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2022 CODE CYCLE:

# Custom Cost Effectiveness Analysis: City of Healdsburg

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## Legal Notice

This report was prepared by Pacific Gas and Electric Company and funded by the California utility customers under the auspices of the California Public Utilities Commission.



# Acronym List

B/C – Benefit-to-Cost Ratio

CBECC - California Building Energy Code Compliance

CBSC - California Building Standards Commission

CEC - California Energy Commission

CZ – Climate Zone

GHG - Greenhouse Gas

IOU – Investor-Owned Utility

POU – Publicly Owned Utility

PG&E – Pacific Gas & Electric (utility)

SCE – Southern California Edison (utility)

SCG – Southern California Gas (utility)

SDG&E – San Diego Gas & Electric (utility)

CPAU – City of Palo Alto Utilities

LADWP – Los Angeles Department of Water and Power

kWh – Kilowatt Hour

NPV – Net Present Value

PV - Solar Photovoltaic

TDV - Time Dependent Valuation

Title 24 – California Code of Regulations Title 24, Part 6

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# 1 Introduction

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

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

This report is an addendum to the *2022 Single Family New Construction Cost-effectiveness Study* modified to accurately represent the City of Healdsburg, California. The study analyzes cost-effectiveness of measures and measure packages that exceed the minimum state requirements, the 2022 Building Energy Efficiency Standards, effective January 1, 2023, in newly constructed buildings. This report was developed in coordination with the California Statewide Investor Owned Utilities (IOUs) Codes and Standards Program, key consultants, and engaged cities - collectively known as the Reach Codes Team.

The prototype building designs analyzed in this study are newly constructed:

- Single Family Home
- Detached Accessory Dwelling Unit (ADU)

The methodology, prototype characteristics, and measure packages are retained from the main studies referenced above except for the energy costs are calculated using local City of Healdsburg utility rates. Measure packages include combinations of energy efficiency, electrification, solar photovoltaics (PV), and battery storage with results evaluated for California Climate Zone CZ02.

This report presents measures or measure packages that local jurisdictions may consider adopting to achieve energy savings and emissions reductions beyond what will be accomplished by enforcing minimum state requirements, the 2022 Building Energy Efficiency Standards (Title 24, Part 6), effective January 1, 2023.

Local jurisdictions may also adopt ordinances that amend different Parts of the California Building Standards Code or may elect to amend other state or municipal codes. The decision regarding which code to amend will determine the specific requirements that must be followed for an ordinance to be legally enforceable. 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 residents, local leadership, and other stakeholders make informed policy decisions.

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

The Reach Codes Team analyzed two residential prototype designs to represent a variety of common building types using the cost-effectiveness methodology detailed in this section below. The general methodology is consistent with analyses of other prototypes, whereas some specifics such as utility rate selection are customized for the City of Healdsburg rates.

## 2.1 Reach Codes

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

### 2.1.1 Benefits

This analysis used both on-bill and time dependent valuation (TDV) of energy-based approaches to evaluate cost-effectiveness. Both on-bill and TDV require estimating and quantifying the energy savings and costs associated with energy measures. The primary difference between on-bill and TDV is how energy is valued:

- 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 for residential and 15 years for nonresidential designs, accounting for a three percent discount rate and energy cost inflation per Appendix 7.2.3.
- TDV: TDV was developed by the Energy Commission to reflect the time dependent value of energy including long-term projected costs of energy such as the cost of providing energy during peak periods of demand and other societal costs including projected costs for carbon emissions and grid transmission impacts. This metric values energy use differently depending on the fuel source (gas, electricity, and propane), time of day, and season. Electricity used (or saved) during peak periods has a much higher value than electricity used (or saved) during off-peak periods.

The Reach Codes Team performed energy simulations using the most recent software available for 2022 Title 24 code compliance analysis, CBECC-Res v1.0.

### 2.1.2 Costs

The Reach Codes Team assessed the incremental costs and savings of the energy packages over the lifecycle of 30 years for the single family and ADU buildings. Incremental costs represent the equipment, installation, replacements, and maintenance costs of the proposed measure relative to the 2019 Title 24 Standards minimum requirements or standard industry practices. The Reach Codes Team obtained measure costs from manufacturer distributors, contractors, literature review, and online sources such as Home Depot and RS Means. Taxes and contractor markups were added as appropriate. Maintenance and replacement costs are included.

### 2.1.3 Metrics

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

- 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).
- B/C Ratio: Ratio of the present value of all benefits to the present value of all costs over 30 years (NPV benefits divided by NPV costs). The criteria for cost-effectiveness is a B/C greater than 1.0. A value of one

indicates the savings over the life of the measure are equivalent to the incremental cost of that measure. A value greater than one represents a positive return on investment.

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 TDV 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), B/C ratio cost-effectiveness is represented by ">1". Because of these situations, NPV savings are also reported, which, in these cases, are positive values.

### 2.1.4 Utility Rates

In coordination with the City of Healdsburg, the Reach Codes Team determined appropriate tariffs for each package, summarized in Table 1, based on the annual load profile of the prototype and the corresponding package, and the most prevalent rate for each building type.

For a more detailed breakdown of the rates selected refer to Appendix 7.2 Utility Rate Schedules.

**Table 1. Utility Tariffs in City of Healdsburg**

| Electric / Gas Utility | Electricity | Natural Gas |
|---|---|---|
| **Residential (Single Family and Detached ADU)** | | |
| City of Healdsburg / PG&E | E-7 TOU | G1 |

Utility rates are assumed to escalate over time, using assumptions detailed in Appendix 7.2. Please see the main *2022 Single Family New Construction Reach Code Cost Effectiveness Studies* for further details on methodology.

## 2.2 Greenhouse Gas Emissions

The analysis uses the greenhouse gas (GHG) emissions estimates built-in to CBECC-Res. There are 8760 hourly multipliers accounting for time dependent energy use and carbon emissions based on source emissions, including renewable portfolio standard projections. Natural gas fugitive emissions, which are shown to be substantial, are not included. There are two strings of multipliers—one for Northern California climate zones, and another for Southern California climate zones.[1].

[1] CBECC-Res multipliers are the same for CZs 1-5 and 11-13 (presumed to be Northern California), while there is another set of multipliers for CZs 6-10 and 14-16 (assumed to be Southern California).

# 3 Prototype Designs and Measure Packages

## 3.1 Residential Occupancies

Table 2 describes the basic characteristics of each residential prototype design. The prototypes have equal geometry on all walls, windows and roof to be orientation neutral.

### Table 2: Residential Prototype Characteristics

| Characteristic | Single Family One-Story | Single Family Two-Story | ADU |
|---|---|---|---|
| Conditioned Floor Area | 2,100 $ft^2$ | 2,700 $ft^2$ | 625 $ft^2$ |
| Num. of Stories | 1 | 2 | 1 |
| Num. of Bedrooms | 3 | 3 | 1 |
| Window-to-Floor Area Ratio | 20% | 20% | 20% |

The Reach Codes Team evaluated three packages for mixed fuel homes and five packages for all-electric homes for each prototype and climate zone, as described below.

