DOCKETED	
Docket Number:	19-BSTD-06
Project Title:	Local Ordinances Exceeding the 2019 Energy Code
TN #:	231843
Document Title:	2019 Cost Effectiveness Study Low Rise Residential NC - Addendum Healdsburg Analysis
Description:	California Energy Codes and Standards Local Energy Efficiency Ordinances 2019 Cost-effectiveness Study for Low-Rise Residential New Construction Addendum Analysis for Healdsburg
Filer:	Danuta Drozdowicz
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	1/31/2020 11:47:21 AM
Docketed Date:	1/31/2020

CALIFORNIA ENERGY CODES & STANDARDS

A STATEWIDE UTILITY PROGRAM

Title 24, Parts 6 and 11
Local Energy Efficiency Ordinances

2019 Cost-effectiveness Study: Low-Rise Residential New Construction Addendum – Healdsburg Analysis

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Last Modified: July 26, 2019

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1 Introduction

This addendum presents results from analysis conducted in response to a request from the City of Healdsburg to more accurately reflect anticipated local energy costs. This report documents cost-effective combinations of measures within the City of Healdsburg 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 2 (Healdsburg). All proposed package options include a combination of efficiency measures and on-site renewable energy.

This analysis builds upon the results of the 2019 Cost-effectiveness Study: Low-Rise Residential New Construction (Statewide Reach Codes Team, 2019) conducted for the California Statewide Codes and Standards Program and last modified July 17, 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 one exception, as described below.

1. City of Healdsburg E-7 residential Time of Use (TOU) electricity rate schedules were applied in place of PG&E electricity rate schedules. The E-7 rate has a peak period of 1:30pm-7:30pm; however, the analysis provides hourly simulation results and therefore this evaluation used a peak period of 1pm-7pm.
   In addition to the costs calculated based on the E-7 rate, a non-bypassable charge to support the Public Benefit Fund is added. See Appendix A for further details. Any annual electricity production in excess of annual electricity consumption is credited to the utility account at the net surplus compensation rate of $0.088/kWh. PG&E gas rates continue to be applied.

Refer to the 2019 Cost-effectiveness Study: Low-Rise Residential New Construction (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 way 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 are presented as a lifecycle benefit-to-cost (B/C) ratio, a net present value (NPV) metric which represents the cost-effectiveness of a measure over a 30-year lifetime taking into account discounting of future savings and costs and financing of incremental first costs. 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. The Reach Code Team considers this more reflective of how builders meet above code requirements in practice.
3) **Efficiency & PV**: Using the Efficiency – Non-Preempted Package as a starting point, 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 as required by 2019 Title 24, Part 6.
4) **Efficiency & PV/Battery**: Using the Efficiency & PV Package as a starting point, PV capacity is added as well as a battery system.

Electrification Scenarios

In comparing mixed fuel and all-electric cases, three 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. **Neutral Cost Package**: Compares an all-electric home with PV beyond code minimum with a 2019 code compliant mixed fuel home. The PV system for the all-electric case is sized to result in a zero lifetime incremental cost relative to a mixed fuel home.

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 1 summarizes the target EDR Margins by case. Table 2 and Table 3 present details of the analysis results for single family and low-rise multifamily homes, respectively. Results are presented as EDR Margin instead of compliance margin. EDR is the metric used to determine code compliance for residential buildings in the 2019 cycle. Target EDR Margin is based on taking the calculated EDR Margin for the case and rounding down to the

next half of a whole number. Target EDR Margin for the Efficiency Package are defined based on the lower of the EDR Margin 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 Margin of 4.5 and the preempted package an EDR Margin of 5.0, the Target EDR Margin is set at 4.5 in this case.

