



**CALIFORNIA
ENERGY**
CODES & STANDARDS

A STATEWIDE UTILITY PROGRAM

Title 24, Parts 6 and 11
Local Energy Efficiency Ordinances

**2019 DRAFT Cost-effectiveness Study:
Low-Rise Residential
Addendum – SMUD Analysis**

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

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

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1 Introduction

This addendum presents results from analysis conducted in response to a request from Sacramento Municipal Utility District (SMUD) to more accurately reflect anticipated local energy costs. This report documents cost-effective combinations of measures within SMUD territory that exceed the minimum state requirements, the 2019 Building Energy Efficiency Standards, which become effective January 1, 2020, for new single family and low-rise (one- to three-story) multifamily residential construction. The analysis includes evaluation of both mixed fuel and all-electric homes, documenting that the performance requirements can be met by either type of building design. Compliance package options and cost-effectiveness analysis are presented for California Climate Zone 12 (Sacramento). All proposed package options include a combination of efficiency measures and on-site renewable energy.

This analysis builds upon the results of the Draft 2019 Cost-effectiveness Study: Low-Rise Residential (Statewide Reach Codes Team, 2019) conducted for the California Statewide Codes and Standards Program and last modified March 15, 2019, which evaluated compliance packages across all sixteen California climate zones.

2 Methodology and Assumptions

The same methodology used in the statewide analysis was applied to this analysis with two exceptions, as described below.

1. SMUD R-TOD electricity rate schedules were applied in place of PG&E electricity rate schedules. Any annual electricity production in excess of annual electricity consumption is credited to the utility account at the net surplus compensation rate of \$0.0559/kWh. PG&E gas rates continue to be applied. Appendix A summarizes the utility rate schedules used for this study.

Revised assumptions for escalation of utility fuel rates over the 30-year analysis period to reflect recent General Rate Case filings in the near term and historical escalation rates for the long term. The escalation rates are provided in



2. Table 1 and were provided by Energy & Environmental Economics (E3) in March 2019.



Table 1: Utility Escalation Rates

<u>Year</u>	<u>Natural Gas Real Escalation (%/yr)</u>	<u>Electricity Real Escalation (%/yr)</u>	<u>Year</u>	<u>Natural Gas Real Escalation (%/yr)</u>	<u>Electricity Real Escalation (%/yr)</u>
2021	2.0%	2.0%	2036	1.0%	1.0%
2022	2.0%	2.0%	2037	1.0%	1.0%
2023	4.0%	2.0%	2038	1.0%	1.0%
2024	4.0%	2.0%	2039	1.0%	1.0%
2025	4.0%	2.0%	2040	1.0%	1.0%
2026	1.0%	1.0%	2041	1.0%	1.0%
2027	1.0%	1.0%	2042	1.0%	1.0%
2028	1.0%	1.0%	2043	1.0%	1.0%
2029	1.0%	1.0%	2044	1.0%	1.0%
2030	1.0%	1.0%	2045	1.0%	1.0%
2031	1.0%	1.0%	2046	1.0%	1.0%
2032	1.0%	1.0%	2047	1.0%	1.0%
2033	1.0%	1.0%	2048	1.0%	1.0%
2034	1.0%	1.0%	2049	1.0%	1.0%
2035	1.0%	1.0%	2050	1.0%	1.0%

Refer to the Draft 2019 Cost-effectiveness Study: Low-Rise Residential (Statewide Reach Codes Team, 2019) for further details. Key components of the methodology are repeated below.

Cost-effectiveness

This analysis uses two different metrics to assess cost-effectiveness. Both methodologies require estimating and quantifying the incremental costs and energy savings associated with energy efficiency measures as compared to the 2019 prescriptive Title 24 requirements. The main difference between the methodologies is the manner in which they value energy and thus the cost savings of reduced or avoided energy use.