1. All-Electric Code Minimum: This package meets all the prescriptive requirements of the 2022 Title 24 Code.
2. Efficiency Only: This package uses only efficiency measures that don't trigger federal preemption issues including envelope and water heating or duct distribution efficiency measures.
3. Efficiency + NEEA (Preempted): This package was evaluated for the all-electric homes only and shows an alternative design that applies water heating equipment that is more efficient than federal standards meeting the NEEA Tier 3 rating. The Reach Codes Team considers this more reflective of how builders meet above code requirements in practice.
4. Efficiency + PV: Using the Efficiency Package as a starting point, PV capacity was added to offset most of the estimated electricity use.
5. Efficiency + PV + Battery: Using the Efficiency & PV Package as a starting point, a battery system was added. For mixed-fuel homes the package of efficiency measures differed from the Efficiency Package in some climate zones to arrive at a cost effective solution.

# 4 Results

Results are presented as per the prototype-specific Measure Packages described in Section 4. Overarching factors impacting the results include:

- Designation of a **'benefit'** or a **'cost'** varies with the scenarios because both energy savings, and incremental construction costs may be negative depending on the package. Typically, utility bill savings are categorized as a 'benefit' while incremental construction costs are treated as 'costs.' In cases where both construction costs are negative and utility bill savings are negative, the construction cost savings are treated as the 'benefit' while the utility bill negative savings are the 'cost.'
- All-electric packages will have lower **GHG emissions** than equivalent mixed-fuel packages in all cases, due to the clean power sources currently available from California's power providers.
- The Reach Codes Team coordinated with the City of Healdsburg to select the most prevalent tariffs for each prototype given the annual energy demand profile. The Reach Codes Team **did not compare a variety of tariffs** to determine their impact on cost-effectiveness although utility rate changes or updates can effect on-bill cost-effectiveness results.

## 4.1 Residential Occupancies

Table 3 and Table 4 shows results for the single family and ADU prototypes, respectively, for all the evaluated packages.  All packages are cost-effective based on TDV. All of the single family packages are On-Bill cost-effective with the exception of the mixed fuel Efficiency + PV + Battery case. Half of the ADU packages on On-Bill cost-effective.

## Table 3. Single Family Cost-Effectiveness Summary

| Case | Efficiency EDR2 Margin | Annual Elec Savings (kWh) | Annual Gas Savings (therms) | Average Annual GHG Reductions (metric tons) | Utility Cost Savings | | Incremental Cost | | On-Bill | | TDV | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | First Year | Lifecycle (2022$) | First Year | Lifecycle (2022$) | B/C Ratio | NPV | B/C Ratio | NPV |
| **All-Electric** | | | | | | | | | | | | |
| Code Minimum | 5.7 | -3,170 | 247 | 0.8 | ($82) | $2,422 | ($5,288) | ($5,234) | >1 | $7,656 | >1 | $5,390 |
| Efficiency Only | 13.5 | -2,586 | 247 | 0.9 | $15 | $4,607 | ($3,513) | ($3,242) | >1 | $7,849 | >1 | $7,579 |
| Efficiency + NEEA | 16.2 | -2,318 | 247 | 1.0 | $58 | $5,564 | ($3,513) | ($3,242) | >1 | $8,806 | >1 | $8,957 |
| Efficiency + PV | 13.5 | 1,348 | 247 | 1.1 | $820 | $22,680 | $3,687 | $6,387 | 3.6 | $16,293 | 2.9 | $10,678 |
| Efficiency + PV + Battery | 19.1 | 1,211 | 247 | 1.5 | $808 | $22,362 | $9,154 | $17,903 | 1.2 | $4,460 | 1.9 | $13,716 |
| **Mixed Fuel** | | | | | | | | | | | | |
| Efficiency Only | 8.8 | 185 | 38 | 0.3 | $113 | $3,267 | $1,774 | $1,993 | 1.6 | $1,274 | 2.5 | $2,664 |
| Efficiency + PV | 8.8 | 1,348 | 38 | 0.3 | $351 | $8,609 | $3,903 | $4,839 | 1.8 | $3,770 | 1.8 | $3,565 |
| Efficiency + PV + Battery | 13.5 | 1,264 | 35 | 0.7 | $318 | $7,819 | $8,951 | $15,899 | 0.5 | ($8,080) | 1.4 | $6,396 |

## Table 4. ADU Cost-Effectiveness Summary

| Case | Efficiency EDR2 Margin | Annual Elec Savings (kWh) | Annual Gas Savings (therms) | Average Annual GHG Reductions (metric tons) | Utility Cost Savings | | Incremental Cost | | On-Bill | | TDV | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | First Year | Lifecycle (2022$) | First Year | Lifecycle (2022$) | B/C Ratio | NPV | B/C Ratio | NPV |
| **All-Electric** | | | | | | | | | | | | |
| Code Minimum | 0.4 | -1,380 | 75 | 0.2 | ($135) | ($2,097) | ($3,260) | ($2,957) | 1.4 | $861 | 1.2 | $403 |
| Efficiency Only | 9.5 | -1,110 | 75 | 0.3 | ($92) | ($1,127) | ($2,603) | ($1,006) | 0.9 | ($121) | 3.3 | $481 |
| Efficiency + NEEA | 13.8 | -917 | 75 | 0.3 | ($64) | ($491) | ($2,603) | ($1,006) | 2.0 | $515 | >1 | $1,403 |
| Efficiency + PV | 9.4 | 3,461 | 75 | 0.4 | $816 | $19,258 | $5,772 | $10,194 | 1.9 | $9,065 | 1.5 | $4,682 |
| Efficiency + PV + Battery | 14.6 | 3,427 | 75 | 0.8 | $794 | $18,763 | $11,298 | $21,788 | 0.9 | ($3,024) | 1.3 | $6,522 |
| **Mixed Fuel** | | | | | | | | | | | | |
| Efficiency Only | 9.4 | -230 | 40 | 0.2 | $50 | $1,914 | $656 | $1,951 | 0.98 | ($37) | 1.1 | $148 |
| Efficiency + PV | 9.4 | 1,348 | 40 | 0.3 | $783 | $18,354 | $7,410 | $10,983 | 1.7 | $7,370 | 1.4 | $3,499 |
| Efficiency + PV + Battery | 14.5 | 1,337 | 40 | 0.6 | $764 | $17,940 | $12,944 | $22,587 | 0.8 | ($4,648) | 1.2 | $4,938 |

# 5 Summary

The Reach Codes Team developed packages of energy efficiency measures as well as packages combining energy efficiency with solar PV generation, simulated them in building modeling software, and gathered costs to determine the cost-effectiveness of multiple scenarios. The Reach Codes Team coordinated with multiple utilities, cities, and building community experts to develop a set of assumptions considered reasonable in the current market. Changing assumptions, such as the period of analysis, measure selection, cost assumptions, energy escalation rates, or utility tariffs are likely to change results.

Table 5 (all-electric) and Table 6 (mixed fuel) summarize results for each prototype and depict the efficiency EDR2 compliance margins achieved for each climate zone and package. Because local reach codes must both exceed the Energy Commission performance budget (i.e., have a positive compliance margin) and be cost-effective, the Reach Codes Team highlighted cells meeting these two requirements to help clarify the upper boundary for potential reach code policies. All results presented in this study have a positive compliance margin.

