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City of Palo Alto Local Ordinance Application Cost Effectiveness Report Appendix (Multifamily New Construction)

Appendix documenting utility tariff data used in the cost-effectiveness calculations for Multifamily New Construction Buildings.

Additional submitted attachment is included below.

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Last modified: 2023/06/20
Revision: 1.1

2022 Cost-Effectiveness Study: Multifamily New Construction

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Legal Notice

Acronym List

2023 PV$ – Present value costs in 2023

ACH50 – Air Changes per Hour at 50 pascals pressure differential

ACM – Alternative Calculation Method

ADU – Accessory Dwelling Unit

AFUE – Annual Fuel Utilization Efficiency

B/C – Lifecycle Benefit-to-Cost Ratio

BEopt – Building Energy Optimization Tool

BSC – Building Standards Commission

CA IOUs – California Investor-Owned Utilities

CASE – Codes and Standards Enhancement

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

CFI – California Flexible Installation

CFM – Cubic Feet per Minute

CO_2 – Carbon Dioxide

CPAU – City of Palo Alto Utilities

CPUC – California Public Utilities Commission

CZ – California Climate Zone

DHW – Domestic Hot Water

DOE – Department of Energy

DWHR – Drain Water Heat Recovery

EDR – Energy Design Rating

EER – Energy Efficiency Ratio

EF – Energy Factor

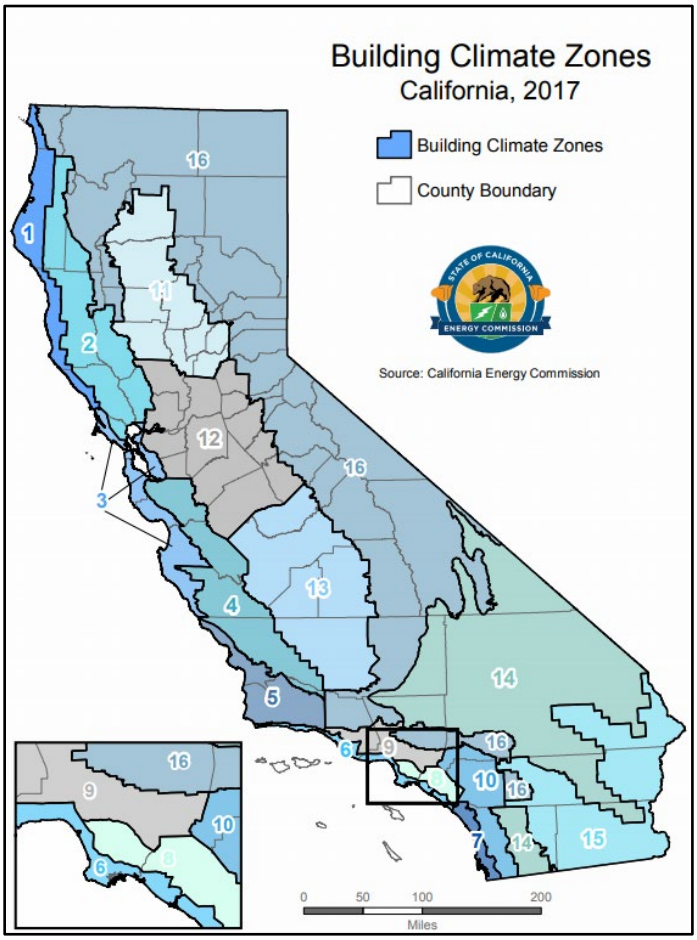
GHG – Greenhouse Gas

7 Appendices

7.1 Map of California Climate Zones

Climate zone geographical boundaries are depicted in Figure 3. The map in Figure 3 along with a zip-code search directory is available at: https://ww2.energy.ca.gov/maps/renewable/building_climate_zones.html

Figure 3. Map of California climate zones.



7.2 Utility Rate Schedules

The Reach Codes Team used the CA IOU and POU rate tariffs detailed below to determine the On-Bill savings for each package. The California Climate Credit was applied for both electricity and natural gas service for the IOUs using the 2022 credits shows below.[9] The credits were applied to reduce the total calculated annual bill, including any fixed fees or minimum bill amounts.

2022 Electric California Climate Credit Schedule

	April	May	June	July	Aug	Sept	Oct
PG&E	$39.30						$39.30
SCE	$59.00						$59.00
SDG&E					$64.17	$64.17	

Residential Natural Gas California Climate Credit

The 2022 Natural Gas California Climate Credit is distributed in April.

	2018‡	2019	2020	2021	2022	Total Value Received Per Household 2018-2022
PG&E	$30	$25	$27	$25	$47.83	**$154**
SDG&E	*	$34	$21	$18	$43.06	**$116**
Southwest Gas	$22	$25	$27	$28	$49.44	**$150**
SoCalGas	*	$50	$26	$22	$44.17	**$142**

Electricity rates reflect the most recent approved tariffs. Monthly gas rates were estimated based on the latest available gas rate (December 2022) and a curve to reflect how natural gas prices fluctuate with seasonal supply and demand. The seasonal curve was estimated from monthly residential tariffs between 2012 and 2022 (between 2020 and 2022 for CPAU). 12-month curves were created from monthly gas rates for each of the eleven years (three years for CPAU). These annual curves were then averaged to arrive at an average normalized annual curve. This was conducted separately for baseline and excess energy rates. Costs used in this analysis were then derived by establishing the most recent baseline and excess rate from the latest tariff as a reference point (December 2022), and then using the normalized curve to estimate the cost for the remaining months relative to the reference point rate.

[9] https://www.cpuc.ca.gov/industries-and-topics/natural-gas/greenhouse-gas-cap-and-trade-program/california-climate-credit

7.2.1 Pacific Gas & Electric

The following pages provide details on the PG&E electricity and natural gas tariffs applied in this study. **Error! Reference source not found.** describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of $0.0474/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between November 2021 and October 2022.

Table 23. PG&E Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ01	V
CZ02	X
CZ03	T
CZ04	X
CZ05	T
CZ11	R
CZ12	S
CZ13	R
CZ16	Y

The PG&E monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in **Error! Reference source not found.**. These are applied to both the G-1 and GM rates. These rates are based on applying a normalization curve to the December 2022 tariff based on eleven years of historical gas data. See the beginning of Section **Error! Reference source not found. Error! Reference source not found.** for further details. The corresponding CARE rates are shown in **Error! Reference source not found.** and reflect the 20 percent discount per the GL-1 tariff. The GM master metered wather heating baseline quantity of 0.43 therms per dwelling unit per day in all baseline territories and in both seasons was applied to the centrally metered gas water heating.

