

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Low Income Single Family Weatherization

Description:

Residential income-qualified natural gas and electricity customers have energy efficiency measures performed at no cost.

Algorithms:

Baseline Home Energy Use	Energy characteristics for the baseline home were calculated in REM/Rate using data collected during the 2011 Program Evaluation. These characteristics vary by region and by home construction type (i.e. mobile home vs. site built). Details can be seen in Table 1.
Gross Dth	Dth savings were calculated per measure as a parametric simulation in REM/Rate as part of the 2011 Program Evaluation. Results are shown in Table 2.
Customer kWh	kWh savings were calculated per measure as a parametric simulation in REM/Rate as part of the 2011 Program Evaluation. Results are shown in Table 3.
Customer kW	kW savings were calculated per measure as a parametric simulation in REM/Rate as part of the 2011 Program Evaluation. Results are shown in Table 4.
Net Dth	= Gross Dth x NTG
Gross Generator kWh	= Customer kWh / (1-TDLF)
Gross Generator kW	= Customer kW x CF / (1-TDLF)
Net Generator kWh	= Gross Generator kWh x NTG
Net Generator kW	= Gross Generator kW x NTG

Variables:

NTG	Net-to-Gross, as established in the 2011 Program Evaluation, is 100%
O&M Savings	No measures result in Operations and Maintenance Savings
TDLF	Transmission Distribution Loss Factor = 7.7%
Coincidence Factor	The probability that the Customer kW value will be realized during peak generation periods. Results per measure shown in Table 5.
Lifetime	Measure lifetimes are shown in Table 6.
Incremental Cost	Measure incremental costs are shown in Table 7.

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Tables:

Table 1: Home Characteristics (Reference 1)

Category	Characteristic	Evaluation Result	Home Type
Envelope and Mechanical Systems	Home Type	Mobile and Site Built	Specified
	Location	Multiple Regions	Both
	Conditioned Floor Area	961 Square Feet	Mobile
		1,452 Square Feet	Site Built
	Number of Bedrooms	Two	Mobile
		Three	Site Built
	Foundation Type	Open Crawlspace	Mobile
		Enclosed Crawlspace	Site Built
	Foundation Wall Type	Mobile Home Skirt	Mobile
		R-11 Draped Insulation	Site Built
	Home Complexity	Four Corners	Both
	Nominal Ceiling Height	7.6 Feet Mobile	Mobile
		8.2 Feet Site Built	Site Built
	Ceiling Type Baseline	REM/Rate Default	Mobile
		R-11 + Grade III	Site Built
	Ceiling Type Weatherized	R-38 + Grade II	Both
	Above Grade Wall Type Baseline	REM/Rate Default	Mobile
		Empty Cavity Insulation	Site Built
	Above Grade Wall Type Weatherized	R-4.37 Grade III	Site Built
		R-11 + Grade III	
	Foundation Floor Type	R-9.3	Mobile
		Uninsulated	Site Built
	Door Type	R-1.7	Both
	Infiltration Rate	0.8 ACH	Both
	Window Properties	U Value 0.86	Mobile
		SHGC 0.72	
		U Value 0.75	Site Built
		SHGC 0.67	
		108.25 sqft	Mobile
		144.15 sqft	Site Built
Furnace Baseline Properties	78 AFUE, 57.9 kBtuh	Mobile	
	78 AFUE, 65.9 kBtuh	Site Built	
Furnace Weatherized Properties	92 AFUE, 57.9 kBtuh	Mobile	
	92 AFUE, 65.9 kBtuh	Site Built	
Duct System Properties	R-9.3	Mobile	
	Uninsulated	Site Built	
	25% Duct Leakage	Both	
Appliances	85% have Dishwashers 74% have electric ranges 88% and 89% have Clothes Washer and Electric Dryer 68% have Ceiling Fans	Both	
Refrigerators	Adjusted Volume	21.58 Cubic Feet	Both
	Survival Rate	Dependent on age	Both
	Degradation	1.25%	Both
CFLs	Operating Hours	2.78	Both
	Coincidence Factor	8%	Both
	CFLs Installed	10.3	Mobile
16		Site Built	

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Table 2: Gas Energy Savings by Region (Reference 1)*

Measure	Denver	Dillon	Eagle	Grand Junction	Leadville
Water Heater Replacement	1.1	1.1	1.1	1.1	1.1
Wall Insulation	27.9	49.8	39.6	25.4	57.9
SB Furnace Replacement	18.3	31.9	26.3	16.9	36.0
MH Furnace Replacement	13.3	23.5	19.3	12.3	26.3
Air Sealing	5.1	9.1	7.2	4.6	10.5
Duct Sealing	3.6	6.4	5.1	3.3	7.4
SB Ceiling Insulation	16.5	29.4	23.8	15.2	33.5
MH Ceiling Insulation	7.9	11.5	20.5	16.7	10.7
Storm Window Installation	16.3	29.0	23.1	14.8	33.7
Crawspace Insulation	3.7	6.7	5.3	3.4	7.7

*SB = Site Built, MH = Mobile Home. All others are not expected to be affected by home type.

