CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

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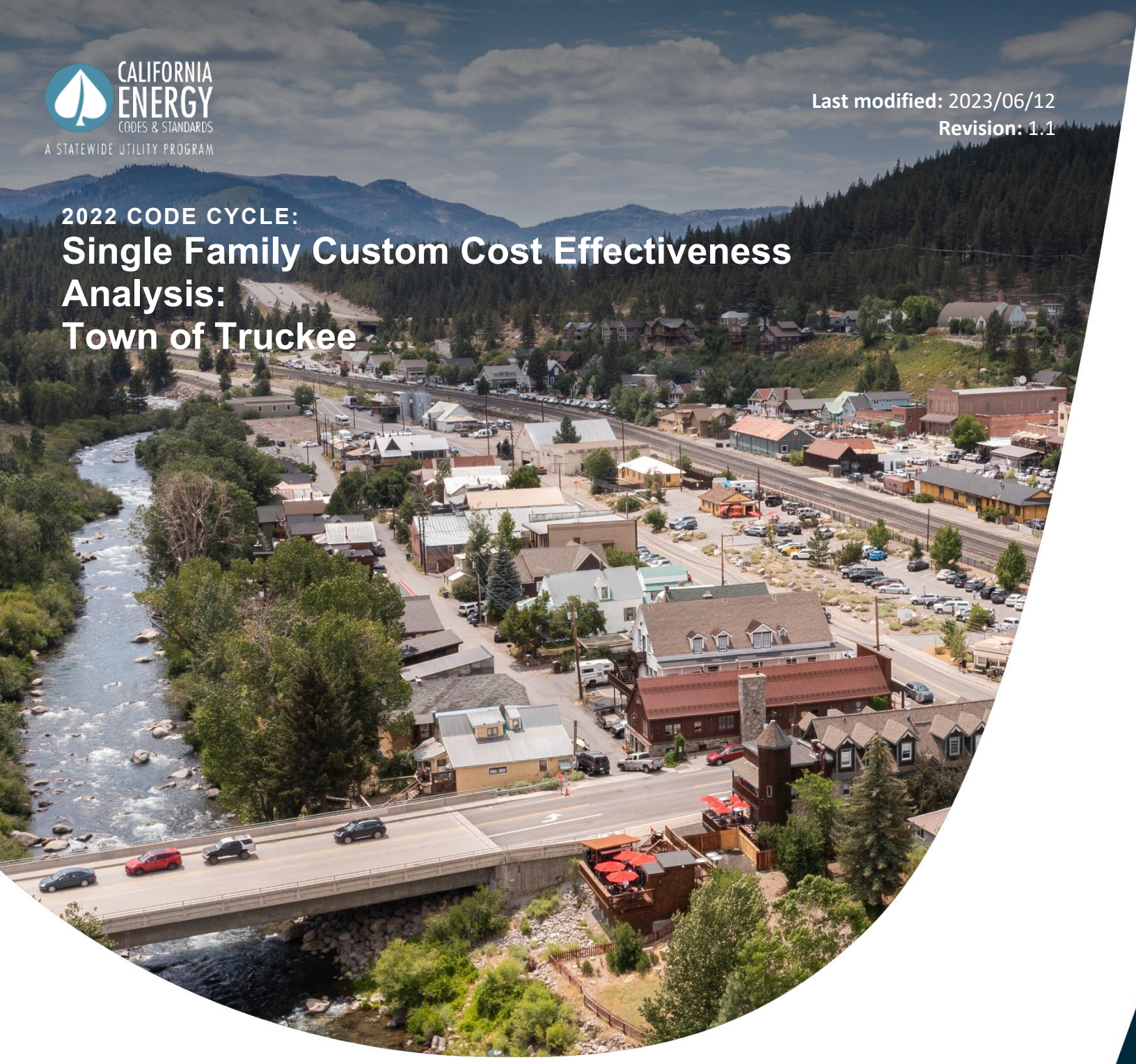

2022 CODE CYCLE:

Single Family Custom Cost Effectiveness Analysis: Town of Truckee

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Pacific Gas and Electric Company | Southern California Edison: Energy for What's Ahead | SDGE

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Acronym List

AFUE – Annual Fuel Utilization Efficiency

B/C – Benefit-to-Cost Ratio

CBECC - California Building Energy Code Compliance

CBSC - California Building Standards Commission

CEC - California Energy Commission

CPAU – City of Palo Alto Utilities

CZ – Climate Zone

GHG - Greenhouse Gas

HSPF2 – Heating Seasonal Performance Factor 2

IOU – Investor-Owned Utility

kWh – Kilowatt Hour

LADWP – Los Angeles Department of Water and Power

Liberty – Liberty Utilities

NPV – Net Present Value

PG&E – Pacific Gas & Electric (utility)

POU – Publicly Owned Utility

PV - Solar Photovoltaic

SCE – Southern California Edison (utility)

SCG – Southern California Gas (utility)

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

SEER2 – Seasonal Energy Efficiency Ratio 2

TDV - Time Dependent Valuation

TDPUD – Truckee Donner Public Utility District

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 Town of Truckee, 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 Truckee utility rates. Measure packages include combinations of energy efficiency, electrification, solar photovoltaics (PV), and battery storage with results evaluated for California Climate Zone 16.

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. All methodology and assumptions are consistent with that from the statewide analysis (Statewide Reach Code Team, 2022) with the following exceptions. Additional details are provided in the sections below.

1. Applied the CEC's Truckee weather file in place of the Blue Canyon weather file, which is the default for Climate Zone 16.
2. Updated simulations based on the latest certified CBECC-Res v2.1 software.
3. Evaluated two new packages:
    a. A high efficiency electrification scenario where an all-electric building with high efficiency heat pump equipment is compared to a mixed fuel home with high efficiency heating and cooling equipment.
    b. An electrification scenario that is compared to a mixed fuel home that is not installing air conditioning (AC).
4. Updated costs for the electrification scenarios.
5. Applied local Truckee gas and electricity rates.
6. Removed utility subsidies for gas main distribution line extension costs based on the recent California Public Utilities Commission (CPUC) ruling that eliminates these subsidies effective July 1, 2023.

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 7.2.4.
- 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 v2.1.

2.1.2 Costs

The Reach Codes Team assessed the incremental costs of the measures and packages over a 30-year lifecycle. Incremental costs represent the equipment, installation, replacement, and maintenance costs of the proposed measure relative to the 2022 Title 24 Standards minimum requirements or standard industry practices. Present value of replacement cost is included for measures with lifetimes less than the evaluation period.

In calculating On-Bill cost effectiveness, incremental first costs were assumed to be financed into a mortgage or loan with a 30-year loan term and four percent interest rate. Financing was not applied to future replacement or

maintenance costs. In calculating TDV cost effectiveness, incremental first costs were not assumed to be financed into a mortgage or loan.

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 Town of Truckee, 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. Both Truckee Donner Public Utility District (TDPUD) and Liberty Utilities (Liberty) utility rates were evaluated in addition to the impacts for permanent versus nonpermanent residents.

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

Table 1: Utility Tariffs in Town of Truckee

Electric / Gas Utility		Electricity	Natural Gas
Residential (Single Family and Detached ADU)			
TDPUD / Southwest Gas	Permanent Resident	P10	GN 10
	Nonpermanent Resident	S10	GN 15
Liberty / Southwest Gas	Permanent Resident	D-1	GN 10
	Nonpermanent Resident	D-1 (without baseline quantities	GN 15

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 Study* for further details on methodology.

3 Prototype, Measure Packages, and Costs

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. The Energy Commission's protocol for the two single family prototypes is to weight the simulated energy impacts by a factor that represents the distribution of single-story and two-story homes being built statewide. This study assumed 50 percent single-story and 50 percent two-story. "Single family" simulation results in this study are characterized according to this ratio, which is approximately equivalent to a 2,400-square foot (ft^2) house. ADU results are presented separately.

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	4	1
Window-to-Floor Area Ratio	20%	20%	20%

3.1 Measure Definitions and Costs

Measures evaluated in this study fall into two categories: those associated with general efficiency, onsite generation, and demand flexibility and those associated with building electrification. The efficiency, PV, and battery measures evaluated in this study align with those applied in the statewide study (Statewide Reach Code Team, 2022). The following describes updates to the building electrification measures applied in this study in response to the Town of Truckee's requests.

3.1.1 Space Heating

In addition to a case with minimum efficiency heating and cooling equipment, a high efficiency heat pump was also evaluated with the following specifications:

- 9.0 Heating Seasonal Performance Factor 2 (HSPF2)
- 16 Seasonal Energy Efficiency Ratio 2 (SEER2)

This case was compared to a mixed fuel base case also with a high efficiency furnace and air conditioner with the following specifications:

- 95% Annual Fuel Utilization Efficiency (AFUE)
- 16 SEER2

Another scenario was evaluated that compared an all-electric home with a minimum efficiency heat pump to a mixed fuel base case with a gas furnace but no air conditioning.

Typical HVAC incremental costs were based on material costs from the AC Wholesalers website and labor costs from 2022 RS Means. Two updates were made to the minimum efficiency equipment costs from the costs used in the statewide study (Statewide Reach Code Team, 2022). Equipment costs were increased 15 percent to account for cost increases observed on the AC Wholesalers website between the time that the costs were collected and the time of this report. Additionally, the costs were differentiated between the ADU and the single family homes. Interviews with contractors have indicated that in the Truckee area heat pumps would be upsized a half to a full ton from the capacity of an air conditioner coupled with a furnace. As a result, the single family costs assume a 2- or 2.5-ton air

conditioner and a 2.5- or 3-ton heat pump. For the ADU heating loads are substantially lower and can be satisfied with a 2-ton heat pump. Standard split air conditioning and heat pump equipment often is not available in capacities lower than 2-tons. Smaller capacity systems are available with mini-split heat pumps, but the costing in this study is based on standard heat pumps. As a result, a 2-ton air conditioner and a 2-ton heat pump were assumed for costing.

Table 3 and Table 4 present the heat pump costs used in this analysis for the single family and ADU prototypes, respectively. Incremental replacement costs are based on a 20-year lifetime for a gas furnace, 17.5-year lifetime for a gas furnace coupled with an air conditioner, and a 15-year lifetime for a heat pump. The residual value of the gas furnace and air conditioner at the end of the 30-year analysis period was accounted for to represent the remaining life of the equipment.

Table 3. Single Family Space Heating All-Electric Appliance Incremental Costs

Measure	Incremental Cost (2023 PV$)		
	First Cost	Replacement Cost	Total Lifetime Financed
Heat Pump vs Gas Furnace/Split AC			
Equipment & Installation	$496	$1,164	$1,721
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**($41)**	**$1,164**	**$1,118**
Heat Pump vs Gas Furnace (no AC)			
Equipment & Installation	$2,958	$2,697	$6,018
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**$2,421**	**$2,697**	**$5,416**
High Efficiency Heat Pump vs High Efficiency Gas Furnace/Split AC			
Equipment & Installation	$891	$1,757	$2,757
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**$354**	**$1,757**	**$2,155**

Table 4. ADU Space Heating All-Electric Appliance Incremental Costs

Measure	Incremental Cost (2023 PV$)		
	First Cost	Replacement Cost	Total Lifetime Financed
Heat Pump vs Gas Furnace/Split AC			
Equipment & Installation	($309)	$633	$286
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**($846)**	**$633**	**($317)**
Heat Pump vs Gas Furnace (no AC)			
Equipment & Installation	$2,066	$2,124	$4,445
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**$1,530**	**$2,124**	**$3,842**
High Efficiency Heat Pump vs High Efficiency Gas Furnace/Split AC			
Equipment & Installation	($195)	$1,060	$840
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**($732)**	**$1,060**	**$238**

3.1.2 Water Heating

In addition to a case with minimum efficiency water heating equipment, a high efficiency HPWH that meets the Northwest Energy Efficiency Alliance (NEEA)[1] Tier 3 rating was also evaluated. This case was compared to a mixed fuel base case with a standard efficiency gas tankless water heater.

Costs do not differ from what was applied in the statewide study (Statewide Reach Code Team, 2022) and are reported in Table 5.

[1] Based on operational challenges experienced in the past, NEEA established rating test criteria to ensure newly installed HPWHs perform adequately, especially in colder climates. The NEEA rating requires products comply with ENERGY STAR and includes requirements regarding noise and prioritizing heat pump use over supplemental electric resistance heating.

Table 5. Water Heating All-Electric Appliance Incremental Costs

Measure	Incremental Cost (2023 PV$)		
	First Cost	Replacement Cost	Total Lifetime Financed
Single Family Heat Pump Water Heater vs Gas Tankless			
Equipment & Installation	$0	$652	$652
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**($537)**	**$652**	**$49**
ADU Heat Pump Water Heater vs Gas Tankless			
Equipment & Installation	$652	$652	$1,384
Electric Service Upgrade	$43	$0	$49
In-House Gas Piping	($580)	$0	($651)
Total	**$115**	**$652**	**$781**
NEEA Tier 3 HPWH vs Federal Minimum HPWH			
Equipment	$0	$0	$0
Total	**$0**	**$0**	**$0**

3.1.3 Gas Infrastructure Costs

Utility Gas Main Extensions rules have historically categorized distribution line extensions as "refundable" costs, which are offset or subsidized by all other ratepayers. The CPUC issued a Final Decision[2] in September 2022 that will eliminate the subsidies effective July 1, 2023.[3] The subsidies that were included in the statewide analysis (Statewide Reach Code Team, 2022) have been removed as part of the results shown in this report. Table 6 presents the resultant total estimated costs for natural gas infrastructure per single family home after the subsidies are removed. This is considered a cost savings for all-electric homes.

Table 6. Single Family Total Natural Gas Infrastructure Costs

Total Cost	**$4,560**

The CPUC ruling does not impact the ADU analysis. When developing on an existing lot or in an infill scenario the existing natural gas infrastructure onsite is utilized in most cases without a need for a distribution line extension.

3.2 Measure Packages

The Reach Codes Team evaluated three packages for mixed fuel homes and seven packages for all-electric homes for each prototype and climate zone, as described below. These packages are also summarized in Table 7.

1. All-Electric Code Minimum: This package meets all the prescriptive requirements of the 2022 Title 24 Code. The prescriptive minimum package did not comply with code, and efficiency measures were added to meet minimum compliance requirements. This is compared to a mixed fuel home with air conditioning (AC).

[2] https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=496876177
[3] https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-decision-makes-ca-first-state-in-country-to-eliminate-natural-gas-subsidies

2. All-Electric Code Minimum, no AC: This is the same as the All-Electric Code Minimum Package except it's compared to a mixed fuel home without AC.
3. All-Electric High Efficiency Equipment (Preempted): Using the All-Electric Code Minimum Package as a starting point, a high efficiency heat pump space heater and heat pump water heater were applied. This is compared to a mixed fuel home with a high efficiency furnace and AC.
4. 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.
5. 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.
6. Efficiency + PV: Using the Efficiency Package as a starting point, PV capacity was added to offset most of the estimated electricity use.
7. 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.