- Cells highlighted in **green** depict a positive compliance margin and cost-effective results using both On-Bill and TDV approaches.
- Cells highlighted in **yellow** depict a positive compliance and cost-effective results using either the On-Bill or TDV approach.
- Cells **not highlighted** depict a package that was not cost effective using either the On-Bill or TDV approach.

The Reach Codes Team found all-electric code compliant new construction to be feasible and cost effective based on TDV and Healdsburg electricity rates for both the single family and ADU prototypes. While the code compliant all-electric building had higher first year utility costs, the additional cost was small. Combining higher capacity PV systems and all-electric construction does reduce utility costs.

For a reach code that allows for mixed fuel buildings the mixed fuel efficiency, PV, and battery package was found to be cost effective based on TDV for both prototypes with EDR2 margins between 13.5 and 14.5.

### Table 5. Summary of All-Electric Efficiency EDR2 Margins and Cost-Effectiveness

| Single Family | | | | ADU | | | |
|---|---|---|---|---|---|---|---|
| Code | EE | EE+PV | EE+PV/Batt | Code Min | EE | EE+PV | EE+PV/Batt |
| 5.7 | 13.5 | 13.4 | 19.1 | 0.4 | 9.5 | 9.5 | 14.6 |

### Table 6. Summary of Mixed Fuel Efficiency EDR2 Margins and Cost-Effectiveness

| Single Family | | | ADU | | |
|---|---|---|---|---|---|
| EE | EE+PV | EE+PV/Batt | EE | EE+PV | EE+PV/Batt |
| 8.8 | 8.8 | 13.5 | 9.4 | 9.4 | 14.5 |

# 6 References

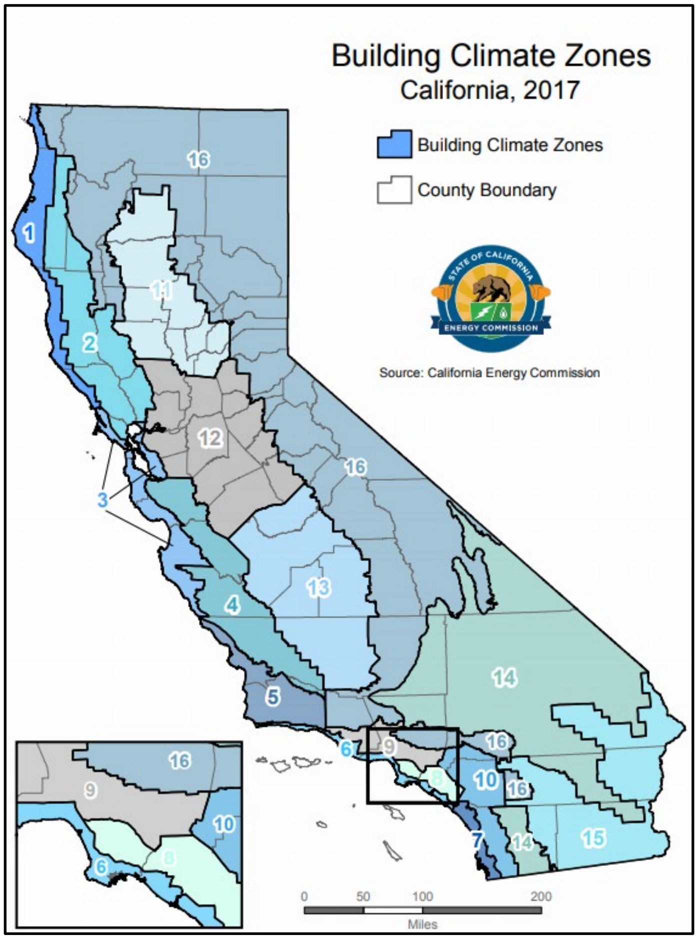
California Public Utilities Commission. (2021a). *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1.* Retrieved from https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf

# 7 Appendices

## 7.1 Map of California Climate Zones

Climate zone geographical boundaries are depicted in Figure 1. The map in Figure 1 along with a zip-code search directory is available at: https://ww2.energy.ca.gov/maps/renewable/building_climate_zones.html

**Figure 1. Map of California climate zones.**



## 7.2 Utility Rate Schedules

The Reach Codes Team used the City of Healdsburg tariffs detailed below to determine the On-Bill savings for each package.

### 7.2.1 City of Healdsburg

#### 7.2.1.1 Residential

Following are the City of Healdsburg electricity tariffs applied in this study. E-7 is applied to all cases. FY2018-2019 tariffs were used.

https://www.ci.healdsburg.ca.us/DocumentCenter/View/8912/Electric-Rate-Schedule-2018-19

**E-7 Electric Rates**

| | |
|---|---|
| Summer Peak Period | $0.2721 / kWh |
| Summer Off Peak Period | $0.1638 / kWh |
| Winter Peak Period | $0.2419 / kWh |
| Winter Off Peak Period | $0.1515 / kWh |
| Monthly Customer Charge | $13.02 / Month |

**Net-Metering** – For customers with qualifying self-generation, a net-metered rate modifier is available to promote the development of renewable energy. The customer's applicable rate will be applied under the crediting policy of net-metered services. At the end of each billing period, excess kWh will be converted to an equivalent bill credit based upon that billing period's kWh rate. If at the end of the billing period, the customer owes the utility a payment, a debt will be shown. If after 12-months the customer is a net-consumer, a bill will be sent showing the balance owed and due. If after a twelve-month period the customer was a net-generator of energy, each surplus kWhr will be credited according to the customers Net-Surplus credit election.

Customers wishing to take the benefits of net-metering must sign and comply with the City's interconnection agreement before the net-metering modifier will be applied to their account.

https://www.ci.healdsburg.ca.us/DocumentCenter/View/6397/Electric-Rate-2016-Resolution-Effective-November-2016-PDF?bidId=

| | FY2015-2016 | FY2016-2017 | FY2017-2018 | FY2018-2019 |
|---|---|---|---|---|
| **Net Surplus Compensation Rate** | EXISTING | | | |
| Energy Compensation Rate | $0.082 | $0.084 | $0.086 | $0.088 |

In addition to the rate details outlined above, for homes with PV a non-bypassable charge to support the Public Benefit Fund (PBF) is added as a surcharge based on conversations with City of Healdsburg staff. The surcharge is 2.85% on the overall/net bill (energy plus monthly charges).

### 7.2.2 PG&E

Refer to the statewide study 2022 Single Family New Construction Cost-effectiveness Study for details on the gas rates applied.

### 7.2.3 Fuel Escalation Rates

#### 7.2.3.1 Residential Occupancies

The average annual escalation rates in Table 7 were used in this study. The natural gas rates are based on assumptions from the CPUC 2021 En Banc hearings on utility costs through 2030 (California Public Utilities Commission, 2021a). Electricity rates through 2030 are based on feedback from City of Healdsburg staff that rates tend to escalate nominally three percent annually. A real rate of one percent was calculated based on an average annual value for inflation of two percent. Escalation rates through the remainder of the 30-year evaluation period are based on the escalation rate assumptions within the 2022 TDV factors.