Table 1: Summary of Climate Zone 2 Target EDR Margins

Climate Zone	Mixed Fuel		All-Electric		
	Efficiency	Efficiency & PV/Battery	Efficiency	Efficiency & PV	Efficiency & PV/Battery
Single Family	3.0	10.0	4.5	19.0	30.0
Multifamily	1.5	10.5	1.5	17.5	30.5

All packages are cost effective based on the TDV approach. Most of the efficiency packages are also cost effective using the On-Bill approach, with the exception of the Efficiency-Non-Preempted packages for the all-electric single family case and the mixed fuel multifamily case. The Efficiency & PV/Battery packages are cost effective based on the On-Bill approach for the all-electric cases but not the mixed fuel cases. All-electric buildings were found to be cost effective when compared to a mixed fuel basecase under both methodologies, with the exception of the code compliant all-electric home based on the On-Bill approach. A code compliant all-electric design reduces GHG emissions 50% for single family and 42% for multifamily relative to a comparable code compliant mixed fuel design.

The City of Healdsburg E-7 rate is a non-tiered time-of-use tariff with usage rates 25%-40% lower than the PG&E TOU-B time-of-use rates, except during winter peak periods where the E-7 rate is slightly higher than PG&E's rate[1]. The E-7 peak hours are 1:30-7:30pm[2] year-round. This differs from the PG&E peak period, which is 4-9pm year-round. Another difference between the two rates is that the E-7 rate applies a fixed monthly charge of $13.02 ($156.24 annually) in place of PG&E's minimum bill charge of ~$120 annually. The Healdsburg fixed monthly charge can be offset each month by excess PV production to lower overall customer bill when PV system is sized close to annual electricity use. The combined impact of the lower rates, earlier peak period, and no minimum bill results in lower annual costs under City of Healdsburg rates relative to PG&E rates for all single family cases and all but two multifamily cases.

On-Bill cost effectiveness using City of Healdsburg's rates is similar to that with PG&E rates in Climate Zone 2 for the mixed fuel packages, except the Efficiency & PV/Battery packages, which are more cost effective under City of Healdsburg rates. On-Bill cost-effectiveness is not as favorable using City of Healdsburg rates for the all-electric packages, again except for the Efficiency & PV/Battery packages where the results are very similar for the single family but improve for multifamily under City of Healdsburg rates. Under the City of Healdsburg rates On-Bill cost effectiveness improves for the electrification scenarios relative to PG&E rates, except for the multifamily Efficiency & PV case.

[1] PG&E's E-TOU Option B which was applied in the statewide study for Climate Zone 2 (Statewide Reach Codes Team, 2019).

[2] The peak was evaluated as 1-7pm because the simulation results are hourly not subhourly.

Table 2: Single Family City of Healdsburg Climate Zone 2 Results Summary

Climate Zone 2 Healdsburg/PG&E Single Family		Annual Net kWh	Annual therms	EDR Margin[4]	PV Size Change (kW)[5]	CO2-Equivalent Emissions (lbs/sf)		NPV of Lifetime Incremental Cost ($)	Benefit to Cost Ratio (B/C)	
						Total	Reduction		On-Bill	TDV
Mixed Fuel[1]	Code Compliant	(0)	421	n/a	n/a	2.23	n/a	n/a	n/a	n/a
	Efficiency-Non-Preempted	0	360	3.0	(0.04)	1.94	0.30	$1,504	1.60	1.66
	Efficiency-Equipment	(0)	352	3.0	(0.03)	1.90	0.33	$724	3.73	3.63
	Efficiency & PV/Battery	(22)	360	10.0	0.06	1.82	0.41	$5,393	0.62	1.56
All-Electric[2]	Code Compliant	5,014	0	n/a	n/a	1.11	n/a	n/a	n/a	n/a
	Efficiency-Non-Preempted	4,079	0	4.5	0.00	0.94	0.18	$3,943	0.90	1.07
	Efficiency-Equipment	4,122	0	5.0	0.00	0.94	0.17	$2,108	1.65	2.10
	Efficiency & PV	847	0	19.0	2.07	0.49	0.63	$12,106	1.57	1.38
	Efficiency & PV/Battery	(15)	0	30.0	2.71	0.26	0.86	$18,132	1.33	1.43
Mixed Fuel to All-Electric[3]	Code Compliant	5,014	0	0.0	0.00	1.11	1.12	($5,349)	0.91	1.59
	Efficiency & PV	847	0	19.0	2.07	0.49	1.75	$6,758	1.94	39.70
	Neutral Cost	2,891	0	9.5	1.36	0.82	1.41	$0	236.64	>1

