CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

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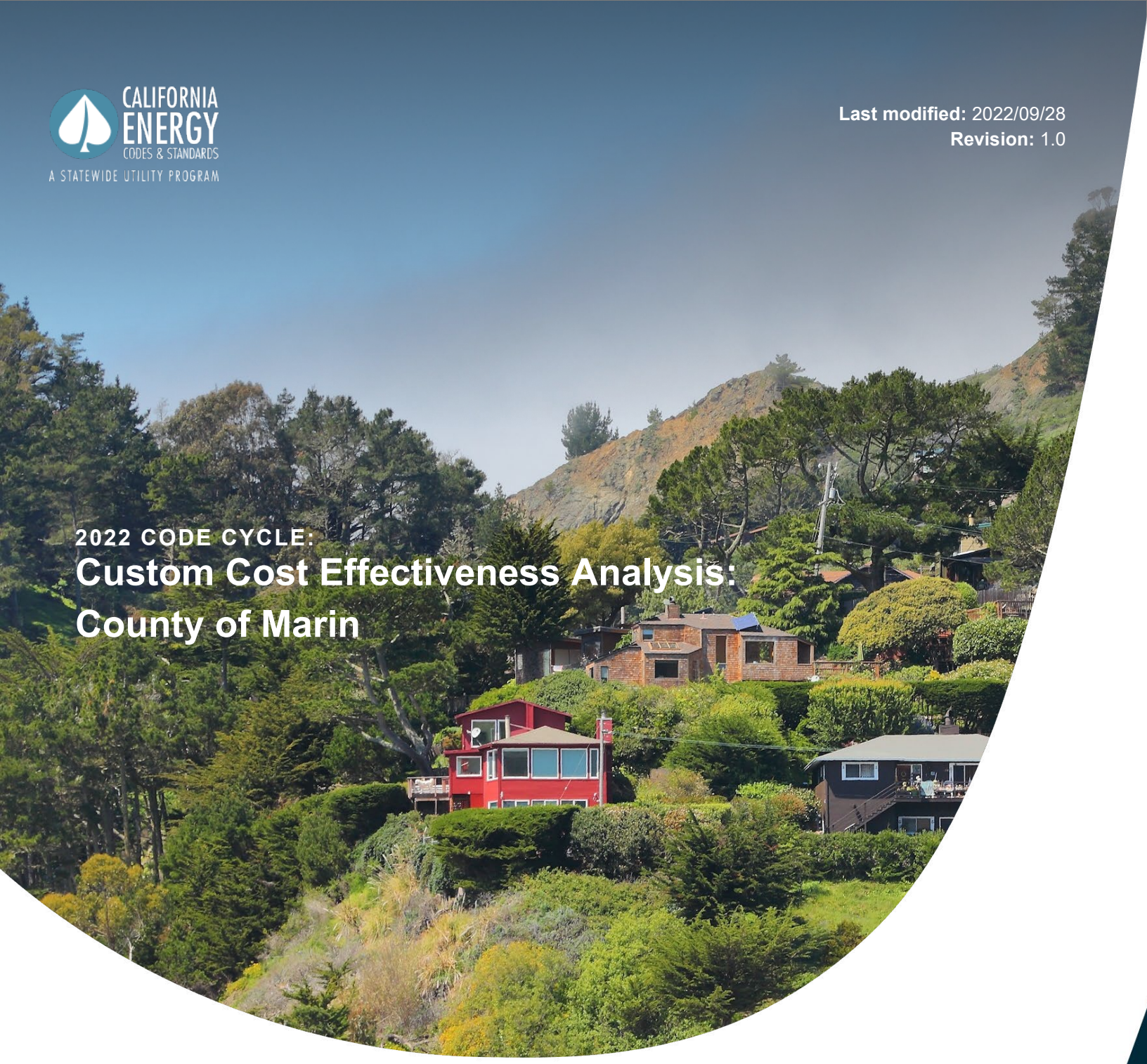

2022 CODE CYCLE:

Custom Cost Effectiveness Analysis: County of Marin

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Legal Notice

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

MCE – Marin Clean Energy

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 County of Marin, 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 Marin Clean Energy (MCE) utility rates. Measure packages include combinations of energy efficiency, electrification, solar photovoltaics (PV), and battery storage with results evaluated for California Climate Zones 2 and 3.

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 County of Marin 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 County of Marin, 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 County of Marin

Electric / Gas Utility	Electricity	Natural Gas
Residential (Single Family and Detached ADU)		
MCE / PG&E	E-1	G1
MCE / PG&E	E-TOU-C	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 County of Marin 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 the E-1 rate in Climate Zone 2. Table 5 and Table 6 show results for the single family and ADU prototypes, respectively, for the E-TOU-C rate in Climate Zone 2. Table 7 and Table 8 show results for the single family and ADU prototypes, respectively, for the E-1 rate in Climate Zone 3. Table 9 and Table 10 show results for the single family and ADU prototypes, respectively, for the E-TOU-C rate in Climate Zone 3. Results are shown for all the evaluated packages. All packages are cost-effective based on TDV. The Reach Codes Team found both all-electric and mixed fuel new construction designs to be feasible and cost effective based on TDV in all cases except for the mixed fuel Efficiency Only package in Climate Zone 3. All-electric code minimum construction results in an increase in utility costs and is not cost-effective On-Bill. Electrification combined with increased PV capacity results in utility cost savings and was found to be On-Bill cost effective in all cases. Adding battery storage reduces cost-effectiveness, but the all-electric packages remain cost-effective under the TDV methodology. These results were based on today's net energy metering rules and do not account for future changes to utility agreements, which are expected to decrease the value of PV to the consumer.

Table 3: E-1 Rate Climate Zone 2 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	($558)	($9,526)	($5,288)	($5,234)	0.5	($4,292)	>1	$5,390
Efficiency Only	13.5	-2,586	247	0.9	($357)	($4,754)	($3,513)	($3,242)	0.7	($1,512)	>1	$7,579
Efficiency + NEEA	16.2	-2,318	247	1.0	($268)	($2,659)	($3,513)	($3,242)	1.2	$583	>1	$8,957
Efficiency + PV	13.5	1,348	247	1.1	$753	$21,517	$3,687	$6,387	3.4	$15,130	2.9	$10,678
Efficiency + PV + Battery	19.1	1,211	247	1.5	$766	$21,830	$9,154	$17,903	1.2	$3,927	1.9	$13,716
Efficiency Only	8.8	185	38	0.3	$137	$3,869	$1,774	$1,993	1.9	$1,876	2.5	$2,664
Efficiency + PV	8.8	1,348	38	0.3	$415	$10,455	$3,903	$4,839	2.2	$5,616	1.8	$3,565
Efficiency + PV + Battery	13.5	1,264	35	0.7	$399	$10,027	$8,951	$15,899	0.6	($5,871)	1.4	$6,396