**Table 7: Real Utility Rate Escalation Rate Assumptions**

| Year | Statewide Natural Gas Average Rate (%/year, real) | Healdsburg Electric Average Rate (%/year, real) |
|---|---|---|
| 2023 | 4.6% | 1.0% |
| 2024 | 4.6% | 1.0% |
| 2025 | 4.6% | 1.0% |
| 2026 | 4.6% | 1.0% |
| 2027 | 4.6% | 1.0% |
| 2028 | 4.6% | 1.0% |
| 2029 | 4.6% | 1.0% |
| 2030 | 4.6% | 1.0% |
| 2031 | 2.0% | 0.6% |
| 2032 | 2.4% | 0.6% |
| 2033 | 2.1% | 0.6% |
| 2034 | 1.9% | 0.6% |
| 2035 | 1.9% | 0.6% |
| 2036 | 1.8% | 0.6% |
| 2037 | 1.7% | 0.6% |
| 2038 | 1.6% | 0.6% |
| 2039 | 2.1% | 0.6% |
| 2040 | 1.6% | 0.6% |
| 2041 | 2.2% | 0.6% |
| 2042 | 2.2% | 0.6% |
| 2043 | 2.3% | 0.6% |
| 2044 | 2.4% | 0.6% |
| 2045 | 2.5% | 0.6% |
| 2046 | 1.5% | 0.6% |
| 2047 | 1.3% | 0.6% |
| 2048 | 1.6% | 0.6% |
| 2049 | 1.3% | 0.6% |
| 2050 | 1.5% | 0.6% |
| 2051 | 1.8% | 0.6% |
| 2052 | 1.8% | 0.6% |

## 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.

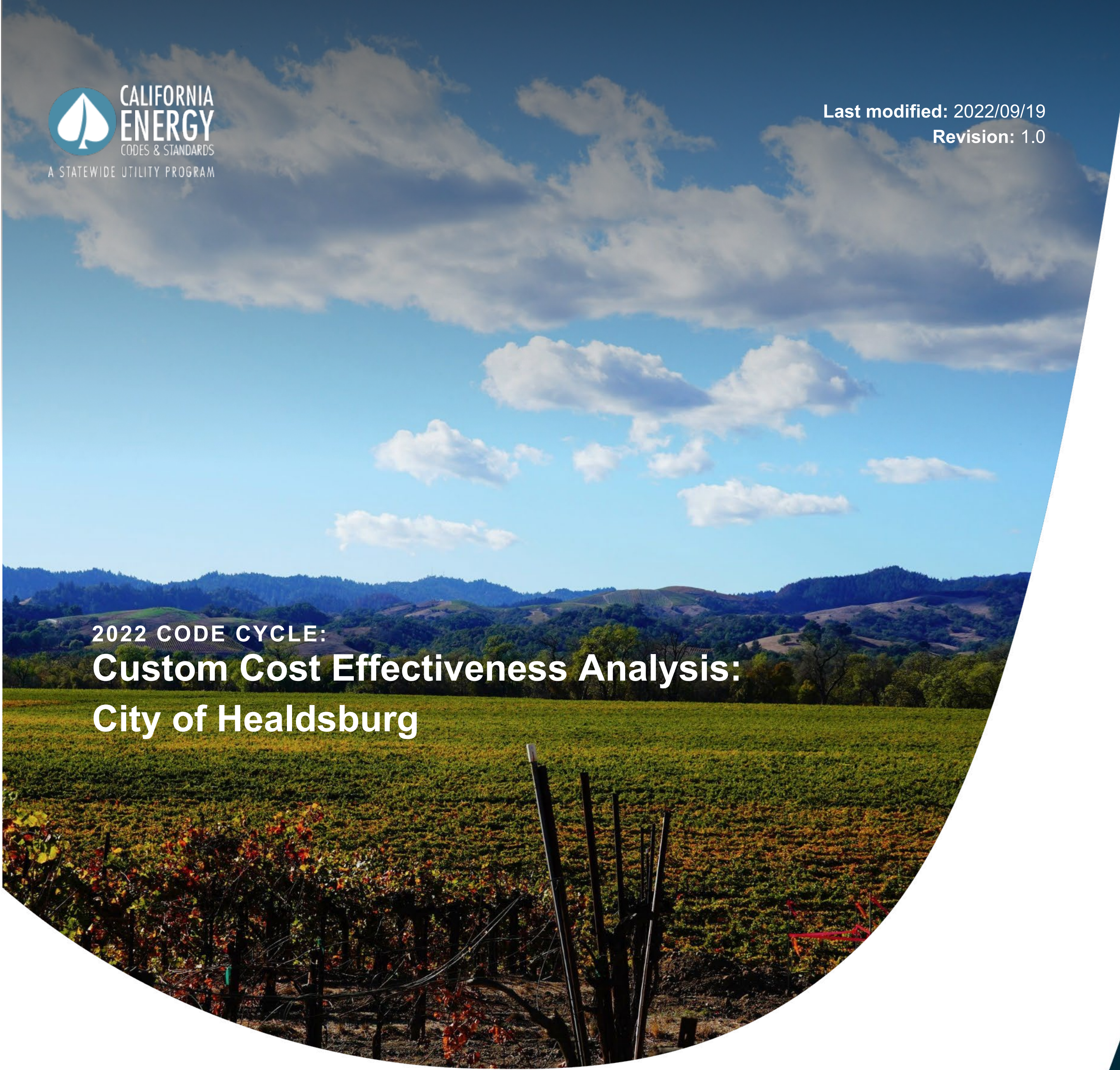
Our experts develop robust toolkits as well as provide specific technical assistance to local jurisdictions (cities and counties) considering adopting energy reach codes. These include cost-effectiveness research and analysis, model ordinance language and other code development and implementation tools, 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

Follow us on Twitter



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**Prepared for:**
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- Medium Office
- Medium Retail
- Quick-Service Restaurant
- Small Hotel

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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

The Reach Codes Team analyzed four nonresidential prototypes to represent a variety of common building types using the cost-effectiveness methodology detailed in this section below. The general methodology is consistent with analyses of other prototypes, whereas some specifics such as utility rate selection are customized for the City of Healdsburg rates.

## 2.1 Reach Codes

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

### 2.1.1 Benefits

This analysis used both on-bill and time dependent valuation (TDV) of energy-based approaches to evaluate cost-effectiveness. Both on-bill and TDV require estimating and quantifying the energy savings and costs associated with energy measures. The primary difference between on-bill and TDV is how energy is valued:

- 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 for residential and 15 years for nonresidential designs, accounting for a three percent discount rate and energy cost inflation per Appendix 6.2.3.
- TDV: TDV was developed by the Energy Commission to reflect the time dependent value of energy including long-term projected costs of energy such as the cost of providing energy during peak periods of demand and other societal costs including projected costs for carbon emissions and grid transmission impacts. This metric values energy use differently depending on the fuel source (gas, electricity, and propane), time of day, and season. Electricity used (or saved) during peak periods has a much higher value than electricity used (or saved) during off-peak periods. This refers to the "Total TDV" that includes all the energy end uses such as space-conditioning, mechanical ventilation, service water heating indoor lighting, photovoltaic (PV) and battery storage systems, and covered process loads.

The Reach Codes Team performed energy simulations using the most recent software available (June 8, 2022) for 2022 Title 24 code compliance analysis, California's Building Energy Code Compliance Software CBECC 2022.1.0 (1250).