- **Utility Bill Impacts (On-Bill):** Customer-based Lifecycle Cost (LCC) approach that values energy based upon estimated site energy usage and customer on-bill savings using electricity and natural gas utility rate schedules over a 30-year duration accounting for discount rate and energy inflation.
- **Time Dependent Valuation (TDV):** Energy Commission LCC methodology, which is intended to capture the “societal value or cost” of energy use including long-term projected costs such as the cost of providing energy during peak periods of demand and other societal costs such as projected costs for carbon emissions, as well as grid transmission and distribution 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 (Horii et al, 2014). This is the methodology used by the Energy Commission in evaluating cost-effectiveness for efficiency measures in Title 24, Part 6.

Results for both methodologies are presented as a benefit-to-cost (B/C) ratio, which is a net present value (NPV) metric which represents the cost-effectiveness of a measure over a 30-year lifetime. A value of one indicates the NPV of the savings over the life of the measure is equivalent to the NPV of the lifetime incremental cost of that measure. A value greater than one represents a positive return on investment.



Package Development

Three to four packages were evaluated for each prototype, as described below.

- 1) **Efficiency – Non-Preempted**: This package uses only efficiency measures that don't trigger federal preemption issues including envelope, and water heating and duct distribution efficiency measures.
- 2) **Efficiency – Equipment, Preempted**: This package shows an alternative design that applies HVAC and water heating equipment that are more efficient than federal standards.
- 3) **Efficiency & PV**: Using the Efficiency – Non-Preempted Package as a starting point, additional PV capacity is added to offset most of the estimated electricity use. This only applies to the all-electric case, since for the mixed fuel cases, 100% of the projected electricity use is already being offset in the efficiency only packages as required by 2019 Title 24, Part 6.
- 4) **Efficiency & PV/Battery**: Using the Efficiency & PV Package as a starting point, additional PV capacity is added as well as a battery system.

Electrification Scenarios

In comparing mixed fuel and all-electric cases, two scenarios were evaluated for each prototype:

1. **2019 Code Compliant**: Compares a 2019 code compliant all-electric home with a 2019 code compliant mixed fuel home.
2. **Efficiency & PV Package**: Compares an all-electric home with efficiency and PV sized to 90% of the annual electricity use to a 2019 code compliant mixed fuel home. The first cost savings in the code compliant all-electric house is invested in above code efficiency and PV reflective of the Efficiency & PV packages described above.

3 Results & Discussion

The analysis found cost-effective, non-preempted packages for both single family and low-rise multifamily buildings, under both mixed fuel and all-electric cases. The results of this analysis can be used by local jurisdictions to support the adoption of reach codes.

For the efficiency-only packages, measures were refined to ensure that the non-preempted package was cost-effective based on one of the two metrics applied in this study, TDV or On-Bill. The preempted equipment package, which the Reach Code Team considers to be a package of upgrades most reflective of what builders commonly apply to exceed code requirements, was designed to be cost-effective based on the On-Bill cost-effectiveness approach. The packages presented are representative examples of designs and measures that can be used to meet the requirements. In practice, a builder can use any combination of non-preempted or preempted compliant measures to meet the requirements.

Table 2 summarizes the target EDR reductions by case.



Table 3 and Table 4 present details of the analysis results for single family and low-rise multifamily homes, respectively. Results are presented as EDR reduction instead of compliance margin, as EDR is the metric used to determine code compliance for residential buildings in the 2019 cycle. Target EDR reduction is based on taking the calculated EDR reduction for the case and rounding down to the next half of a whole number. Target EDR reduction for the Efficiency Package are defined based on the lower of the EDR reduction of the non-preempted package and the equipment, preempted package. For example, for single family homes the all-electric non-preempted package has an EDR reduction of 3.5 and the preempted package an EDR reduction of 4.5, the Target EDR reduction is set at 3.5 in this case.