Table 7. Summary of Evaluated Packages

	Package	Base Case	Preempted
1	All-Electric Code Minimum	2022 mixed fuel prescriptive home	No
2	All-Electric Code Minimum, no AC	2022 mixed fuel prescriptive home with no AC	No
3	All-Electric High Efficiency Equipment	2022 mixed fuel prescriptive home with high efficiency furnace & AC	Yes
4	Efficiency Only	2022 mixed fuel prescriptive home	No
5	Efficiency + NEEA	2022 mixed fuel prescriptive home	Yes
6	Efficiency + PV	2022 mixed fuel prescriptive home	No
7	Efficiency + PV + Battery	2022 mixed fuel prescriptive home	No

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 Town of Truckee 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.

4.1 Residential Occupancies

Table 8 through Table 11 show results for the single family and ADU prototypes, respectively, for permanent residents under TDPUD rates. Table 12 through Table 15 show results for the single family and ADU prototypes, respectively, for nonpermanent residents under TDPUD rates. Table 16 through Table 19 show results for the single family and ADU prototypes, respectively, for permanent residents under Liberty rates. Table 20 through Table 23 show results for the single family and ADU prototypes, respectively, for nonpermanent residents under Liberty rates. Results are shown for all the evaluated packages. All packages are cost-effective based on TDV except for the all-electric Code Minimum – No AC case in all cases and the all-electric High Efficiency Equipment case for the ADU only. All packages are On-Bill cost-effective with the exception of the mixed fuel Efficiency + PV + Battery case for the single family permanent resident scenarios.

Table 8: TDPUD Permanent Resident 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	4.3	-6,822	652	2.4	$339	$18,819	($3,630)	($2,913)	>1	$21,731	>1	$3,033
Code Minimum – No AC	4.3	-6,822	652	2.4	$339	$18,819	($1,705)	$1,434	13.1	$17,384	0.3	($1,077)
High Efficiency Equipment	15.9	-5,461	556	2.1	$341	$17,286	($3,772)	($1,826)	>1	$19,112	>1	$4,203
Efficiency Only	7.9	-6,431	652	2.4	$397	$20,197	($2,316)	($1,437)	>1	$21,634	>1	$4,401
Efficiency + NEEA	8.3	-6,305	652	2.5	$416	$20,642	($2,316)	($1,437)	>1	$22,079	>1	$4,715
Efficiency + PV	7.9	1,930	652	2.8	$1,640	$49,632	$10,921	$16,266	3.1	$33,366	1.9	$12,992
Efficiency + PV + Battery	16.8	1,778	652	3.2	$1,617	$49,097	$16,377	$27,767	1.8	$21,330	1.7	$16,797
Mixed Fuel												
Efficiency Only	16.3	167	172	1.0	$379	$11,789	$3,344	$3,755	3.1	$8,033	3.5	$8,464
Efficiency + PV	16.3	1,930	172	1.1	$641	$17,996	$6,136	$7,489	2.4	$10,507	2.6	$10,269
Efficiency + PV + Battery	24.6	1,847	167	1.5	$617	$17,353	$11,166	$18,524	0.9	($1,172)	1.8	$13,724

Table 9: TDPUD Permanent Resident Single Family Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$581	$1,353	1,930	652
All-Electric				
Code Minimum	$1,595	$0	8,748	0
Code Minimum – No AC	$1,595	$0	8,748	0
High Efficiency Equipment	$1,393	$0	7,392	0
Efficiency Only	$1,537	$0	8,364	0
Efficiency + NEEA	$1,518	$0	8,232	0
Efficiency + PV	$294	$0	0	0
Efficiency + PV + Battery	$317	$0	156	0
Mixed Fuel				
Efficiency Only	$556	$999	1,764	480
Efficiency + PV	$294	$999	0	480
Efficiency + PV + Battery	$307	$1,010	84	485

Table 10: TDPUD Permanent Resident 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	-2,630	200	0.7	$36	$4,269	($2,798)	($2,509)	>1	$6,778	1.2	$310
Code Minimum – No AC	0.4	-2,630	200	0.7	$36	$4,269	($307)	$2,431	1.8	$1,838	0.0	($4,323)
High Efficiency Equipment	9.6	-2,176	174	0.6	$13	$3,577	($2,569)	($1,173)	>1	$4,750	0.9	($79)
Efficiency Only	13.0	-2,066	200	0.8	$120	$6,254	($3,065)	($1,665)	>1	$7,919	>1	$2,972
Efficiency + NEEA	14.0	-1,971	200	0.8	$134	$6,590	($3,065)	($1,665)	>1	$8,255	>1	$3,258
Efficiency + PV	13.0	3,980	200	1.0	$1,019	$27,541	$6,508	$11,138	2.5	$16,403	2.0	$9,914
Efficiency + PV + Battery	21.4	3,921	200	1.4	$1,010	$27,334	$12,024	$22,719	1.2	$4,615	1.6	$12,565
Mixed Fuel												
Efficiency Only	12.7	-1,187	164	0.7	$158	$6,405	$352	$1,539	4.2	$4,866	2.4	$2,040
Efficiency + PV	12.7	3,980	164	0.9	$926	$24,598	$8,534	$12,481	2.0	$12,117	1.7	$7,873
Efficiency + PV + Battery	21.0	3,942	164	1.3	$920	$24,463	$14,053	$24,066	1.0	$397	1.5	$9,934

Table 11: TDPUD Permanent Resident ADU Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$886	$427	3,980	200
All-Electric				
Code Minimum	$1,277	$0	6,612	0
Code Minimum – No AC	$1,209	$0	6,612	0
High Efficiency Equipment	$1,209	$0	6,156	0
Efficiency Only	$1,193	$0	6,048	0
Efficiency + NEEA	$1,179	$0	5,952	0
Efficiency + PV	$294	$0	0	0
Efficiency + PV + Battery	$303	$0	60	0
Mixed Fuel				
Efficiency Only	$1,062	$93	5,172	36
Efficiency + PV	$294	$93	0	36
Efficiency + PV + Battery	$300	$93	36	36

Table 12: TDPUD Nonpermanent Resident 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	4.3	-6,822	652	2.4	$318	$19,276	($3,630)	($2,913)	>1	$22,189	>1	$3,033
Code Minimum – No AC	4.3	-6,822	652	2.4	$318	$19,276	($1,705)	$1,434	13.4	$17,842	0.3	($1,077)
High Efficiency Equipment	15.9	-5,461	556	2.1	$230	$14,646	($3,772)	($1,826)	>1	$16,473	>1	$4,203
Efficiency Only	7.9	-6,431	652	2.4	$397	$20,197	($2,316)	($1,437)	>1	$21,634	>1	$4,401
Efficiency + NEEA	8.3	-6,305	652	2.5	$416	$20,642	($2,316)	($1,437)	>1	$22,079	>1	$4,715
Efficiency + PV	7.9	1,930	652	2.8	$1,640	$49,632	$10,921	$16,266	3.1	$33,366	1.9	$12,992
Efficiency + PV + Battery	16.8	1,778	652	3.2	$1,617	$49,097	$16,377	$27,767	1.8	$21,330	1.7	$16,797
Mixed Fuel												
Efficiency Only	16.3	167	172	1.0	$408	$12,692	$3,344	$3,755	3.4	$8,936	3.5	$8,464
Efficiency + PV	16.3	1,930	172	1.1	$706	$19,752	$6,136	$7,489	2.6	$12,263	2.6	$10,269
Efficiency + PV + Battery	24.6	1,847	167	1.5	$680	$19,036	$11,166	$18,524	1.0	$511	1.8	$13,724

Table 13: TDPUD Nonpermanent Resident Single Family Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$621	$1,472	1,930	652
All-Electric				
Code Minimum	$1,774	$0	8,748	0
Code Minimum – No AC	$1,774	$0	8,748	0
High Efficiency Equipment	$1,544	$0	7,392	0
Efficiency Only	$1,708	$0	8,364	0
Efficiency + NEEA	$1,686	$0	8,232	0
Efficiency + PV	$294	$0	0	0
Efficiency + PV + Battery	$320	$0	156	0
Mixed Fuel				
Efficiency Only	$592	$1,092	1,764	480
Efficiency + PV	$294	$1,092	0	480
Efficiency + PV + Battery	$308	$1,104	84	485

Table 14: TDPUD Nonpermanent Resident 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	-2,630	200	0.7	$23	$4,275	($2,798)	($2,509)	>1	$6,783	1.2	$310
Code Minimum – No AC	0.4	-2,630	200	0.7	$23	$4,275	($307)	$2,431	1.8	$1,843	0.0	($4,323)
High Efficiency Equipment	9.6	-2,176	174	0.6	($42)	$2,286	($2,569)	($1,173)	>1	$3,459	0.9	($79)
Efficiency Only	13.0	-2,066	200	0.8	$118	$6,531	($3,065)	($1,665)	>1	$8,196	>1	$2,972
Efficiency + NEEA	14.0	-1,971	200	0.8	$134	$6,914	($3,065)	($1,665)	>1	$8,579	>1	$3,258
Efficiency + PV	13.0	3,980	200	1.0	$1,140	$30,741	$6,508	$11,138	2.8	$19,603	2.0	$9,914
Efficiency + PV + Battery	21.4	3,921	200	1.4	$1,130	$30,505	$12,024	$22,719	1.3	$7,787	1.6	$12,565
Mixed Fuel												
Efficiency Only	12.7	-1,187	164	0.7	$164	$6,803	$352	$1,539	4.4	$5,263	2.4	$2,040
Efficiency + PV	12.7	3,980	164	0.9	$1,038	$27,492	$8,534	$12,481	2.2	$15,011	1.7	$7,873
Efficiency + PV + Battery	21.0	3,942	164	1.3	$1,031	$27,339	$14,053	$24,066	1.1	$3,273	1.5	$9,934

Table 15: TDPUD Nonpermanent Resident ADU Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$967	$468	3,980	200
All-Electric				
Code Minimum	$1,412	$0	6,612	0
Code Minimum – No AC	$1,412	$0	6,612	0
High Efficiency Equipment	$1,335	$0	6,156	0
Efficiency Only	$1,317	$0	6,048	0
Efficiency + NEEA	$1,300	$0	5,952	0
Efficiency + PV	$294	$0	0	0
Efficiency + PV + Battery	$304	$0	60	0
Mixed Fuel				
Efficiency Only	$1,168	$103	5,172	36
Efficiency + PV	$294	$103	0	36
Efficiency + PV + Battery	$301	$103	36	36

Table 16: Liberty Permanent Resident 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	4.3	-6,822	652	2.4	$286	$17,573	($3,630)	($2,913)	>1	$20,486	>1	$3,033
Code Minimum – No AC	4.3	-6,822	652	2.4	$286	$17,573	($1,705)	$1,434	12.3	$16,139	0.3	($1,077)
High Efficiency Equipment	15.9	-5,461	556	2.1	$310	$16,530	($3,772)	($1,826)	>1	$18,357	>1	$4,203
Efficiency Only	7.9	-6,431	652	2.4	$351	$19,099	($2,316)	($1,437)	>1	$20,536	>1	$4,401
Efficiency + NEEA	8.3	-6,305	652	2.5	$369	$19,533	($2,316)	($1,437)	>1	$20,970	>1	$4,715
Efficiency + PV	7.9	1,930	652	2.8	$1,626	$49,298	$10,921	$16,266	3.0	$33,032	1.9	$12,992
Efficiency + PV + Battery	16.8	1,778	652	3.2	$1,602	$48,745	$16,377	$27,767	1.8	$20,978	1.7	$16,797
Mixed Fuel												
Efficiency Only	16.3	167	172	1.0	$379	$11,787	$3,344	$3,755	3.1	$8,031	3.5	$8,464
Efficiency + PV	16.3	1,930	172	1.1	$640	$17,974	$6,136	$7,489	2.4	$10,485	2.6	$10,269
Efficiency + PV + Battery	24.6	1,847	167	1.5	$616	$17,331	$11,166	$18,524	0.9	($1,193)	1.8	$13,724

Table 17: Liberty Permanent Resident Single Family Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$342	$1,353	1,930	652
All-Electric				
Code Minimum	$1409	$0	8,748	0
Code Minimum – No AC	$1409	$0	8,748	0
High Efficiency Equipment	$1186	$0	7,392	0
Efficiency Only	$1344	$0	8,364	0
Efficiency + NEEA	$1326	$0	8,232	0
Efficiency + PV	$69	$0	0	0
Efficiency + PV + Battery	$93	$0	156	0
Mixed Fuel				
Efficiency Only	$317	$999	1,764	480
Efficiency + PV	$56	$999	0	480
Efficiency + PV + Battery	$68	$1010	84	485

Table 18: Liberty Permanent Resident 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	-2,630	200	0.7	$38	$4,300	($2,798)	($2,509)	>1	$6,808	1.2	$310
Code Minimum – No AC	0.4	-2,630	200	0.7	$38	$4,300	($307)	$2,431	1.8	$1,868	0.0	($4,323)
High Efficiency Equipment	9.6	-2,176	174	0.6	$109	$5,852	($2,569)	($1,173)	>1	$7,025	0.9	($79)
Efficiency Only	13.0	-2,066	200	0.8	$121	$6,278	($3,065)	($1,665)	>1	$7,943	>1	$2,972
Efficiency + NEEA	14.0	-1,971	200	0.8	$135	$6,613	($3,065)	($1,665)	>1	$8,278	>1	$3,258
Efficiency + PV	13.0	3,980	200	1.0	$1,017	$27,495	$6,508	$11,138	2.5	$16,357	2.0	$9,914
Efficiency + PV + Battery	21.4	3,921	200	1.4	$1,008	$27,288	$12,024	$22,719	1.2	$4,570	1.6	$12,565
Mixed Fuel												
Efficiency Only	12.7	-1,187	164	0.7	$153	$6,295	$352	$1,539	4.1	$4,756	2.4	$2,040
Efficiency + PV	12.7	3,980	164	0.9	$924	$24,551	$8,534	$12,481	2.0	$12,071	1.7	$7,873
Efficiency + PV + Battery	21.0	3,942	164	1.3	$918	$24,417	$14,053	$24,066	1.0	$351	1.5	$9,934

Table 19: Liberty Permanent Resident ADU Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$646	$427	3,980	200
All-Electric				
Code Minimum	$1,035	$0	6,612	0
Code Minimum – No AC	$968	$0	6,612	0
High Efficiency Equipment	$968	$0	6,156	0
Efficiency Only	$952	$0	6,048	0
Efficiency + NEEA	$938	$0	5,952	0
Efficiency + PV	$56	$0	0	0
Efficiency + PV + Battery	$65	$0	60	0
Mixed Fuel				
Efficiency Only	$827	$93	5,172	36
Efficiency + PV	$56	$93	0	36
Efficiency + PV + Battery	$62	$93	36	36

Table 20: Liberty Nonpermanent Resident 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	4.3	-6,822	652	2.4	$298	$18,806	($3,630)	($2,913)	>1	$21,718	>1	$3,033
Code Minimum – No AC	4.3	-6,822	652	2.4	$298	$18,806	($1,705)	$1,434	13.1	$17,371	0.3	($1,077)
High Efficiency Equipment	15.9	-5,461	556	2.1	$310	$16,530	($3,772)	($1,826)	>1	$18,357	>1	$4,203
Efficiency Only	7.9	-6,431	652	2.4	$366	$20,400	($2,316)	($1,437)	>1	$21,838	>1	$4,401
Efficiency + NEEA	8.3	-6,305	652	2.5	$387	$20,915	($2,316)	($1,437)	>1	$22,352	>1	$4,715
Efficiency + PV	7.9	1,930	652	2.8	$1,803	$54,452	$10,921	$16,266	3.3	$38,187	1.9	$12,992
Efficiency + PV + Battery	16.8	1,778	652	3.2	$1,777	$53,833	$16,377	$27,767	1.9	$26,067	1.7	$16,797
Mixed Fuel												
Efficiency Only	16.3	167	172	1.0	$408	$12,703	$3,344	$3,755	3.4	$8,948	3.5	$8,464
Efficiency + PV	16.3	1,930	172	1.1	$712	$19,885	$6,136	$7,489	2.7	$12,396	2.6	$10,269
Efficiency + PV + Battery	24.6	1,847	167	1.5	$685	$19,163	$11,166	$18,524	1.0	$639	1.8	$13,724