### 2.1.2 Costs

The Reach Codes Team assessed the incremental costs and savings of the energy packages over the lifecycle of 15 years for the nonresidential buildings. Incremental costs represent the equipment, installation, replacements, and maintenance costs of the proposed measure relative to the 2022 Title 24 Standards minimum requirements or standard industry practices. The Reach Code Team obtained baseline and measure costs from manufacturer distributors, contractors, literature review, and online sources such as RS Means.

### 2.1.3 Metrics

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

- 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).

- B/C Ratio: Ratio of the present value of all benefits to the present value of all costs over 15 years (NPV benefits divided by NPV costs). The criteria for cost-effectiveness is a B/C greater than 1.0. A value of one indicates the savings over the life of the measure are equivalent to the incremental cost of that measure. A value greater than one represents a positive return on investment.

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 TDV 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), B/C ratio cost-effectiveness is represented by “>1”. Because of these situations, NPV savings are also reported, which, in these cases, are positive values.

### 2.1.4 Utility Rates

In coordination with the City of Healdsburg, the Reach Codes Team determined appropriate tariffs for each package, summarized in Table 1, based on the annual load profile of the prototype and the corresponding package, and the most prevalent rate for each building type.

For a more detailed breakdown of the rates selected refer to Appendix 6.2 Utility Rate Schedules.

**Table 1. Utility Tariffs in City of Healdsburg**

| Electric / Gas Utility | Electricity | Natural Gas |
|---|---|---|
| **Nonresidential Buildings** | | |
| City of Healdsburg / PG&E | A-6 or E-19 TOU | G-NR1 |

Utility rates are assumed to escalate over time, using assumptions detailed in Appendix 9.2 of the main report. Please see the main *2022 Nonresidential New Construction Reach Code Cost Effectiveness Study* for further details on methodology.

## 2.2 Greenhouse Gas Emissions

The analysis uses the greenhouse gas (GHG) emissions estimates built-in to CBECC software. There are 8,760 hourly multipliers accounting for time dependent energy use and carbon emissions based on source emissions, including RPS projections. There are 32 strings of multipliers, with a different string for each California CZ and each fuel type (metric tons of CO2 per kWh for electricity and metric tons of CO2 per therm for natural gas).

## 2.3 Nonresidential Occupancies

Table 2 describes the basic characteristics of each nonresidential prototype design.

## Table 2: Nonresidential Prototype Characteristics

| | Medium Office | Medium Retail | Quick-Service Restaurant | Small Hotel |
|---|---|---|---|---|
| **Conditioned floor area ($ft^2$)** | 53,628 | 24,563 | 2,501 | 42,554<br>(77 guest rooms) |
| **Number of stories** | 3 | 1 | 1 | 4 |
| **Window-to-Wall Area ratio** | 0.33 | 0.07 | 0.11 | 0.14 |
| **Window U-factor/SHGC** | U-factor:<br>CZ 1-8, 10, 16 – 0.36<br>CZ 9, 11-15 – 0.34<br>SHGC:<br>CZ 1-8, 10, 16 – 0.25<br>CZ 9, 11-15 – 0.22 | U-factor:<br>CZ 1-8, 10, 16 – 0.36<br>CZ 9, 11-15 – 0.34<br>SHGC:<br>CZ 1-8, 10, 16 – 0.25<br>CZ 9, 11-15 – 0.22 | U-factor:<br>CZ 1-8, 10, 16 – 0.36<br>CZ 9, 11-15 – 0.34<br>SHGC:<br>CZ 1-8, 10, 16 – 0.25<br>CZ 9, 11-15 – 0.22 | Nonresidential:<br>U-factor:<br>CZ 1-8,10,16 – 0.36<br>CZ 9, 11-15 –0.34<br>SHGC:<br>CZ 1-8,10,16 – 0.25<br>CZ 9, 11-15 – 0.22<br><br>Guest Rooms:<br>U-factor: 0.36<br>SHGC: 0.25 |
| **Solar PV size** | 123 kW – 204 kW<br>Depending on CZ | 64 kW – 87 kW<br>Depending on CZ | None | 17 kW – 25 kW<br>Depending on CZ |
| **Battery Storage** | 217 kWh – 360 kWh<br>Depending on CZ | 70 kWh – 94 kWh<br>Depending on CZ | None | 16 kWh – 24 kWh<br>Depending on CZ |
| **HVAC System** | VAV reheat system with packaged rooftop units, gas boilers, VAV terminal units with hot water reheat | CZ 1<br>Heat recovery for Core Retail space only<br><br>CZ 1, 16<br>< 65 kBtu/h: SZAC with gas furnace<br>> 65 kBtu/h and < 240 kBtu/h: SZHP and gas furnace (i.e., dual fuel heat pump). VAV.<br>> 240 kBtu/h: SZAC VAV with gas furnace<br><br>CZ 2-15<br>< 65 kBtu/h: SZAC with gas furnace<br>> 65 kBtu/h and < 240 kBtu/h: SZHP VAV<br>> 240 kBtu/h: SZAC VAV with gas furnace | < 65 kBtu/h:<br>SZAC + gas furnace<br><br>> 65 kBtu/h:<br>SZAC VAV | Nonresidential and Laundry:<br>VAV reheat system with packaged rooftop units, gas boilers, VAV terminal units with hot water reheat<br><br>Guest Rooms: SZAC with gas furnaces |
| **SHW System** | 5-gallon electric resistance water heater | 5-gallon electric resistance water heater | 100-gallon gas water heater | Nonresidential: 30-gallon electric resistance water heater<br>Laundry Room: 120-gal gas storage water heater<br>Guest rooms: Central gas water heater, 250 gallons storage, recirculation loop |

The Reach Codes Team evaluated mixed fuel efficiency and all-electric packages for each prototype and climate zone, as described below.

- **Mixed Fuel + Efficiency Measures**: Mixed-fuel prescriptive building per 2022 Title 24 requirements, including additional efficiency measures.
- **All-Electric Code Minimum Efficiency:** All-Electric building to minimum Title 24 prescriptive standards and federal minimum efficiency standards. This package has the same PV size as mixed-fuel prescriptive baseline.
- **All-Electric Energy Efficiency:** All-Electric building with added energy efficiency measures related to HVAC, SHW, lighting or envelope.
- **All-Electric Energy Efficiency + Load Flexibility:** All-Electric building with added energy efficiency and load flexibility measures.
- **All-Electric Energy Efficiency + Solar PV:** All-Electric building with added energy efficiency and additional Solar PV. The added PV size is larger than prescriptive 2022 Title 24 code requirements and accounts for roof space availability.

For Quick Service Restaurant (QSR), the Reach Code Team has analyzed two scenarios for All-Electric packages, one with electric cooking and the one with gas cooking (the latter of which is referred to as the “HS” package to reflect all-electric HVAC and SHW).

For Small Hotel, the Reach Code Team also analyzed an alternative scenario with PTHP instead of SZHP in All-Electric scenario. It is denoted by the “PTHP” in parenthesis in package name.