Table 24. PG&E Monthly Gas Rate ($/therm)

Month	Total Charge	
	Baseline	Excess
January	$2.20579	$2.66008
February	$2.24291	$2.69637
March	$2.11750	$2.58278
April	$2.08101	$2.55500
May	$2.08062	$2.55844
June	$2.09104	$2.56928
July	$2.10404	$2.58189
August	$2.15162	$2.63251
September	$2.18718	$2.67910
October	$2.23153	$2.71934
November	$2.32121	$2.79158
December	$2.34123	$2.80922

Table 25. PG&E Monthly CARE (GL-1) Gas Rate ($/therm)

Month	Total CARE Charge	
	Baseline	Excess
January	$1.76463	$2.12806
February	$1.79433	$2.15710
March	$1.69400	$2.06622
April	$1.66480	$2.04400
May	$1.66449	$2.04675
June	$1.67283	$2.05543
July	$1.68323	$2.06551
August	$1.72129	$2.10601
September	$1.74974	$2.14328
October	$1.78523	$2.17547
November	$1.85697	$2.23327
December	$1.87298	$2.24738

Residential
GAS
Baseline Territories and Quantities [1/]

Effective April 1, 2022 - Present

BASELINE QUANTITIES (Therms **Per Day** Per Dwelling Unit)

Individually Metered			
Baseline Territories	**Summer (April-October) Effective Apr. 1, 2022**	**Winter Off-Peak (Nov, Feb, Mar) Effective Nov. 1, 2022**	**Winter On-Peak (Dec, Jan) Effective Dec. 1, 2022**
P	0.39	1.88	2.19
Q	0.56	1.48	2.00
R	0.36	1.24	1.81
S	0.39	1.38	1.94
T	0.56	1.31	1.68
V	0.59	1.51	1.71
W	0.39	1.14	1.68
X	0.49	1.48	2.00
Y	0.72	2.22	2.58

Master Metered			
Baseline Territories	**Summer (April-October) Effective Apr. 1, 2022**	**Winter Off-Peak (Nov, Feb, Mar) Effective Nov. 1, 2022**	**Winter On-Peak (Dec, Jan) Effective Dec. 1, 2022**
P	0.29	1.01	1.13
Q	0.56	0.67	0.77
R	0.33	0.87	1.16
S	0.29	0.61	0.65
T	0.56	1.01	1.10
V	0.59	1.28	1.32
W	0.26	0.71	0.87
X	0.33	0.67	0.77
Y	0.52	1.01	1.13

Summer Season: Apr-Oct
Winter Off-Peak: Nov, Feb, Mar
Winter On-Peak: Dec, Jan

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Decision 21-11-016
GRC 2020 Ph II [Application 19-11-019]
Filed: Nov 22, 2019

Pacific Gas and Electric Company
U 39 San Francisco, California

Revised Cal. P.U.C. Sheet No. 53472-E
Cancelling Revised Cal. P.U.C. Sheet No. 52702-E

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

RATES: (Cont'd.)

E-TOU-C TOTAL BUNDLED RATES (T)

Total Energy Rates ($ per kWh)	PEAK		OFF-PEAK	
Summer				
Total Usage	$0.48902	(I)	$0.42558	(I)
Baseline Credit (Applied to Baseline Usage Only)	($0.09054)	(R)	($0.09054)	(R)
Winter				
Total Usage	$0.39193	(I)	$0.37460	(I)
Baseline Credit (Applied to Baseline Usage Only)	($0.09054)	(R)	($0.09054)	(R)
Delivery Minimum Bill Amount ($ per meter per day)	$0.34810			
California Climate Credit (per household, per semi-annual payment occurring in the April and October bill cycles)	($39.30)			

Total bundled service charges shown on customer's bills are unbundled according to the component rates shown below. Where the delivery minimum bill amount applies, the customer's bill will equal the sum of (1) the delivery minimum bill amount plus (2) for bundled service, the generation rate times the number of kWh used. For revenue accounting purposes, the revenues from the delivery minimum bill amount will be assigned to the Transmission, Transmission Rate Adjustments, Reliability Services, Public Purpose Programs, Nuclear Decommissioning, Competition Transition Charges, Energy Cost Recovery Amount, Wildfire Fund Charge, and New System Generation Charges based on kWh usage times the corresponding unbundled rate component per kWh, with any residual revenue assigned to Distribution.

(Continued)

Advice 6603-E-A
Decision

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Robert S. Kenney
Vice President, Regulatory Affairs

Submitted May 31, 2022
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Pacific Gas and Electric Company
San Francisco, California
U 39

Revised Cal. P.U.C. Sheet No. 53474-E
Cancelling Revised Cal. P.U.C. Sheet No. 50175-E

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

SPECIAL CONDITIONS:

1. BASELINE (TIER 1) QUANTITIES: The following quantities of electricity are to be used to define usage eligible for the baseline credit:

BASELINE QUANTITIES (kWh PER DAY)

Baseline Territory*	Code B - Basic Quantities				Code H - All-Electric Quantities			
	Summer		Winter		Summer		Winter	
	Tier 1		Tier 1		Tier 1		Tier 1	
P	13.5	(R)	11.0	(R)	15.2	(R)	26.0	(R)
Q	9.8	(R)	11.0	(R)	8.5	(R)	26.0	(R)
R	17.7	(R)	10.4	(R)	19.9	(R)	26.7	(R)
S	15.0	(R)	10.2	(R)	17.8	(R)	23.7	(R)
T	6.5	(R)	7.5	(R)	7.1	(R)	12.9	(R)
V	7.1	(R)	8.1	(R)	10.4	(R)	19.1	(I)
W	19.2	(R)	9.8	(R)	22.4	(R)	19.0	(R)
X	9.8	(R)	9.7	(R)	8.5	(R)	14.6	(R)
Y	10.5	(R)	11.1	(R)	12.0	(R)	24.0	(R)
Z	5.9	(R)	7.8	(R)	6.7	(R)	15.7	(R)

2. TIME PERIODS FOR **E-TOU-C**: Times of the year and times of the day are defined as follows:

Summer (service from June 1 through September 30):

Peak: 4:00 p.m. to 9:00 p.m. All days

Off-Peak: All other times

Winter (service from October 1 through May 31):

Peak: 4:00 p.m. to 9:00 p.m. All days

Off-Peak: All other times

* The applicable baseline territory is described in Part A of the Preliminary Statement

(Continued)

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Vice President, Regulatory Affairs

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Pacific Gas and Electric Company
San Francisco, California
U 39

Revised Cal. P.U.C. Sheet No. 53424-E
Cancelling Revised Cal. P.U.C. Sheet No. 52653-E

ELECTRIC SCHEDULE D-CARE Sheet 1
LINE-ITEM DISCOUNT FOR CALIFORNIA ALTERNATE RATES FOR ENERGY (CARE) CUSTOMERS

APPLICABILITY: This schedule is applicable to single-phase and polyphase residential service in single-family dwellings and in flats and apartments separately metered by PG&E and domestic submetered tenants residing in multifamily accommodations, mobilehome parks and to qualifying recreational vehicle parks and marinas and to farm service on the premises operated by the person whose residence is supplied through the same meter, where the applicant qualifies for California Alternate Rates for Energy (CARE) under the eligibility and certification criteria set forth in Electric Rule 19.1. CARE service is available on Schedules E-1, E-6, E-TOU-B, E-TOU-C, E-TOU-D, EV2, EM, ES, ESR, ET and EM-TOU.

TERRITORY: This rate schedule applies everywhere PG&E provides electric service.

RATES: Customers taking service on this rate schedule will receive a percentage discount ("A" below) on their total bundled charges on their otherwise applicable rate schedule (except for the California Climate Credit, which will not be discounted). In addition, customers will receive a percentage discount ("B" below) on the delivery minimum bill amount, if applicable. The CARE discount will be calculated for direct access and community choice aggregation customers based on the total charges as if they were subject to bundled service rates. Discounts will be applied as a residual reduction to distribution charges, after D-CARE customers are exempted from the Wildfire Fund Charge, Recovery Bond Charge, Recovery Bond Credit, and the CARE surcharge portion of the public purpose program charge used to fund the CARE discount. These conditions also apply to master-metered customers and to qualified sub-metered tenants where the master-meter customer is jointly served under PG&E's Rate Schedule D-CARE and either Schedule EM, ES, ESR, ET, or EM-TOU. (T) (T)

For master-metered customers where one or more of the submetered tenants qualifies for CARE rates under the eligibility and certification criteria set forth in Rule 19.1, 19.2, or 19.3, the CARE discount is equal to a percentage ("C" below) of the total bundled charges, multiplied by the number of CARE units divided by the total number of units. In addition, master-metered customers eligible for D-CARE will receive a percentage discount ("D" below) on the delivery minimum bill amount, if applicable.