Table 4: E-1 Rate Climate Zone 2 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	($335)	($7,106)	($3,260)	($2,957)	0.4	($4,149)	1.2	$403
Efficiency Only	9.5	-1,110	75	0.3	($239)	($4,835)	($2,603)	($1,006)	0.2	($3,829)	3.3	$481
Efficiency + NEEA	13.8	-917	75	0.3	($177)	($3,366)	($2,603)	($1,006)	0.3	($2,360)	>1	$1,403
Efficiency + PV	9.5	3,461	75	0.4	$989	$24,236	$5,761	$10,180	2.4	$14,056	1.5	$4,707
Efficiency + PV + Battery	14.6	3,427	75	0.8	$985	$24,151	$11,298	$21,788	1.1	$2,364	1.3	$6,522
Efficiency Only	9.4	-230	40	0.2	$23	$1,223	$656	$1,951	0.6	($728)	1.1	$148
Efficiency + PV	9.4	3,461	40	0.3	$971	$23,676	$7,410	$10,983	2.2	$12,693	1.4	$3,499
Efficiency + PV + Battery	14.5	3,451	40	0.6	$970	$23,650	$12,944	$22,587	1.0	$1,063	1.2	$4,938

Table 5: E-TOU-C Rate Climate Zone 2 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	($507)	($8,326)	($5,288)	($5,234)	0.6	($3,092)	>1	$5,390
Efficiency Only	13.5	-2,586	247	0.9	($316)	($3,782)	($3,513)	($3,242)	0.9	($540)	>1	$7,579
Efficiency + NEEA	16.2	-2,318	247	1.0	($229)	($1,739)	($3,513)	($3,242)	1.9	$1,503	>1	$8,957
Efficiency + PV	13.5	1,348	247	1.1	$768	$21,877	$3,687	$6,387	3.4	$15,490	2.9	$10,678
Efficiency + PV + Battery	19.1	1,211	247	1.5	$776	$22,073	$9,154	$17,903	1.2	$4,170	1.9	$13,716
Efficiency Only	8.8	185	38	0.3	$135	$3,829	$1,774	$1,993	1.9	$1,836	2.5	$2,664
Efficiency + PV	8.8	1,348	38	0.3	$383	$9,697	$3,903	$4,839	2.0	$4,858	1.8	$3,565
Efficiency + PV + Battery	13.5	1,264	35	0.7	$386	$9,718	$8,951	$15,899	0.6	($6,181)	1.4	$6,396

Table 6: E-TOU-C Rate Climate Zone 2 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	($320)	($6,773)	($3,260)	($2,957)	0.4	($3,816)	1.2	$403
Efficiency Only	9.5	-1,110	75	0.3	($229)	($4,595)	($2,603)	($1,006)	0.2	($3,589)	3.3	$481
Efficiency + NEEA	13.8	-917	75	0.3	($169)	($3,189)	($2,603)	($1,006)	0.3	($2,183)	>1	$1,403
Efficiency + PV	9.5	3,461	75	0.4	$957	$23,476	$5,761	$10,180	2.3	$13,295	1.5	$4,707
Efficiency + PV + Battery	14.6	3,427	75	0.8	$963	$23,633	$11,298	$21,788	1.1	$1,845	1.3	$6,522
Efficiency Only	9.4	-230	40	0.2	$32	$1,437	$656	$1,951	0.7	($514)	1.1	$148
Efficiency + PV	9.4	3,461	40	0.3	$942	$22,984	$7,410	$10,983	2.1	$12,001	1.4	$3,499
Efficiency + PV + Battery	14.5	3,451	40	0.6	$946	$23,073	$12,944	$22,587	1.0	$485	1.2	$4,938

Table 7: E-1 Rate Climate Zone 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	4.7	-2,413	171	0.7	($465)	($8,893)	($5,136)	($5,116)	0.6	($3,777)	63.5	$4,414
Efficiency Only	10.5	-2,065	171	0.8	($346)	($6,076)	($3,474)	($3,249)	0.5	($2,827)	>1	$4,674
Efficiency + NEEA	14.4	-1,820	171	0.8	($267)	($4,200)	($3,474)	($3,249)	0.8	($951)	>1	$6,023
Efficiency + PV	10.5	1,127	171	0.9	$546	$15,052	$2,170	$4,299	3.5	$10,753	2.9	$7,145
Efficiency + PV + Battery	15.8	983	171	1.3	$541	$14,937	$7,629	$15,803	0.9	($866)	1.6	$9,058
Efficiency Only	5.7	255	7	0.1	$98	$2,420	$1,956	$2,196	1.1	$224	0.97	($56)
Efficiency + PV	5.7	1,127	7	0.1	$301	$7,232	$3,498	$4,258	1.7	$2,973	1.2	$602
Efficiency + PV + Battery	11.2	1,073	7	0.6	$295	$7,094	$7,718	$14,333	0.5	($7,240)	1.2	$2,956

Table 8: E-1 Rate Climate Zone 3 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	0.0	-1,665	123	0.5	($350)	($6,859)	($2,457)	($2,106)	0.3	($4,753)	2.0	$888
Efficiency Only	5.7	-1,549	123	0.5	($308)	($5,869)	($1,512)	($535)	0.1	($5,334)	14.1	$325
Efficiency + NEEA	11.4	-1,392	123	0.6	($256)	($4,638)	($1,512)	($535)	0.1	($4,102)	>1	$1,206
Efficiency + PV	5.7	2,739	123	0.7	$849	$21,534	$6,071	$9,606	2.2	$11,929	1.5	$4,249
Efficiency + PV + Battery	10.5	2,709	123	1.0	$846	$21,458	$11,596	$21,199	1.0	$260	1.2	$4,720
Efficiency Only	6.3	118	2	0.1	$38	$916	$944	$1,571	0.6	($655)	0.7	($475)
Efficiency + PV	6.3	2,739	2	0.1	$674	$15,990	$5,579	$7,769	2.1	$8,221	1.3	$1,856
Efficiency + PV + Battery	12.1	2,750	2	0.4	$675	$16,008	$11,077	$19,325	0.8	($3,318)	1.1	$1,349

Table 9: E-TOU-C Rate Climate Zone 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	4.7	-2,413	171	0.7	($453)	($8,596)	($5,136)	($5,116)	0.6	($3,480)	63.5	$4,414
Efficiency Only	10.5	-2,065	171	0.8	($339)	($5,906)	($3,474)	($3,249)	0.6	($2,657)	>1	$4,674
Efficiency + NEEA	14.4	-1,820	171	0.8	($262)	($4,069)	($3,474)	($3,249)	0.8	($820)	>1	$6,023
Efficiency + PV	10.5	1,127	171	0.9	$513	$14,279	$2,170	$4,299	3.3	$9,980	2.9	$7,145
Efficiency + PV + Battery	15.8	983	171	1.3	$523	$14,505	$7,629	$15,803	0.9	($1,298)	1.6	$9,058
Efficiency Only	5.7	255	7	0.1	$92	$2,286	$1,956	$2,196	1.0	$90	0.97	($56)
Efficiency + PV	5.7	1,127	7	0.1	$263	$6,326	$3,498	$4,258	1.5	$2,068	1.2	$602
Efficiency + PV + Battery	11.2	1,073	7	0.6	$268	$6,435	$7,718	$14,333	0.4	($7,898)	1.2	$2,956