[1]All reductions and incremental costs relative to the **mixed fuel** code compliant home.
[2]All reductions and incremental costs relative to the **all-electric** code compliant home.
[3]All reductions and incremental costs relative to the **mixed fuel** code compliant home except the EDR Margins are relative to the Standard Design for each case which is the **all-electric** code compliant home. Incremental costs for these packages reflect the cots used in the On-Bill cost effectiveness methodology. Costs differ for the TDV methodology due to differences in the site gas infrastructure costs (see Section 2.6).
[4]This represents the Efficiency EDR Margin for the Efficiency-Non-Preempted and Efficiency-Equipment packages and Total EDR Margin for the Efficiency & PV, Efficiency & PV/Battery, and Neutral Cost packages.
[5]Positive values indicate an increase in PV capacity relative to the Standard Design.

Table 3: Multifamily City of Healdsburg Climate Zone 2 Results Summary – Results per Unit

Climate Zone 2 Healdsburg/PG&E Multifamily		Annual Net kWh	Annual therms	EDR Margin[4]	PV Size Change (kW)[5]	CO2-Equivalent Emissions (lbs/sf)		NPV of Lifetime Incremental Cost ($)	Benefit to Cost Ratio (B/C)	
						Total	Reduction		On-Bill	TDV
Mixed Fuel[1]	Code Compliant	(0)	150	n/a	n/a	2.37	n/a	n/a	n/a	n/a
	Efficiency-Non-Preempted	0	142	1.5	(0.02)	2.25	0.12	$309	0.90	1.75
	Efficiency-Equipment	(0)	134	2.0	(0.01)	2.15	0.22	$497	1.05	1.49
	Efficiency & PV/Battery	(11)	142	10.5	0.04	2.07	0.30	$2,413	0.35	1.60
All-Electric[2]	Code Compliant	2,151	0	n/a	n/a	1.38	n/a	n/a	n/a	n/a
	Efficiency-Non-Preempted	2,038	0	1.5	0.00	1.32	0.06	$361	1.27	2.05
	Efficiency-Equipment	1,928	0	3.0	0.00	1.25	0.13	$795	1.11	1.56
	Efficiency & PV	476	0	17.5	1.00	0.72	0.67	$3,711	2.13	1.82
	Efficiency & PV/Battery	(7)	0	30.5	1.36	0.35	1.04	$6,833	1.59	1.74
Mixed Fuel to All-Electric[3]	Code Compliant	2,151	0	0.0	0.00	1.38	0.99	($2,337)	0.55	1.42
	Efficiency & PV	60	0	17.5	1.00	0.72	1.65	$1,375	2.69	>1
	Neutral Cost	1,063	0	10.5	0.70	0.96	1.41	$0	>1	>1

[1]All reductions and incremental costs relative to the **mixed fuel** code compliant home.
[2]All reductions and incremental costs relative to the **all-electric** code compliant home.
[3]All reductions and incremental costs relative to the **mixed fuel** code compliant home except the EDR Margins are relative to the Standard Design for each case which is the **all-electric** code compliant home. Incremental costs for these packages reflect the cots used in the On-Bill cost effectiveness methodology. Costs differ for the TDV methodology due to differences in the site gas infrastructure costs (see Section 2.6).
[4]This represents the Efficiency EDR Margin for the Efficiency-Non-Preempted and Efficiency-Equipment packages and Total EDR Margin for the Efficiency & PV, Efficiency & PV/Battery, and Neutral Cost packages.
[5]Positive values indicate an increase in PV capacity relative to the Standard Design.

4 References

Statewide Reach Codes Team. 2019. 2019 Cost-effectiveness Study: Low-Rise Residential New Construction. Prepared for Pacific Gas and Electric Company. Prepared by Frontier Energy. July 2019. https://localenergycodes.com/download/800/file_path/fieldList/2019%20Res%20NC%20Reach%20Codes

Appendix A – Utility Tariff Details

Electric Rates

Following are the City of Healdsburg electricity tariffs applied in this study.

