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 comprehensive, holistic product for residential natural gas and electric customers who are implementing multiple energy efficiency improvements. Public Service uses this approach by requiring a comprehensive audit followed by meetings with an Energy Advisor to assist the customer with prioritizing the needed improvements in the home. The Energy Advisor can assist in getting and evaluating contractor quotes to perform the work as well as follow up with the contractor to ensure quality of services provided.

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 "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 inculding 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 "Air Conditioning Quality Install"	Refer to Programs "Air Conditioning - CO" and "Residential Heating - CO" to find formulas and variables for Therms Saved at Customer for the heating portion of "Air Conditioning Quality Install" measures.

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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.
Measures for "Energy Star Smart Thermostat"	Refer to Program "Smart Thermostat and Optimization" to find formulas and variables for (Gross kW Saved at Customer, Gross kWh Saved at Customer, Customer PCkW, etc.) for all "Energy Star Smart Thermostat" measures.
Measures for "Energy Star Clothes Washer"	Refer to "Energy Efficient Showerheads - CO" to find formulas and variables for Non-Energy O&M Cost Savings calculations for the "Energy Star Clothes Washer" measures.

Algorithms:

Setback_Thermostat_PCkW (Coincident kW Saved at Customer)	= Setback_Thermostat_kW x CF
Gross kW Saved at Customer kW_Saved	= Gross Annual kWh / Hours
Gross Peak Coincident kW Saved at Customer (PC_kW_Saved)	= Gross kW Saved at Customer * CF

Variables:

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

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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.
Clothes washer electric energy savings (Gross Annual kWh)	See Table 1	Energy savings for the clothes washer are based on the ENERGY STAR Clothes Washer Savings Calculator: Reference 4. This will vary based on source for domestic hot water heat; gas or electric.
Clothes washer Hours	295	Assumed Annual Hours of operation for a clothes washer, based on number of duty cycles and a duty cycle of 1 hour.
Clothes Dryer Hours	283	Assumed Annual Hours of operation for a clothes dryer, based on number of duty cycles and a duty cycle of 1 hour.
Clothes washer natural gas savings (Gross Dth/Yr)	See Table 1	Energy savings for the clothes washer are based on the ENERGY STAR Clothes Washer Savings Calculator: Reference 4. For homes with gas domestic hot water heat.
Non-energy O&M savings	See Table 1	Water Savings per year for an Energy Star Clothes Washers
CF Clothes Washer & Clothes Dryer	See Table 1	Coincidence Factor of Energy Star Clothes Washers and Clothes Dryers
Incremental Cost Clothes Washer	See Table 1	Incremental Cost of an energy star Clothes Washer (Reference 5)
Incremental Cost Clothes Dryer	See Table 1	Incremental Cost of an energy star Clothes Dryer (Reference 5)
Measure Life Clothes Washer	11	Life of an energy star Clothes Washer (Reference 6)
Measure Life Clothes Dryer	12	Life of an energy star Clothes Dryer (Reference 6)
BTU to kWh	3412	Conversion from BTU to kWh, 1kWh = 3412 BTU
NTG	116.00%	Net-to-Gross Factor = We will use 116% based on Reference 1.

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Tables:

Table 1 (Reference 4)	Front Loading Clothes Washer	Top Loading Clothes Washer	Energy Star Dryer
Total Water Savings/Year - Gallons	1,180	5,443	N/A
kWh Savings in home with electric water heater	151	397	98
kWh Savings in home with gas water heater	125	306	98
DTherm Savings in home with gas water heater	0.12	0.41	N/A
Coincidence_Factor (CF)	3.37%	3.37%	3.23%
Non-Energy O&M Savings	$ 8.30	$ 38.26	$ -
Incremental Cost	$ 50.00	$ 190.00	$ 75.00

Inputs:

Reference Stand-alone programs for a complete list of required customer inputs	
Identify all implemented measures	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
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 2 evaporative coolers is assumed to be 116% to match the rest of the Home Performance Program.

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

Quality install procedures require duct sealing which also benefits and existing associated gas furnace as well.

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
4. https://www.energystar.gov › files › asset › document › appliance_calculator
5. ENERGY STAR Appliance Calculator Incremental Costs - Cadmus research on available models, July 2016
6. ENERGY STAR Appliance Calculator Equipment Life - Appliance Magazine, Market Research Report, January 2011

Changes from 2017 / 2018 Plan

Added evaporative cooling
Revised Deemed sheet to fit new standard format
removed refigerator replacement measure
Added QI Heating savings to existing Res AC Quality Install measures.
Removed Tank Type gas water heaters.
Modified ENERGY STAR Clothes Washer to separate Top Loading and Front Loading as well as incorporate dry savings due to water removal.
Added ENERGY STAR Clothes Dryer to capture additional savings due to Energy Star Features and Sensors.
Modified Heat Pump Water Heaters to match the Water Heating Program methodology update.