Table 10: E-TOU-C Rate Climate Zone 3 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	0.0	-1,665	123	0.5	($344)	($6,729)	($2,457)	($2,106)	0.3	($4,622)	2.0	$888
Efficiency Only	5.7	-1,549	123	0.5	($304)	($5,776)	($1,512)	($535)	0.1	($5,240)	14.1	$325
Efficiency + NEEA	11.4	-1,392	123	0.6	($253)	($4,576)	($1,512)	($535)	0.1	($4,040)	>1	$1,206
Efficiency + PV	5.7	2,739	123	0.7	$816	$20,753	$6,071	$9,606	2.2	$11,147	1.5	$4,249
Efficiency + PV + Battery	10.5	2,709	123	1.0	$824	$20,949	$11,596	$21,199	0.99	($250)	1.2	$4,720
Efficiency Only	6.3	118	2	0.1	$34	$842	$944	$1,571	0.5	($729)	0.7	($475)
Efficiency + PV	6.3	2,739	2	0.1	$645	$15,295	$5,579	$7,769	2.0	$7,526	1.3	$1,856
Efficiency + PV + Battery	12.1	2,750	2	0.4	$650	$15,422	$11,077	$19,325	0.8	($3,903)	1.1	$1,349

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 11 (all-electric) and Table 12 (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 for both the single family and ADU prototypes, but not based on MCE utility rates. Combining higher capacity PV systems and all-electric construction does reduce utility costs, resulting in greater savings and On-Bill cost-effectiveness.

For a reach code that allows for mixed fuel buildings the mixed fuel Efficiency + PV + Battery package was found to be cost effective based on TDV in all cases and based on On-Bill in Climate Zone 2 for the ADU. EDR2 margins range between 13.5 and 14.5 for Climate Zone 2 and 11.2 and 12.1 for Climate Zone 3.

Table 11: Summary of All-Electric Efficiency EDR2 Margins and Cost-Effectiveness

		Single Family				ADU			
CZ	Rate	Code	EE	EE+PV	EE+PV/Batt	Code	EE	EE+PV	EE+PV/Batt
02	E-1	5.7	13.5	13.5	19.1	0.4	9.5	9.5	14.6
02	E-TOU-C	5.7	13.5	13.5	19.1	0.4	9.5	9.5	14.6
03	E-1	4.7	10.5	10.5	15.8	0	5.7	5.7	10.5
03	E-TOU-C	4.7	10.5	10.5	15.8	0	5.7	5.7	10.5

Table 12: Summary of Mixed Fuel Efficiency EDR2 Margins and Cost-Effectiveness

		Single Family			ADU		
CZ	Rate	EE	EE+PV	EE+PV/Batt	EE	EE+PV	EE+PV/Batt
02	E-1	8.8	8.8	13.5	9.4	9.4	14.5
02	E-TOU-C	8.8	8.8	13.5	9.4	9.4	14.5
03	E-1	5.7	5.7	11.2	6.3	6.3	12.1
03	E-TOU-C	5.7	5.7	11.2	6.3	6.3	12.1

6 References

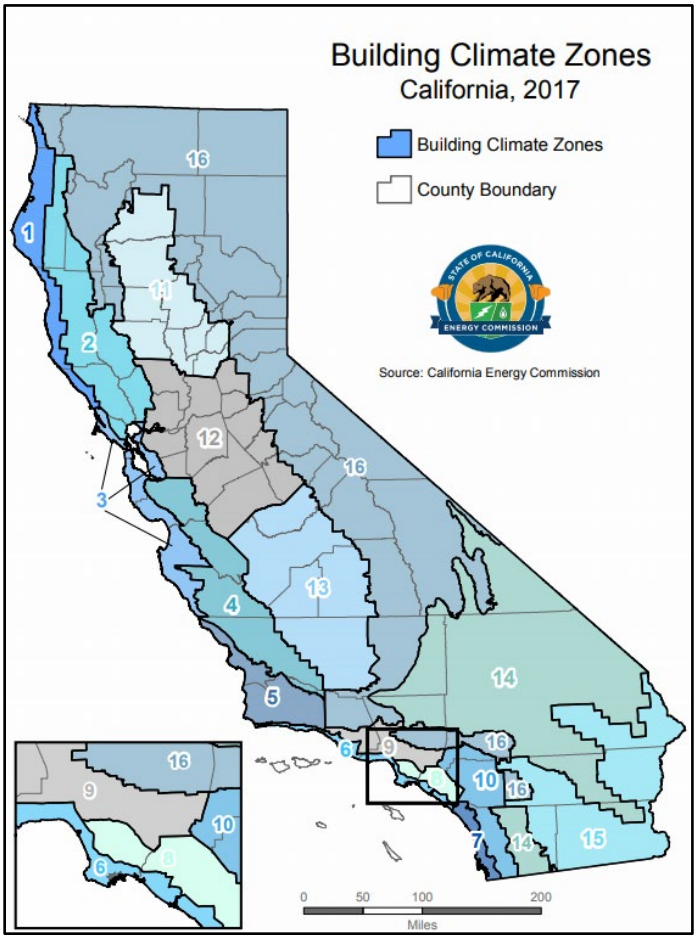
California Public Utilities Commission. (2021a). *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1.* Retrieved from https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-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 MCE and PG&E tariffs detailed below to determine the On-Bill savings for each package.

7.2.1 Marin Clean Energy

7.2.1.1 Residential

Following are MCE electricity tariffs applied in this study. E-1, E-TOU-C and MCE Light Green rates are applied to all cases. The Power Charge Indifference Adjustment (PCIA) and Franchise Fee (FFS) were applied for vintage year 2011.