Table 2: Summary of Target EDR Reductions

Climate Zone	Mixed Fuel		All-Electric		
	Efficiency	Efficiency & PV/Battery	Efficiency	Efficiency & PV	Efficiency & PV/Battery
Single Family	3.0	9.5	3.5	16.0	26.0
Multifamily	1.5	10.0	2.5	14.5	27.0

All packages are cost effective based on the TDV approach. The mixed fuel efficiency packages are also cost effective using the On-Bill approach, but the Efficiency & PV/Battery Package is not. None of the all-electric packages are cost effective using the On-Bill approach, except the Efficiency & PV package for multifamily buildings. All electrification scenarios are cost effective under both methodologies. An all-electric design reduces GHG emissions 50% for single family and 41% for multifamily relative to a comparable mixed fuel design.

The SMUD R-TOD rate is a non-tiered time-of-use rate with usage rates 25%-50% lower than PG&E rates¹. The R-TOD peak hours are 5-8pm year-round with a summer mid-peak period 12-5pm and 8pm-12am. This differs from the PG&E peak period, which is 4-9pm year-round. A fixed monthly charge of \$20.30 is applied under the R-TOD, which results in an annual bill of around \$245 for a net-zero customer.

Before taking into account the utility fuel escalation rates applied in this analysis, on-bill cost effectiveness using SMUD's rates are similar to PG&E rates in Climate Zone 12 for the mixed fuel packages. On-bill cost-effectiveness is not as favorable using SMUD rates for the all-electric packages but is better for the electrification scenarios. Changes in escalation rates, which are on average higher for electricity and lower for natural gas than what was applied in the draft statewide study, improves cost effectiveness for the all-electric packages and decreases it for the mixed fuel packages and the electrification scenarios.

¹ PG&E's E-TOU Option B which was applied in the statewide study for Climate Zone 12 (Statewide Reach Codes Team, 2019).



Table 3: Single Family SMUD Climate Zone 12 Results Summary

Climate Zone 12 SMUD Single Family		EDR Red.	PV Size Change (kW) ⁴	CO ₂ -Equivalent Emissions (lb/sqft)		Inc. Cost (\$)	First Year Utility Savings		Benefit to Cost Ratio (B/C)	
				Total	Red.		Elec	Gas	On- Bill	TDV
				Mixed Fuel ¹	Efficiency-Non-Preempted		3.5	(0.1)	1.9	0.2
Efficiency-Equipment	3.0	(0.0)	1.9		0.3	\$618	\$3	\$83	3.2	4.7
Efficiency & PV/Battery	9.5	0.0	1.8		0.3	\$4,732	\$62	\$77	0.7	1.9
All- Electric ²	Efficiency-Non-Preempted	3.5	0.0	0.9	0.1	\$3,485	\$59	\$0	0.4	1.1
	Efficiency-Equipment	4.5	0.0	0.9	0.2	\$1,996	\$82	\$0	0.9	2.3
	Efficiency & PV	16.0	2.0	0.5	0.5	\$10,827	\$421	\$0	0.9	1.4
	Efficiency & PV/Battery	26.0	2.6	0.3	0.8	\$16,046	\$584	\$0	0.8	1.5
Mixed Fuel to All- Electric ³	Code Compliant	0.0	0.0	1.1	1.0	(\$5,349)	(\$479)	\$537	>1	1.8
	Efficiency & PV	16.0	2.0	0.5	1.5	\$6,187	(\$58)	\$537	1.7	>1