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

E-7 Electric Rates	
Summer Peak Period	$0.2721 / kWh
Summer Off Peak Period	$0.1638 / kWh
Winter Peak Period	$0.2419 / kWh
Winter Off Peak Period	$0.1515 / kWh
Monthly Customer Charge	$13.02 / Month

E-7 Time Schedules

Summer (May 1st – October 31st)
Peak Period – 1:30pm to 7:30pm Monday through Saturday
Off-Peak Period – All other times and Holidays*

Winter (November 1st – April 30th)
Peak Period – 1:30pm to 7:30pm Monday through Saturday
Off-Peak Period – All other times and Holidays*

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

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

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

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

In addition to the rate details outlined above, a non-bypassable charge to support the Public Benefit Fund is added to the total calculated costs based on conversations with City of Healdsburg staff. This charge is assessed on total electricity imported from the utility grid within each billing period. The rate applied is $0.0045/kWh and is calculated as 2.85% of the average between the summer and winter off-peak period E-7 rates.

Natural Gas Rates

The following provides details on the PG&E natural gas tariffs applied in this study. For Climate Zone 2 PG&E baseline territory X was applied.

The PG&E monthly gas rate in $/therm was applied on a monthly basis for the 12-month period ending January 2019 according to the rates shown below.

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/] (Non-CARE)	
				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

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 schedule[1] 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:

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

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.

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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)

Advice 4052-G
Decision 97-10-065 & 98-07-025

Issued by
Robert S. Kenney
Vice President, Regulatory Affairs

Submitted December 21, 2018
Effective January 1, 2019
Resolution

Appendix B –Detailed Results

Table 4: 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 Margin	% Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio	Final EDR	Efficiency EDR	EDR Margin	% Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio
Mixed Fuel SF	25.0	46.0	12	2.2	2.8	22.0	42.7	3.3	16.3%	1.9	2.8	1.6	1.7	21.8	42.6	3.3	16.4%	1.9	2.8	3.7	3.6
All-Electric SF	32.8	53.7	16	1.1	2.8	27.9	48.7	4.9	20.5%	0.9	2.8	0.9	1.1	27.7	48.5	5.1	21.2%	0.9	2.8	1.6	2.1
Mixed Fuel MF	25.7	56.5	12	2.4	13.9	24.2	54.7	1.8	9.9%	2.3	13.8	0.9	1.7	23.6	54.2	2.3	12.5%	2.2	13.9	1.0	1.5
All-Electric MF	34.3	63.4	16	1.4	13.9	32.4	61.5	1.9	9.1%	1.3	13.9	1.3	2.1	31.1	60.2	3.2	15.1%	1.3	13.9	1.1	1.6

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

Table 5: Efficiency & PV-PV/Battery Package Cost-Effectiveness Results

Climate Zone	BASECASE				Efficiency & PV							Efficiency & PV/Battery						
	Final EDR	CALGreen Tier 1 EDR Target	lbs CO2 per sqft	PV kW	Final EDR	EDR Margin	% Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio	Final EDR	EDR Margin	% Comp Margin	lbs CO2 per sqft	PV kW	On-Bill B/C Ratio	TDV B/C Ratio
Mixed Fuel SF	25.0	12	2.2	2.8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14.9	10.1	27.3%	1.8	2.9	0.6	1.6
All-Electric SF	32.8	16	1.1	2.8	13.4	19.4	20.5%	0.5	4.9	1.6	1.4	2.7	30.1	31.5%	0.3	5.51	1.3	1.4
Mixed Fuel MF	25.7	12	2.4	13.9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14.8	10.9	16.9%	2.1	14.2	0.4	1.6
All-Electric MF	34.3	16	1.4	13.9	16.8	17.5	9.1%	0.7	21.9	2.1	1.8	3.4	30.9	16.1%	0.3	24.8	1.6	1.7

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