MCE Residential Rates Last Updated March 1, 2022 (mcecleanenergy.org)

E1, EM, ES, ESR, ET - Basic Residential

All Electric Usage	$0.107/kWh

E-TOUC - Default Residential Time-of-Use

Summer - Service June 1 through September 30		
Peak	$0.15/kWh	4 P.M. to 9 P.M. Everyday
Off-Peak	$0.103/kWh	All other hours
Winter - Service October 1 through May 31		
Peak	$0.107/kWh	4 P.M. to 9 P.M. Everyday
Off-Peak	$0.094/kWh	All other hours

Enrollment Year	Vintage Year	Communities	PCIA	FFS
2010	2009	Marin County	$0.01321/kwh	$0.001/kwh
2011	2010	Marin County	$0.01782/kwh	$0.00096/kwh
2012	2011	Marin County	$0.01931/kwh	$0.00095/kwh
2013	2012		$0.02073/kwh	$0.00094/kwh
2014	2013	Richmond	$0.02001/kwh	$0.00095/kwh
2015	2014	Benicia, El Cerrito, San Pablo, & Uninc. Napa County	$0.01995/kwh	$0.00095/kwh
2016	2015		$0.01963/kwh	$0.00095/kwh
2017	2016	American Canyon, Calistoga, Lafayette, Napa City, Saint Helena, & Walnut Creek	$0.02002/kwh	$0.00095/kwh
2018	2017	Concord, Danville, Martinez, Moraga, Oakley, Pinole, Pittsburg, San Ramon, & Uninc. Contra Costa County	$0.01969/kwh	$0.00095/kwh
2019	2018		$0.01949/kwh	$0.00095/kwh
2020	2019	Uninc. Solano County	$0.01964/kwh	$0.00095/kwh
2021	2020	Pleasant Hill & Vallejo	$0.01375/kwh	$0.00099/kwh
2022	2021	Fairfield	$0.02554/kwh	$0.00099/kwh

MCE's Solar Net Energy Metering (mcecleanenergy.org)

Benefits for MCE Solar Customers

If you have solar panels at your home or business, you can take advantage of MCE's Net Energy Metering (NEM) program, which offers credits for the excess energy you generate and send back to the grid.

- **Credit Accrual and Premium Payment Rates** – If you generate more electricity than you use during a month, you will receive a credit for excess generation at full retail rates that will be automatically applied toward future electricity usage. At the end of the 12-month cycle (which starts in April), remaining credits will be cashed out at 2x the wholesale rate, or double what PG&E offers.
- **Cash Out Annually** – Cash-out payments will be automatically processed annually. For payments of $50 or more you will receive a check. Payments under $50 will appear on your monthly statement as a bill credit.
- **No Large Annual Payment** – MCE credits and charges NEM customers monthly, so you won't end up with a year's worth of generation charges at your true-up.

7.2.2 PG&E

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

7.2.3 Fuel Escalation Rates

7.2.3.1 Residential Occupancies

The average annual escalation rates in Table 13 were used in this study. The electricity and natural gas 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 MCE, therefore electricity escalation rates for PG&E and statewide natural gas escalation rates were applied.

Table 13: Real Utility Rate Escalation Rate Assumptions

Year	Statewide Natural Gas Average Rate (%/year, real)	PG&E Electric Average Rate (%/year, real)
2023	4.6%	1.8%
2024	4.6%	1.8%
2025	4.6%	1.8%
2026	4.6%	1.8%
2027	4.6%	1.8%
2028	4.6%	1.8%
2029	4.6%	1.8%
2030	4.6%	1.8%
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

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

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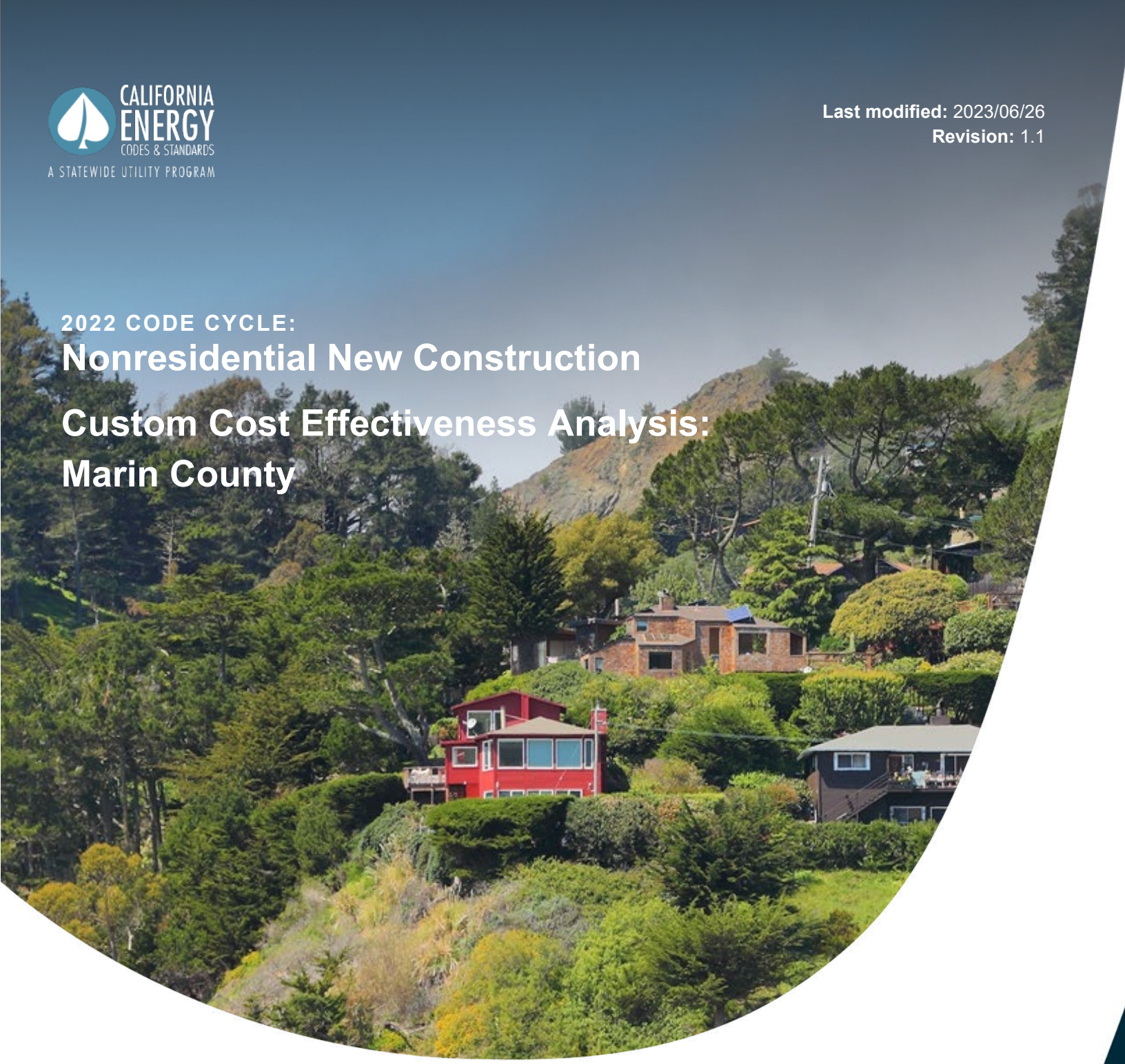

2022 CODE CYCLE:

Nonresidential New Construction

Custom Cost Effectiveness Analysis: Marin County

Prepared by:
TRC Companies, Inc

Prepared for:
Jay Madden, Codes and Standards Program, Southern California Electric

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

Legal Notice

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, 2022) 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 Nonresidential New Construction Reach Code Cost Effectiveness Study** modified to accurately represent the Marin County, 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 Code Team (or “the Team” in short).