It is the responsibility of the master-metered customer to advise PG&E within 15 days following any change in the number of dwelling units and/or any decrease in the number of qualifying CARE applicants that results when such applicants move out of their submetered or non-submetered dwelling unit, or submetered permanent-residence RV or permanent-residence boat.

A.	D-CARE Discount:	34.947 % (Percent)	(I)
B.	Delivery Minimum Bill Discount:	50.000 % (Percent)	
C.	Master-Meter D-CARE Discount:	34.947 % (Percent)	(I)
D.	Master-Meter Delivery Minimum Bill Discount:	50.000 % (Percent)	

SPECIAL CONDITIONS: 1. OTHERWISE APPLICABLE SCHEDULE: The Special Conditions of the Customer's otherwise applicable rate schedule will apply to this schedule.

(Continued)

Advice 6603-E-A
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Robert S. Kenney
Vice President, Regulatory Affairs

Submitted May 31, 2022
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Resolution

7.2.2 Southern California Edison

The following pages provide details on are the SCE electricity tariffs applied in this study. **Error! Reference source not found.** describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of $ 0.04361/ kWh was applied to any net annual electricity generation based on a one-year average of the rates between November 2021 and October 2022

Table 26: SCE Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ06	6
CZ08	8
CZ09	9
CZ10	10
CZ14	14
CZ15	15

Summer Daily Allocations (June through September)

Baseline Region Number	Daily kWh Allocation	All-Electric Allocation
5	17.2	17.9
6	11.4	8.8
8	12.6	9.8
9	16.5	12.4
10	18.9	15.8
13	22.0	24.6
14	18.7	18.3
15	46.4	24.1
16	14.4	13.5

Winter Daily Allocations (October through May)

Baseline Region Number	Daily kWh Allocation	All-Electric Allocation
5	18.7	29.1
6	11.3	13.0
8	10.6	12.7
9	12.3	14.3
10	12.5	17.0
13	12.6	24.3
14	12.0	21.3
15	9.9	18.2
16	12.6	23.1

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

Sheet 12 (T)

SPECIAL CONDITIONS

1. Applicable rate time periods are defined as follows:

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

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

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

Revised Cal. PUC Sheet No. 74502-E
Cancelling Revised Cal. PUC Sheet No. 73968-E

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

Sheet 2

RATES

Customers receiving service under this Schedule will be charged the applicable rates under Option 4-9 PM, Option 4-9 PM-CPP, Option 5-8 PM, Option 5-8 PM-CPP, Option PRIME, Option PRIME-CPP Option A, Option A-CPP, Option B, or Option B-CPP, as listed below. CPP Event Charges will apply to all energy usage during CPP Event Energy Charge periods and CPP Non-Event Energy Credits will apply as a reduction on CPP Non-Event Energy Credit Periods during Summer Season days, 4:00 p.m. to 9:00 p.m., as described in Special Conditions 1 and 3, below:

	Delivery Service	Generation[2]	
Option 4-9 PM / Option 4-9 PM-CPP	Total[1]	UG***	DWREC[3]
Energy Charge - $/kWh			
Summer Season - On-Peak	0.29820 (R)	0.23706 (I)	0.00000
Mid-Peak	0.29820 (R)	0.13648 (I)	0.00000
Off-Peak	0.25471 (I)	0.07939 (R)	0.00000
Winter Season - Mid-Peak	0.29820 (R)	0.17235 (I)	0.00000
Off-Peak	0.25471 (I)	0.10198 (R)	0.00000
Super-Off-Peak	0.23907 (I)	0.08508 (I)	0.00000
Baseline Credit**** - $/kWh	(0.09086) (I)	0.00000	
Fixed Recovery Charge - $/kWh	0.00117 (I)		
Basic Charge - $/day			
Single-Family Residence	0.031		
Multi-Family Residence	0.024		
Minimum Charge** - $/day			
Single Family Residence	0.346		
Multi-Family Residence	0.346		
Minimum Charge (Medical Baseline)** - $/day			
Single Family Residence	0.173		
Multi-Family Residence	0.173		
California Climate Credit[4]	(59.00)		
California Alternate Rates for Energy Discount - %	100.00*		
Family Electric Rate Assistance Discount -	100.00		
Option 4-9 PM-CPP			
CPP Event Energy Charge - $/kWh		0.80000	
Summer CPP Non-Event Credit On-Peak Energy Credit - $/kWh		(0.15170)	
Maximum Available Credit - $/kWh***** Summer Season		(0.50662) (I)	

* Represents 100% of the discount percentage as shown in the applicable Special Condition of this Schedule.
** The Minimum Charge is applicable when the Delivery Service Energy Charge, plus the applicable Basic Charge is less than the Minimum Charge.
*** The ongoing Competition Transition Charge CTC of ($0.00019) per kWh is recovered in the UG component of Generation. (R)
**** The Baseline Credit applies up to 100% of the Baseline Allocation, regardless of Time-of-Use time period. Additional Baseline Allocations apply for Customers with Heat Pump Water Heaters served under this Option. The Baseline Allocations are set forth in Preliminary Statement, Part H. (T) (T)
***** The Maximum Available Credit is the capped credit amount for CPP Customers dual participating in other demand response programs.
1 Total = Total Delivery Service rates are applicable to Bundled Service, Direct Access (DA) and Community Choice Aggregation Service (CCA Service) Customers, except DA and CCA Service Customers are not subject to the DWRBC rate component of this Schedule but instead pay the DWRBC as provided by Schedule DA-CRS or Schedule CCA-CRS.
2 Generation = The Gen rates are applicable only to Bundled Service Customers. See Special Condition below for PCIA recovery.
3 DWREC = Department of Water Resources (DWR) Energy Credit – For more information on the DWR Energy Credit, see the Billing Calculation Special Condition of this Schedule.
4 Applied on an equal basis, per household, semi-annually. See the Special Conditions of this Schedule for more information.

(Continued)

(To be inserted by utility)
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Southern California Edison Revised Cal. PUC Sheet No. 74493-E
Rosemead, California (U 338-E) Cancelling Revised Cal. PUC Sheet No. 73964-E

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

APPLICABILITY

Applicable to domestic service to CARE households residing in a permanent Single-Family Accommodation or Multifamily Accommodation where the customer meets all the Special Conditions of this Schedule. Customers enrolled in the CARE program are not eligible for the Family Electric Rate Assistance (FERA) program.

Pursuant to Special Condition 12 herein, customers receiving service under this Schedule are eligible to receive the California Climate Credit as shown in the Rates section below.

TERRITORY

Within the entire territory served.

RATES

The applicable charges set forth in Schedule D shall apply to Customers served under this Schedule.

CARE Discount:

A 28.9 percent discount is applied to a CARE Customer's bill prior to the application of the Public Utilities Commission Reimbursement Fee (PUCRF) and any applicable user fees, taxes, and late payment charges. CARE Customers are required to pay the PUCRF and any applicable user fees, taxes, and late payment charges in full. In addition, CARE Customers are exempt from paying the CARE Surcharge of $0.00931 per kWh and the Wildfire Fund Non-Bypassable Charge of $0.00652 per kWh. (I)
The 28.9 percent discount, in addition to these exemptions result in an average effective CARE Discount of 32.5 percent. (R)

(Continued)

(To be inserted by utility)
Advice 4864-E
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Vice President

(To be inserted by Cal. PUC)
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7.2.3 Southern California Gas

Following are the SoCalGas natural gas tariffs applied in this study. **Error! Reference source not found.** describes the baseline territories that were assumed for each climate zone.

