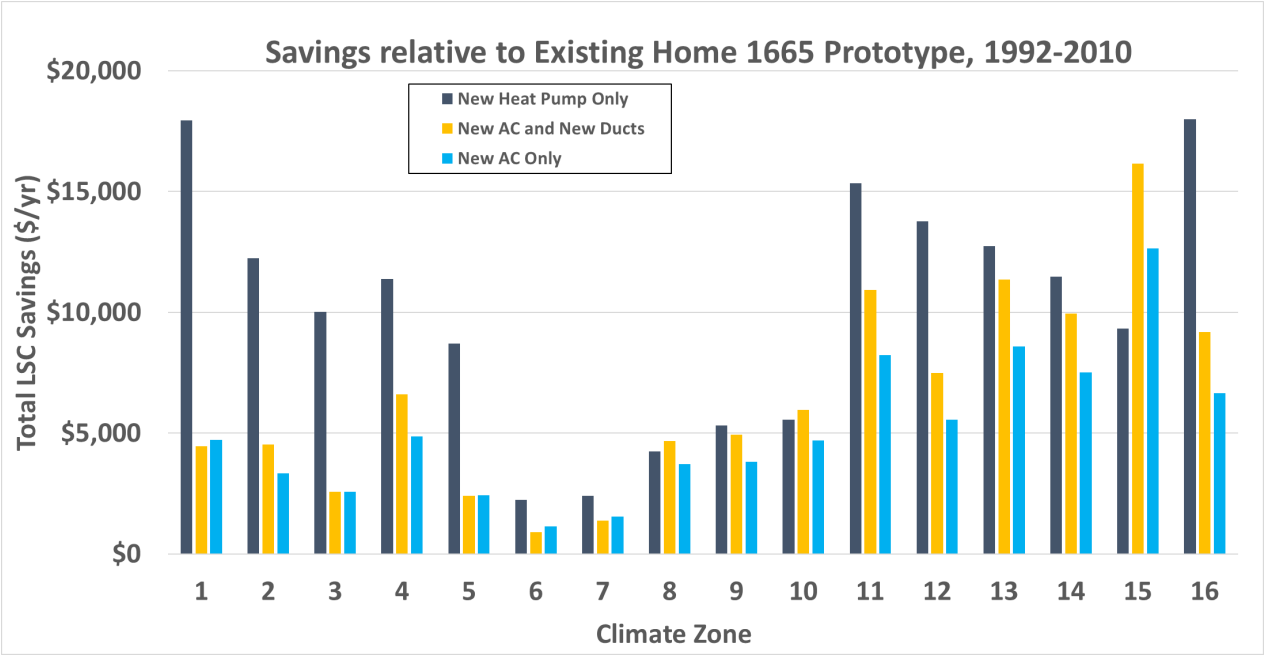
Figure 1 shows two AC pathways, one with an existing duct system and another path with a new duct system, alongside the heat pump pathways. The figure presents the proposed efficiency upgrade measures that would be part of a reach code (solid blue) along with the relevant requirements from Title 24, 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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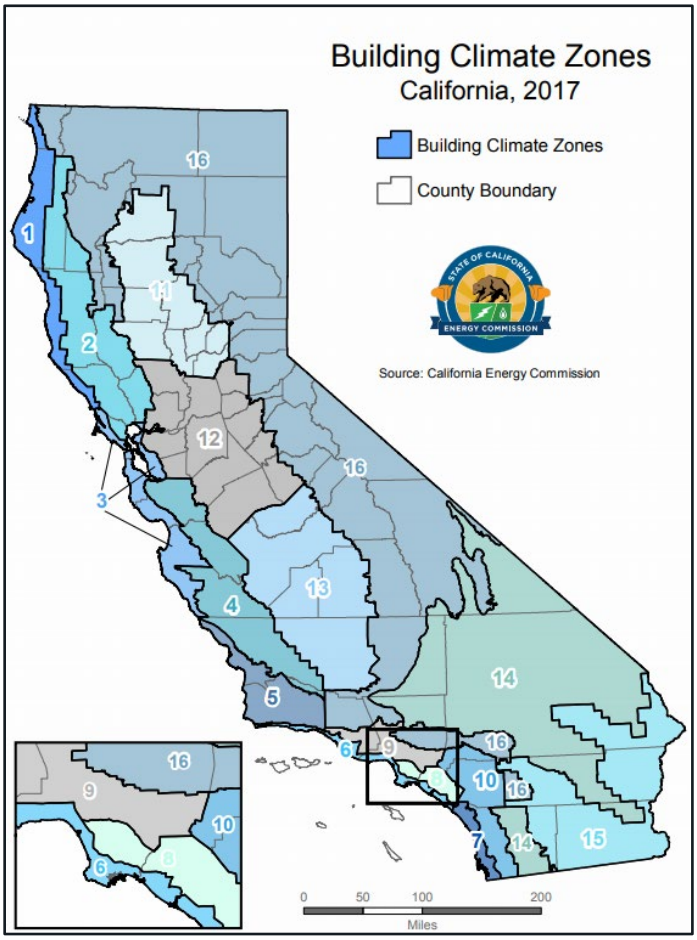
6 Appendices