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

- Medium Office
- Medium Retail
- Quick-Service Restaurant
- Small Hotel

The methodology, prototype characteristics, and measure packages are retained from the main studies referenced above except for the energy costs are calculated using local Marin County utility rates. Measure packages include combinations of energy efficiency, electrification, solar photovoltaics (PV) with results evaluated for California Climate Zones 2 and 3.

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 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 Marin County rates.

2.1 Reach Codes

This section describes the approach to calculate 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 15-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 criterion 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 Marin County and Marin Clean Energy (MCE), 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 Marin County

Electric / Gas Utility	Electricity	Natural Gas
Nonresidential Buildings		
MCE Light Green-PG&E / PG&E	B-1/B-10	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 CO_2 per kWh for electricity and metric tons of CO_2 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 (ft²)	53,628	24,563	2,501	42,554 (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: CZ 1-8, 10, 16 – 0.36 CZ 9, 11-15 – 0.34 SHGC: CZ 1-8, 10, 16 – 0.25 CZ 9, 11-15 – 0.22	U-factor: CZ 1-8, 10, 16 – 0.36 CZ 9, 11-15 – 0.34 SHGC: CZ 1-8, 10, 16 – 0.25 CZ 9, 11-15 – 0.22	U-factor: CZ 1-8, 10, 16 – 0.36 CZ 9, 11-15 – 0.34 SHGC: CZ 1-8, 10, 16 – 0.25 CZ 9, 11-15 – 0.22	Nonresidential: U-factor: CZ 1-8,10,16 – 0.36 CZ 9, 11-15 –0.34 SHGC: CZ 1-8,10,16 – 0.25 CZ 9, 11-15 – 0.22 Guest Rooms: U-factor: 0.36 SHGC: 0.25
Solar PV size	123 kW – 204 kW Depending on CZ	64 kW – 87 kW Depending on CZ	None	17 kW – 25 kW Depending on CZ
Battery Storage	217 kWh – 360 kWh Depending on CZ	70 kWh – 94 kWh Depending on CZ	None	16 kWh – 24 kWh Depending on CZ
HVAC System	VAV reheat system with packaged rooftop units, gas boilers, VAV terminal units with hot water reheat	CZ 1 Heat recovery for Core Retail space only CZ 1, 16 < 65 kBtu/h: SZAC with gas furnace > 65 kBtu/h and < 240 kBtu/h: SZHP and gas furnace (i.e., dual fuel heat pump). VAV. > 240 kBtu/h: SZAC VAV with gas furnace CZ 2-15 < 65 kBtu/h: SZAC with gas furnace > 65 kBtu/h and < 240 kBtu/h: SZHP VAV > 240 kBtu/h: SZAC VAV with gas furnace	< 65 kBtu/h: SZAC + gas furnace > 65 kBtu/h: SZAC VAV	Nonresidential and Laundry: VAV reheat system with packaged rooftop units, gas boilers, VAV terminal units with hot water reheat 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 Laundry Room: 120-gal gas storage water heater 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 Marin County 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 affect on-bill cost-effectiveness results.

3.1 Nonresidential Occupancies

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Across all prototypes in both climate zones 2 and 3, the Reach Code Team identified cost-effective efficiency measures when added to the mixed-fuel baseline prototype.

- In climate zone 2, The Team identified On-Bill cost-effective packages for all-electric Medium Office, Medium Retail, and Small Hotel with MCE Light Green–PG&E rates except for all-electric code minimum efficiency. For Quick Service Restaurant, all-electric with gas cooking packages are On-Bill cost-effective with added efficiency and solar PV measures.
- In climate zone 3, The Team identified On-Bill cost-effective packages for all-electric Medium Retail with MCE Light Green–PG&E rates. For Medium Office and Small Hotel, The Team identified all-electric On-Bill cost-effectiveness except for all-electric code minimum efficiency packages. For Quick Service Restaurant, all-electric with gas cooking packages are On-Bill cost-effective with added efficiency and solar PV measures.

Table 3 through Table 6 show results for the four nonresidential prototypes for all the evaluated packages for climate zones 2 and 3. For both climate zones, most packages are cost-effective based on On-Bill impacts due to lower electricity rates.

- Across all prototypes in both climate zones 2 and 3, the Reach Code Team identified cost-effective efficiency measures when added to the mixed-fuel baseline prototype.
- In climate zone 2, The Team identified On-Bill cost-effective packages for all-electric Medium Office, Medium Retail, and Small Hotel with MCE Light Green–PG&E rates except for all-electric code minimum efficiency. For Quick Service Restaurant, all-electric with gas cooking packages are On-Bill cost-effective with added efficiency and solar PV measures.
- In climate zone 3, The Team identified On-Bill cost-effective packages for all-electric Medium Retail with MCE Light Green–PG&E rates. For Medium Office and Small Hotel, The Team identified all-electric On-Bill cost-effectiveness except for all-electric code minimum efficiency packages. For Quick Service Restaurant, all-electric with gas cooking packages are On-Bill cost-effective with added efficiency and solar PV measures.

Table 3. Medium Office Cost-Effectiveness Summary

Package	CZ	Elec Rate	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	CZ02	B-10	11,362	(129)	0.5	5.4	5.3	0.14	$12,296	$34,653	$25,484	2.8	2.1	$22,357	$13,188
All Electric Code Minimum Efficiency	CZ02	B-10	(68,141)	3,253	(0.0)	(22.8)	(22.3)	0.12	($76,465)	($86,266)	($106,287)	0.9	0.7	($9,801)	($29,822)
All Electric Energy Efficiency	CZ02	B-10	(59,522)	3,253	0.6	(18.2)	(17.7)	0.30	($64,169)	($57,376)	($84,291)	1.1	0.8	$6,793	($20,123)
All-Electric Energy Efficiency and Load Flexibility	CZ02	B-10	(46,042)	3,253	4.3	(8.1)	(7.7)	1.4	($64,169)	($6,977)	($36,568)	9.2	1.8	$57,191	$27,600
Mixed-Fuel + Efficiency Measures	CZ03	B-10	8,773	(85)	0.6	4.0	3.9	0.17	$0	$26,120	$18,675	>1	>1	$26,120	$18,675
All Electric Code Minimum Efficiency	CZ03	B-10	(56,037)	2,672	(0.2)	(19.3)	(18.7)	0.05	($63,831)	($66,772)	($89,088)	1.0	0.7	($2,942)	($25,258)
All Electric Energy Efficiency	CZ03	B-10	(49,105)	2,672	0.4	(15.9)	(15.3)	0.24	($63,831)	($45,070)	($72,933)	1.4	0.9	$18,760	($9,103)
All-Electric Energy Efficiency and Load Flexibility	CZ03	B-10	(36,218)	2,672	3.9	(7.3)	(6.8)	1.28	($63,831)	($2,158)	($32,351)	29.6	2.0	$61,673	$31,480