Table 21: Liberty Nonpermanent Resident Single Family Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$388	$1,472	1,930	652
All-Electric				
Code Minimum	$1,561	$0	8,748	0
Code Minimum – No AC	$1,561	$0	8,748	0
High Efficiency Equipment	$1,186	$0	7,392	0
Efficiency Only	$1,494	$0	8,364	0
Efficiency + NEEA	$1,472	$0	8,232	0
Efficiency + PV	$56	$0	0	0
Efficiency + PV + Battery	$82	$0	156	0
Mixed Fuel				
Efficiency Only	$359	$1,092	1,764	480
Efficiency + PV	$56	$1,092	0	480
Efficiency + PV + Battery	$70	$1,104	84	485

Table 22: Liberty Nonpermanent Resident 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	-2,630	200	0.7	$15	$4,093	($2,798)	($2,509)	>1	$6,602	1.2	$310
Code Minimum – No AC	0.4	-2,630	200	0.7	$15	$4,093	($307)	$2,431	1.7	$1,662	0.0	($4,323)
High Efficiency Equipment	9.6	-2,176	174	0.6	$109	$5,852	($2,569)	($1,173)	>1	$7,025	0.9	($79)
Efficiency Only	13.0	-2,066	200	0.8	$112	$6,389	($3,065)	($1,665)	>1	$8,054	>1	$2,972
Efficiency + NEEA	14.0	-1,971	200	0.8	$129	$6,779	($3,065)	($1,665)	>1	$8,444	>1	$3,258
Efficiency + PV	13.0	3,980	200	1.0	$1,152	$31,016	$6,508	$11,138	2.8	$19,878	2.0	$9,914
Efficiency + PV + Battery	21.4	3,921	200	1.4	$1,142	$30,776	$12,024	$22,719	1.4	$8,057	1.6	$12,565
Mixed Fuel												
Efficiency Only	12.7	-1,187	164	0.7	$161	$6,721	$352	$1,539	4.4	$5,181	2.4	$2,040
Efficiency + PV	12.7	3,980	164	0.9	$1,049	$27,767	$8,534	$12,481	2.2	$15,286	1.7	$7,873
Efficiency + PV + Battery	21.0	3,942	164	1.3	$1,043	$27,611	$14,053	$24,066	1.1	$3,545	1.5	$9,934

Table 23: Liberty Nonpermanent Resident ADU Energy Cost and Use Summary

Case	Annual Energy Costs		Annual Energy Usage	
	(kWh)	(Therms)	(kWh)	(Therms)
Prescriptive Code Baseline	$741	$468	3,980	200
All-Electric				
Code Minimum	$1,193	$0	6,612	0
Code Minimum – No AC	$1,193	$0	6,612	0
High Efficiency Equipment	$968	$0	6,156	0
Efficiency Only	$1,494	$0	6,048	0
Efficiency + NEEA	$1,472	$0	5,952	0
Efficiency + PV	$56	$0	0	0
Efficiency + PV + Battery	$82	$0	60	0
Mixed Fuel				
Efficiency Only	$945	$103	5,172	36
Efficiency + PV	$56	$103	0	36
Efficiency + PV + Battery	$63	$103	36	36

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 24, Table 25 (all-electric), and Table 26 (mixed fuel) summarize results for each prototype and depict the efficiency EDR2 compliance margins achieved for each package in Climate Zone 16. The cost-effective outcome did not differ between TDPUD and Liberty electricity tariffs, but there were minor differences between permanent and nonpermanent resident rates. 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, TDPUD, and Liberty electricity rates for both the single family and ADU prototypes. The code-compliant all-electric building resulted in lower first year utility cost for the single family home and ADU. Combining higher capacity PV systems and all-electric construction further reduces 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 21.0 and 24.6.

Table 24: Summary of Single Family All-Electric Efficiency EDR2 Margins and Cost-Effectiveness

Residency	Code Min	Code Min No AC	High Eff	EE	EE+PV	EE+PV/Batt
TDPUD Permanent	4.3	4.3	15.9	7.9	7.9	16.8
TDPUD Nonpermanent	4.3	4.3	15.9	7.9	7.9	16.8
Liberty Permanent	4.3	4.3	15.9	7.9	7.9	16.8
Liberty Nonpermanent	4.3	4.3	15.9	7.9	7.9	16.8

Table 25: Summary of ADU All-Electric Efficiency EDR2 Margins and Cost-Effectiveness

Residency	Code Min	Code Min No AC	High Eff	EE	EE+PV	EE+PV/Batt
TDPUD Permanent	0.4	0.4	9.6	13.0	13.0	21.4
TDPUD Nonpermanent	0.4	0.4	9.6	13.0	13.0	21.4
Liberty Permanent	0.4	0.4	9.6	13.0	13.0	21.4
Liberty Nonpermanent	0.4	0.4	9.6	13.0	13.0	21.4

Table 26: Summary of Mixed Fuel Efficiency EDR2 Margins and Cost-Effectiveness

	Single Family			ADU		
Residency	**EE**	**EE+PV**	**EE+PV/ Batt**	**EE**	**EE+PV**	**EE+PV/ Batt**
TDPUD Permanent	16.3	16.3	24.6	12.7	12.7	21.0
TDPUD Nonpermanent	16.3	16.3	24.6	12.7	12.7	21.0
Liberty Permanent	16.3	16.3	24.6	12.7	12.7	21.0
Liberty Nonpermanent	16.3	16.3	24.6	12.7	12.7	21.0

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

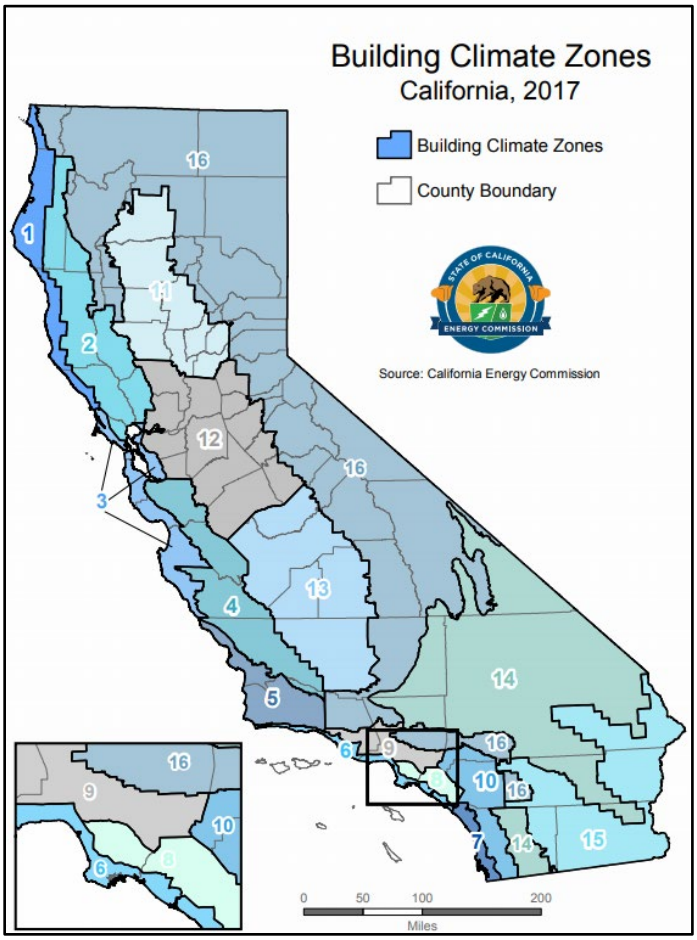
Statewide Reach Code Team. (2022, September). *2022 Cost-Effectiveness Study: Single Family New Construction.* Prepared for Pacific Gas and Electric Company. Prepared by Frontier Energy. Retrieved from https://localenergycodes.com/download/1240/file_path/fieldList/2022%20Single%20Family%20NewCon%20Cost-eff%20Study.docx

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 Town of Truckee tariffs detailed below to determine the On-Bill savings for each package.

7.2.1 Truckee Donner Public Utility District

Following are the TDPUD electricity tariffs applied in this study, P10 for permanent residents and S10 for non-permanent residents. The 2023 rates were used.[4] A net energy metering arrangement was evaluated that credits any net generation monthly based on the appropriate rate per the tariff.[5]

	2022	2023
Permanent Residents		
Customer Charge (per month)	$21.33	$24.53
Energy Charge (per kwh)	$0.1417	$0.1486
Non-Permanent Residents		
Customer Charge (per month)	$21.33	$24.53
Energy Charge (per kwh)	$0.1623	$0.1690

7.2.2 Liberty Utilities

Following are details on the Liberty Utility electricity tariff, D-1[6], applied in this study. For nonpermanent residents the rate for quantities in excess of baseline was applied to all energy use. A net energy metering arrangement was evaluated that credits any net generation monthly based on the appropriate rate per the tariff. Any generation credits do not offset the monthly minimum charge.[7] The CPUC Reimbursement Surcharge is applied monthly only when net kWh is positive.

A more recent Liberty tariff is available effective January 2023. The updated rates are slightly lower, about 6 percent, for both baseline and excess quantities than the January 2022 rates applied in this study. Applying the 2023 rates in place of the 2022 rates will not have an appreciable difference on the results presented in this report.

[4] https://www.tdpud.org/customer-service/billing-options/rates
[5] https://www.tdpud.org/home/showpublisheddocument/200/636225809920030000
[6] https://california.libertyutilities.com/uploads/CalPeco%20Tariffs/Schedule%20No%20D-1.pdf
[7] https://california.libertyutilities.com/uploads/NEM_NEMA%20PDF%207-13-17.pdf

SCHEDULE NO. D-1
DOMESTIC SERVICE

APPLICABILITY

This rate schedule is applicable to all domestic power service to separately metered single family dwellings and individual living units of multi-unit complexes, where such units are metered by the Utility.

TERRITORY

Entire California Service Area.

RATES

Customer Charge
Per meter, per month $9.67

Energy Charges (Per kWh)

A. For Quantities up to and Including Baseline Quantities (See Special Condition 2):

Distribution	Generation [1]	Vegetation [2]	SIP [4]	PPP [5]		BRRBA [7]	Total	
$0.08197	$0.04371	$0.00563	$0.00072	$0.00270	(R)	$0.01178	$0.14651	(R)

B. For Quantities in Excess of Baseline Quantities (See Special Condition 2):

$0.08197	$0.06751	$0.00563	$0.00072	$0.00270	(R)	$0.01178	$0.17031	(R)

Other Energy Charges (Per kWh)
Surcharges[8] $0.00160

Late Charge
1% on any amount 45 days in arrears from previous billings

Minimum Charge
The per meter, per month Customer Charge

1. Generation – Charge includes the Energy Cost Adjustment Clause Billing Factor as described in the Preliminary Statement, Number 6.
2. Vegetation – Charge to recover amounts in the Vegetation Management Balancing Account, as described in the Preliminary Statement, Number 18.
3. CEMA – Charge to recover amounts in the Catastrophic Event Memorandum Account as approved in D.16-12-024 and as described in the Preliminary Statement, Number 13.A.
4. SIP – Charge to recover the costs of the Solar Initiative Program as described in the Preliminary Statement, Number 21.
5. PPP – Charge to recover Public Purpose Programs funding energy efficiency and low-income assistance programs described in Preliminary Statement, Numbers 10, 17 and 19.
6. GRCMA – Charge to recover amounts in the General Rate Case Memorandum Account as described in the Preliminary Statement, Number 13.I.
7. BRRBA – Charge to recover amounts in the Base Revenue Requirement Balancing Account as described in the Preliminary Statement Number 8.
8. Surcharges – Charge to recover the Public Utilities Commission Reimbursement Surcharge as described in Rate Schedule RF and the Energy Commission Surcharge that is established by the California Energy Commission.

(Continued)

Issued by
Advice Letter No. 180-E-A — Christopher G. Alario (Name) — Date Filed November 1, 2021
Decision No. D.21-10-023 — President (Title) — Effective January 1, 2022

SCHEDULE NO. D-1
DOMESTIC SERVICE
(Continued)

SPECIAL CONDITIONS

1. Service hereunder shall only be single-phase as described in Rule 2, Description of Service, and supplied to electric motors no larger than 10 horsepower.

2. Baseline Quantities. Each residential customer in a single-family dwelling consisting of a permanent residential unit is eligible for a baseline quantity of electricity which is necessary to supply a significant portion of the reasonable energy needs of the average residential customer. Residential Customer means a customer who is eligible for service on a domestic service rate schedule, and excludes general, commercial, industrial, and every other category of customer.

   A. Eligibility. Baseline quantities are available only to separately metered, permanent Residential Customers. Non-permanent Customers such as recreational or vacation home customers are not eligible. The Utility may require Customers to complete and file with it an appropriate Declaration of Eligibility for baseline quantities. The Utility may also require proof of permanent residency, such as voter registration or property tax exemption. The penalty for presenting false information in this declaration shall be any legal action which the Utility might elect to pursue.

   B. Different Baseline Quantities. Different baseline quantities are established for a) basic use, and b) all-electric only or electric space heat or both, as follows:

	kWh Per Day Quantity[1]	
Season	Basic Use (E02, E06)	All-Electric Use (E04, E08)
Summer[2]	14.5 (I)	16.4 (R)
Winter[3]	19.0 (I)	31.4 (R)

1. Per day baseline quantities for each monthly billing cycle shall be equal to the daily baseline quantities (including Medical Baseline Quantities as appropriate) multiplied by the number of days in the billing cycle.
2. Summer baseline quantities will be used for six consecutive billing periods beginning on or after May 1.
3. Winter baseline quantities will be used for six consecutive billing periods beginning on or after November 1.

(Continued)

7.2.3 Southwest Gas

The monthly gas rate in $/therm applied in this analysis is shown in Table 27.[8] The monthly basic service charge was based on the most current tariff statements. Daily baseline quantities were applied for Truckee.[9] A Franchise Fee of

[8] https://www.swgas.com/en/california-rates-and-regulation
[9] https://www.swgas.com/7200000202051/GS-10_GN-10_SLT-10---GRC_Eff-April-1-2021.pdf

2.5% was applied to the total monthly bill. Lastly, the annual California Climate Credit of $49.44 for 2022 was applied.[10]

The gas rates were developed based on the latest available gas rate for May 2023 and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from Southwest Gas monthly residential tariffs for the Northern California service area between 2012 and 2023. 12-month curves were created from monthly gas rates for each of the eleven years. The 11 annual curves were then averaged to arrive at an average normalized annual curve. This was conducted separately for baseline and excess energy rates. The costs presented in Table 27 were then derived by establishing the May baseline and excess rates from the latest 2023 tariff as a reference point, and then using the normalized curve to estimate the cost for the remaining months relative to the May rates.