Table 4: Multifamily SMUD Climate Zone 12 Results Summary – Results per Unit

Climate Zone 12 SMUD Multifamily		EDR Red.	PV Size Change Per Unit (kW) ⁴	CO ₂ -Equivalent Emissions (lb/sqft)		Inc. Cost Per Unit (\$)	First Year Utility Savings Per Unit		Benefit to Cost Ratio (B/C)	
				Total	Red.		Elec	Gas	On- Bill	TDV
				Mixed Fuel ¹	Efficiency-Non-Preempted		1.5	(0.2)	2.2	0.1
Efficiency-Equipment	2.5	(0.2)	2.1		0.2	\$411	\$3	\$19	1.2	2.2
Efficiency & PV/Battery	10.0	0.3	2.0		0.3	\$1,979	\$36	\$11	0.5	2.0
All- Electric ²	Efficiency-Non-Preempted	2.5	0.0	1.3	0.1	\$944	\$19	\$0	0.4	1.1
	Efficiency-Equipment	3.0	0.0	1.2	0.1	\$753	\$25	\$0	0.7	1.7
	Efficiency & PV	14.5	6.6	0.8	0.6	\$3,564	\$171	\$0	1.1	1.6
	Efficiency & PV/Battery	27.0	9.4	0.4	0.9	\$6,217	\$262	\$0	0.9	1.8
Mixed Fuel to All- Electric ³	Code Compliant	0.0	0.0	1.4	1.0	(\$2,337)	(\$212)	\$183	5.2	1.6
	Efficiency & PV	14.5	6.6	0.8	1.5	\$1,454	(\$41)	\$183	2.8	>1

¹All reductions and incremental costs relative to the mixed fuel code compliant home.

²All reductions and incremental costs relative to the all-electric code compliant home.

³All reductions and incremental costs relative to the mixed fuel code compliant home except the EDR reductions are relative to the Standard Design for each case which is the all-electric code compliant home.

⁴Positive values indicate an increase in PV capacity relative to the Standard Design.



4 References

Statewide Reach Codes Team. 2019. Draft 2019 Cost-effectiveness Study: Low-Rise Residential. Prepared for Pacific Gas and Electric Company. Prepared by Frontier Energy. March 2019.

http://localenergycodes.com/download/602/file_path/fieldList/2019%20ResNewCon%20Cost-Eff-PublicDraft



Appendix A – Utility Tariff Details

Following are the SMUD electricity tariffs applied in this study.

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

I. Applicability

This Rate Schedule 1-R-TOD applies to single- and three-phase service for the following types of residential premises:

1. Individual or dual metered residences with digital communicating meter installed, including single-family homes, duplexes, apartments, and condominiums; and
2. General farm service where the meter also serves the residence or additional meters on a farm where the electricity consumed is solely for domestic purposes.

Master-metered service to a qualifying multifamily accommodation or mobile home parks are not eligible for Time-of-Day rates under rate schedule R-TOD.

For the purposes of this schedule a “month” is considered to be a single billing period of 27 to 34 days.

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. Customers who have an eligible renewable electrical generation facility under Rate Schedule 1-NEM that was approved for installation by SMUD after December 31, 2017 must be on the TOD (5-8 p.m.) Rate.
2. Existing eligible customers on the Legacy Rate, with rate categories RSCH, RWCH, RSEH, RWEH, RSGH and RWGH under Rate Schedule R, will gradually transition as determined by SMUD to the TOD (5-8 p.m.) Rate beginning the first full billing cycle in January 2019, and complete transition no later than December 31, 2019.
3. After being transitioned to the TOD (5-8 p.m.) Rate, eligible customers can elect the Fixed Rate under Rate Schedule R as an alternative rate.
4. Customers who move-in or transfer service to premises with an eligible renewable electrical generation facility after December 31, 2017 must be on the TOD (5-8 p.m.) Rate.
5. 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 the 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

B. Optional Time-of-Day (4-7 p.m.) Rate (rate category RT01) Closed

1. The TOD (4-7 p.m.) Rate is closed for enrollment to residential customers who did not have an eligible renewable electrical generation facility under Rate Schedule 1-NEM that was approved for installation by SMUD before January 1, 2018.
2. Customers who have an eligible renewable electrical generation facility under Rate Schedule 1-NEM that was approved for installation by SMUD before January 1, 2018, and are enrolled on the TOD (4-7 p.m.) Rate may remain on this closed rate until December 31, 2022.
3. The TOD (4-7 p.m.) Rate will terminate for customers with an eligible renewable electrical generation facility under Rate Schedule 1-NEM on their first full billing cycle that closes in 2023, and customers will then transition to SMUD’s residential standard rate.
4. If a customer with an eligible renewable electrical generation facility under Rate Schedule 1-NEM on this rate category elects an open rate, the customer cannot return to the TOD (4-7 p.m.) Rate.