Table 4. Medium Retail Cost-Effectiveness Summary

Package	CZ	Elec Rate	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	CZ02	B-10	20,145	(121)	2.3	23.4	23.5	1.53	$14,234	$60,267	$51,385	4.2	3.6	$46,033	$37,151
All Electric Code Minimum Efficiency	CZ02	B-10	(11,790)	1,600	6.0	5.4	5.4	4.08	($10,420)	($11,556)	$11,753	0.9	>1	($1,136)	$22,173
All Electric Energy Efficiency	CZ02	B-1	7,073	1,600	8.8	28.7	28.9	5.93	$3,814	$135,168	$63,177	35.4	16.6	$131,354	$59,363
Mixed-Fuel + Efficiency Measures	CZ03	B-1	19,268	(90)	2.4	20.1	20.3	1.60	$12,800	$69,545	$44,382	5.4	3.5	$56,745	$31,582
All Electric Code Minimum Efficiency	CZ03	B-1	(8,120)	1,186	4.5	4.3	4.3	3.10	($10,188)	$7,354	$9,471	>1	>1	$17,542	$19,659
All Electric Energy Efficiency	CZ03	B-1	10,324	1,186	7.3	24.4	24.6	4.95	$2,612	$76,429	$53,885	29.3	20.6	$73,817	$51,273

Table 5. Quick-Service Restaurant Cost-Effectiveness Summary

Package	CZ	Elec Rate	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	CZ02	B-1	3,168	786	4.9	121.4	121.4	39.32	$16,150	$33,290	$27,017	2.1	1.7	$17,140	$10,867
All Electric HS Energy Code Minimum Efficiency	CZ02	B-1	(41,615)	3,716	11.6	(129.6)	(129.6)	63.53	$20,723	($48,662)	($28,841)	-2.3	-1.4	($69,385)	($49,564)
All-Electric HS Energy Efficiency	CZ02	B-1	(28,843)	3,716	14.3	28.2	28.2	80.96	$36,872	($1,986)	$6,287	-0.1	0.2	($38,858)	($30,585)
All-Electric HS Energy Efficiency + Load Flexibility	CZ02	B-1	(29,190)	3,716	15.3	52.2	52.2	87.69	$42,282	($1,508)	$11,621	0.0	0.3	($43,790)	($30,662)
All-Electric HS Energy Efficiency + Solar PV	CZ02	B-1	(799)	3,716	15.5	28.2	250.7	88.90	$87,280	$97,631	$55,810	1.1	0.6	$10,350	($31,471)
All Electric Code Minimum Efficiency	CZ02	B-10	(142,558)	11,170	33.2	(152.4)	(152.4)	57.60	$145,989	($169,725)	($150,962)	-1.2	-1.0	($315,714)	($296,951)
All Electric Energy Efficiency	CZ02	B-1	(129,513)	11,170	35.9	5.5	5.5	75.23	$162,138	($166,377)	($115,830)	-1.0	-0.7	($328,515)	($277,968)
All-Electric Energy Efficiency + Load Flexibility	CZ02	B-1	(129,614)	11,170	37.1	32.5	32.5	82.70	$167,548	($164,726)	($109,811)	-1.0	-0.7	($332,275)	($277,360)
Mixed-Fuel + Efficiency Measures	CZ03	B-1	12,218	682	6.0	200.8	200.8	28.87	$22,540	$63,249	$44,696	2.8	2.0	$40,710	$22,156
All Electric HS Energy Code Minimum Efficiency	CZ03	B-1	(33,213)	3,151	10.1	(102.8)	(102.8)	39.33	$21,650	($34,471)	($22,884)	-1.6	-1.1	($56,121)	($44,533)
All-Electric HS Energy Efficiency	CZ03	B-1	(12,456)	3,151	14.3	133.7	133.7	66.19	$44,189	$41,593	$29,759	0.9	0.7	($2,597)	($14,430)
All-Electric HS Energy Efficiency + Load Flexibility	CZ03	B-1	(12,926)	3,151	15.3	160.2	160.2	72.94	$49,599	$41,659	$35,659	0.8	0.7	($7,940)	($13,940)
All-Electric HS Energy Efficiency + Solar PV	CZ03	B-1	16,567	3,151	15.5	133.7	352.7	74.48	$94,597	$144,430	$78,512	1.5	0.8	$49,833	($16,085)
All Electric Code Minimum Efficiency	CZ03	B-1	(134,274)	10,605	31.9	(126.9)	(126.9)	34.11	$150,795	($200,162)	($154,469)	-1.3	-1.0	($350,956)	($305,264)
All Electric Energy Efficiency	CZ03	B-1	(113,442)	10,605	35.9	108.2	108.2	60.49	$173,334	($124,002)	($102,137)	-0.7	-0.6	($297,336)	($275,471)
All-Electric Energy Efficiency + Load Flexibility	CZ03	B-1	(114,068)	10,605	37.0	135.6	135.6	67.90	$178,744	($124,268)	($96,039)	-0.7	-0.5	($303,012)	($274,783)

Table 6. Small Hotel Cost-Effectiveness Summary

Package	CZ	Elec Rate	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	CZ02	B-1	7,384	2,044	12.8	23.4	23.4	4.5	$21,214	$83,820	$88,716	4.0	4.2	$62,606	$67,502
All Electric Code Minimum Efficiency	CZ02	B-10	(223,801)	13,161	49.6	(11.1)	(11.1)	14.1	($231,686)	($286,543)	($82,022)	0.8	2.8	($54,857)	$149,664
All Electric Energy Efficiency	CZ02	B-10	(197,677)	13,161	51.7	4.5	4.5	14.9	($210,472)	($184,741)	($21,632)	1.1	9.7	$25,731	$188,840
All Electric Code Energy Efficiency + Solar PV	CZ02	B-10	(116,614)	13,161	54.4	4.5	42.1	15.9	($64,343)	$15,833	$120,692	>1	>1	$80,176	$185,036
All-Electric Code Minimum Efficiency with PTHP	CZ02	B-10	(223,628)	13,161	49.9	(10.4)	(10.4)	14.2	($737,367)	($289,788)	($79,417)	2.5	9.3	$447,579	$657,950
Mixed-Fuel + Efficiency Measures	CZ03	B-1	4,837	2,163	13.3	21.9	21.9	4.7	$21,214	$77,152	$83,003	3.6	3.9	$55,938	$61,789
All Electric Code Minimum Efficiency	CZ03	B-10	(214,540)	12,725	48.9	(9.9)	(9.9)	13.9	($217,341)	($280,148)	($72,359)	0.8	3.0	($62,807)	$144,982
All Electric Energy Efficiency	CZ03	B-10	(189,962)	12,725	51.0	3.5	3.5	14.7	($196,127)	($188,801)	($19,985)	1.0	9.8	$7,327	$176,142
All Electric Code Energy Efficiency + Solar PV	CZ03	B-10	(101,013)	12,725	54.1	3.5	43.7	15.9	($41,150)	$30,650	$132,047	>1	>1	$71,800	$173,197
All-Electric Code Minimum Efficiency with PTHP	CZ03	B-10	(215,259)	12,725	48.8	(10.3)	(10.3)	13.9	($724,535)	($282,360)	($73,936)	2.6	9.8	$442,175	$650,599

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
- All-Electric – Code Min with PTHP: All-Electric Code Minimum Efficiency with PTHP

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.

