DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Home Performance with ENERGY STAR

Description:

Home Performance with Energy Star program, residential natural gas and electric customers receive a cash rebate for implementing multiple energy efficiency improvements. The Home Performance with ENERGY STAR Product provides a "systems approach" to comprehensive energy improvements. Public Service uses this approach by requiring an upgraded home "shell," including code level attic insulation and a reduction in air infiltration coupled with a combustion safety check if naturally vented combustion appliances (furnace/boiler or water heater) remain in the home after product participation. Low-income customers may participate in this product, but also have dedicated product offerings.

Program References:

Measures "Attic Insulation", "Wall Insulation", and "Air Sealing"	Refer to Program "Insulation and Air Sealing - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Attic Insulation", "Wall Insulation", and "Air Sealing" measures.
Measures "Heating Efficiency", "High Efficiency Furnace"	Refer to Program "Residential Heating - CO" to find formulas and variables for (Customer Dth, Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Heating Efficiency" measures.
Measures for "LED"	Refer to Program "Home Lighting and Recycling - CO" to find formulas and variables for (Customer PCkW, Coincidence Factor, Basline Lamp Watts, etc.) for all "LED" measures.
Measures for "Energy Star Clothes Washer"	Refer to Program "Energy Star New Homes - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Energy Star Clothes Washer" measures.
Measures for "Water Heating Efficiency"	Refer to Program "Water Heating - CO" to find formulas and variables for (Customer Dth, Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Water Heating Efficiency" measures including condensing water heaters, instantaneous water heaters, and heat pump water heaters.
Measures for "Refrigerator Replacement", "Removal of Primary Refrigerator"	Refer to Program "Refrigerator and Freezer Recycling - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for "Refrigerator Replacement", and "Removal of Primary Refrigerator" measures.
Measures for "Air Conditioning" and "Ground Source Heat Pumps"	Refer to Program "High Efficiency Air Conditioning - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Air Conditioning", "Ground Source Heat Pump" and "Quality Install" measures.
Measures for "Evaporative Cooling"	Refer to Program "Evaporative Cooling - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Evaporative Cooling" measures.
Measures for "Programmable T-Stat Setback"	Refer to Program "Home Energy Squad - CO" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Programmable T-Stat" measures.

Algorithms:

LED_kW (kW Saved at Customer)	= (kW_Bulb_Existing - kW_Bulb_New) x (Qty_LED_After - Qty_LED_Before)
LED_kWh (Annual kWh Saved at Customer)	= (kW_Bulb_Existing - kW_Bulb_New) x (Qty_LED_After - Qty_LED_Before) x (Hours_Per_Bulb)
~~Setback_Thermostat_kW Saved at Customer~~	~~= Setback_Thermostat_kWh / Hours_Electric_Cooling~~
Setback_Thermostat_PCkW (Coincident kW Saved at Customer)	= Setback_Thermostat_kW x CF

Variables:

Effn	Customer Input	= Efficiency of the newly installed natural gas heating unit. We will use the nameplate value provided by the customer.

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BTUH	Customer Input	= Size of the newly installed natural gas heating unit. We will use the nameplate value provided by the customer.
Qty_LED_After	Customer Input	= Number of LED bulbs present in the home after the upgrade (minimum of 20), provided by the customer
Qty_LED_Before	Customer Input	= Number of LED bulbs present in the home before upgrade, provided by the customer
kW_Bulb_Existing	43	EISA baseline wattage associated with the average new bulb wattage, Reference Home Lighting and Recycling Program.
kW_Bulb_New	9.65	Average new LED lamp wattage as determined by sales in the Home Lighting and Recycling program.
Setback_Thermostat_Dtherm (Customer Dth Savings per year)	4.19	Annual energy savings for heating due to an average temperature setback of 2.4 degree F for Heating Season and baseline home heating is 61.6 DTherms / year. Savings is = 4.19 DTherms / year.
Setback_Thermostat_kWh (Customer kWh Savings per year)	118	Annual energy savings for cooling energy due to average temperature setback of 1.33 Degree F for Cooling Season. Baseline cooling energy per year is 1,901 kWh and the annual savings is 118 kWh / year.
Setback Thermostat Coincidence Factor	76%	CF for cooling only per T-Stat Setback Bin Calcs in the "Home Energy Squad - CO" program.
Setback Thermostat Measure Life	10	Reference 2
Setback Thermostat Incremental Cost	$50.00	Reference 3
Setback_Thermostat_kW (Customer kW Savings)	0.140	Customer kW savings for cooling energy due to average temperature setback of 1.33 Degree F and Home Energy Squad's model savings of 0.1056 kW / degree of setback.
Hours_Electric_Cooling (Setback Thermostat Measure)	Refer to Program "Air Conditioning - CO" to find reference for Cooling Hours.	
3412	Conversion from BTU to kWh, 1kWh = 3412 BTU	
NTG	Net-to-Gross Factor = We will use 116% based on Reference 1.	

Inputs:

Reference Stand-alone programs for a complete list of required customer inputs	
Identify all implemented measures	Customer Input
Qty_LED_After	Customer Input
Qty_LED_Before	Customer Input
Quantity Refrigerators Removed	Customer Input
Example Inputs from Standalone Programs:	
Actual cost of Attic Insulation	Customer Input
Attic Square Footage Insulated	Customer Input
Attic Insulation R-Value Pre Project	Customer Input
Attic Insulation R-Value Post-Project	Customer Input
Actual Cost of Air Sealing	Customer Input
BTUH size of new fuel fired heating equipment	Customer Input
EFFn of new heating equipment	Customer Input
EFFn of new domestic water heating equipment	Customer Input
Blower Door Test-in CFM50	Customer Input
Blower Door Test-out CFM50	Customer Input
Climate Zone (Front Range, Western Slope, or Mountains)	Customer Input
Number of Stories above grade in Home	Customer Input

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Conditioned Square Footage	Customer Input

Assumptions:
Any home with an existing ACH natural of 0.45 ACH will not be eligible for the air sealing measure.
A Blower Door Test will be required for all participating homes.
The Attic Bypass Air Sealing energy savings will be captured with Air Sealing and Weather Stripping measure.
TMY3 Climate Data used for the following areas: Front Range = Denver; Western Slope = Grand Junction; Mountains = Alamosa
The NTG for the Tier 1 evaporative coolers is 59.7%. This was determined in the 2006 Summit Blue Consulting report. The NTG for the Tier 2 evaporative coolers

Qualifying Evaporative Cooling Equipment must be new and be a permanently installed direct (Tier 1 or 2), indirect or two-stage evaporative cooling unit. Portable coolers or systems with vapor compression equipment are not eligible, nor is used or reconditioned equipment.

References:
1. COLORADO HOME PERFORMANCE WITH ENERGY STAR® PROGRAM EVALUATION Printed May 2014
2. Lifetime of 10 years for programmable T-Stats from "Measure Life Report Residential and Commercial/Industrial Lighting and HVAC Measures", June 2007 by GDS Associates
3. Xcel Energy estimate

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