Table 27: Southwest Gas Monthly Gas Rate ($/therm)

Month	GN-10		GN-15	
	Baseline	Excess	Baseline	Excess
Jan	$2.02019	$2.14082	$2.20110	$2.20110
Feb	$2.00848	$2.12956	$2.19081	$2.19081
Mar	$1.96729	$2.08833	$2.14969	$2.14969
Apr	$1.86074	$1.98597	$2.04682	$2.04682
May	$1.90459	$2.02910	$2.09002	$2.09002
June	$1.92006	$2.04429	$2.06172	$2.06172
July	$1.94063	$2.06425	$2.12536	$2.12536
Aug	$1.93890	$2.06235	$2.12333	$2.12333
Sept	$1.94525	$2.06882	$2.12956	$2.12956
Oct	$1.95151	$2.07456	$2.13538	$2.13538
Nov	$2.00846	$2.12969	$2.19059	$2.19059
Dec	$2.04239	$2.16289	$2.22361	$2.22361

[10] https://www.cpuc.ca.gov/climatecredit/

STATEMENT OF RATES

RATES APPLICABLE TO NORTHERN CALIFORNIA SERVICE AREA [1] [2]

Schedule No. and Type of Charge	Margin	Charges [3] and Adjustments	Subtotal Gas Usage Rate	Other Surcharges CPUC	Other Surcharges PPP	Gas Cost	Effective Sales Rate	
GN-10-Residential Gas Service								
Basic Service Charge	$5.75						$5.75	
Cost per Therm								
Baseline Quantities	$ .78902	$ .34019	$1.12921	$ .00300	$ .08786	$ .51120	$1.73127	R
Tier II	.91425	.34019	1.25444	.00300	.08786	.51120	1.85650	R
GN-12-CARE Residential Gas Service								
Basic Service Charge	$4.00						$4.00	
Cost per Therm								
Baseline Quantities	$ .43504	$ .34019	$ .77523	$ .00300	$ .06533	$ .51120	$1.38066	R
Tier II	.53523	.34019	.87542	.00300	.06533	.51120	1.48084	R
GN-15-Secondary Residential Gas Service								
Basic Service Charge	$6.00						$6.00	
Cost per Therm	$ .97510	$ .34019	$1.31529	$ .00300	$ .08786	$ .51120	$1.91735	R
GN-20-Multi-Family Master-Metered Gas Service								
Basic Service Charge	$25.00						$25.00	
Cost per Therm								
Baseline Quantities	$ .78902	$ .34019	$1.12921	$ .00300	$ .08786	$ .51120	$1.73127	R
Tier II	.91425	.34019	1.25444	.00300	.08786	.51120	1.85650	R
GN-25-Multi-Family Master-Metered Gas Service-Submetered								
Basic Service Charge	$25.00						$25.00	
Cost per Therm								
Baseline Quantities	$ .78902	$ .34019	$1.12921	$ .00300	$ .08786	$ .51120	$1.73127	R
Tier II	.91425	.34019	1.25444	.00300	.08786	.51120	1.85650	R
Submetered Discount per Occupied Space	($ 9.33)						($ 9.33)	
GN-35-Agriculture Employee Housing & Nonprofit Group Living Facility Gas Service								
Basic Service Charge	$ 8.80						$ 8.80	
Cost per Therm								
First 100	$ .33590	$ .34019	$ .67609	$ .00300	$ .06533	$ .51120	$1.28151	R
Next 500	.19870	.34019	.53889	.00300	.06533	.51120	1.14431	R
Next 2,400	.08216	.34019	.42235	.00300	.06533	.51120	1.02777	R
Over 3,000	(.09171)	.34019	.24848	.00300	.06533	.51120	.85391	R
GN-40-Core General Gas Service (non-Covered Entities)								
Basic Service Charge	$11.00						$11.00	
Transportation Service Charge	$780.00						$780.00	
Cost per Therm								
First 100	$ .66509	$ .34019	$1.00528	$ .00300	$ .08786	$ .51120	$1.60734	R
Next 500	.49359	.34019	.83378	.00300	.08786	.51120	1.43584	R
Next 2,400	.34791	.34019	.68810	.00300	.08786	.51120	1.29016	R
Over 3,000	.13058	.34019	.47077	.00300	.08786	.51120	1.07283	R

Advice Letter No. 1258
Decision No.

Issued by
Amy L. Timperley
Chief Regulatory Officer

Date Filed April 28, 2023
Effective May 1, 2023
Resolution No.

The baseline daily quantity in therms for all individually-metered residential uses are:

Climate Zone	Summer Season (May - Oct.)	Winter Off-Peak (Spring/Fall) (Mar., Apr. & Nov.)	Winter Peak (Dec.-Feb)
Barstow	0.39	1.12	2.11
Needles	0.23	0.53	0.92
Victorville	0.39	1.25	2.04

	Summer Season (June - Oct.)	Winter Off-Peak (Spring/Fall) (Apr., May & Nov.)	Winter Peak (Dec.-March)
Big Bear	0.46	1.45	2.83
No. Lake Tahoe	0.66	2.11	3.09
So. Lake Tahoe	0.72	2.04	3.09
Truckee	0.72	2.17	3.55

7.2.4 Fuel Escalation Rates

7.2.4.1 Residential Occupancies

The average annual escalation rates in Table 28 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 the utilities that serve Truckee, therefore electricity escalation rates for PG&E and statewide natural gas escalation rates were applied.

Table 28: 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.

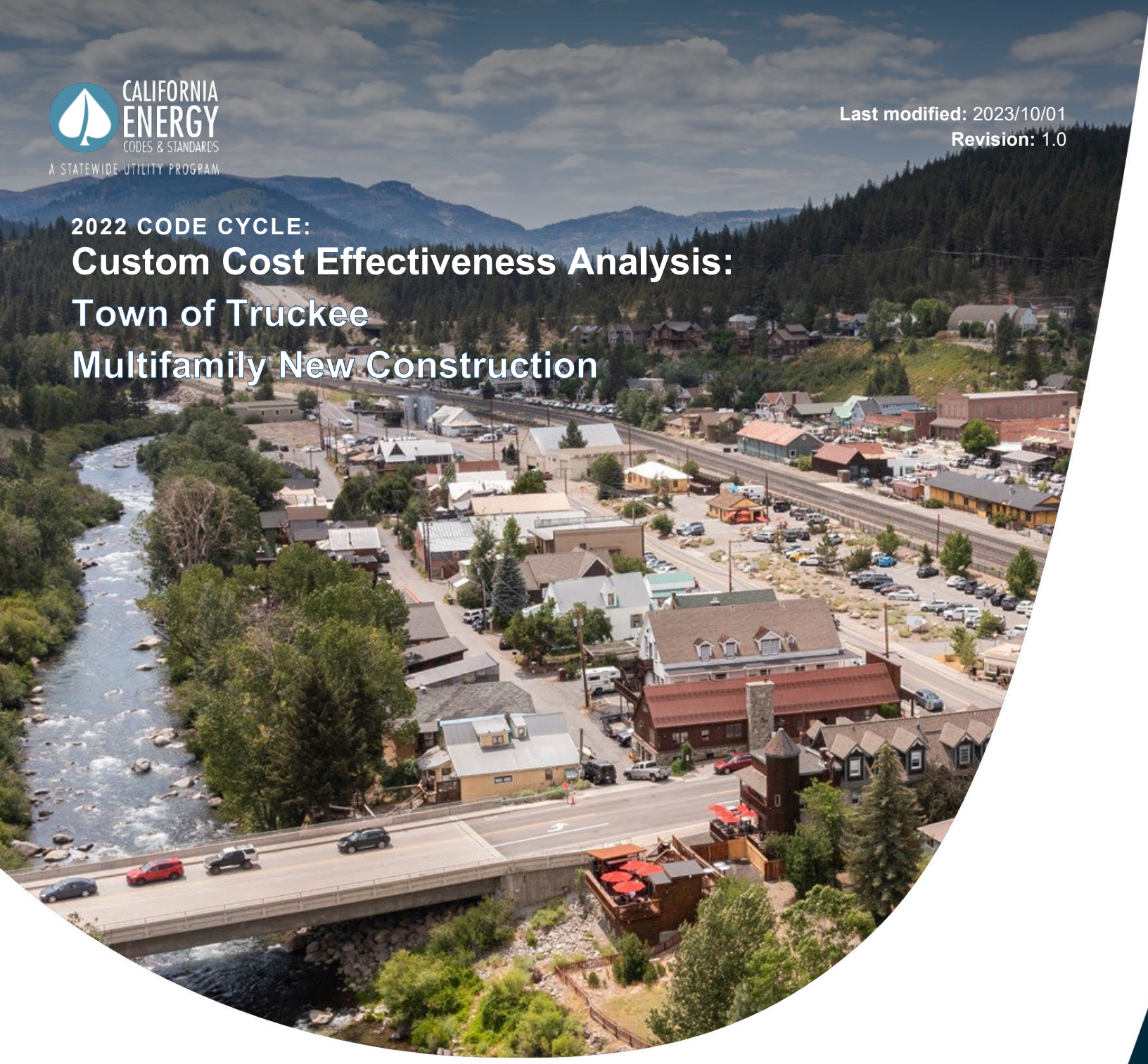
Visit LocalEnergyCodes.com to access our resources and sign up for newsletters

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

Last modified: 2023/10/01
Revision: 1.0



2022 CODE CYCLE:

Custom Cost Effectiveness Analysis:
Town of Truckee
Multifamily New Construction

Prepared by:
Frontier Energy, Inc
Misti Bruceri & Associates, LLC

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

Pacific Gas and Electric Company
Southern California Edison — Energy for What's Ahead
SDGE

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

kWh – Kilowatt Hour

Liberty – Liberty Utilities

NPV – Net Present Value

PG&E – Pacific Gas & Electric (utility)

POU – Publicly Owned Utility

PV - Solar Photovoltaic

SCE – Southern California Edison (utility)

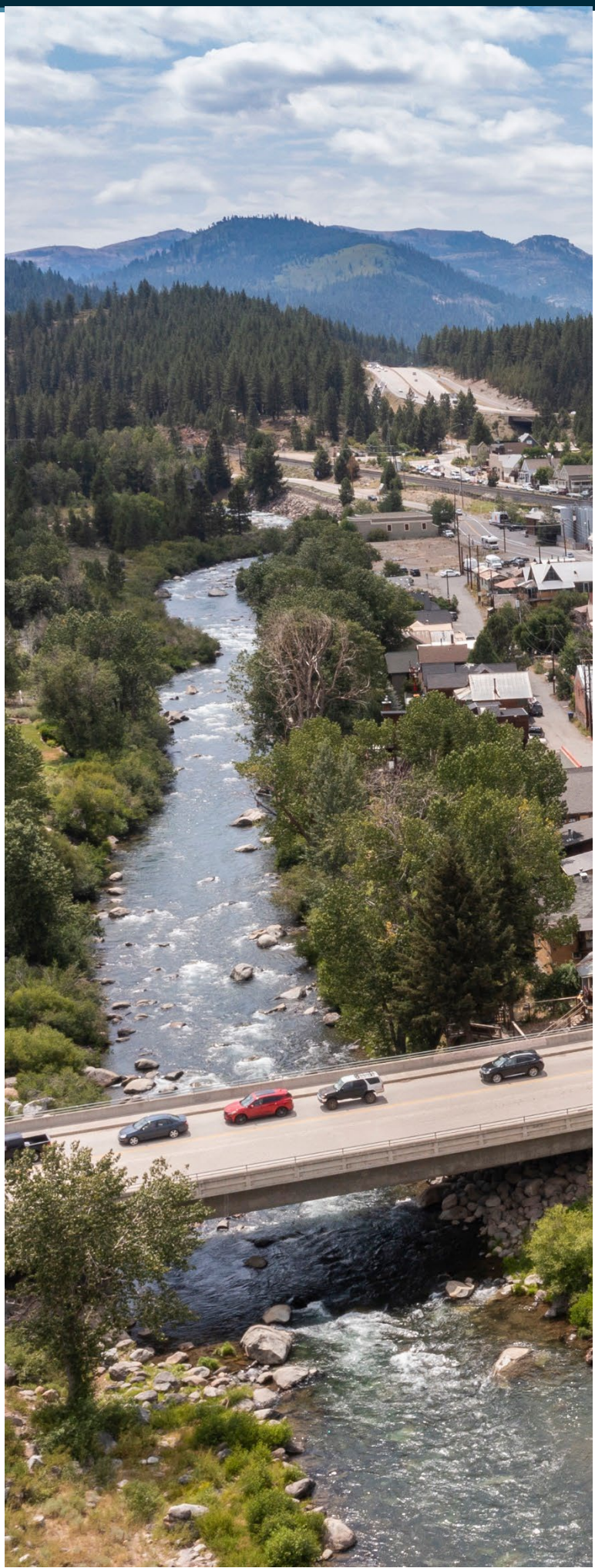
SoCalGas – Southern California Gas (utility)

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

TDV - Time Dependent Valuation

TDPUD – Truckee Donner Public Utility District

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 Multifamily New Construction Cost-effectiveness Study (Statewide Reach Codes Team, 2023) modified to accurately represent the Town of Truckee, 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.

Two multifamily prototypes were evaluated in this study. A 3-story loaded corridor and a 5-story mixed use prototype, which combined are estimated to represent 91 percent of new multifamily construction in California. The methodology, prototype characteristics, and measure packages are retained from the main studies referenced above except for the energy costs are calculated using local Truckee utilities rates. Measure packages include combinations of energy efficiency, electrification, solar photovoltaics (PV), and battery storage with results evaluated for California Climate Zone 16.

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 the 3-story and 5-story prototypes as requested by the Town of Truckee. The analysis uses cost-effectiveness methodology detailed in this section below. The general methodology is consistent with other reach code analysis, whereas some specifics such as utility rate selection are customized for the Town of Truckee rates. All methodology and assumptions are consistent with that from the statewide analysis (Statewide Reach Codes Team, 2023) with the following exceptions. Additional details are provided in the sections below.

1. Applied the CEC's Truckee weather file in place of the Blue Canyon weather file, which is the default for Climate Zone 16.
2. Applied local Truckee gas and electricity 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 7.2.4.
- 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 2022.2.0.

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 multifamily 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 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 where appropriate.

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 Town of Truckee, 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. Both Truckee Donner Public Utility District (TDPUD) and Liberty Utilities (Liberty) utility rates were evaluated in addition to the impacts for permanent versus nonpermanent residents.

The multifamily prototypes used in this analysis include common area spaces that serve the residents (lobby, leasing office, corridors, etc.). Most of the electricity use for these spaces could not be separated from that for the dwelling units within the CBECC model. As a result, average per dwelling unit hourly energy use was calculated to include both the dwelling unit and common space energy use and utility costs were calculated based on the residential electricity tariffs shown in Table 1. Space heating gas use within the dwelling unit and central water heating gas use were separated for this analysis. Utility costs were calculated applying the residential gas tariffs to the dwelling unit gas use and the commercial GN-40 tariff to the central water heating gas use.