Table 27. SoCalGas Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ05	2
CZ06	1
CZ08	1
CZ09	1
CZ10	1
CZ14	2
CZ15	1

The SoCalGas monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in **Error! Reference source not found.**. These rates are based on applying a normalization curve to the December 2022 tariff based on eleven years of historical gas data. See the beginning of Section **Error! Reference source not found. Error! Reference source not found.** for further details. Long-term historical natural gas rate data was only available for SoCalGas' procurement charges.[10] The baseline and excess transmission charges were found to be consistent over the course of a year and applied for the entire year based on 2022 rates. CARE rates reflect the 20 percent discount per the GR tariff.

Table 28. SoCalGas Monthly Gas Rate ($/therm)

Month	Procurement Charge	Transportation Charge		Total Charge	
		Baseline	Excess	Baseline	Excess
January	$0.90581	$0.82487	$1.23877	$1.73068	$2.14458
February	$0.83669	$0.82487	$1.23877	$1.66156	$1.84967
March	$0.80596	$0.82487	$1.23877	$1.63083	$1.82938
April	$0.71941	$0.82487	$1.23877	$1.54428	$1.75890
May	$0.77049	$0.82487	$1.23877	$1.59536	$1.78548
June	$0.86253	$0.82487	$1.23877	$1.68740	$1.83337
July	$0.87687	$0.82487	$1.23877	$1.70174	$1.86833
August	$0.95391	$0.82487	$1.23877	$1.77878	$1.91089
September	$0.85896	$0.82487	$1.23877	$1.68383	$1.83611
October	$0.84147	$0.82487	$1.23877	$1.66634	$1.84936
November	$0.89018	$0.82487	$1.23877	$1.71505	$1.88836
December	$1.05329	$0.82487	$1.23877	$1.87816	$1.98294

[10] The SoCalGas procurement and transmission charges were obtained from the following site: https://www.socalgas.com/for-your-business/energy-market-services/gas-prices

Schedule No. GM — Sheet 2
MULTI-FAMILY SERVICE
(Includes GM-E, GM-C, GM-EC, GM-CC, GT-ME, GT-MC and all GMB Rates)
(Continued)

APPLICABILITY (Continued)

Multi-family Accommodations built prior to December 15, 1981 and currently served under this schedule may also be eligible for service under Schedule No. GS. If an eligible Multi-family Accommodation served under this schedule converts to an applicable submetered tariff, the tenant rental charges shall be revised for the duration of the lease to reflect removal of the energy related charges.

Eligibility for service hereunder is subject to verification by the Utility.

TERRITORY

Applicable throughout the service territory.

RATES

	GM/GT-M	GMB/GT-MB
Customer Charge, per meter, per day:	16.438¢	$19.792
For "Space Heating Only" customers, a daily Customer Charge applies during the winter period from November 1 through April 30[1/]:	33.149¢	

GM

	GM-E	GM-EC[3/]	GT-ME
Baseline Rate, per therm (baseline usage defined per Special Conditions 3 and 4):			
Procurement Charge:[2/]	110.870¢	110.870¢	N/A
Transmission Charge:	90.256¢	90.256¢	90.256¢
Total Baseline Charge (all usage):	201.126¢	201.126¢	90.256¢
Non-Baseline Rate, per therm (usage in excess of baseline usage):			
Procurement Charge:[2/]	110.870¢	110.870¢	N/A
Transmission Charge:	135.367¢	135.367¢	135.367¢
Total Non Baseline Charge (all usage):	246.237¢	246.237¢	135.367¢

3. Baseline Usage: The following usage is to be billed at the Baseline rate for Multi-family Accommodation units. Usage in excess of applicable Baseline allowances will be billed at the Non-Baseline rate.

Per Residence	Daily Therm Allowance for Climate Zones*		
	1	2	3
Summer (May 1- Oct.31)	0.424	0.424	0.424
Winter On-Peak (Dec., Jan., and Feb.)	1.600	1.867	2.600
Winter Off-Peak (Nov., Mar., and Apr.)	0.874	0.923	1.714

7.2.4 San Diego Gas & Electric

Following are the SDG&E electricity and natural gas tariffs applied in this study. **Error! Reference source not found.** describes the baseline territories that were assumed for each climate zone. A net surplus compensation rate of $0.04174 / kWh was applied to any net annual electricity generation based on a one-year average of the rates between January 2022 and December 2022.

Table 29. SDG&E Baseline Territory by Climate Zone

Climate Zone	Baseline Territory
CZ07	Coastal
CZ10	Inland
CZ14	Mountain

The SDG&E monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in **Error! Reference source not found.**. These rates are based on applying a normalization curve to the December 2022 tariff based on eleven years of historical gas data. See the beginning of Section **Error! Reference source not found. Error! Reference source not found.** for further details. CARE rates reflect the 20 percent discount per the G-CARE tariff.

Table 30. SDG&E Monthly Gas Rate ($/therm)

Month	Total Charge	
	Baseline	Excess
January	$2.33762	$2.34748
February	$2.26751	$2.28440
March	$2.25119	$2.27016
April	$2.20192	$2.22744
May	$2.24252	$2.26403
June	$2.31819	$2.33060
July	$2.32406	$2.33630
August	$2.37527	$2.38090
September	$2.33542	$2.34971
October	$2.30366	$2.32151
November	$2.31722	$2.33381
December	$2.45653	$2.73517

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

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

SCHEDULE GM

Sheet 2

MULTI-FAMILY NATURAL GAS SERVICE
(Includes Rates for GM, GM-C and GTC/GTCA)

RATES

	GM	GM-C		GTC/GTCA[1]
Baseline Rate, per therm (baseline usage defined in Special Condition 4)				
Procurement Charge[2]	$1.05454	$1.42421	I	N/A
Transmission Charge	$1.40199	$1.40199		$1.40201
Total Baseline Charge	$2.45653	$2.82620	I	$1.40201
Non-Baseline Rate (usage in excess of baseline usage)				
Procurement Charge[2]	$1.05454	$1.42421	I	N/A
Transmission Charge	$1.68063	$1.68063		$1.68065
Total Non-Baseline Charge	$2.73517	$3.10484	I	$1.68065
Minimum Bill, per day[3]				
Non-CARE customers	$0.13151	$0.13151		$0.13151
CARE customers	$0.10521	$0.10521		$0.10521

Franchise Fee Differential:

A Franchise Fee Differential of 1.03% will be applied to the monthly billings calculated under this schedule for all customers within the corporate limits of the City of San Diego. Such Franchise Fee Differential shall be so indicated and added as a separate item to bills rendered to such customers.

Additional Charges
Rates may be adjusted to reflect any applicable taxes, franchise fees or other fees, regulatory surcharges, and interstate or intrastate pipeline charges that may occur.

SPECIAL CONDITIONS

1. Definitions. The definitions of principal terms used in this schedule are found either herein or in Rule 1, Definitions.

2. Number of Therms. The number of therms to be billed shall be determined in accordance with Rule 2. The daily therm allowance in the Baseline Usage, shown in Special Condition 4, shall be multiplied by the number of qualified residential units. It is the responsibility of the customer to advise the Utility within 15 days following any change in the submetering arrangements or the number of dwelling units or Mobilehome Park spaces provided gas service. The number of qualifying units is subject to verification by the Utility.

3. Exclusions. Gas service for non-domestic enterprises such as rooming houses, boarding houses, dormitories, rest homes, military barracks, transient trailer parks, stores, restaurants, service stations, and other similar establishments will be separately metered and billed under the applicable schedules.