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 the16 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

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Filed: Nov 22, 2019

Pacific Gas and Electric Company
U 39 Oakland, California

Revised Cal. P.U.C. Sheet No. 59120-E
Cancelling Revised Cal. P.U.C. Sheet No. 58758-E

ELECTRIC SCHEDULE E-TOU-C Sheet 2
RESIDENTIAL TIME-OF-USE (PEAK PRICING 4 - 9 p.m. EVERY DAY)

RATES:
(Cont'd.)

E-TOU-C TOTAL BUNDLED RATES

Total Energy Rates ($ per kWh)	PEAK		OFF-PEAK	
Summer				
Total Usage	$0.60729	(R)	$0.50429	(R)
Baseline Credit (Applied to Baseline Usage Only)	($0.10135)	(R)	($0.10135)	(R)
Winter				
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
Decision

Issued by
Shilpa Ramaiya
Vice President
Regulatory Proceedings and Rates

Submitted December 30, 2024
Effective January 1, 2025
Resolution

Pacific Gas and Electric Company
U 39 Oakland, California

Cancelling Revised Cal. P.U.C. Sheet No. 59121-E
Revised 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)

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Pacific Gas and Electric Company
U 39 Oakland, California

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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
Decision

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Regulatory Proceedings and Rates

Submitted December 30, 2024
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Pacific Gas and Electric Company
U 39 San Francisco, California

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

ELECTRIC SCHEDULE E-ELEC Sheet 3 (N)
RESIDENTIAL TIME-OF-USE (ELECTRIC HOME) (N)
SERVICE FOR CUSTOMERS WITH QUALIFYING ELECTRIC TECHNOLOGIES

SPECIAL CONDITIONS:

1. TIME PERIODS: Times of the year and times of the day are defined as follows: (N)

   All Year:

   Peak: 4:00 p.m. to 9:00 p.m. every day including weekends and holidays.

   Partial-Peak: 3:00 p.m. to 4:00 p.m. and 9:00 p.m. to 12:00 a.m. every day including weekends and holidays.

   Off-Peak: All other hours.

2. SEASONAL CHANGES: The summer season is June 1 through September 30 and the winter season is October 1 through May 31. When billing includes use in both the summer and winter periods, charges will be prorated based upon the number of days in each period.

3. ADDITIONAL METERS: If a residential dwelling unit is served by more than one electric meter, the customer must designate which meter is the primary meter and which is (are) the additional meter(s).

4. BILLING: A customer's bill is calculated based on the option applicable to the customer.

   Bundled Service Customers receive generation and delivery services solely from PG&E. The customer's bill is based on the Unbundling of Total Rates set forth above.

   Transitional Bundled Service (TBS) Customers take TBS as prescribed in Rules 22.1 and 23.1, or take PG&E bundled service prior to the end of the six (6) month advance notice period required to elect PG&E bundled service as prescribed in Rules 22.1 and 23.1. TBS customers shall pay all charges shown in the Unbundling of Total Rates except for the Bundled Power Charge Indifference Adjustment and the generation charge. TBS customers shall also pay for their applicable Vintaged Power Charge Indifference Adjustment provided in the table below, and the short-term commodity prices as set forth in Schedule TBCC. (N)

(Continued)

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

Pacific Gas and Electric Company
U 39 Oakland, California

	Revised	Cal. P.U.C. Sheet No.	59329-E
Cancelling	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	February 26, 2025
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			Resolution	

Pacific Gas and Electric Company
U 39 Oakland, California

	Revised	Cal. P.U.C. Sheet No.	59087-E
Cancelling	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	Issued by	Submitted	December 30, 2024
Decision		**Shilpa Ramaiya**	Effective	January 1, 2025
		Vice President	Resolution	
		Regulatory Proceedings and Rates		

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

1. Applicable rate time periods are defined as follows:

Option 4-9 PM, Option 4-9 PM-CPP, Option PRIME, Option PRIME-CPP : (T)