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

5. Existing customers who have an eligible renewable electrical generation facility under Rate Schedule 1-NEM that was approved for installation by SMUD before January 1, 2018 may enroll in the TOD (5-8 p.m.) Rate at any time; however, once enrolled in the TOD (5-8 p.m.) Rate, the customer cannot return to the TOD (4-7 p.m.) Rate.
6. Existing customers on the TOD (4-7 p.m.) Rate who do not have an eligible renewable electrical generation facility under Rate Schedule 1-NEM will transition as determined by SMUD to the TOD (5-8 p.m.) Rate no later than December 31, 2019 and will no longer be eligible for the TOD (4-7 p.m.) Rate.
7. This rate has three kilowatt-hour (kWh) prices, depending on the time-of-day and season as shown below. Holidays are detailed in Section V. Conditions of Service.

Jun 1 - Sep 30	Summer Super Peak	Weekdays between 4:00 p.m. and 7:00 p.m.
Year-round (Jan 1 - Dec 31)	Peak	Weekdays between 9:00 a.m. and 9:00 p.m. except during the Summer Super Peak hours.
	Off-Peak	All other hours, including weekends and the holidays ¹ .

¹ See Section V. Conditions of Service

II. Firm Service Rates

A. Time-of-Day (5-8 p.m.) Rate	Rate Category RT02
System Infrastructure Fixed Charge per month	\$20.30
Non-Summer Prices* – October 1 through May 31	
Electricity Usage Charge	
Peak \$/kWh	\$0.1338
Off-Peak \$/kWh	\$0.0969
Summer Prices - June 1 through September 30	
Electricity Usage Charge	
Peak \$/kWh	\$0.2835
Mid-Peak \$/kWh	\$0.1611
Off-Peak \$/kWh	\$0.1166

* Non-Summer Season includes Fall (Oct 1 – Nov 30), Winter (Dec 1 – Mar 31) and Spring (Apr 1 – May 31) periods.



Following are the PG&E natural gas tariffs applied in this study. The PG&E monthly gas rate in \$/therm was applied on a monthly basis for the 12-month period ending January 2018.



Pacific Gas and Electric Company
U 39 San Francisco, California

Revised Cal. P.U.C. Sheet No. 34735-G
Cancelling Revised Cal. P.U.C. Sheet No. 34691-G

**GAS SCHEDULE G-1
RESIDENTIAL SERVICE**

Sheet 1

APPLICABILITY: This rate schedule¹ applies to natural gas service to Core End-Use Customers on PG&E's Transmission and/or Distribution Systems. To qualify, service must be to individually-metered single family premises for residential use, including those in a multifamily complex, and to separately-metered common areas in a multifamily complex where Schedules GM, GS, or GT are not applicable. Common area accounts that are separately metered by PG&E have an option of switching to a core commercial rate schedule. Common area accounts are those accounts that provide gas service to common use areas as defined in Rule 1.

Per D.15-10-032 and D.18-03-017, transportation rates include GHG Compliance Cost for non-covered entities. Customers who are directly billed by the Air Resources Board (ARB), i.e., covered entities, are exempt from paying AB 32 GHG Compliance Costs through PG&E's rates.² A "Cap-and-Trade Cost Exemption" credit for these costs will be shown as a line item on exempt customers' bills.^{3,4}

TERRITORY: Schedule G-1 applies everywhere within PG&E's natural gas Service Territory.