[1] The rates for core transportation-only customers, with the exception of customers taking service under Schedule GT-NGV, include any FERC Settlement Proceeds Memorandum Account (FSPMA) credit adjustments.
[2] This charge is applicable to Utility Procurement Customers and includes the GPC and GPC-A Procurement Charges shown in Schedule GPC which are subject to change monthly as set forth in Special Condition 7.
[3] Effective starting May 1, 2020, the minimum bill is calculated as the minimum bill charge of $0.13151 per day times the number of days in the billing cycle (approximately $4 per month) with a 20% discount applied for CARE customer resulting in a minimum bill charge of $0.10521 per day (approximately $3.20 per month).

(Continued)

2H7 Issued by Submitted Dec 9, 2022
Advice Ltr. No. 3145-G Effective Dec 10, 2022

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 36337-E
Canceling Revised Cal. P.U.C. Sheet No. 35747-E

SCHEDULE TOU-DR1

Sheet 2

RESIDENTIAL TIME-OF-USE

RATES

Total Rates:

Description – TOU DR1	UDC Total Rate		DWR BC + WF-NBC		EECC Rate + DWR Credit		Total Rate	
Summer:								
On-Peak	0.26467	I	0.00309	R	0.42232	R	0.69008	R
Off-Peak	0.26467	I	0.00309	R	0.19003	R	0.45779	I
Super Off-Peak	0.26467	I	0.00309	R	0.06802	R	0.33578	I
Winter:								
On-Peak	0.39848	I	0.00309	R	0.14268	R	0.54425	R
Off-Peak	0.39848	I	0.00309	R	0.08004	R	0.48161	I
Super Off-Peak	0.39848	I	0.00309	R	0.06187	R	0.46344	I
Summer Baseline Adjustment Credit up to 130% of Baseline	(0.10182)	R					(0.10182)	R
Winter Baseline Adjustment Credit up to 130% of Baseline	(0.10182)	R					(0.10182)	R
Minimum Bill ($/day)	0.350						0.350	

Note:
(1) Total Rates consist of UDC, Schedule DWR-BC (Department of Water Resources Bond Charge), Schedule WF-NBC (CA Wildfire Fund charge) and Schedule EECC (Electric Energy Commodity Cost) rates, with the EECC rates reflecting a DWR Credit. EECC rates are applicable to bundled customers only. See Special Condition 16 for PCIA (Power Charge Indifference Adjustment) recovery.
(2) Total Rates presented are for customers that receive commodity supply and delivery service from Utility.
(3) DWR-BC and WF-NBC charges do not apply to CARE customers.
(4) As identified in the rates tables, customer bills will also include line-item summer and winter credits for usage up to 130% of baseline to provide the rate capping benefits adopted by Assembly Bill 1X and Senate Bill 695.
(5) WF-NBC rate is 0.00652 + DWR-BC Bond Charge is (0.00343). R

(Continued)

2C10
Advice Ltr. No. 4004-E
Decision No. 22-03-003

Issued by
Dan Skopec
Vice President
Regulatory Affairs

Submitted May 16, 2022
Effective Jun 1, 2022
Resolution No.

Time Periods

All time periods listed are applicable to local time. The definition of time will be based upon the date service is rendered.

TOU Periods – Weekdays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	6:00 a.m. – 4:00 p.m.; 9:00 p.m. - midnight	6:00 a.m. – 4:00 p.m. Excluding 10:00 a.m. – 2:00 p.m. in March and April; 9:00 p.m. - midnight
Super Off-Peak	Midnight – 6:00 a.m.	Midnight – 6:00 a.m. 10:00 a.m. – 2:00 p.m. in March and April
TOU Period – Weekends and Holidays	Summer	Winter
On-Peak	4:00 p.m. – 9:00 p.m.	4:00 p.m. – 9:00 p.m.
Off-Peak	2:00 p.m. – 4:00 p.m.; 9:00 p.m. - midnight	2:00 p.m. – 4:00 p.m.; 9:00 p.m. - midnight
Super Off-Peak	Midnight – 2:00 p.m.	Midnight – 2:00 p.m.

Seasons: Summer June 1 – October 31
Winter November 1 – May 31

15. Baseline Usage: The following quantities of electricity are used to calculate the baseline adjustment credit.

	Baseline Allowance For Climatic Zones*			
	Coastal	Inland	Mountain	Desert
Basic Allowance				
Summer (June 1 to October 31)	9.0	10.4	13.6	15.9
Winter (November 1 to May 31)	9.2	9.6	12.9	10.9
All Electric**				
Summer (June 1 to October 31)	6.0	8.7	15,2	17.0
Winter (November 1 to May 31)	8.8	12.2	22.1	17.1

* Climatic Zones are shown on the Territory Served, Map No. 1.
** All Electric allowances are available upon application to those customers who have permanently installed space heating or who have electric water heating and receive no energy from another source.

(1) Total Rates consist of UDC, Schedule DWR-BC (Department of Water Resources Bond Charge), and Schedule EECC (Electric Energy Commodity Cost) rates, with the EECC rates reflecting a DWR Credit of $0.00000 that customers receive on their monthly bills.
(2) Total Rates presented are for customers that receive commodity supply and delivery service from Utility. Differences in total rates paid by Direct Access (DA) and Community Choice Aggregation (CCA) customers are identified in Schedule DA-CRS and CCA-CRS, respectively.
(3) DWR-BC charges do not apply to CARE or Medical Baseline customers.
(4) Total Effective CARE Rate is presented for illustrative purposes only, and reflects the average effective CARE discount CARE customers receive which consists of (a) exemptions from paying the CARE Surcharge, DWR-BC, California Solar Initiative (CSI) and Vehicle-Grid Integration (VGI) Costs; (b) a 50% minimum bill relative to Non-CARE; and (c) a separate line-item bill discount for all qualified residential CARE customers.
(5) Current DWR-BC as presented is now used for collecting the California Wildfire Fund Charge effective Oct 1, 2020 (See Schedule WF – NBC). DWR BC will be renamed at implementation of SDG&E's new customer information system.

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 35718-E
Canceling Revised Cal. P.U.C. Sheet No. 32576-E

SCHEDULE E-CARE

Sheet 1

CALIFORNIA ALTERNATE RATES FOR ENERGY

APPLICABILITY

This schedule provides a California Alternate Rates for Energy (CARE) discount to each of the following types of customers listed below that meet the requirements for CARE eligibility as defined in Rule 1, Definitions, and herein, and is taken in conjunction with the customer's otherwise applicable service schedule.

1) Customers residing in a permanent single-family accommodation, separately metered by the Utility.

2) Multi-family dwelling units and mobile home parks supplied through one meter on a single premises where the individual unit is submetered.

3) Non-profit group living facilities.

4) Agricultural employee housing facilities.

TERRITORY

Within the entire territory served by the Utility.

DISCOUNT

1) Residential CARE: Qualified residential CARE customers will receive a total effective discount according to the following:

	2015	2016	2017	2018	2019	2020 and beyond
Effective Discount	**40%**	**39%**	**38%**	**38%**	**36% R**	**35%**

Pursuant to Commission Decision (D.) 15-07-001, the average effective CARE discount for residential customers will decrease 1% each year until an average effective discount of 35% is reached in 2020.