# 3 Results

Results are presented as per the prototype-specific Measure Packages described in Section 4. Overarching factors impacting the results include:

- Designation of a **'benefit'** or a **'cost'** varies with the scenarios because both energy savings, and incremental construction costs may be negative depending on the package. Typically, utility bill savings are categorized as a 'benefit' while incremental construction costs are treated as 'costs.' In cases where both construction costs are negative and utility bill savings are negative, the construction cost savings are treated as the 'benefit' while the utility bill negative savings are the 'cost.'
- Most all-electric packages will have lower **GHG emissions** than equivalent mixed-fuel packages in all cases, due to the clean power sources currently available from California's power providers.
- The Reach Codes Team coordinated with the City of Healdsburg to select the most prevalent tariffs for each prototype given the annual energy demand profile. The Reach Codes Team **did not compare a variety of tariffs** to determine their impact on cost-effectiveness although utility rate changes or updates can effect on-bill cost-effectiveness results.

## 3.1 Nonresidential Occupancies

Across all prototypes and climate zones, the Reach Code Team identified cost effective efficiency measures when added to the mixed-fuel baseline prototype.

- Team identified cost effective all-electric packages for all four prototypes with Healdsburg rates except all-electric restaurant including cooking electrification.

Table 3 through **Error! Reference source not found.** shows results for the four nonresidential prototypes for all the evaluated packages. All packages are cost-effective based on On-Bill impacts except all-electric commercial kitchen cooking packages.

- Across all prototypes and climate zones, the Reach Code Team identified cost effective efficiency measures when added to the mixed-fuel baseline prototype.
- Team identified cost effective all-electric packages for all four prototypes with Healdsburg rates except all-electric restaurant including cooking electrification.

## Table 3. Medium Office Cost-Effectiveness Summary

| Package | Annual Elec Savings (kWh) | Annual Gas Savings (therms) | Annual GHG savings (tons) | Eff TDV Margin | Total Compliance Margin | Source kBtu Margin | Upfront Incremental Package Cost | Lifecycle Energy Cost Savings | Lifecycle $-TDV Savings | B/C Ratio (On-bill) | B/C Ratio (TDV) | NPV (On-bill) | NPV (TDV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mixed-Fuel + Efficiency Measures | 11,362 | (129) | 0.5 | 5.4 | 5.3 | 0.14 | $12,296 | $23,261 | $25,484 | 1.9 | 2.1 | $10,965 | $13,188 |
| All Electric Code Minimum Efficiency | (68,141) | 3,253 | (0.0) | (22.8) | (22.3) | 0.12 | ($76,465) | ($8,417) | ($106,287) | 9.9 | 0.7 | $68,048 | ($29,822) |
| All Electric Energy Efficiency | (59,522) | 3,253 | 0.6 | (18.2) | (17.7) | 0.30 | ($64,169) | ($14,034) | ($84,291) | >1 | 0.8 | $78,202 | ($20,123) |
| All-Electric Energy Efficiency + Load Flexibility | (46,042) | 3,253 | 4.3 | (8.1) | (7.7) | 1.42 | ($64,169) | $51,854 | ($36,568) | >1 | 1.8 | $116,023 | $27,600 |

## Table 4. Medium Retail Cost-Effectiveness Summary

| Package | Annual Elec Savings (kWh) | Annual Gas Savings (therms) | Annual GHG savings (tons) | Eff TDV Margin | Total Compliance Margin | Source kBtu Margin | Upfront Incremental Package Cost | Lifecycle Energy Cost Savings | Lifecycle $-TDV Savings | B/C Ratio (On-bill) | B/C Ratio (TDV) | NPV (On-bill) | NPV (TDV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mixed-Fuel + Efficiency Measures | 20,145 | (121) | 3.0 | 23.4 | 23.5 | 1.53 | $14,234 | $35,113 | $51,385 | 2.5 | 3.6 | $20,879 | $37,151 |
| All Electric Code Minimum Efficiency | (11,790) | 1,600 | 6.0 | 5.4 | 5.4 | 4.08 | ($10,420) | $24,493 | $11,753 | >1 | >1 | $34,913 | $22,173 |
| All Electric Energy Efficiency | 7,073 | 1,600 | 8.8 | 28.7 | 28.9 | 5.93 | $3,814 | $61,538 | $63,177 | 16.1 | 16.6 | $57,724 | $59,363 |

## Table 5. Quick-Service Restaurant Cost-Effectiveness Summary

| Package | Annual Elec Savings (kWh) | Annual Gas Savings (therms) | Annual GHG savings (tons) | Eff TDV Margin | Total Compliance Margin | Source kBtu Margin | Upfront Incremental Package Cost | Lifecycle Energy Cost Savings | Lifecycle $-TDV Savings | B/C Ratio (On-bill) | B/C Ratio (TDV) | NPV (On-bill) | NPV (TDV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mixed-Fuel + Efficiency Measures | 3,168 | 786 | 4.9 | 121.4 | 121.4 | 39.32 | $16,150 | $29,028 | $27,017 | 1.8 | 1.7 | $12,879 | $10,867 |
| All Electric HS Energy Code Minimum Efficiency | (41,615) | 3,716 | 11.6 | (129.6) | (129.6) | 63.53 | $20,723 | $30,752 | ($28,841) | 1.5 | -1.4 | $10,029 | ($49,564) |
| All-Electric HS Energy Efficiency | (28,843) | 3,716 | 14.3 | 28.2 | 28.2 | 80.96 | $36,872 | $53,953 | $6,287 | 1.5 | 0.2 | $17,081 | ($30,585) |
| All-Electric HS Energy Efficiency + Load Flexibility | (29,190) | 3,716 | 15.3 | 52.2 | 52.2 | 87.69 | $42,282 | $52,303 | $11,621 | 1.2 | 0.3 | $10,020 | ($30,662) |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **All-Electric HS Energy Efficiency + Solar PV** | (799) | 3,716 | 15.5 | 28.2 | 250.7 | 88.9 | $87,280 | $99,607 | $55,810 | 1.1 | 0.6 | $12,327 | ($31,471) |
| **All Electric Code Minimum Efficiency** | (142,558) | 11,170 | 33.2 | (152.4) | (152.4) | 57.60 | $145,989 | $15,249 | ($150,962) | 0.1 | -1.0 | ($130,739) | ($296,951) |
| **All Electric Energy Efficiency** | (129,513) | 11,170 | 35.9 | 5.5 | 5.5 | 75.2 | $162,138 | $38,929 | ($115,830) | 0.2 | -0.7 | ($123,209) | ($277,968) |
| **All-Electric Energy Efficiency + Load Flexibility** | (129,614) | 11,170 | 37.1 | 32.5 | 32.5 | 82.70 | $167,548 | $40,703 | ($109,811) | 0.2 | -0.7 | ($126,846) | ($277,360) |