TOU Period	Weekdays		Weekends and Holidays	
	Summer	Winter	Summer	Winter
On-Peak	4 p.m. - 9 p.m.	N/A	N/A	N/A
Mid-Peak	N/A	4 p.m. - 9 p.m.	4 p.m. - 9 p.m.	4 p.m. - 9 p.m.
Off-Peak	All other hours	9 p.m. - 8 a.m.	All other hours	9 p.m. - 8 a.m.
Super-Off-Peak	N/A	8 a.m. - 4 p.m.	N/A	8 a.m. - 4 p.m.
CPP Event Period	4 p.m. - 9 p.m.	4 p.m. - 9 p.m.	N/A	N/A

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

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

		Delivery Service Total[1]	Generation[2] UG***	Generation[2] DWREC[3]
Option 4-9 PM / Option 4-9 PM-CPP				
Energy Charge - $/kWh				
	Summer Season - On-Peak	0.35546 (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[4]		(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 ($0.00058) 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 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)
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2C7

SOUTHERN CALIFORNIA EDISON
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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)

		Delivery Service Total[1]	Generation[2] UG**	Generation[2] DWREC[3]
Option PRIME / Option PRIME-CPP				
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)

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6C9

SOUTHERN CALIFORNIA EDISON
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Southern California Edison
Rosemead, California (U 338-E)

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

Schedule D-CARE Sheet 1
CALIFORNIA ALTERNATE RATES FOR ENERGY
DOMESTIC SERVICE

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.. (I) (I) (I)

(Continued)

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1H14

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:

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

SDGE
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

Sheet 5

RESIDENTIAL TIME-OF-USE

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

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.

Sheet 4

SCHEDULE EV-TOU-5

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. T N N

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.

(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:

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

CITY OF PALO ALTO UTILITIES

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

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 *per month per meter*	$23.50	$24.15	$24.80	$25.50	$26.20
Electricity Usage Charge					
Peak *$/kWh*	$0.1547	$0.1590	$0.1633	$0.1678	$0.1724
Off-Peak *$/kWh*	$0.1120	$0.1151	$0.1183	$0.1215	$0.1248
Summer Season (June - September)					
System Infrastructure Fixed Charge *per month per meter*	$23.50	$24.15	$24.80	$25.50	$26.20
Electricity Usage Charge					
Peak *$/kWh*	$0.3279	$0.3369	$0.3462	$0.3557	$0.3655
Mid-Peak *$/kWh*	$0.1864	$0.1914	$0.1967	$0.2021	$0.2077
Off-Peak *$/kWh*	$0.1350	$0.1387	$0.1425	$0.1464	$0.1505

B. Optional Critical Peak Pricing Rate

1. The CPP Rate base prices per time-of-day period are the same as the prices per time-of-day period for TOD (5-8 p.m.).
2. The CPP Rate provides a discount per kWh on the Mid-Peak and Off-Peak prices during summer months.
3. During CPP Events, customers will be charged for energy used at the applicable time-of-day period rate plus the CPP Rate Event Price per kWh as shown on www.smud.org.
4. During CPP Events, energy exported to the grid will be compensated at the CPP Rate Event Price per kWh as shown on www.smud.org.
5. The CPP Rate Event Price and discount will be updated annually at SMUD's discretion and posted on www.smud.org.

C. Plug-In Electric Vehicle Credit (rate categories RT02 and RTC1)

This credit is for residential customers who have a licensed passenger battery electric plug-in or plug-in hybrid electric vehicle. Credit applies to all electricity usage charges from midnight to 6:00 a.m. daily.

Electric Vehicle Credit…… -$0.0150/kWh

III. Electricity Usage Surcharges

Refer to the following rate schedules for details on these surcharges.

A. Hydro Generation Adjustment (HGA). Refer to Rate Schedule HGA.

IV. Rate Option Menu

A. Energy Assistance Program Rate. Refer to Rate Schedule EAPR.

B. Medical Equipment Discount Program. Refer to Rate Schedule MED.

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

SACRAMENTO MUNICIPAL UTILITY DISTRICT
Resolution No. 23-09-09 adopted September 21, 2023

Sheet No. **R-TOD-2**
Effective: **September 22, 2023**

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.

Visit

LocalEnergyCodes.com to access our resources and sign up for newsletters

Contact

info@localenergycodes.com for no-charge assistance from expert Reach Code advisors

Explore

The Cost-Effectiveness Explorer is a free resource to help California local governments and stakeholders develop energy policies for buildings.

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