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

Table 1. Utility Tariffs in Town of Truckee

Electric / Gas Utility		Electricity	Natural Gas Dwelling Unit / Central Water Heating
TDPUD / Southwest Gas	Permanent Resident	P10	GN-10/GN-40
	Nonpermanent Resident	S10	GN-15/GN-40
Liberty / Southwest Gas	Permanent Resident	D-1 (permanent)	GN-10/GN-40
	Nonpermanent Resident	D-1 (non-permanent)	GN-15/GN-40

Utility rates are assumed to escalate over time, using assumptions detailed in Appendix 7.2. Please see the main *2022 Multifamily 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. 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 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 Multifamily Prototype Buildings

The Energy Commission defines building prototypes which it uses to evaluate the cost-effectiveness of proposed changes to Title 24 requirements. There are 4 multifamily prototypes used in code development: a 2-story garden style, a 3-story loaded corridor, a 5-story mixed use and a 10-story mixed use. Based on work completed for the 2022 Title 24 code development, the 3-story and the 5-story represent 33 percent and 58 percent, respectively, of new multifamily construction in California. As a result, these two prototypes are used in this analysis. Additional details on all four prototypes can be found in the Multifamily Prototypes Report (TRC, 2019).

Table 2 describes the basic characteristics of each prototype.

Table 2: Residential Prototype Characteristics

Characteristic	3-Story Loaded Corridor	5-Story Mixed Use
Conditioned Floor Area	39,372 ft^2	113,100 ft^2 total: 33,660 ft^2 nonresidential 79,440 ft^2 residential
Num. of Stories	3	6 Stories total: 1 story parking garage (below grade) 1 story of nonresidential space 4 stories of residential space
Num. of Bedrooms	(6) Studio (12) 1-bed (12) 2-bed (6) 3-bed	(8) studios (40) 1-bed units (32) 2-bed units (8) 3-bed units
Window-to-Wall Area Ratio	25%	25%
Wall Type	Wood framed	Wood frame over a first-floor concrete podium
Roof Type	Flat roof	Flat roof
Foundation	Slab-on-grade	Concrete podium with underground parking

3.2 Measure Packages

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

1. All-Electric Prescriptive Code: This package meets all the prescriptive requirements of the 2022 Energy Code.
2. All-Electric Prescriptive Code + PV: Using the code minimum package as a starting point, PV capacity was added to offset 100 percent of the estimated annual electricity use.
3. Mixed Fuel Efficiency Only: This package uses only efficiency measures that do not trigger federal preemption including envelope and duct distribution efficiency measures.
4. Mixed Fuel Efficiency + PV: Using the Efficiency Package as a starting point, PV capacity was added to offset 100 percent of the estimated annual electricity use. This package only applies to the 5-story prototype.
5. Mixed Fuel Efficiency + PV + Battery: Using the Efficiency Package as a starting point, PV capacity was added to offset 100 percent of the estimated annual electricity use. A battery system was also added. This package only applies to the 3-story prototype. The 5-story prototype includes a battery system in the baseline per the 2022 prescriptive requirements.

4 Results

Cost-effectiveness results are presented per prototype and measure packages described in Section 3.2. The TDV and On-Bill based cost-effectiveness results are presented in terms of B/C ratio and NPV. Energy savings, compliance margin, utility bill savings, and incremental costs are also shown.

In the following figures, green highlighting indicates that the case is cost-effective with a B/C ratio greater than or equal to 1 and a NPV greater than or equal to 0. Red highlighting indicates the case is not cost-effective.

Compliance margins are presented as percentages both for the efficiency TDV and the source energy metrics. A compliance margin that is equal to or greater than 0 indicates the case is code compliant.

Table 3 and Table 4 show results for the 3-story multifamily prototype with TDPUD permanent resident and non-permanent resident rates, respectively. Table 5 and Table 6 show results for the 5-story multifamily prototype with TDPUD permanent resident and non-permanent resident rates, respectively. Table 7 and Table 8 show results for the 3-story multifamily prototype with Liberty permanent resident and non-permanent resident rates, respectively. Table 9 and Table 10 show results for the 5-story multifamily prototype with Liberty permanent resident and non-permanent resident rates, respectively.

Table 3: TDPUD Permanent Resident 3-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	21%	34%	-3,289	281	$32	$4,971	($4,045)	($2,983)	>1	$7,955	4.1	$2,255
PV	21%	43%	1,053	281	$677	$19,932	($344)	$1,830	10.9	$18,102	7.6	$12,029
Mixed Fuel												
Efficiency Only	7%	6%	26	23	$48	$1,479	$712	$712	2.1	$767	2.3	$911
Efficiency + PV + Battery	7%	15%	980	23	$190	$4,765	$3,557	$5,394	0.9	($629)	1.6	$3,342

Table 4: TDPUD Nonpermanent Resident 3-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	21%	34%	-3,289	281	$2	$4,597	($4,045)	($2,983)	>1	$7,580	4.1	$2,255
PV	21%	43%	1,053	281	$736	$21,611	($344)	$1,830	11.8	$19,781	7.6	$12,029
Mixed Fuel												
Efficiency Only	7%	6%	26	23	$54	$1,648	$712	$712	2.3	$936	2.3	$911
Efficiency + PV + Battery	7%	15%	980	23	$215	$5,384	$3,557	$5,394	0.998	($10)	1.6	$3,342

Table 5: TDPUD Permanent Resident 5-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	10%	18%	-2,158	206	$42	$3,941	($4,886)	($6,142)	>1	$10,083	>1	$6,701
PV	10%	27%	803	206	$483	$14,143	($2,327)	($2,815)	>1	$16,958	>1	$14,899
Mixed Fuel												
Efficiency Only	4%	3%	62	13	$34	$976	$665	$665	1.5	$311	1.8	$528
Efficiency + PV	4%	6%	877	13	$155	$3,784	$1,374	$1,588	2.4	$2,197	2.9	$3,002

Table 6: TDPUD Nonpermanent 5-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	10%	18%	-2,158	206	$19	$3,581	($4,886)	($6,142)	>1	$9,723	>1	$6,701
PV	10%	27%	803	206	$520	$15,183	($2,327)	($2,815)	>1	$17,998	>1	$14,899
Mixed Fuel												
Efficiency Only	4%	3%	62	13	$38	$1,091	$665	$665	1.6	$426	1.8	$528
Efficiency + PV	4%	6%	877	13	$175	$4,285	$1,374	$1,588	2.7	$2,697	2.9	$3,002

Table 7: Liberty Permanent Resident 3-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	21%	34%	-3,289	281	($252)	($1,603)	($4,045)	($2,983)	1.9	$1,380	4.1	$2,255
PV	21%	43%	1,053	281	$765	$21,973	($344)	$1,830	12.0	$20,143	7.6	$12,029
Mixed Fuel												
Efficiency Only	7%	6%	26	23	$51	$1,532	$712	$712	2.2	$820	2.3	$911
Efficiency + PV + Battery	7%	15%	980	23	$274	$6,706	$3,557	$5,394	1.2	$1,312	1.6	$3,342

Table 8: Liberty Nonpermanent Resident 3-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	21%	34%	-3,289	281	($344)	($3,434)	($4,045)	($2,983)	0.9	($451)	4.1	$2,255
PV	21%	43%	1,053	281	$844	$24,119	($344)	$1,830	13.2	$22,289	7.6	$12,029
Mixed Fuel												
Efficiency Only	7%	6%	26	23	$57	$1,712	$712	$712	2.4	$1,000	2.3	$911
Efficiency + PV + Battery	7%	15%	980	23	$317	$7,759	$3,557	$5,394	1.4	$2,365	1.6	$3,342

Table 9: Liberty Permanent Resident 5-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	10%	18%	-2,158	206	($143)	($366)	($4,886)	($6,142)	16.8	$5,776	>1	$6,701
PV	10%	27%	803	206	$550	$15,704	($2,327)	($2,815)	>1	$18,519	>1	$14,899
Mixed Fuel												
Efficiency Only	4%	3%	62	13	$39	$1,099	$665	$665	1.7	$434	1.8	$528
Efficiency + PV	4%	6%	877	13	$229	$5,518	$1,374	$1,588	3.5	$3,931	2.9	$3,002

Table 10: Liberty Nonpermanent Resident 5-Story Multifamily Cost-Effectiveness Results per Dwelling Unit

Case	Efficiency TDV Comp Margin	Source Comp Margin	Annual Elec Savings (kWh)	Annual Gas Savings (therms)	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	10%	18%	-2,158	206	($208)	($1,682)	($4,886)	($6,142)	3.7	$4,460	>1	$6,701
PV	10%	27%	803	206	$603	$17,100	($2,327)	($2,815)	>1	$19,915	>1	$14,899
Mixed Fuel												
Efficiency Only	4%	3%	62	13	$44	$1,241	$665	$665	1.9	$576	1.8	$528
Efficiency + PV	4%	6%	877	13	$267	$6,407	$1,374	$1,588	4.0	$4,820	2.9	$3,002

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 and Table 12 summarize results for each prototype and depict the source energy compliance margins achieved for each 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 concluded the following from the results of this study.

- All-electric code compliant multifamily new construction is feasible, cost effective based on TDV in all cases, and cost effective On-Bill for cases except for the 3-story prototype for nonpermanent resident Liberty customers.
- Source energy compliance margins for all-electric construction are significantly higher than for mixed fuel construction.
- Combining higher capacity PV systems and all-electric construction reduces utility costs, increasing utility savings. The all-electric Prescriptive Code + PV package was cost-effective based on both TDV and On-Bill in all scenarios.
- For a reach code that allows for mixed fuel buildings the Mixed Fuel Efficiency + PV + Battery package was found to be cost effective for the 3-story prototype based on TDV in all cases and On-Bill for Liberty customers. The Mixed Fuel Efficiency + PV package was found to be cost effective for the 5-story prototype based on TDV and On-Bill in all cases.

Table 11: Summary of Compliance Margins and Cost-Effectiveness for the 3-Story Prototype

Rate Scenario	All-Electric Prescriptive Code	All-Electric + PV	Mixed Fuel Efficiency	Mixed Fuel Efficiency + PV + Battery
TDPUD Permanent	34%	43%	6%	15%
TDPUD Nonpermanent	34%	43%	6%	15%
Liberty Permanent	34%	43%	6%	15%
Liberty Nonpermanent	34%	43%	6%	15%

Table 12: Summary of Compliance Margins and Cost-Effectiveness for the 5-Story Prototype

Rate Scenario	All-Electric Prescriptive Code	All-Electric + PV	Mixed Fuel Efficiency	Mixed Fuel Efficiency + PV
TDPUD Permanent	18%	27%	3%	6%
TDPUD Nonpermanent	18%	27%	3%	6%
Liberty Permanent	18%	27%	3%	6%
Liberty Nonpermanent	18%	27%	3%	6%

6 References

Statewide Reach Codes Team. (2023). *2022 Cost-Effectiveness Study: Multifamily New Construction.* Prepared for Pacific Gas and Electric Company. Prepared by Frontier Energy. Retrieved from https://localenergycodes.com/download/1552/file_path/fieldList/2022%20Multifamily%20NewCon%20Cost-Eff%20Report.pdf

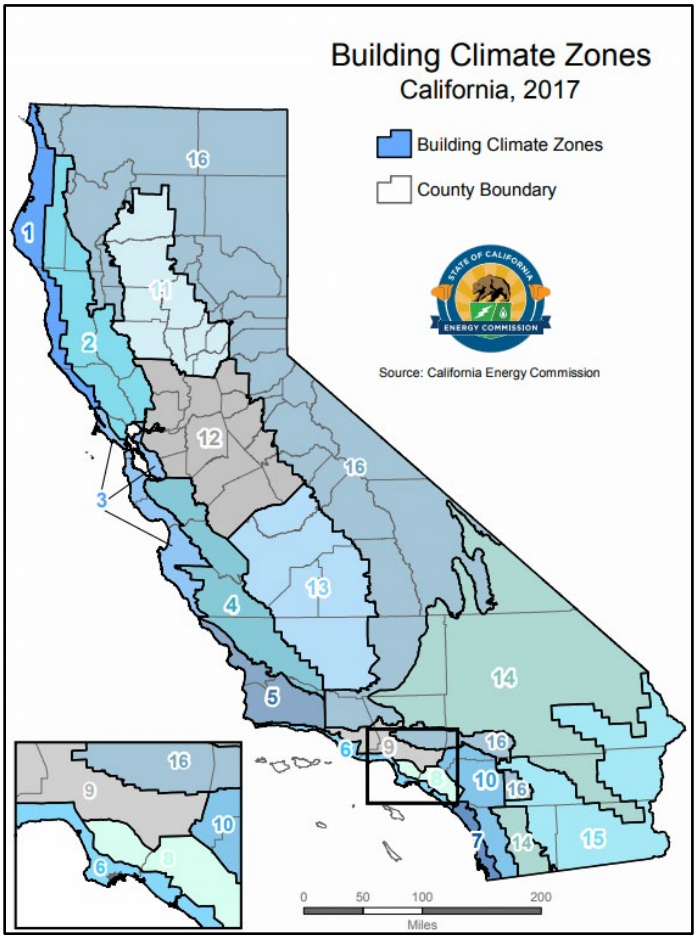
TRC. (2019). *Multifamily Prototypes.* Prepared for Southern California Edison. Retrieved from https://title24stakeholders.com/wp-content/uploads/2019/06/SCE-MFModeling_MultifamilyPrototypesReport_2019-06-07_clean.pdf

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 Town of Truckee tariffs detailed below to determine the On-Bill savings for each package.

7.2.1 Truckee Donner Public Utility District

Following are the TDPUD electricity tariffs applied in this study both for permanent residents (P10) and non-permanent residents (S10). The 2023 rates were used.[2] A net energy metering arrangement was evaluated that credits any net generation monthly based on the appropriate rate per the tariff.[3]

	2022	2023
Permanent Residents		
Customer Charge (per month)	$21.33	$24.53
Energy Charge (per kwh)	$0.1417	$0.1486
Non-Permanent Residents		
Customer Charge (per month)	$21.33	$24.53
Energy Charge (per kwh)	$0.1623	$0.1690

7.2.2 Liberty Utilities

Following are details on the Liberty Utility electricity tariff, D-1[4], applied in this study. Baseline quantities were only applied to the permanent resident rates. A net energy metering arrangement was evaluated that credits any net generation monthly based on the appropriate rate per the tariff. Any generation credits do not offset the monthly minimum charge.[5] The Public Utilities Commission Reimbursement Surcharge of $0.00160/kWh is applied monthly only when net kWh is positive. An annual Climate Credit of $58.98 was applied to each dwelling unit.[6]

[2] https://www.tdpud.org/customer-service/billing-options/rates
[3] https://www.tdpud.org/home/showpublisheddocument/200/636225809920030000
[4] https://california.libertyutilities.com/uploads/CalPeco%20Tariffs/Schedule%20No%20D-1.pdf
[5] https://california.libertyutilities.com/uploads/NEM_NEMA%20PDF%207-13-17.pdf
[6] https://www.cpuc.ca.gov/climatecredit/

LIBERTY UTILITIES (CALPECO ELECTRIC) LLC
SOUTH LAKE TAHOE, CALIFORNIA 32nd Revised CPUC Sheet No. 76
Canceling 31st Revised CPUC Sheet No. 76

SCHEDULE NO. D-1

DOMESTIC SERVICE

APPLICABILITY

This rate schedule is applicable to all domestic power service to separately metered single family dwellings and individual living units of multi-unit complexes, where such units are metered by the Utility. Where electricity is furnished for EV charging, a customer may use the Electric Vehicle Supply Equipment (EVSE) as a submeter to measure EV charge load, and ancillary EV charge service (i.e., demand response, vehicle-grid integration, etc.). All EVSE used for submetering purposes must meet the requirements established in the Plug-in Electric Vehicle Submetering Protocol pursuant to Decision 22-08-024.