RATES: Customers on this schedule pay a Procurement Charge and a Transportation Charge, per meter, as shown below. The Transportation Charge will be no less than the Minimum Transportation Charge, as follows:

<u>Minimum Transportation Charge:</u> ⁵		<u>Per Day</u>	
		\$0.09863	
		<u>Per Therm</u>	
	<u>Baseline</u>		<u>Excess</u>
<u>Procurement:</u>	\$0.43394 (l)	\$0.43394 (l)	(l)
<u>Transportation Charge:</u>	\$0.99414 (l)	\$1.59063 (l)	(l)
Total:	\$1.42808 (l)	\$2.02457 (l)	
California Natural Gas Climate Credit (per Household, annual payment occurring in October 2018 bill cycle, and thereafter in the April bill cycle)	(\$25.45) (l)		

Public Purpose Program Surcharge:

Customers served under this schedule are subject to a gas Public Purpose Program (PPP) Surcharge under Schedule G-PPPS.

See Preliminary Statement, Part B for the Default Tariff Rate Components.

The Procurement Charge on this schedule is equivalent to the rate shown on informational Schedule G-CP—Gas Procurement Service to Core End-Use Customers.

¹ PG&E's gas tariffs are available online at www.pge.com.
² Covered entities are not exempt from paying costs associated with LUAF Gas and Gas used by Company Facilities.
³ The exemption credit will be equal to the effective non-exempt AB 32 GHG Compliance Cost Rate (\$ per therm) included in Preliminary Statement – Part B, multiplied by the customer's billed volumes (therms) for each billing period.
⁴ PG&E will update its billing system annually to reflect newly exempt or newly excluded customers to conform with lists of Directly Billed Customers provided annually by the ARB.
⁵ The Minimum Transportation charge does not apply to submetered tenants of master-metered customers served under gas rate Schedules GS and GT.

(Continued)

<i>Advice</i>	4052-G	<i>Issued by</i>	<i>Submitted</i>	<u>December 21, 2018</u>
<i>Decision</i>	97-10-065 & 98-07-025	<i>Robert S. Kenney</i>	<i>Effective</i>	<u>January 1, 2019</u>
		<i>Vice President, Regulatory Affairs</i>	<i>Resolution</i>	



Pacific Gas and Electric Company

Residential Non-CARE and CARE Gas Tariff Rates

January 1, 2018, to Present

(\$/therm)^{1/}

Effective Date	Advice Letter Number	Minimum Transportation Charge ^{2/} (per day)	Procurement Charge	Transportation Charge ^{2/}		TOTAL Residential Non-CARE Schedules Charge ^{3/}	
				Baseline	Excess	Baseline	Excess
01/01/18	3918-G	\$0.09863	\$0.37310	\$0.91828	\$1.46925	\$1.29138	\$1.84235
02/01/18	3931-G	\$0.09863	\$0.40635	\$0.91828	\$1.46925	\$1.32463	\$1.87560
03/01/18	3941-G	\$0.09863	\$0.32103	\$0.91828	\$1.46925	\$1.23931	\$1.79028
04/01/18	3959-G	\$0.09863	\$0.34783	\$0.91828	\$1.46925	\$1.26611	\$1.81708
05/01/18	3969-G	\$0.09863	\$0.26995	\$0.91828	\$1.46925	\$1.18823	\$1.73920
06/01/18	3980-G	\$0.09863	\$0.21571	\$0.91828	\$1.46925	\$1.13399	\$1.68496
07/01/18	3984-G	\$0.09863	\$0.22488	\$0.93438	\$1.49502	\$1.15926	\$1.71990
08/01/18	3995-G	\$0.09863	\$0.28814	\$0.93438	\$1.49502	\$1.22252	\$1.78316
09/01/18	4008-G	\$0.09863	\$0.25597	\$0.93438	\$1.49502	\$1.19035	\$1.75099
10/01/18	4018-G	\$0.09863	\$0.27383	\$0.93438	\$1.49502	\$1.20821	\$1.76885
11/01/18	4034-G	\$0.09863	\$0.35368	\$0.93438	\$1.49502	\$1.28806	\$1.84870
12/01/18	4046-G	\$0.09863	\$0.42932	\$0.93438	\$1.49502	\$1.36370	\$1.92434
01/01/19	4052-G	\$0.09863	\$0.43394 ^{7/}	\$0.99414	\$1.59063	\$1.42808	\$2.02457

^{1/} Unless otherwise noted

^{2/} Effective July 1, 2005, the Transportation Charge will be no less than the Minimum Transportation Charge of \$0.09863 (per day). Applicable to Rate Schedule G-1 only and does not apply to submetered tenants of master-metered customers served under gas Rate Schedule GS and GT.