Table 7. Summary of Medium Office Packages

CZ	Utility	Mixed Fuel	All-Electric		
		EE	Code Min	EE	EE + LF
cz02	MCE Light Green – PG&E	Both	-	-	-
cz03	MCE Light Green – PG&E	Both	-	-	-

Table 8. Summary of Medium Retail Packages

CZ	Utility	Mixed Fuel	All-Electric	
		EE	Code Min	EE
cz02	MCE Light Green – PG&E	Both	TDV	Both
cz03	MCE Light Green – PG&E	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	MCE Light Green – PG&E	Both	-	Comp	Comp	-	Comp	Comp	On-bill
cz03	MCE Light Green – PG&E	Both	-	Comp	Comp	-	Comp	Comp	On-bill

Table 10. Summary of Small Hotel Packages

CZ	Utility	Mixed Fuel	All-Electric			
		EE	Code Min	EE	EE + PV	Code Min (PTHP)
cz02	MCE Light Green – PG&E	Both	-	Both	Both	-
cz03	MCE Light Green – PG&E	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

Please refer to the limitations of this study, described in *2022 Nonresidential New Construction Reach Code Cost Effectiveness Study* Section 3.5, while using these results to inform reach code policies. 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 gas 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.

Results support reach code adoption for energy efficiency measures over mixed fuel nonresidential building types for all four prototypes in both climate zones 2 and 3.

The All-Electric packages indicate the capability of achieving the greatest greenhouse savings as compared to mixed-fuel buildings. The Reach Codes Team found All-Electric new construction to be cost-effective based on MCE Light Green-PG&E electricity rates for Medium Retail in both climate zones. The Team identified that without kitchen electrification, the Quick Service Restaurant All-Electric new construction building is cost-effective with added efficiency and solar PV measures, and hence can be pursued for reach code with an exemption for the commercial cooking appliance. All-electric Small Hotel packages with added efficiency and/or solar PV measures are code compliant and cost-effective in both climate zones 2 and 3.

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

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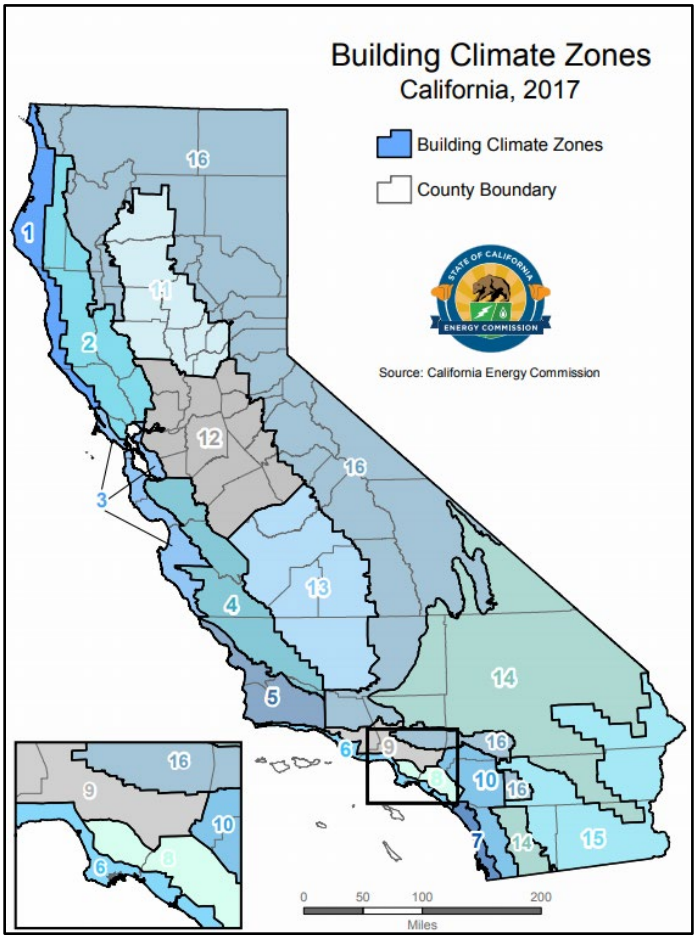
6 Appendices

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 Marin County tariffs detailed below to determine the On-Bill impacts.

6.2.1 Marin Clean Energy

6.2.1.1 Nonresidential Electricity

Following are the MCE electricity tariffs applied in this study. MCE Light Green rate is applied for electricity generation, and B-1/B-10 PG&E rates are applied for other non-generation rates, including distribution fee, Transmission fee, Power Charge Indifference Adjustment (PCIA), Franchise fee (FA), and others. For both PCIA and FA, 2009 was assumed as the Vintage Year.

6.2.1.1.1 MCE Light Green Generation Rate

Following are the MCE Light Green rate for electricity generation applied in this study.[1] B-1/B-10 is applied based on the peak demand.

B1 - Small General Service Time-of-Use (4 P.M. to 9 P.M. Peak)

Summer - Service June 1 through September 30		
Peak	$0.16/kWh	4 P.M. to 9 P.M. everyday, including weekends and holidays
Part-Peak	$0.116/kWh	2 P.M. to 4 P.M. and 9 P.M. to 11 P.M. everyday, including weekends and holidays
Off-Peak	$0.097/kWh	All other hours
Winter - Service from October 1 through May 31		
Peak	$0.111/kWh	4 P.M. to 9 P.M. everyday, including weekends and holidays
Off-Peak	$0.096/kWh	All other hours
Super Off-Peak	$0.081/kWh	9 A.M. to 2 P.M. everyday in March, April, and May only, including weekends and holidays

B10 - Medium General Service Time-of-Use (4 P.M. to 9 P.M. Peak)

Summer	**Secondary**	**Primary**	**Transmission**
Peak	$0.179/kWh	$0.168/kWh	$0.169/kWh
Part-Peak	$0.125/kWh	$0.116/kWh	$0.111/kWh
Off-Peak	$0.096/kWh	$0.088/kWh	$0.081/kWh
Winter			
Peak	$0.128/kWh	$0.119/kWh	$0.115/kWh
Off-Peak	$0.097/kWh	$0.089/kWh	$0.082/kWh
Super Off-Peak	$0.065/kWh	$0.056/kWh	$0.045/kWh

Time-of-Use Periods:

Summer - Service June 1 through September 30	
Peak	4 P.M. to 9 P.M. everyday, including weekends and holidays
Part-Peak	2 P.M. to 4 P.M. and 9 P.M. to 11 P.M. everyday, including weekends and holidays
Off-Peak	All other hours
Winter - Service from October 1 through May 31	
Peak	4 P.M. to 9 P.M. everyday, including weekends and holidays
Off-Peak	All other hours
Super Off-Peak	9 A.M. to 2 P.M. everyday in March, April, and May only, including weekends and holidays

[1] MCE Commercial General Service (Non-Residential) Rates Last Updated March 1, 2022 (mcecleanenergy.org)

6.2.1.1.2 PG&E Non-generation rates

Following are the PG&E Non-generation electricity tariffs applied in this study. B-1/B-10 is applied based on the peak demand.