The average effective CARE discount consists of: (a) exemptions from paying the CARE Surcharge, Department of Water Resources Bond Charge (DWR-BC), Vehicle-Grid Integration (VGI) costs, and California Solar Initiative (CSI); (b) a 50% minimum bill relative to Non-CARE; (c) the California Wildfire Fund Charge (WF-NBC) and (d) a separate line-item bill discount for all qualified residential CARE customers with the exclusion of CARE Medical Baseline customers taking service on tiered rates schedules. D.15-07-001 retained the rate subsidies in Non-CARE Medical Baseline tiered rates and thereby a separate line-item discount is provided for these CARE Medical Baseline customers T

(Continued)

1C5
Advice Ltr. No. 3928-E

Issued by
Dan Skopec
Vice President

Submitted Dec 30, 2021
Effective Jan 1, 2022

7.2.5 City of Palo Alto Utilities

Following are the CPAU electricity and natural gas tariffs applied in this study. The CPAU monthly gas rate in $/therm was applied on a monthly basis according to the rates shown in **Error! Reference source not found.**. These rates are based on applying a normalization curve to the December 2022 tariff based on three years of historical gas data. See the beginning of Section **Error! Reference source not found. Error! Reference source not found.** for further details. The monthly service charge applied was $106.90 per month per the December 2022 G-2 tariff.

Table 31. CPAU Monthly Gas Rate ($/therm)

Month	G2 Volumetric Totals
January	$1.80964
February	$1.67009
March	$1.68480
April	$1.68698
May	$1.78478
June	$1.88288
July	$1.88355
August	$2.06943
September	$2.06798
October	$2.08553
November	$2.09681
December	$2.45700

RESIDENTIAL ELECTRIC SERVICE

UTILITY RATE SCHEDULE E-1

A. APPLICABILITY:

This Rate Schedule applies to separately metered single-family residential dwellings receiving Electric Service from the City of Palo Alto Utilities.

B. TERRITORY:

This rate schedule applies everywhere the City of Palo Alto provides Electric Service.

C. UNBUNDLED RATES:

Per kilowatt-hour (kWh)	Commodity	Distribution	Public Benefits	Total
Tier 1 usage	$0.08547	$0.05429	$0.00469	$0.14445
Tier 2 usage Any usage over Tier 1	0.11858	0.08008	0.00469	0.20335
Minimum Bill ($/day)				0.3447

RESIDENTIAL MASTER-METERED AND SMALL NON-RESIDENTIAL ELECTRIC SERVICE

UTILITY RATE SCHEDULE E-2

A. APPLICABILITY:

This Rate Schedule applies to the following Customers receiving Electric Service from the City of Palo Alto Utilities:

1. Small non-residential Customers receiving Non-Demand Metered Electric Service; and
2. Customers with Accounts at Master-Metered multi-family facilities.

B. TERRITORY:

This rate schedule applies everywhere the City of Palo Alto provides Electric Service.

C. UNBUNDLED RATES:

Per kilowatt-hour (kWh)	Commodity	Distribution	Public Benefits	Total
Summer Period	$0.12151	$0.09276	$0.00469	$0.21896
Winter Period	0.08715	0.06171	0.00469	0.15355
Minimum Bill ($/day)				0.8777

EXPORT ELECTRICITY COMPENSATION

UTILITY RATE SCHEDULE E-EEC-1

A. APPLICABILITY:

This Rate Schedule applies in conjunction with the otherwise applicable Rate Schedules for each Customer class. This Rate Schedule may not apply in conjunction with any time-of-use Rate Schedule. This Rate Schedule applies to Customer-Generators as defined in Rule and Regulation 2 who are either not eligible for Net Energy Metering or who are eligible for Net Energy metering but elect to take Service under this Rate Schedule.

B. TERRITORY:

Applies to locations within the service area of the City of Palo Alto.

C. RATE:

The following buyback rate shall apply to all electricity exported to the grid.

	Per kWh
Export electricity compensation rate	$0.1045

7.2.6 Sacramento Municipal Utilities District (Electric Only)

Following are the SMUD electricity tariffs applied in this study. The rates effective January 2023 were used.

Residential Time-of-Day Service
Rate Schedule R-TOD

II. Firm Service Rates

A. Time-of-Day (5-8 p.m.) Rate

	Effective as of October 1, 2021	Effective as of March 1, 2022	Effective as of January 1, 2023
Time-of-Day (5-8 p.m.) Rate (RT02)			
Non-Summer Season (October - May)			
System Infrastructure Fixed Charge *per month per meter*	$22.70	$23.05	$23.50
Electricity Usage Charge			
Peak *$/kWh*	$0.1494	$0.1516	$0.1547
Off-Peak *$/kWh*	$0.1082	$0.1098	$0.1120
Summer Season (June - September)			
System Infrastructure Fixed Charge *per month per meter*	n/a	$23.05	$23.50
Electricity Usage Charge			
Peak *$/kWh*	n/a	$0.3215	$0.3279
Mid-Peak *$/kWh*	n/a	$0.1827	$0.1864
Off-Peak *$/kWh*	n/a	$0.1323	$0.1350

A. Time-of-Day (5-8 p.m.) Rate (rate category RT02)

1. The TOD (5-8 p.m.) Rate is the standard rate for SMUD's residential customers. Eligible customers can elect the Fixed Rate under Rate Schedule R as an alternative rate.

2. The TOD (5-8 p.m.) Rate is an optional rate for customers who have an eligible renewable electrical generation facility under Rate Schedule NEM1 that was approved for installation by SMUD prior to January 1, 2018.

3. This rate has five kilowatt-hour (kWh) prices, depending on the time-of-day and season as shown below. Holidays are detailed in Section V. Conditions of Service.

Summer (Jun 1 - Sept 30)	**Peak**	Weekdays between 5:00 p.m. and 8:00 p.m.
	Mid-Peak	Weekdays between noon and midnight except during the Peak hours.
	Off-Peak	All other hours, including weekends and holidays[1].
Non-Summer (Oct 1 - May 31)	**Peak**	Weekdays between 5:00 p.m. and 8:00 p.m.
	Off-Peak	All other hours, including weekends and holidays[1].

[1] See Section V. Conditions of Service

C. Master-Metered Multifamily Accommodation and Mobile Home Park Billing (Rate Category RSMM) Closed

	Effective as of October 1, 2021	Effective as of March 1, 2022	Effective as of January 1, 2023
Master Metered Multifamily and Mobile Home Park Billing (Closed)			
Non-Summer Season (October - May)			
System Infrastructure Fixed Charge *per month per meter*	$22.70	$23.05	$23.50
Electricity Usage Charge			
All kWh usage per month *$/kWh*	$0.1279	$0.1298	$0.1324
Summer Season (June - September)			
System Infrastructure Fixed Charge *per month per meter*	n/a	$23.05	$23.50
Electricity Usage Charge			
All kWh usage per month *$/kWh*	n/a	$0.1486	$0.1516

7.2.7 Fuel Escalation Assumptions

The average annual escalation rates in **Error! Reference source not found.** were used in this study. These are based on assumptions from the CPUC 2021 En Banc hearings on utility costs through 2030 (California Public Utilities Commission, 2021a). Escalation rates through the remainder of the 30-year evaluation period are based on the escalation rate assumptions within the 2022 TDV factors. No data was available to estimate electricity escalation rates for CPAU and SMUD, therefore electricity escalation rates for PG&E and statewide natural gas escalation rates were applied.