TERRITORY

Entire California Service Area.

RATES

Customer Charge
Per meter, per month $12.00 (I)

Energy Charges (Per kWh)

Residential Permanent Customers (see definition in Rule 1) (N)

A. For Quantities up to and Including Baseline Quantities (See Special Condition 2):

Distribution		Generation [1]		Vegetation [2]		SIP [4]	PPP [5]		GRCMA [6]		BRRBA [7]	Total	
$0.11779	(I)	$0.06076	(I)	$0.00000	(R)	$0.00072	$0.00319	(R)	$0.04070	(I)	$0.01006	$0.23322	(I)

B. For Quantities in Excess of Baseline Quantities (See Special Condition 2):

$0.13916	(I)	$0.09274	(I)	$0.00000	(R)	$0.00072	$0.00319	(R)	$0.04070	(I)	$0.01006	$0.28656	(I)

Residential Non-Permanent Customers (see definition in Rule 1) (N)

Distribution		Generation [1]		Vegetation [2]		SIP [4]	PPP [5]		GRCMA [6]		BRRBA [7]	Total	
$0.13362	(I)	$0.08444	(I)	$0.00000	(R)	$0.00072	$0.00319	(R)	$0.04070	(I)	$0.01006	$0.27272	(I)

Other Energy Charges (Per kWh)
Surcharges[8] $0.00160

Late Charge
1% on any amount 45 days in arrears from previous billings.

Minimum Charge
The per meter, per month Customer Charge.

1. Generation – Charge includes the Energy Cost Adjustment Clause Billing Factor as described in the Preliminary Statement, Number 6.
2. Vegetation – Charge to recover amounts in the Vegetation Management Balancing Account, as described in the Preliminary Statement, Number 18.
3. CEMA – Charge to recover amounts in the Catastrophic Event Memorandum Account as approved in D.16-12-024 and as described in the Preliminary Statement, Number 13.A.
4. SIP – Charge to recover the costs of the Solar Initiative Program as described in the Preliminary Statement, Number 21.
5. PPP – Charge to recover Public Purpose Programs funding energy efficiency and low-income assistance programs described in Preliminary Statement, Numbers 10, 17 and 19.
6. GRCMA – Charge to recover amounts in the General Rate Case Memorandum Account as described in the Preliminary Statement, Number 13.I.
7. BRRBA – Charge to recover amounts in the Base Revenue Requirement Balancing Account as described in the Preliminary Statement Number 8.
8. Surcharges – Charge to recover the Public Utilities Commission Reimbursement Surcharge as described in Rate Schedule RF and the Energy Commission Surcharge that is established by the California Energy Commission.

(Continued)

Issued by
Advice Letter No. 219-E-B Edward N. Jackson (Name) Date Filed: May 30, 2023
Decision No. 23-04-043 President (Title) Effective Date: July 1, 2023
Resolution No.

LIBERTY UTILITIES (CALPECO ELECTRIC) LLC
SOUTH LAKE TAHOE, CALIFORNIA 5th Revised CPUC Sheet No. 77
Canceling 4th Revised CPUC Sheet No. 77

SCHEDULE NO. D-1

Page 2

DOMESTIC SERVICE
(Continued)

SPECIAL CONDITIONS

1. Service hereunder shall only be single-phase as described in Rule 2, Description of Service, and supplied to electric motors no larger than 10 horsepower.

2. Baseline Quantities. Each residential customer in a single-family dwelling consisting of a permanent residential unit is eligible for a baseline quantity of electricity which is necessary to supply a significant portion of the reasonable energy needs of the average residential customer. Residential Customer means a customer who is eligible for service on a domestic service rate schedule, and excludes general, commercial, industrial, and every other category of customer.

   A. Eligibility. Baseline quantities are available only to separately metered, permanent residential customers. Non-permanent residential customers are not eligible. The Utility may require customers to complete and file with it an appropriate Declaration of Eligibility for baseline quantities. The penalty for presenting false information shall be any legal action Liberty might elect to pursue. (T) | (T)

   B. Different Baseline Quantities. Different baseline quantities are established for a) basic use, and b) all-electric only or electric space heat or both, as follows:

kWh Per Day Quantity[1]

Season	Basic Use (E02, E06)	All-Electric Use (E04, E08)
Summer[2]	14.5	16.4
Winter[3]	19.0	31.4

1. Per day baseline quantities for each monthly billing cycle shall be equal to the daily baseline quantities (including Medical Baseline Quantities as appropriate) multiplied by the number of days in the billing cycle.
2. Summer baseline quantities will be used for six consecutive billing periods beginning on or after May 1.
3. Winter baseline quantities will be used for six consecutive billing periods beginning on or after November 1.

(Continued)

Advice Letter No. 219-E-B
Decision No. 23-04-043
Issued by
Edward N. Jackson
Name
President
Title
Date Filed: May 30, 2023
Effective Date: July 1, 2023
Resolution No.

7.2.3 Southwest Gas

The Southwest Gas monthly gas rates in $/therm applied in this analysis are shown in Table 13 and Table 14.[7] The monthly basic service charge was based on the most current tariff statements. For GN-40 the rates for non-Covered Entities and the Basic Service Charge were used. For GN-10 daily baseline quantities were applied for Truckee.[8] A Franchise Fee of 2.5% was applied to the total monthly bill. Lastly, the annual California Climate Credit of $56.35 for 2023 was applied per dwelling unit for the GN-10 and GN-15 rates.[9]

The gas rates were developed based on the latest available gas rate for August 2023 and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from Southwest Gas monthly residential tariffs between 2012 and 2023. 12-month curves were created from monthly gas rates for each of the eleven years. The 11 annual curves were then averaged to arrive at an average normalized annual curve. The average normalized annual curve was developed based on residential rates for the South Lake Tahoe service area. Rate trends across multiple Southwest Gas tariffs were reviewed and were found to be consistent. The costs presented in Table 13 and Table 14 were then derived by establishing the August 2023 rate from the latest 2023 tariff as a reference point, and then using the normalized curve to estimate the cost for the remaining months relative to the August rates.

Table 13: Southwest Gas In-Unit Monthly Gas Rate ($/therm)

Month	GN-10		GN-15
	Baseline	Excess	All
Jan	$1.91122	$2.05572	$2.12593
Feb	$1.88990	$2.03278	$2.10221
Mar	$1.84874	$1.98851	$2.05642
Apr	$1.74763	$1.87976	$1.94396
May	$1.78020	$1.91479	$1.98018
June	$1.80387	$1.94024	$2.00651
July	$1.81951	$1.95708	$2.02392
Aug	$1.65640	$1.78163	$1.84248
Sept	$1.81402	$1.95117	$2.01781
Oct	$1.84393	$1.98333	$2.05107
Nov	$1.92820	$2.07398	$2.14481
Dec	$1.96337	$2.11180	$2.18393

[7] https://www.swgas.com/en/california-rates-and-regulation
[8] https://www.swgas.com/7200000202051/GS-10_GN-10_SLT-10---GRC_Eff-April-1-2021.pdf
[9] https://www.cpuc.ca.gov/climatecredit/

Table 14: Southwest Gas Central Water Heating Monthly Gas Rate ($/therm)

Month	GN-40 Non-Covered Entities			
	Baseline	Tier 2	Tier 3	Tier 4
Jan	$1.76823	$1.57035	$1.40225	$1.15149
Feb	$1.74850	$1.55282	$1.38661	$1.13864
Mar	$1.71042	$1.51900	$1.35641	$1.11384
Apr	$1.61687	$1.43593	$1.28222	$1.05292
May	$1.64700	$1.46269	$1.30612	$1.07255
June	$1.66890	$1.48213	$1.32348	$1.08681
July	$1.68338	$1.49499	$1.33497	$1.09623
Aug	$1.53247	$1.36097	$1.21529	$0.99796
Sept	$1.67830	$1.49048	$1.33094	$1.09292
Oct	$1.70597	$1.51505	$1.35288	$1.11094
Nov	$1.78393	$1.58429	$1.41471	$1.16172
Dec	$1.81647	$1.61319	$1.44051	$1.18290

SOUTHWEST GAS CORPORATION
P.O. Box 98510
Las Vegas, Nevada 89193-8510
California Gas Tariff — 189th Revised Cal. P.U.C. Sheet No. 68
Canceling — 188th Revised Cal. P.U.C. Sheet No. 68

STATEMENT OF RATES

RATES APPLICABLE TO NORTHERN CALIFORNIA SERVICE AREA [1] [2]

Schedule No. and Type of Charge	Margin	Charges [3] and Adjustments	Subtotal Gas Usage Rate	Other Surcharges CPUC	Other Surcharges PPP	Gas Cost	Effective Sales Rate	
GN-10-Residential Gas Service								
Basic Service Charge	$5.75						$5.75	
Cost per Therm								
Baseline Quantities	$ .78902	$ .34019	$1.12921	$ .00300	$ .08786	$ .43633	$1.65640	I
Tier II	.91425	.34019	1.25444	.00300	.08786	.43633	1.78163	I
GN-12-CARE Residential Gas Service								
Basic Service Charge	$4.00						$4.00	
Cost per Therm								
Baseline Quantities	$ .47591	$ .34019	$ .81610	$ .00300	$ .06533	$ .43633	$1.32076	I
Tier II	.57610	.34019	.91629	.00300	.06533	.43633	1.42095	I
GN-15-Secondary Residential Gas Service								
Basic Service Charge	$6.00						$6.00	
Cost per Therm	$ .97510	$ .34019	$1.31529	$ .00300	$ .08786	$ .43633	$1.84248	I
GN-20-Multi-Family Master-Metered Gas Service								
Basic Service Charge	$25.00						$25.00	
Cost per Therm								
Baseline Quantities	$ .78902	$ .34019	$1.12921	$ .00300	$ .08786	$ .43633	$1.65640	I
Tier II	.91425	.34019	1.25444	.00300	.08786	.43633	1.78163	I
GN-25-Multi-Family Master-Metered Gas Service-Submetered								
Basic Service Charge	$25.00						$25.00	
Cost per Therm								
Baseline Quantities	$ .78902	$ .34019	$1.12921	$ .00300	$ .08786	$ .43633	$1.65640	I
Tier II	.91425	.34019	1.25444	.00300	.08786	.43633	1.78163	I
Submetered Discount per Occupied Space	($ 9.33)						($ 9.33)	
GN-35-Agriculture Employee Housing & Nonprofit Group Living Facility Gas Service								
Basic Service Charge	$ 8.80						$ 8.80	
Cost per Therm								
First 100	$ .37677	$ .34019	$ .71696	$ .00300	$ .06533	$ .43633	$1.22162	I
Next 500	.23957	.34019	.57976	.00300	.06533	.43633	1.08442	I
Next 2,400	.12302	.34019	.46321	.00300	.06533	.43633	.96787	I
Over 3,000	(.05084)	.34019	.28935	.00300	.06533	.43633	.79401	I
GN-40-Core General Gas Service (non-Covered Entities)								
Basic Service Charge	$11.00						$11.00	
Transportation Service Charge	$780.00						$780.00	
Cost per Therm								
First 100	$ .66509	$ .34019	$1.00528	$ .00300	$ .08786	$ .43633	$1.53247	I
Next 500	.49359	.34019	.83378	.00300	.08786	.43633	1.36097	I
Next 2,400	.34791	.34019	.68810	.00300	.08786	.43633	1.21529	I
Over 3,000	.13058	.34019	.47077	.00300	.08786	.43633	.99796	I

Advice Letter No. 1268
Decision No.

Issued by
Amy L. Timperley
Chief Regulatory Officer

Date Filed July 31, 2023
Effective August 1, 2023
Resolution No.

SOUTHWEST GAS CORPORATION
P.O. Box 98510
Las Vegas, Nevada 89193-8510
California Gas Tariff

Canceling 4th Revised Cal. P.U.C. Sheet No. 79
3rd Revised Cal. P.U.C. Sheet No. 79

Schedule Nos. GS-10/GN-10/SLT-10

RESIDENTIAL GAS SERVICE

APPLICABILITY

Applicable to gas service to customers which consists of direct domestic gas usage in a residential dwelling for space heating, air conditioning, cooking, water heating, and other residential uses. This schedule is available only to primary residences.

TERRITORY

Throughout the Company's certificated California service areas, except as may hereafter be provided.

RATES

The commodity charges and basic service charge are set forth in the currently-effective Statement of Rates of this California Gas Tariff and are incorporated herein by reference.

Customers on this schedule may receive the California (CA) Climate Credit, if applicable, annually each April.[1] The credit will display as a line item on the customer's bill. The CA Climate Credit will be issued to all active accounts receiving natural gas service on the date the credit is given.

The baseline daily quantity in therms for all individually-metered residential uses are:

Climate Zone	Summer Season (May - Oct.)	Winter Off-Peak (Spring/Fall) (Mar., Apr. & Nov.)	Winter Peak (Dec.-Feb)
Barstow	0.39	1.12	2.11
Needles	0.23	0.53	0.92
Victorville	0.39	1.25	2.04

	Summer Season (June - Oct.)	Winter Off-Peak (Spring/Fall) (Apr., May & Nov.)	Winter Peak (Dec.-March)
Big Bear	0.46	1.45	2.83
No. Lake Tahoe	0.66	2.11	3.09
So. Lake Tahoe	0.72	2.04	3.09
Truckee	0.72	2.17	3.55

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For billing purposes all quantities sold each month in excess of the baseline quantities shall be billed at the Tier II rate.

D
D

[1]Due to cycle billing, some customers may receive the CA Climate Credit on their May bills.

Advice Letter No. 1168
Decision No. 21-03-052

Issued by
Justin Lee Brown
Senior Vice President

Date Filed March 31, 2021
Effective April 1, 2021
Resolution No.

7.2.4 Fuel Escalation Rates

7.2.4.1 Residential Occupancies

The average annual escalation rates in Table 15 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 Truckee, therefore electricity escalation rates for PG&E and statewide natural gas escalation rates were applied.

Table 15: 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.