## Table 6. Small Hotel Cost-Effectiveness Summary

| Package | Annual Elec Savings (kWh) | Annual Gas Savings (therms) | Annual GHG savings (tons) | Eff TDV Margin | Total Compliance Margin | Source kBtu Margin | Upfront Incremental Package Cost | Lifecycle Energy Cost Savings | Lifecycle $-TDV Savings | B/C Ratio (On-bill) | B/C Ratio (TDV) | NPV (On-bill) | NPV (TDV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mixed-Fuel + Efficiency Measures** | 7,384 | 2,044 | 12.8 | 23.4 | 23.4 | 4.5 | $21,214 | $77,466 | $88,716 | 3.7 | 4.2 | $56,252 | $67,502 |
| **All Electric Code Minimum Efficiency** | (223,801) | 13,161 | 49.6 | (11.1) | (11.1) | 14.1 | ($231,686) | ($169,091) | ($82,022) | 1.4 | 2.8 | $62,595 | $149,664 |
| **All Electric Energy Efficiency** | (197,677) | 13,161 | 51.7 | 4.5 | 4.5 | 14.9 | ($210,472) | ($95,279) | ($21,632) | 2.2 | 9.7 | $115,193 | $188,840 |
| **All-Electric Energy Efficiency + Load Flexibility** | (196,262) | 13,161 | 51.7 | 5.6 | 5.6 | 14.9 | ($210,472) | ($57,221) | ($13,242) | 3.7 | 15.9 | $153,251 | $197,230 |
| **All Electric Code Energy Efficiency + Solar PV** | (116,614) | 13,161 | 54.4 | 4.5 | 42.1 | 15.9 | ($64,343) | $51,084 | $120,692 | >1 | >1 | $115,427 | $185,036 |

# 4 Summary

The Reach Codes Team developed packages of energy efficiency measures as well as packages combining energy efficiency with solar PV generation, simulated them in building modeling software, and gathered costs to determine the cost-effectiveness of multiple scenarios. The Reach Codes Team coordinated with multiple utilities, cities, and building community experts to develop a set of assumptions considered reasonable in the current market. Changing assumptions, such as the period of analysis, measure selection, cost assumptions, energy escalation rates, or utility tariffs are likely to change results.

The combined result of cost effectiveness and code compliance across all packages are detailed in Table 7 through Table 10 below. The tables are formatted to show:

- "Both" with **green** highlight – for scenarios that are cost effective on both metrics and have positive compliance margin across all three compliance metrics.
- "TDV/On-Bill" with **yellow** highlight – for scenarios that are cost effective on either one of the metrics and has positive compliance margin across all three compliance metrics.
- "Comp" with gray highlight – for scenarios that are not cost effective on either metric but have positive compliance margin across all three compliance metrics.
- "-" with no color highlight – for scenarios that do not comply across any one code compliance metric and may or may not be cost effective.

The package names in table results columns are as follows:

- Mixed fuel – EE: Mixed Fuel + Efficiency Measures
- All-Electric – Code Min: All-Electric Code Minimum Efficiency
- All-Electric – EE: All-Electric Energy Efficiency
- All-Electric – EE+ LF: All-Electric Energy Efficiency and Load Flexibility
- All-Electric – EE + PV: All-Electric Energy Efficiency and Solar PV

The QSR has two electrification scenarios, with and without cooking appliance electrification, which is denoted by "HS" prefix.

The Small Hotel has an extra package that evaluates a different HVAC type in the All-Electric Code Minimum Efficiency package, a Packaged Terminal Heat Pump (PTHP) instead of a Single Zone Heat Pump.

Due to the greenhouse gas savings potential, the Reach Code Team advises jurisdictions to require All-Electric packages where there is **green** or **yellow** highlight (cost effective and compliant). Jurisdictions may also consider adopting all-electric requirements where packages are shown as gray highlight (compliant but may or may not be cost effective) if they are looking to require electrification based on energy code compliance alone and less concerned about cost impacts.

### Table 7. Summary of Medium Office Packages

| CZ | Utility | Mixed Fuel | All-Electric | | |
|---|---|---|---|---|---|
| | | EE | Code Min | EE | EE + LF |
| cz02 | HBG | Both | - | - | - |

### Table 8. Summary of Medium Retail Packages

| CZ | Utility | Mixed Fuel | All-Electric | |
|---|---|---|---|---|
| | | EE | Code Min | EE |
| cz02 | HBG | Both | Both | Both |

### Table 9. Summary of Quick Service Restaurant Packages

| CZ | Utility | Mixed Fuel | All-electric | | | All-electric "HS" (HVAC+SHW) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | EE | Code Min | EE | EE + LF | Code Min | EE | EE + LF | EE + PV |
| cz02 | HBG | Both | - | Comp | Comp | - | On-Bill | On-Bill | On-Bill |

### Table 10. Summary of Small Hotel Packages

| CZ | Utility | Mixed Fuel | All-Electric | | |
|---|---|---|---|---|---|
| | | EE | Code Min | EE | EE + PV |
| cz02 | HBG | Both | - | Both | Both |

**LEGEND KEY**

| | |
|---|---|
| Both | Compliant & c/e on both metrics |
| On-bill/TDV | Compliant & c/e on one metric |
| Comp | Compliant not c/e |
| - | Not compliant |

The Reach Codes Team found all-electric code compliant new construction to be feasible and cost effective based on TDV and Healdsburg electricity rates for all four nonresidential prototypes. Medium Office All-Electric packages are cost effective, but not code compliant due to the use of electric resistance VAV reheat systems. The most likely all-electric replacement for a central has boiler serving a variable air volume reheat system would be a central heat pump boiler; however, this system cannot be modeled in CBECC at the time of the writing of this report. As such, the Reach Code Team is treating this analysis as temporary until a compliance pathway is established for a central heat pump boiler in the Energy Code and results can be updated accordingly. This modeling capability is anticipated in early 2023 according to discussions with the CBECC software development team, and the cost-effectiveness analysis should become available in the first half of 2023. Heat pump systems are multiple times more efficient, but may also be multiple times more costly, than the electric resistance reheat systems currently analyzed.

# 5 References

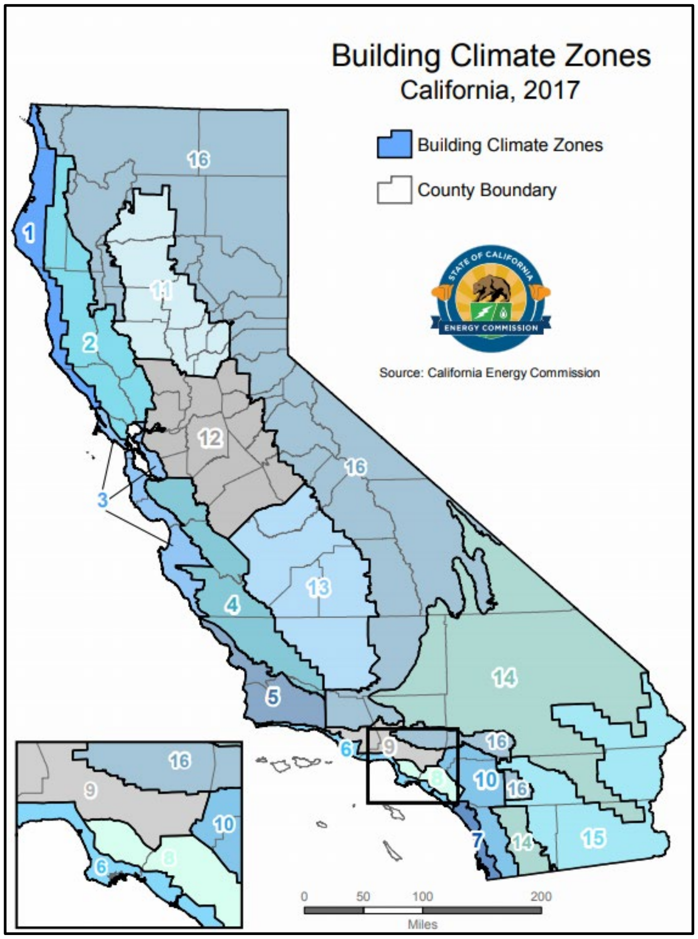
California Public Utilities Commission. (2021a). *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1.* Retrieved from https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf

# 6 Appendices

## 6.1 Map of California Climate Zones

Climate zone geographical boundaries are depicted in Figure 1. The map in Figure 1 along with a zip-code search directory is available at: https://ww2.energy.ca.gov/maps/renewable/building_climate_zones.html

Figure 1. Map of California climate zones.