Table 3: Electric Energy Savings by Measure (Reference 1)*, **

Measure	Denver	Dillon	Eagle	Grand Junction	Leadville
CFL (1 lamp - 2012)	37	37	37	37	37
CFL (1 lamp - 2013)	33	33	33	33	33
Refrigerator Replacement	584	584	584	584	584
Wall Insulation	6,508	11,617	9,238	5,925	13,506
Air Sealing	1,183	2,112	1,680	1,077	2,456
Duct Sealing	835	1,491	1,186	760	1,733
SB Ceiling Insulation	3,849	6,858	5,552	3,546	7,815
MH Ceiling Insulation	1,843	2,683	4,782	3,896	2,496
Storm Window Installation	3,794	6,771	5,384	3,454	7,873
Crawspace Insulation	870	1,553	1,235	792	1,806

*SB = Site Built, MH = Mobile Home. All others are not expected to be affected by home type.

** envelope measures contribute electric savings when an electric heating source is utilized. Assumed efficiency is 98%.

Table 4: Electric Demand Savings by Measure (Reference 1)*, **

Measure	Denver	Dillon	Eagle	Grand Junction	Leadville
CFL (1 lamp - 2012)	0.04	0.04	0.04	0.04	0.04
CFL (1 lamp - 2013)	0.04	0.04	0.04	0.04	0.04
Refrigerator Replacement	0.08	0.08	0.08	0.08	0.08
Wall Insulation	6,508	11,617	9,238	5,925	13,506
Air Sealing	1,183	2,112	1,680	1,077	2,456
Duct Sealing	835	1,491	1,186	760	1,733
SB Ceiling Insulation	3,849	6,858	5,552	3,546	7,815
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Table 5: Coincidence Factors

Measure	Value (%)
CFL (1 lamp - 2012)	8% (Reference 2)
CFL (1 lamp - 2013)	8% (Reference 2)
Refrigerator Replacement	100%
Wall Insulation	0%
Air Sealing	0%
Duct Sealing	0%
Ceiling Insulation	0%
Storm Window Installation	0%
Crawspace Insulation	0%

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Table 6: Lifetimes

Measure	Value (yrs)
CFL (1 lamp - 2012)	7.77 (Reference 2)
CFL (1 lamp - 2013)	7.39 (Reference 2)
Refrigerator Replacement	7.30 (Reference 3)
Water Heater Replacement	15 (Reference 4)
Wall Insulation	20 (Reference 5)
Furnace Replacement	18 (Reference 6)
Air Sealing	10 (Reference 5)
Duct Sealing	15 (Reference 5)
Ceiling Insulation	20 (Reference 5)
Storm Window Installation	20 (Reference 5)
Crawspace Insulation	20 (Reference 5)

Table 7: Incremental Cost by Measure

Measure	Value (\$)
CFL (1 lamp - 2012)	\$3 (Reference 7)
CFL (1 lamp - 2013)	\$3 (Reference 7)
Refrigerator Replacement	\$631 (Reference 7)
Water Heater Replacement	\$55 (Reference 4)
Wall Insulation	\$670 (Reference 8)
Furnace Replacement	\$623 (Reference 9)
Air Sealing	\$272 (Reference 10)
Duct Sealing	\$325 (Reference 9)
Ceiling Insulation	\$715 (Reference 8)
Storm Window Installation	\$1225 (Reference 8)
Crawspace Insulation	\$175 (Reference 8)

References

- 1) 2011 Program Evaluation by Cadmus Group
- 2) US Lighting Market Characterization Study performed for the Department of Energy in 2002
- 3) Environmental Protection Agency Energy Star Program - www.energystar.gov
- 4) Xcel Energy Water Heater Rebate Program
- 5) California Measurement Advisory Committee (CALMAC) Protocols, Appendix F (www.calmac.org/events/APX_F.pdf).
- 6) Energy Conservation Standards for Residential Furnaces and Boilers, Efficiency Standards for Consumer Products
- 7) CO Governor's Energy Office Guidance
- 8) RS Means RR 2007
- 9) Database for Energy Efficient Resources (DEER)
- 10) NEAT/Frontier