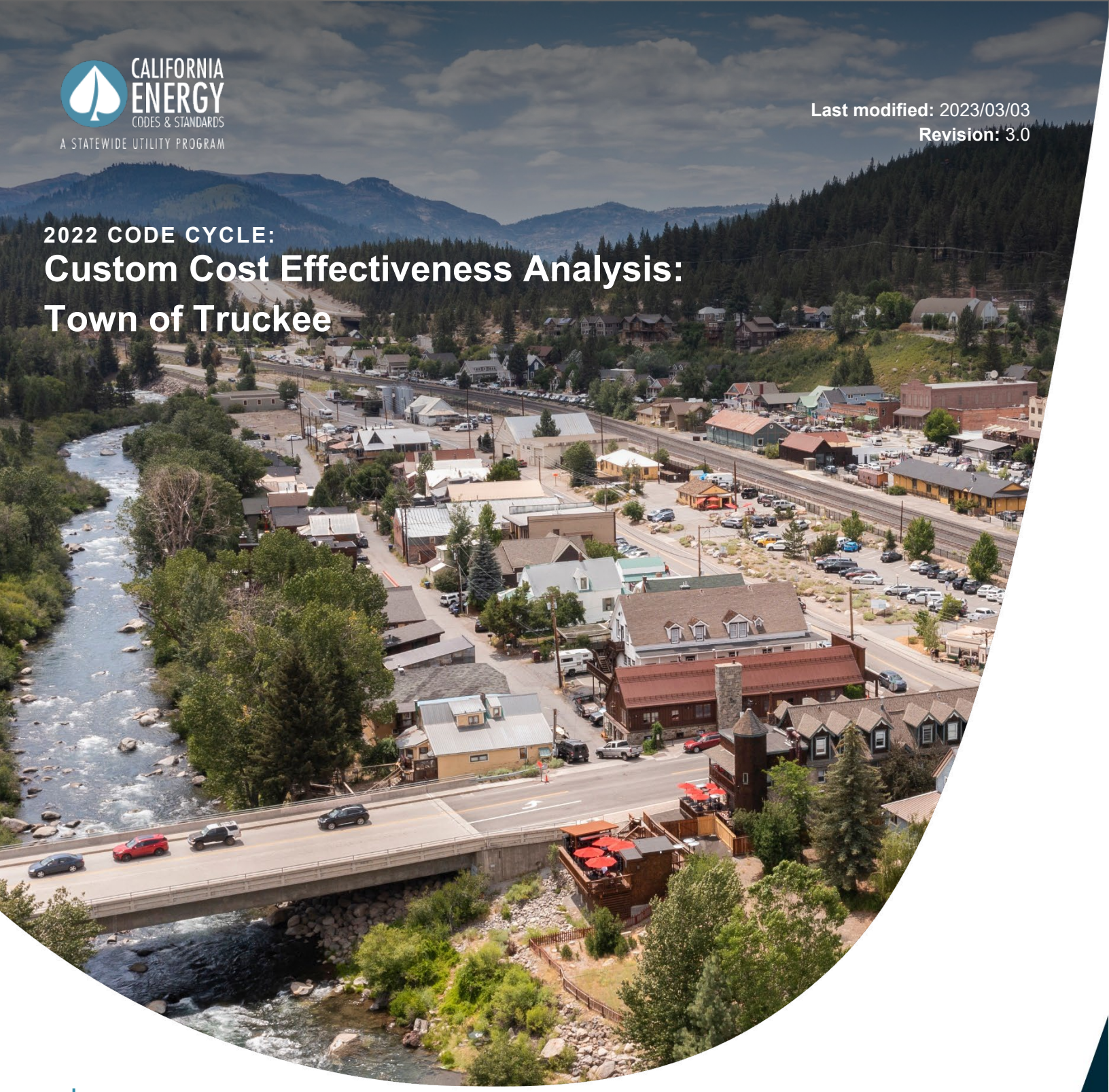
Visit LocalEnergyCodes.com to access our resources and sign up for newsletters

Follow us on LinkedIn

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

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Last modified: 2023/03/03
Revision: 3.0



2022 CODE CYCLE:

Custom Cost Effectiveness Analysis: Town of Truckee

Prepared by:
TRC Companies, Inc

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

Pacific Gas and Electric Company
Southern California Edison — Energy for What's Ahead
SDGE

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 Town of Truckee, 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 Reach Code Team performed cost-effectiveness analysis based on the prescriptive 2022 Title 24 code requirements:

- For the retail building type, the prescriptive code minimum is all-electric. Fuel substitution packages revert to mixed-fuel appliances.
- For all other building types, the prescriptive code minimum is mixed-fuel. Fuel substitution packages switch to all-electric appliances.

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

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 Town of Truckee 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 the Town of Truckee and the utilities Truckee Donner Public Utility District (TDPUD), Liberty (LIB) and Southwest Gas (SWG), 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 Town of Truckee

Electric / Gas Utility	Electricity	Natural Gas
Nonresidential Buildings		
TDPUD / SWG	Rate 15/Rate 20/Rate 25	GN-40
LIB / SWG	A-1/A-2/A-3	GN-40

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 (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 the Town of Truckee 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

. For both TDPUD and LIB rates:

- The Reach Code Team identified cost-effective package of energy efficiency measures when added to the mixed-fuel baseline prototype in all prototypes except for Medium Retail, which has an all-electric baseline.
- For Medium Office, The Team identified On-Bill cost-effective package with added efficiency and load flexibility.
- For Medium Retail, The Team identified all-electric package with added energy efficiency measures to be cost-effective, On-Bill as well as TDV approach.
- For Quick Service Restaurant, The Team identified On-Bill cost-effective packages for all-electric packages without cooking appliance electrification but with added efficiency and/or load flexibility and/or solar PV measures.
- For Small Hotel, all all-electric packages are On-Bill cost-effective with added efficiency and/or solar PV measures or with PTHP instead of SZHP system type, but not cost-effective alone as All Electric Code Minimum Efficiency package.

Please note that for Medium Office, the total compliance margin is highly negative since the total TDV energy of the baseline building is much lower (9 TDV kBtu/ft2-yr) due to the applied PV compared to that of the proposed packages. The small baseline TDV is in the denominator of the package Total Compliance Margin calculations, resulting in large magnitude results. In such scenarios, the positive/negative sign of the Total Compliance Margin is the best indicator of the compliance of a given package.

Table 3 through **Error! Reference source not found.** shows the results for the four nonresidential prototypes for all the evaluated packages for climate zone 16. For both TDPUD and LIB rates:

- The Reach Code Team identified cost-effective package of energy efficiency measures when added to the mixed-fuel baseline prototype in all prototypes except for Medium Retail, which has an all-electric baseline.
- For Medium Office, The Team identified On-Bill cost-effective package with added efficiency and load flexibility.
- For Medium Retail, The Team identified all-electric package with added energy efficiency measures to be cost-effective, On-Bill as well as TDV approach.
- For Quick Service Restaurant, The Team identified On-Bill cost-effective packages for all-electric packages without cooking appliance electrification but with added efficiency and/or load flexibility and/or solar PV measures.
- For Small Hotel, all all-electric packages are On-Bill cost-effective with added efficiency and/or solar PV measures or with PTHP instead of SZHP system type, but not cost-effective alone as All Electric Code Minimum Efficiency package.

Please note that for Medium Office, the total compliance margin is highly negative since the total TDV energy of the baseline building is much lower (9 TDV kBtu/ft2-yr) due to the applied PV compared to that of the proposed packages. The small baseline TDV is in the denominator of the package Total Compliance Margin calculations, resulting in large magnitude results. In such scenarios, the positive/negative sign of the Total Compliance Margin is the best indicator of the compliance of a given package.

Table 3. Medium Office Cost-Effectiveness Summary

Package	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	LIB-A2	9,204	(125)	0.4	4%	39%	1%	$0	$17,421	$16,744	>1	>1	$17,421	$16,744
All Electric Code Minimum Efficiency	LIB-A2	(130,271)	5,799	0.8	-71%	-699%	3%	($52,070)	($86,918)	($303,371)	0.6	0.2	($34,847)	($251,301)
All Electric Energy Efficiency	LIB-A2	(123,647)	5,799	1.4	-68%	-668%	5%	($52,070)	($72,264)	($290,084)	0.7	0.2	($20,193)	($238,013)
All-Electric Energy Efficiency and Load Flexibility	LIB-A2	(111,041)	5,799	5.0	-58%	-567%	14%	($52,070)	($45,385)	($246,130)	1.1	0.2	$6,686	($194,059)
Mixed-Fuel + Efficiency Measures	TDPUD-Rate 20	9,204	(125)	0.4	4%	39%	1%	$0	$16,937	$16,744	>1	>1	$16,937	$16,744
All Electric Code Minimum Efficiency	TDPUD-Rate 20	(130,271)	5,799	0.8	-71%	-699%	3%	($52,070)	($90,794)	($303,371)	0.6	0.2	($38,724)	($251,301)
All Electric Energy Efficiency	TDPUD-Rate 20	(123,647)	5,799	1.4	-68%	-668%	5%	($52,070)	($76,844)	($290,084)	0.7	0.2	($24,773)	($238,013)
All-Electric Energy Efficiency and Load Flexibility	TDPUD-Rate 20	(111,041)	5,799	5.0	-58%	-567%	14%	($52,070)	($46,552)	($246,130)	1.1	0.2	$5,518	($194,059)

Table 4. Medium Retail Cost-Effectiveness Summary

Package	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 Code Minimum	LIB-A2	44,088	(3,537)	(11.4)	12%	18%	-49%	$67,904	($5,616)	$57,931	-0.1	0.9	($73,520)	($9,974)
Mixed-Fuel + Efficiency Measures	LIB-A2	48,319	(3,624)	(11.2)	14%	21%	-48%	$67,904	$1,868	$66,411	0.0	1.0	($66,037)	($1,493)
All Electric Energy Efficiency	LIB-A2	3,504	0	0.6	2%	3%	2%	$0	$6,818	$8,547	>1	>1	$6,818	$8,547
Mixed Fuel Code Minimum	TDPUD-Rate20	44,088	(3,537)	(11.4)	12%	18%	-49%	$67,904	($2,368)	$57,931	0.0	0.9	($70,273)	($9,974)
Mixed-Fuel + Efficiency Measures	TDPUD-Rate20	48,319	(3,624)	(11.2)	14%	21%	-48%	$67,904	$6,880	$66,411	0.1	1.0	($61,024)	($1,493)
All Electric Energy Efficiency	TDPUD-Rate20	3,504	0	0.6	2%	3%	2%	$0	$6,415	$8,547	>1	>1	$6,415	$8,547

Table 5. Quick-Service Restaurant Cost-Effectiveness Summary

Package	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	LIB-A1	10,088	936	7.0	21%	21%	-55%	$22,540	$57,189	$46,308	2.5	2.1	$34,649	$23,768
All Electric HS Energy Code Minimum Efficiency	LIB-A1	(57,545)	4,788	14.7	-32%	-32%	-10%	$23,206	($1,208)	($70,150)	-0.1	-3.0	($24,414)	($93,356)
All-Electric HS Energy Efficiency	LIB-A1	(36,879)	4,788	18.6	-6%	-6%	13%	$45,745	$54,437	($12,601)	1.2	-0.3	$8,692	($58,346)
All-Electric HS Energy Efficiency + Load Flexibility	LIB-A1	(36,807)	4,788	20.0	3%	3%	21%	$51,155	$54,632	$6,395	1.1	0.1	$3,477	($44,760)
All-Electric HS Energy Efficiency + Solar PV	LIB-A1	(6,302)	4,788	20.1	-6%	18%	21%	$96,153	$136,766	$39,572	1.4	0.4	$40,613	($56,581)
All Electric Code Minimum Efficiency	LIB-A2	(160,672)	12,242	36.0	-40%	-40%	-17%	$143,959	$49,957	($222,219)	0.3	-1.5	($94,001)	($366,177)
All Electric Energy Efficiency	LIB-A2	(138,982)	12,242	40.1	-13%	-13%	7%	$166,498	$94,839	($161,663)	0.6	-1.0	($71,659)	($328,161)
All-Electric Energy Efficiency + Load Flexibility	LIB-A2	(139,097)	12,242	41.7	-3%	-3%	16%	$171,908	$99,077	($140,052)	0.6	-0.8	($72,831)	($311,960)
Mixed-Fuel + Efficiency Measures	TDPUD-Rate 15	10,088	936	7.0	21%	21%	-55%	$22,540	$54,623	$46,308	2.4	2.1	$32,083	$23,768
All Electric HS Energy Code Minimum Efficiency	TDPUD-Rate 15	(57,545)	4,788	14.7	-32%	-32%	-10%	$23,206	$13,433	($70,150)	0.6	-3.0	($9,773)	($93,356)
All-Electric HS Energy Efficiency	TDPUD-Rate 15	(36,879)	4,788	18.6	-6%	-6%	13%	$45,745	$63,820	($12,601)	1.4	-0.3	$18,075	($58,346)
All-Electric HS Energy Efficiency + Load Flexibility	TDPUD-Rate 15	(36,807)	4,788	20.0	3%	3%	21%	$51,155	$63,996	$6,395	1.3	0.1	$12,841	($44,760)
All-Electric HS Energy Efficiency + Solar PV	TDPUD-Rate 15	(6,302)	4,788	20.1	-6%	18%	21%	$96,153	$138,369	$39,572	1.4	0.4	$42,216	($56,581)
All Electric Code Minimum Efficiency	TDPUD-Rate 20	(160,672)	12,242	36.0	-40%	-40%	-17%	$143,959	($9,654)	($222,219)	-0.1	-1.5	($153,613)	($366,177)
All Electric Energy Efficiency	TDPUD-Rate20	(138,982)	12,242	40.1	-13%	-13%	7%	$166,498	$33,655	($161,663)	0.2	-1.0	($132,843)	($328,161)
All-Electric Energy Efficiency + Load Flexibility	TDPUD-Rate20	(139,097)	12,242	41.7	-3%	-3%	16%	$171,908	$39,084	($140,052)	0.2	-0.8	($132,824)	($311,960)

Table 6. Small Hotel Cost-Effectiveness Summary

Package	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	LIB-A2	8,939	2,952	18.4	15.7%	18%	18%	$21,214	$114,881	$116,017	5.4	5.5	$93,667	$94,804
All Electric Code Minimum Efficiency	LIB-A3	(313,257)	17,363	61.4	-29.0%	-33%	48%	($179,779)	($325,253)	($248,882)	0.6	0.7	($145,474)	($69,103)
All Electric Energy Efficiency	LIB-A2	(271,171)	17,363	65.0	-18.2%	-21%	52%	($158,565)	($120,735)	($167,773)	1.3	0.9	$37,830	($9,207)
All Electric Energy Efficiency + Solar PV	LIB-A2	(194,632)	17,363	67.9	-18.2%	0%	55%	($3,588)	$39,162	($35,212)	>1	0.1	$42,750	($31,623)
All Electric Code Minimum Efficiency (PTHP)	LIB-A3	(299,522)	17,363	64.5	-19.7%	-22%	52%	($652,012)	($286,302)	($180,549)	2.3	3.6	$365,710	$471,464
Mixed Fuel + Efficiency Measures	TDPUD-Rate 20	8,939	2,952	18.4	15.7%	18%	18%	$21,214	$114,823	$116,017	5.4	5.5	$93,609	$94,804
All Electric Code Minimum Efficiency	TDPUD-Rate 25	(313,257)	17,363	61.4	-29.0%	-33%	48%	($179,779)	($472,169)	($248,882)	0.4	0.7	($292,390)	($69,103)
All Electric Energy Efficiency	TDPUD-Rate 20	(271,171)	17,363	65.0	-18.2%	-21%	52%	($158,565)	($146,961)	($167,773)	1.1	0.9	$11,604	($9,207)
All Electric Energy Efficiency + Solar PV	TDPUD-Rate 20	(194,632)	17,363	67.9	-18.2%	0%	55%	($3,588)	$7,278	($35,212)	>1	0.1	$10,866	($31,623)
All Electric Code Minimum Efficiency (PTHP)	TDPUD-Rate 25	(299,522)	17,363	64.5	-19.7%	-22%	52%	($652,012)	($433,165)	($180,549)	1.5	3.6	$218,848	$471,464

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.