^{3/} Schedule G-PPPS (Public Purpose Program Surcharge) needs to be added to the TOTAL Non-CARE Charge and TOTAL CARE Charge for bill calculation. See Schedule G-PPPS for details and exempt customers.

^{4/} CARE Schedules include California Solar Initiative (CSI) Exemption in accordance with Advice Letter 3257-G-A.

^{5/} Per dwelling unit per day (Multifamily Service)

^{6/} Per installed space per day (Mobilehome Park Service)

^{7/} This procurement rate includes a charge of \$0.03686 per therm to reflect account balance amortizations in accordance with Advice Letter 3157-G.

^{8/} Residential bill credit of (\$29.85) per household, annual bill credit occurring in the October 2018 bill cycle, thereafter in the April bill cycle.

Seasons: Winter = Nov-Mar Summer = April-Oct



Appendix B –Detailed Results

Table 5: Efficiency Package Cost-Effectiveness Results

Climate Zone	BASECASE					Non-Preempted								Equipment - Preempted							
	Final EDR	Efficiency EDR	CALGreen Tier 1 EDR Target	lbs CO2 per sqft	PV kW	Final EDR	Efficiency EDR	EDR Red.	% Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio	Final EDR	Efficiency EDR	EDR Red,	% Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio
Mixed Fuel SF	26.1	45.5	12	2.1	3.0	22.9	41.9	3.6	15.1%	1.9	2.9	1.2	1.9	23.0	42.1	3.4	14.4%	1.9	3.0	3.2	4.7
All-Electric SF	32.2	51.7	13	1.1	3.0	28.3	47.8	3.9	15.3%	0.9	3.0	0.4	1.1	27.3	46.8	4.9	19.0%	0.9	3.0	0.9	2.3
Mixed Fuel MF	26.0	55.4	12	2.3	15.0	24.4	53.5	1.9	8.7%	2.2	14.8	1.1	2.2	23.6	52.6	2.8	12.8%	2.1	14.7	1.2	2.2
All-Electric MF	33.7	62.4	13	1.4	15.0	31.0	59.8	2.6	11.3%	1.3	15.0	0.4	1.1	30.5	59.3	3.1	13.3%	1.2	15.0	0.7	1.7

">1" = indicates cases where there is both first cost savings and annual utility bill savings.

EDR Red. = EDR Reduction.

Table 6: Efficiency & PV-PV/Battery Package Cost-Effectiveness Results

Climate Zone	BASECASE					Efficiency & PV							Efficiency & PV/Battery						
	Final EDR	CALGreen Tier 1 EDR Target	PV kW	lbs CO2 per sqft		Final EDR	EDR Red.	Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio	Final EDR	EDR Red.	Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio
Mixed Fuel SF	26.1	12	2.1	3.0		n/a	n/a	n/a	n/a	n/a	n/a	n/a	16.3	9.8	29.1%	1.8	3.0	0.7	1.9
All-Electric SF	32.2	13	1.1	3.0		16.1	16.1	15.3%	0.5	5.0	0.9	1.4	6.2	26.0	15.3%	0.3	5.63	0.8	1.5
Mixed Fuel MF	26.0	12	2.3	15.0		n/a	n/a	n/a	n/a	n/a	n/a	n/a	15.7	10.3	16.7%	2.0	15.2	0.5	2.0
All-Electric MF	33.7	13	1.4	15.0		19.0	14.7	11.3%	0.8	21.6	1.1	1.6	6.3	27.4	19.3%	0.4	24.4	0.9	1.8

">1" = indicates cases where there is both first cost savings and annual utility bill savings.

EDR Red. = EDR Reduction.