## 6.2 Utility Rate Schedules

The Reach Codes Team used the City of Healdsburg tariffs detailed below to determine the On-Bill savings for each package.

### 6.2.1 City of Healdsburg

#### 6.2.1.1 Nonresidential

Following are the City of Healdsburg electricity tariffs applied in this study. A6 or E19 is applied based on the demands . FY2018-2019 tariffs were used.

https://www.ci.healdsburg.ca.us/DocumentCenter/View/8912/Electric-Rate-Schedule-2018-19

| | FY2015-2016 | FY2016-2017 | FY2017-2018 | FY2018-2019 |
|---|---|---|---|---|
| **A6 - Small General Service TOU:** | EXISTING | | | |
| Customer Charge/Per Month | $26.03 | $27.94 | $29.99 | $32.19 |
| Summer Energy Charge/Per KWH: | | | | |
| On-Peak | $0.2297 | $0.2366 | $0.2437 | $0.2510 |
| Part-Peak | $0.1463 | $0.1517 | $0.1572 | $0.1630 |
| Off-Peak | $0.1157 | $0.1203 | $0.1251 | $0.1301 |
| | | | | |
| Winter Energy Charge/Per KWH: | | | | |
| Part-Peak | $0.1435 | $0.1497 | $0.1562 | $0.1630 |
| Off-Peak | $0.1127 | $0.1180 | $0.1235 | $0.1292 |
| | | | | |

| | FY2015-2016 | FY2016-2017 | FY2017-2018 | FY2018-2019 |
|---|---|---|---|---|
| **E19 - Medium General Service TOU** | EXISTING | | | |
| Customer Charge/Per Month | $134.24 | $138.71 | $143.34 | $148.12 |
| Summer Demand Charge/Per KW: | | | | |
| On-Peak | $16.73 | $14.39 | $14.68 | $14.97 |
| Part-Peak | $5.04 | $5.22 | $5.42 | $5.61 |
| Off-Peak | $3.66 | $0.00 | $0.00 | $0.00 |
| Summer Energy Charge/Per KWH: | | | | |
| On-Peak | $0.1116 | $0.1209 | $0.1310 | $0.1419 |
| Part-Peak | $0.0925 | $0.0999 | $0.1079 | $0.1165 |
| Off-Peak | $0.0859 | $0.0902 | $0.0947 | $0.0994 |
| | | | | |
| Winter Demand Charge/Per KW: | | | | |
| Part-Peak | $7.41 | $7.81 | $8.22 | $8.66 |
| Off-Peak | $3.05 | $0.00 | $0.00 | $0.00 |
| Winter Energy Charge/Per KWH: | | | | |
| Part-Peak | $0.0973 | $0.1044 | $0.1121 | $0.1203 |
| Off-Peak | $0.0817 | $0.0858 | $0.0901 | $0.0946 |

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| | FY2015-2016 | FY2016-2017 | FY2017-2018 | FY2018-2019 |
|---|---|---|---|---|
| **Electric Non-Metered:** | EXISTING | | | |
| Customer Charge/Per Month | $9.53 | $10.29 | $11.12 | $12.01 |
| Energy Charge/Per Connected Watt: | $0.0829 | $0.0895 | $0.0967 | $0.1044 |
| | | | | |

https://www.ci.healdsburg.ca.us/DocumentCenter/View/6397/Electric-Rate-2016-Resolution-Effective-November-2016-PDF?bidId=

### 6.2.2 PG&E

**GAS SCHEDULE G-NR1** Sheet 2
GAS SERVICE TO SMALL COMMERCIAL CUSTOMERS

RATES (CON'T):

| | ADU (Therms) | | | | |
|---|---|---|---|---|---|
| | 0 – 5.0 | 5.1 to 16.0 | 16.1 to 41.0 | 41.1 to 123.0 | 123.1 & Up |
| Customer Charge: (per day) | $0.27048 | $0.52106 | $0.95482 | $1.66489 | $2.14936 |

| | Per Therm | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Summer | | | | Winter | | | |
| | First 4,000 Therms | | Excess | | First 4,000 Therms | | Excess | |
| Procurement Charge: | $0.59465 | (R) | $0.59465 | (R) | $0.59465 | (R) | $0.59465 | (R) |
| Transportation Charge: | $0.90750 | | $0.56273 | | $1.06734 | | $0.66184 | |
| **Total:** | $1.50215 | (R) | $1.15738 | (R) | $1.66199 | (R) | $1.25649 | (R) |

Cap-and-Trade Cost Exemption (per therm): $0.10234

## 6.2.3 Fuel Escalation Rates

### 6.2.3.1 Nonresidential Occupancies

Table 11 below demonstrate the escalation rates used for nonresidential buildings.

**Table 11: Real Utility Rate Escalation Rate Assumptions**

| | Source | Statewide Electric Nonresidential Average Rate (%/year, real) | Statewide Natural Gas Nonresidential Core Rate (%/year, real) |
|---|---|---|---|
| **2023** | E3 2019 | 1.0% | 4.0% |
| **2024** | 2022 TDV | 1.0% | 7.7% |
| **2025** | 2022 TDV | 1.0% | 5.5% |
| **2026** | 2022 TDV | 1.0% | 5.6% |
| **2027** | 2022 TDV | 1.0% | 5.6% |
| **2028** | 2022 TDV | 1.0% | 5.7% |
| **2029** | 2022 TDV | 1.0% | 5.7% |
| **2030** | 2022 TDV | 1.0% | 5.8% |
| **2031** | 2022 TDV | 0.6% | 3.3% |
| **2032** | 2022 TDV | 0.6% | 3.6% |
| **2033** | 2022 TDV | 0.6% | 3.4% |
| **2034** | 2022 TDV | 0.6% | 3.4% |
| **2035** | 2022 TDV | 0.6% | 3.2% |
| **2036** | 2022 TDV | 0.6% | 3.2% |
| **2037** | 2022 TDV | 0.6% | 3.1% |

## Get In Touch

The adoption of reach codes can differentiate jurisdictions as efficiency leaders and help accelerate the adoption of new equipment, technologies, code compliance, and energy savings strategies.

As part of the Statewide Codes & Standards Program, the Reach Codes Subprogram is a resource available to any local jurisdiction located throughout the state of California.

Our experts develop robust toolkits as well as provide specific technical assistance to local jurisdictions (cities and counties) considering adopting energy reach codes. These include cost-effectiveness research and analysis, model ordinance language and other code development and implementation tools, and specific technical assistance throughout the code adoption process.

If you are interested in finding out more about local energy reach codes, the Reach Codes Team stands ready to assist jurisdictions at any stage of a reach code project.

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

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

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