Table 32: Real Utility Rate Escalation Rate Assumptions

	Statewide Natural Gas Residential Average Rate (%/year, real)	Electric Residential Average Rate (%/year, real)		
		PG&E	SCE	SDG&E
2023	4.6%	1.8%	1.6%	2.8%
2024	4.6%	1.8%	1.6%	2.8%
2025	4.6%	1.8%	1.6%	2.8%
2026	4.6%	1.8%	1.6%	2.8%
2027	4.6%	1.8%	1.6%	2.8%
2028	4.6%	1.8%	1.6%	2.8%
2029	4.6%	1.8%	1.6%	2.8%
2030	4.6%	1.8%	1.6%	2.8%
2031	2.0%	0.6%	0.6%	0.6%
2032	2.4%	0.6%	0.6%	0.6%
2033	2.1%	0.6%	0.6%	0.6%
2034	1.9%	0.6%	0.6%	0.6%
2035	1.9%	0.6%	0.6%	0.6%
2036	1.8%	0.6%	0.6%	0.6%
2037	1.7%	0.6%	0.6%	0.6%
2038	1.6%	0.6%	0.6%	0.6%
2039	2.1%	0.6%	0.6%	0.6%
2040	1.6%	0.6%	0.6%	0.6%
2041	2.2%	0.6%	0.6%	0.6%
2042	2.2%	0.6%	0.6%	0.6%
2043	2.3%	0.6%	0.6%	0.6%
2044	2.4%	0.6%	0.6%	0.6%
2045	2.5%	0.6%	0.6%	0.6%
2046	1.5%	0.6%	0.6%	0.6%
2047	1.3%	0.6%	0.6%	0.6%
2048	1.6%	0.6%	0.6%	0.6%
2049	1.3%	0.6%	0.6%	0.6%
2050	1.5%	0.6%	0.6%	0.6%
2051	1.8%	0.6%	0.6%	0.6%
2052	1.8%	0.6%	0.6%	0.6%

7.3 Cost Details

Table 33 presents additional detail on the first cost assumptions for the central water heating systems. For the 5-story prototype costs are provided both for a CO_2 refrigerant Sanden-based and R-134a refrigerant Colmac-based heat pump water heater designs. The results presented in the main body of this report are based on the Sanden design. A sensitivity analysis was also conducted for a Colmac design (see Appendix 7.5 Central Heat Pump Water Heater Comparison) and the cost comparison is presented here. All costs are based on data from the 2022 Multifamily All-Electric CASE Report (Statewide CASE Team, 2020c).

Table 33. Heat Pump Water Heater First Costs per Building (Present Value (2023$))

Item	3-Story (36-units)			5-Story (88-units)			
	Gas Boiler (CZs 1-9)	Gas Boiler (CZs 10-16)	Heat Pump	Gas Boiler (CZs 1-9)	Gas Boiler (CZs 10-16)	Heat Pump (Sanden)	Heat Pump (Colmac)
Water Heating Equipment	$87,602	$87,602	$140,907	$135,146	$135,146	$244,742	$319,485
Solar Thermal Collector	$39,800	$46,888	n/a	$74,740	$91,776	n/a	n/a
Gas Piping	$8,890	$8,890	n/a	$9,065	$9,065	n/a	n/a
Electrical Circuits	n/a	n/a	$25,000	n/a	n/a	$25,000	$25,000
Overhead & Markup	$37,480	$39,430	$45,624	$60,212	$64,896	$74,179	$94,733
Total	**$173,772**	**$182,810**	**$211,531**	**$279,163**	**$300,883**	**$343,920**	**$439,218**

Table 34 presents additional detail on the first cost assumptions for the space hating systems.

Table 34. Heat Pump Space Heater First Costs per Dwelling Unit (Present Value (2023$)

Item	3-Story		5-Story		Source & Notes
	Furnace + Split AC	Heat Pump	Furnace + Split HP	Heat Pump	
Dwelling Unit HVAC	$5,651	$5,460	$6,109	$5,460	Gas system costs based on 2022 Multifamily All-Electric CASE Report. Heat pump costs based on online equipment research indicating a 2-ton HP is $191 less than a furnace/AC of the same size.
Refrigerant Piping	$563	$563	$423	$423	2022 Multifamily All-Electric CASE Report.
Gas Piping	$92	$0	$227	$0	
Electrical Circuits	$0	$150	$0	$150	
Labor	$9,904	$6,985	$9,904	$6,985	Based on the 2022 Multifamily All-Electric CASE Report with adjustments to align with updated equipment costs.
Overhead & Markup	$4,457	$3,618	$4,582	$3,579	Based on a 27% markup
Total	**$20,667**	**$16,776**	**$21,245**	**$16,597**	
Incremental Cost		**($3,891)**		**($4,647)**	

7.4 PG&E Gas Infrastructure Cost Memo

Pacific Gas and Electric Company

Janice Berman
Director – Grid Edge
Pacific Gas and Electric Company
Mail Code B9F
P.O. Box 770000
San Francisco, CA 94177-00001

December 5, 2019

Energy Commission Staff:

On March 2, 2018, PG&E provided gas extension cost estimates for residential existing and new subdivisions (see attached memo). We have recently updated our estimates and are therefore providing an updated memo.

In addition to mainline and service extension costs, we are also providing estimates of the cost of gas meters for different building types including both residential and commercial customers. These estimates are based on PG&E historical jobs.

Developing gas extension cost estimates is complex and the actual costs are project dependent. Costs vary widely with location, terrain, distance to the nearest main, joint trenching, materials, number of dwellings per development, and several other site and job-specific conditions. For these reasons, it is not practical to come up with estimates that represent every case. Instead we are including estimates based on historical averages taken from projects within PG&E's territory. It is not recommended to compare specific project costs to these estimates as any number of factors could lead to higher or lower costs than these averages are representing.

We are also including estimates for in-house gas infrastructure costs and specific plan review costs. These estimates are from external sources, and are not based on PG&E data, but have been provided for the sake of completeness and for use in energy efficiency analysis.

To further anchor the estimates, several assumptions have been made:

1. It is assumed that during new construction, gas infrastructure will likely be joint trenched with electric infrastructure. As a result, the incremental cost of trenching associated with the gas infrastructure alone is minimal. Therefore, all mainline cost estimates exclude trench costs. Service extension cost estimates include both estimates with and without trench costs. In the case where new construction would require overhead electric and underground gas infrastructure, the estimates with trench costs included for service extensions should be utilized.

2. It is assumed that new construction in an existing subdivision would not generally require a mainline extension. In cases where a mainline extension would be required to an existing subdivision, the costs are highly dependent on the location, terrain, and distance to the nearest main.

Pacific Gas and Electric Company

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3. These estimates are for total costs. The cost estimates have not been reduced to account for the portion of the costs paid by all customers due to application of Rule 15[1] and Rule 16[2] allowances. Hence, costs to the specific customer may be lower than the estimates below, as the specific customer benefits from the Rule 15 and Rule 16 allowances.

Table 1: PG&E Gas Infrastructure Cost Estimates

	Existing Subdivision/Development	New Greenfield Subdivision/Development
Mainline Extension	N/A[3]	Single-Family $17/ft[4] Multi-Family $11/ft[4]
Service Extension (Typically 1" pipe from mainline to the meter)	$6750 per service/building[4] (excludes trench costs) $9200 per service/building[4] (includes trench costs)	$1300 per service/building[4] (includes mainline extension costs within the subdivision; excludes trench costs) $1850 per service/building[4] (includes mainline extension costs within the subdivision; includes trench costs)
Meter	Residential Single Family $300 per meter[5] Residential Multi-Family $300 per meter + $300 per meter manifold outlet[5] Small/Medium Commercial $3600 per meter[6]	Residential Single Family $300 per meter[5] Residential Multi-Family $300 per meter + $300 per meter manifold outlet[5] Small/Medium Commercial $3600 per meter[6]

[1] https://www.pge.com/tariffs/tm2/pdf/ELEC_RULES_15.pdf
[2] https://www.pge.com/tariffs/tm2/pdf/ELEC_RULES_16.pdf
[3] It is assumed that new construction in an existing subdivision would not require a main extension.
[4] Estimates based on PG&E jobs from Jan 2016 - Dec 2017 from PG&E's Service Planning team.
[5] Estimates from PG&E's Dedicated Estimating Team. For Multi-Family units, the costs of $300 per meter and $300 per meter manifold outlet should be combined for a total of $600 per meter.
[6] PG&E Marginal Customer Access Cost Estimates presented in the 2018 Gas Cost Allocation Proceedings (GCAP), A.17-09-006, Exhibit PG&E-2, Appendix A, Section A, Table A-1. The Average Connection Cost per Customer values were included in the MCAC workpaper that accompanied the GCAP testimony

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	Large Commercial $32,000 per meter[6]	Large Commercial $32,000 per meter[6]

Note: Service extension cost estimates for New Greenfield Subdivisions include mainline extension costs as well. Therefore, mainline cost estimates can be ignored for the purpose of estimating total project costs.