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
CZ16	TDPUD	Both	-	-	-
CZ16	LIB	Both	-	-	-

Table 8. Summary of Medium Retail Packages

CZ	Utility	Mixed Fuel		All-electric
		Code Min	EE	EE
CZ16	LIB	-	-	Both
CZ16	TDPUD	-	-	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
CZ16	LA	-	-	-	-	-	-	On-bill/TDV	-
CZ16	TDPUD	-	-	-	-	-	-	On-bill/TDV	-

Table 10. Summary of Small Hotel Packages

CZ	Utility	Mixed Fuel	All-Electric				
		EE	Code Min	EE	EE + LF	EE + PV	Code Min + PTHP
CZ16	TDPUD	Both	-	-	-	-	-
CZ16	LIB	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.

Results support reach code adoption for energy efficiency measures over mixed fuel nonresidential building types for all four prototypes in Truckee except for Medium Retail in climate zone 16. For Medium Retail, the mixed-fuel code-minimum package is neither cost-effective nor code compliant since the baseline is all-electric.

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 code compliant new construction to be feasible and cost effective based on TDPUD and LIB electricity rates for all four nonresidential prototypes with added measures. Here is a summary of the results:

- For Medium Office, all-electric package with added efficiency and load flexibility is cost-effective but is 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.

- The Reach Codes Team found All-Electric Medium Retail with added efficiency to be code complaint and cost effective based on both LIB and TDPUD rates in climate zone 16.
- For Quick-Service Restaurant, The Team identified On-Bill cost-effective packages for all-electric packages without cooking appliance electrification but with added efficiency and/or solar PV measures. However, there is only one “code-compliant” all-electric package is without cooking appliance electrification, but with added efficiency and load flexibility, hence can be pursued for reach code adoption with an exemption for the commercial cooking appliance.
- For Small Hotel, all all-electric packages are On-Bill cost-effective except for All Electric Code Minimum Efficiency package. However, none of them achieves compliance because of high heating loads being met by electric resistance VAV system instead of efficient heat pumps in nonresidential areas. This is a similar limitation as Medium Office and will be re-evaluated in 2023.

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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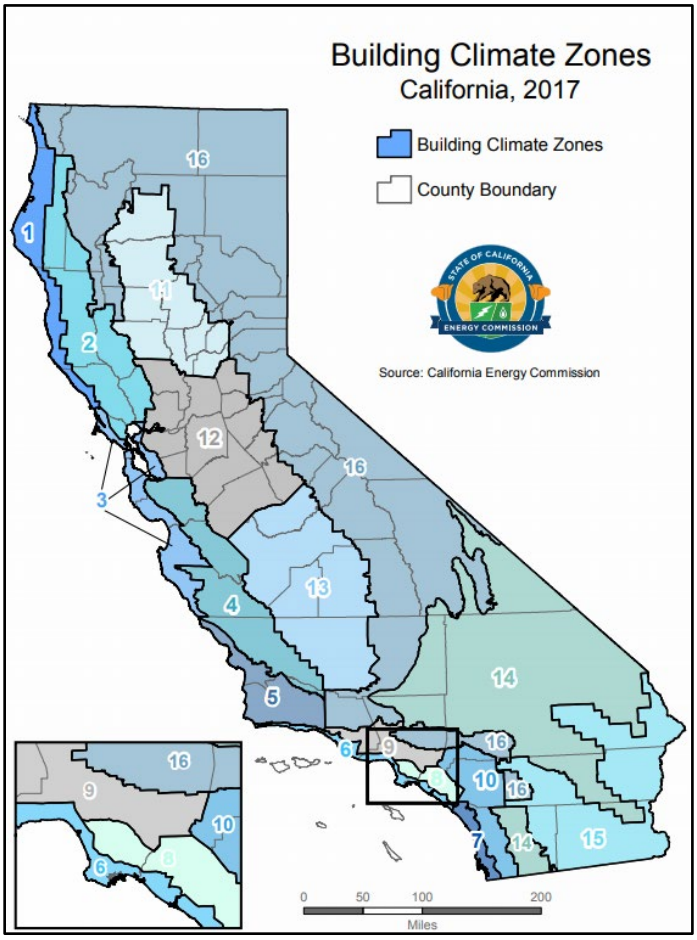
6 Appendices

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 Town of Truckee tariffs detailed below to determine the On-Bill impacts.

6.2.1 Town of Truckee

6.2.1.1 Nonresidential

Following are the Town of Truckee electricity tariffs applied in this study. Liberty and Truckee Donner Public Utility District (TDPUD) electricity rate is applied for electricity usage, and Southwest Gas rate is applied for gas usage.

6.2.1.1.1 Liberty

Following are the Liberty electricity tariffs applied in this study.[1] A-1/A-2/A-3 is applied based on the peak demand.

LIBERTY UTILITIES (CALPECO ELECTRIC) LLC
SOUTH LAKE TAHOE, CALIFORNIA — 30th Revised CPUC Sheet No. 107
Canceling — 29th Revised CPUC Sheet No. 107

SCHEDULE NO. A-1
SMALL GENERAL SERVICE

APPLICABILITY

This schedule is applicable to all non-domestic service where demand is less than fifty (50) kilowatts and no other schedule is specifically applicable. This schedule is applicable to service for agricultural irrigation (Schedule No. PA, Optional Interruptible Irrigation Service) for the billing periods December 1 through the end of February. Non-profit group living facilities taking service under this schedule may be eligible for a 20% low-income rate discount on their bill, if such facilities qualify to receive service under the terms and conditions of Schedule EXPCARE.

TERRITORY

Entire California Service Area.

RATES

Customer Charge
Per meter, per month $17.38

Energy Charges (Per kWh)

A. Rates that are applicable to Customers where demand has not exceeded twenty (20) kilowatts for any three (3) months during the preceding twelve (12) months. Applicability criteria are set forth in Special Condition 5.

Distribution	Generation 1	Vegetation 2	SIP 4	PPP 5	BRRBA 7	Total	
$0.09335	$0.07188 (I)	$0.00633	$0.00072	$0.00364	$0.03054	$0.20646	(I)

B. Rates that are applicable to all other Customers not meeting applicability criteria set forth in Special Condition 5.

$0.09335	$0.07188 (I)	$0.00633	$0.00072	$0.00364	$0.03054	$0.20646	(I)

Other Energy Charges (Per kWh)
Surcharges $0.00160

1. Generation – Charge includes the Energy Cost Adjustment Clause Billing Factor as described in the Preliminary Statement, Number 6.
2. Vegetation – Charge to recover amounts in the Vegetation Management Balancing Account, as described in the Preliminary Statement, Number 18.
3. CEMA – Charge to recover amounts in the Catastrophic Event Memorandum Account as approved in D16-12-024 and as described in the Preliminary Statement, Number 13.A.
4. SIP – Charge to recover the costs of the Solar Initiative Program as described in the Preliminary Statement, Number 21.
5. PPP – Charge to recover Public Purpose Programs funding energy efficiency and low income assistance programs described in Preliminary Statement, Numbers 10, 17 and 19.
6. GRCMA – Charge to recover amounts in the General Rate Case Memorandum Account as described in the Preliminary Statement, Number 13.I.
7. BRRBA – Charge to recover amounts in the Base Revenue Requirement Balancing Account as described in the Preliminary Statement Number 8.
8. Surcharges – Charge to recover the Public Utilities Commission Reimbursement Surcharge as described in Rate Schedule RF and the Energy Commission Surcharge that is established by the California Energy Commission.

(Continued)

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[1] Liberty Tariffs & Rates Page

LIBERTY UTILITIES (CALPECO ELECTRIC) LLC
SOUTH LAKE TAHOE, CALIFORNIA — **30th Revised** CPUC Sheet No. **113**
Canceling — **29th Revised** CPUC Sheet No. **113**

SCHEDULE NO. A-2
MEDIUM GENERAL SERVICE

APPLICABILITY

This schedule is applicable to all service where maximum demand is between fifty (50) kilowatts and two hundred (200) kilowatts for any three months during the preceding twelve months and where another schedule is not specifically applicable. Non-profit group living facilities taking service under this schedule may be eligible for a 20% low-income rate discount on their bill, if such facilities qualify to receive service under the terms and conditions of Schedule EXPCARE.

TERRITORY

Entire California Service Area.

RATES

Customer Charge
Per meter, per month $43.78

Demand Charge
Per kW of Maximum Demand per month

	Distribution	Generation	Total
Winter	$12.97	$0.00	$12.97
Summer	$ 0.00	$8.43	$ 8.43

Energy Charges (Per kWh)

	Distribution	Generation [1]		Vegetation [2]	SIP [4]	PPP [5]	BRRBA [7]	Total	
Winter	$0.05022	$0.03805	(I)	$0.00449	$0.00072	$0.00364	$0.03054	$0.12766	(I)
Summer	$0.00000	$0.11495	(I)	$0.00449	$0.00072	$0.00364	$0.03054	$0.15434	(I)

Other Energy Charges (Per kWh)
Surcharges[8] $0.00160

1. Generation – Charge includes the Energy Cost Adjustment Clause Billing Factor as described in the Preliminary Statement, Number 6.
2. Vegetation – Charge to recover amounts in the Vegetation Management Balancing Account, as described in the Preliminary Statement, Number 18.
3. CEMA – Charge to recover amounts in the Catastrophic Event Memorandum Account as approved in D16-12-024 and as described in the Preliminary Statement, Number 13.A.
4. SIP – Charge to recover the costs of the Solar Initiative Program as described in the Preliminary Statement, Number 21.
5. PPP – Charge to recover Public Purpose Programs funding energy efficiency and low income assistance programs described in Preliminary Statement, Numbers 10, 17 and 19.
6. GRCMA – Charge to recover amounts in the General Rate Case Memorandum Account as described in the Preliminary Statement, Number 13.I.
7. BRRBA – Charge to recover amounts in the Base Revenue Requirement Balancing Account as described in the Preliminary Statement Number 8.
8. Surcharges – Charge to recover the Public Utilities Commission Reimbursement Surcharge as described in Rate Schedule RF and the Energy Commission Surcharge that is established by the California Energy Commission.

(Continued)

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LIBERTY UTILITIES (CALPECO ELECTRIC) LLC
SOUTH LAKE TAHOE, CALIFORNIA **30th Revised** CPUC Sheet No. **120**
Canceling **29th Revised** CPUC Sheet No. **120**

SCHEDULE NO. A-3
LARGE GENERAL SERVICE

APPLICABILITY

This schedule is applicable to three-phase general service, including light and power. This schedule is mandatory for all customers whose monthly maximum demand exceeds two hundred (200) kilowatts for any three months during the preceding twelve months. Customer shall contract for service hereunder for a minimum term of not less than one (1) year. For a customer who installs electric bus charging stations, the period of time in which the demand charge is calculated for those charging stations will be increased from 15 minutes to 30 minutes. The customer who installs these stations must deploy a minimum of 2 buses that utilize these stations. Non-profit group living facilities taking service under this schedule may be eligible for a 20% low-income rate discount on their bill, if such facilities qualify to receive service under the terms and conditions of Schedule EXPCARE.

TERRITORY

Entire California Service Area.

RATES

Customer Charge
Per meter, per month $517.94

Facilities Charge
Per kW of Maximum Demand, per month $5.82

Demand Charges
Per kW of Billing Demand for relevant time-of-use period, per month (See Special Condition 6)

	Distribution	Generation	Total
Winter			
On-Peak	$7.17	$ 1.86	$ 9.03
Mid-Peak	$2.12	$ 1.28	$ 3.40
Summer			
On-Peak	$3.00	$11.92	$14.92

Energy Charges (Per kWh)

	Distribution	Generation [1]		Vegetation [2]	SIP [4]	PPP [5]	BRRBA [7]	Total	
Winter									
On-Peak	$0.03231	$0.05635	(I)	$0.00000	$0.00072	$0.00364	$0.03054	0.12356	(I)
Mid-Peak	$0.02760	$0.05724	(I)	$0.00000	$0.00072	$0.00364	$0.03054	0.11974	(I)
Off-Peak	$0.01456	$0.04871	(I)	$0.00000	$0.00072	$0.00364	$0.03054	0.09817	(I)
Summer									
On-Peak	$0.04279	$0.05624	(I)	$0.00000	$0.00072	$0.00364	$0.03054	0.13393	(I)
Off-Peak	$0.02312	$0.04614	(I)	$0.00000	$0.00072	$0.00364	$0.03054	0.10416	(I)

Other Energy Charges (Per kWh)
Surcharges [8] $0.00160

(Continued)

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6.2.1.1.2 Truckee Donner Public Utility District (TDPUD)

Following are the Truckee Donner Public Utility District (TDPUD) electricity tariffs applied in this study.[2] The "Small Commercial" refers to TDPUD-Rate 15, the "Medium Commercial" is for TDPUD-Rate 20, and the "Large Commercial" refers to TDPUD-Rate25. And the 2023 rates are selected.

Commercial customers are charged based on actual electric use recorded on an electric meter.

	2022	2023
Small Commercial		
Customer Charge (per month)	$30.05	$33.06
Energy Charge (per kwh)	$0.17776	$0.1884
Medium Commercial		
Customer Charge (per month)	$272.84	$272.84
Energy Charge (per kwh)	$0.1166	$0.1257
Demand Charge (per kw)	$14.22	$14.93
Large Commercial		
Customer Charge (per month)	$1,196.79	$1,196.79
Energy Charge (per kwh)	$0.1248	$0.1343
Demand Charge (per kw)	$13.71	$14.40

[2] Rates | Truckee Donner Public Utility District (tdpud.org)

6.2.2 Southwest Gas

Following are the GN-40 Southwest Gas tariffs applied in this study. The Transportation Service Charge doesn't apply here since Truckee is not a "transportation customer". The transportation customer refers to a nonresidential customer who purchases their natural gas independently of Southwest Gas on the natural gas market, and then pays Southwest Gas a monthly transportation fee to transport their purchased gas to their facility.

SOUTHWEST GAS CORPORATION
P.O. Box 98510
Las Vegas, Nevada 89193-8510
California Gas Tariff — Canceling 185th Revised Cal. P.U.C. Sheet No. 69 / 184th Revised Cal. P.U.C. Sheet No. 69

STATEMENT OF RATES

RATES APPLICABLE TO NORTHERN CALIFORNIA SERVICE AREA [1] [2]

	Margin	Charges [3] and Adjustments	Subtotal Gas Usage Rate	Other Surcharges CPUC	Other Surcharges PPP	Gas Cost	Effective Sales Rate	
GN-40-Core General Gas Service (Covered Entities)								
Basic Service Charge	$ 11.00						$ 11.00	
Transportation Service Charge	$780.00						$780.00	
Cost per Therm								
First 100	$ .66509	$ .19578	$ .86087	$ .00300	$ .08786	$ 1.21116	$ 2.16289	I
Next 500	.49359	.19578	.68937	.00300	.08786	1.21116	1.99139	I
Next 2,400	.34791	.19578	.54369	.00300	.08786	1.21116	1.84571	I
Over 3,000	.13058	.19578	.32636	.00300	.08786	1.21116	1.62838	I

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%

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