Pacific Gas and Electric Company
San Francisco, California
U 39

Revised Cal. P.U.C. Sheet No. 54009-E
Cancelling Revised Cal. P.U.C. Sheet No. 53378-E

ELECTRIC SCHEDULE B-1 Sheet 4
SMALL GENERAL SERVICE

RATES: (Cont'd.) Total bundled service charges shown on customers' bills are unbundled according to the component rates shown below. PDP charges and credits are all generation and are not included below.

UNBUNDLING OF TOTAL RATES

Time-of-Use Rates	B-1 Rate		B1-ST Rate	
Customer and Demand Charge Rates: Customer and demand charge rates provided in the Total Rate section above are assigned entirely to the unbundled distribution component.				
Energy Rates by Components ($ per kWh)				
Generation:				
Peak Summer	$0.18237		$0.18709	
Part-Peak Summer	$0.13314		$0.14463	
Off-Peak Summer	$0.11234		$0.10888	
Peak Winter	$0.12712		$0.13651	
Partial-Peak Winter (For B1-ST Only)	---		$0.12417	
Off-Peak Winter	$0.11101		$0.10217	
Super Off-Peak Winter	$0.09459		$0.08575	
Distribution:**				
Peak Summer	$0.12158		$0.17743	
Part-Peak Summer	$0.12158		$0.07859	
Off-Peak Summer	$0.12158		$0.06701	
Peak Winter	$0.10141		$0.13006	
Partial-Peak Winter (For B1-ST Only)	---		$0.11290	
Off-Peak Winter	$0.10141		$0.04585	
Super Off-Peak Winter	$0.10141		$0.04585	
Transmission* (all usage)	$0.03439		$0.03439	
Transmission Rate Adjustments* (all usage)	$0.00167		$0.00167	
Reliability Services* (all usage)	$0.00008		$0.00008	
Public Purpose Programs (all usage)	$0.01993		$0.01993	
Nuclear Decommissioning (all usage)	($0.00013)		($0.00013)	
Competition Transition Charges (all usage)	$0.00022		$0.00022	
Energy Cost Recovery Amount (all usage)	($0.00429)		($0.00429)	
New System Generation Charge (all usage)**	$0.00195		$0.00195	
Wildfire Fund Charge (all usage)	$0.00459		$0.00459	
California Climate Credit (all usage)***	$0.00000		$0.00000	
Wildfire Hardening Charge (all usage)	$0.00145		$0.00145	
Recovery Bond Charge (all usage)	$0.01112	(I)	$0.01112	(I)
Recovery Bond Credit (all usage)	($0.01112)	(R)	($0.01112)	(R)
Bundled Power Charge Indifference Adjustment (all usage)****	$0.02446		$0.02446	

* 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.
*** Only customers that qualify as Small Businesses – California Climate Credit under Rule 1 are eligible for the California Climate Credit.
**** 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)

Pacific Gas and Electric Company
San Francisco, California
U 39

Revised Cal. P.U.C. Sheet No. 54010-E
Cancelling Revised Cal. P.U.C. Sheet No. 53383-E

ELECTRIC SCHEDULE B-10 Sheet 5
MEDIUM GENERAL DEMAND-METERED SERVICE

RATES (Cont'd):

UNBUNDLING OF TOTAL RATES (Cont'd)

Energy Rate by Components ($ per kWh)	Secondary Voltage		Primary Voltage		Transmission Voltage	
Generation:						
Peak Summer	$0.20758		$0.19211		$0.16929	
Part-Peak Summer	$0.14589		$0.13381		$0.11255	
Off-Peak Summer	$0.11332		$0.10297		$0.08248	
Peak Winter	$0.14954		$0.13748		$0.11624	
Off-Peak Winter	$0.11406		$0.10384		$0.08340	
Super Off-Peak Winter	$0.07772		$0.06750		$0.04706	
Distribution:**						
Summer	$0.05717		$0.05716		$0.01271	
Winter	$0.03894		$0.03894		$0.01271	
Transmission Rate Adjustments* (all usage)	$0.00167		$0.00167		$0.00167	
Public Purpose Programs (all usage)	$0.01828		$0.01799		$0.01757	
Competition Transition Charge (all usage)	$0.00024		$0.00024		$0.00024	
Energy Cost Recovery Amount (all usage)	($0.00429)		($0.00429)		($0.00429)	
Nuclear Decommissioning (all usage)	($0.00013)		($0.00013)		($0.00013)	
Wildfire Fund Charge (all usage)	$0.00459		$0.00459		$0.00459	
New System Generation Charge (all usage)**	$0.00186		$0.00186		$0.00186	
California Climate Credit (all usage)***	$0.00000		$0.00000		$0.00000	
Wildfire Hardening Charge (all usage)	$0.00120		$0.00109		$0.00080	
Recovery Bond Charge (all usage)	$0.01112	(I)	$0.01112	(I)	$0.01112	(I)
Recovery Bond Credit (all usage)	($0.01112)	(R)	($0.01112)	(R)	($0.01112)	(R)
Bundled Power Charge Indifference Adjustment (all usage)****	$0.02594		$0.02594		$0.02594	

* 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.
*** Only customers that qualify as Small Businesses – California Climate Credit under Rule 1 are eligible for the California Climate Credit.
**** 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 6689-E
Decision

Issued by
Meredith Allen
Vice President, Regulatory Affairs

Submitted August 30, 2022
Effective September 1, 2022
Resolution

6.2.2 PG&E

Following are the G-NR1 PG&E Gas tariffs applied in this study.

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	2.0%	4.0%
2024	2022 TDV	0.7%	7.7%
2025	2022 TDV	0.5%	5.5%
2026	2022 TDV	0.7%	5.6%
2027	2022 TDV	0.2%	5.6%
2028	2022 TDV	0.6%	5.7%
2029	2022 TDV	0.7%	5.7%
2030	2022 TDV	0.6%	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.

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