Table 2: Gas Infrastructure Cost Estimates from Other Sources

	Existing Subdivision/Development	New Greenfield Subdivision/Development
In-House Infrastructure	Single-Family $800[7] Multi-Family $600 per unit[7] Medium Office $600-4500[7,8] Medium Retail $10,000[8]	Single-Family $800[7] Multi-Family $600 per unit[7] Medium Office $600-4500[7,8] Medium Retail $10,000[8]
Plan Review (Will vary by city and often not a fixed fee)	Residential Palo Alto - $850[9] Nonresidential Palo Alto - $2316[9]	Residential Palo Alto - $850[9] Nonresidential Palo Alto - $2316[9]

Please let us know if there are any follow-up questions or clarifications.

Best regards,

[7] Frontier Energy, Inc., Misti Bruceri & Associates, LLC. 2019. "2019 Cost-effectiveness Study: Low Rise Residential New Construction." Available at: https://localenergycodes.com/content/performance-ordinances
[8] TRC, EnergySoft. 2019. "2019 Nonresidential New Construction Reach Code Cost Effectiveness Study." Available at: https://localenergycodes.com/content/performance-ordinances
[9] TRC. 2018. "City of Palo Alto 2019 Title 24 Energy Reach Code Cost Effectiveness Analysis Draft." Available at: http://cityofpaloalto.org/civicax/filebank/documents/66742

7.5 Central Heat Pump Water Heater Comparison

Table 35 presents energy and cost-effectiveness results for a R-134a refrigerant based system design using a Colmac central heat pump water heater in the 5-story prototype. This was only found to be cost-effective based on at least one of the two metrics in Climate Zones 1, 4 in CPAU territory, and 16.

Table 35. 5-Story Cost-Effectiveness: All-Electric Prescriptive Code with R-134a Heat Pump Water Heater

Climate Zone	Electric /Gas Utility	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
CZ01	PGE	6%	6%	-1,496	147	($155)	($1,240)	($3,556)	($4,223)	3.4	$2,984	>1	$5,870
CZ02	PGE	4%	2%	-1,197	120	($145)	($1,513)	$1,691	$2,749	0.0	($4,262)	0.5	($1,287)
CZ03	PGE	6%	3%	-1,166	120	($138)	($1,360)	$1,691	$2,749	0.0	($4,109)	0.8	($523)
CZ04	PGE	4%	2%	-1,116	113	($76)	($49)	$1,691	$2,749	0.0	($2,798)	0.7	($949)
CZ04	CPAU	4%	2%	-1,116	113	$185	$7,144	$1,718	$2,776	2.6	$4,368	0.6	($976)
CZ05	PGE	5%	2%	-1,161	117	($137)	($1,391)	$1,691	$2,749	0.0	($4,140)	0.5	($1,412)
CZ05	PGE/SCG	5%	2%	-1,161	117	($189)	($3,016)	$1,691	$2,749	0.0	($5,765)	0.5	($1,412)
CZ06	SCE/SCG	4%	1%	-1,000	104	($92)	($879)	$1,691	$2,749	0.0	($3,628)	0.6	($1,013)
CZ07	SDGE	5%	2%	-996	106	($183)	($3,216)	$1,691	$2,749	0.0	($5,965)	0.7	($936)
CZ08	SCE/SCG	3%	1%	-948	100	($156)	($2,413)	$1,691	$2,749	0.0	($5,162)	0.7	($695)
CZ09	SCE	3%	0%	-966	100	($132)	($1,863)	$1,691	$2,749	0.0	($4,612)	0.7	($738)
CZ10	SCE/SCG	3%	1%	-962	84	($188)	($3,375)	$1,444	$2,395	0.0	($5,770)	0.3	($1,596)
CZ10	SDGE	3%	1%	-962	84	($239)	($4,959)	$1,444	$2,395	0.0	($7,354)	0.3	($1,596)
CZ11	PGE	4%	3%	-1,029	92	($165)	($2,487)	$1,444	$2,395	0.0	($4,882)	0.4	($1,367)
CZ12	PGE	4%	3%	-1,081	96	($172)	($2,591)	$1,444	$2,395	0.0	($4,986)	0.3	($1,667)
CZ12	SMUD/PGE	4%	3%	-1,081	96	$26	$1,988	$1,444	$2,395	0.8	($407)	0.3	($1,667)
CZ13	PGE	3%	2%	-976	88	($156)	($2,361)	$1,444	$2,395	0.0	($4,756)	0.4	($1,452)
CZ14	SCE/SCG	2%	-1%	-1,045	84	($210)	($3,880)	$1,444	$2,395	0.0	($6,275)	0.1	($2,056)
CZ14	SDGE	2%	-1%	-1,045	84	($270)	($5,725)	$1,444	$2,395	0.0	($8,120)	0.1	($2,056)
CZ15	SCE/SCG	2%	-1%	-718	65	($146)	($2,713)	$1,444	$2,395	0.0	($5,108)	0.3	($1,564)
CZ16	PG&E	-5%	6%	-1,913	142	($276)	($4,142)	($3,803)	($4,577)	1.1	$435	1.2	$746

7.6 Summary of Measures by Package

Table 36 provides the details of the measures in each of the efficiency package by climate zone. The measures are the same for the 3-story and 5-story prototypes. Table 37 presents the PV capacities per dwelling unit in the upgrade packages. In Climate Zone 6 for the mixed fuel case in the 5-story prototype there is no upgrade to the PV system capacity as the prescriptive PV system already offset all of the estimated electricity use.

Table 36. Mixed Fuel Efficiency Package Measures

Climate Zone	0.70 Roof Solar Reflectance	0.24 U-Factor Windows	0.35 W/cfm	Verified Low Leakage Ducts in Conditioned Space
1			X	X
2				X
3				X
4				X
5				X
6				X
7				X
8				X
9	X			X
10	X		X	X
11	X		X	X
12	X		X	X
13	X		X	X
14	X		X	X
15	X		X	X
16		X	X	X

Table 37. Upgrade Package PV Capacities (kW-DC)

Climate Zone	All-Electric + PV		Mixed Fuel + PV	
	3-Story	5-Story	3-Story	5-Story
CZ01	4.41	4.35	3.69	3.43
CZ02	3.56	3.58	3.02	2.98
CZ03	3.31	3.29	2.80	2.72
CZ04	3.21	3.27	2.73	2.75
CZ05	3.04	3.08	2.57	2.55
CZ06	2.91	3.04	2.49	2.68
CZ07	3.09	3.21	2.64	2.74
CZ08	3.18	3.30	2.76	2.86
CZ09	3.04	3.16	2.63	2.73
CZ10	3.20	3.30	2.79	2.86
CZ11	3.90	3.95	3.42	3.43
CZ12	3.53	3.60	3.05	3.08
CZ13	3.77	3.84	3.32	3.36
CZ14	3.20	3.23	2.79	2.79
CZ15	3.93	3.94	3.58	3.58
CZ16	3.79	3.76	2.60	2.90

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.

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