DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Program: Residential Demand Response - CO

Description:

Prescriptive rebates will be offered to residential customers who install a Smart Saver's Switch or a Smart Thermostat on their air conditioning (AC). Only DR demand savings will be claimed at this time for Smart Thermostats, no EE savings on AC or heating till program can do EE savings evaluation.

Algorithms:

Saver Switch	
F GEN Deem Eq kW (Customer_kW)	= I_Qty_Prop_Equip * Eq.kW_Savings
F HES AC EQ kWh (Customer_kWh)	= I_Qty_Prop_Equip * Eq.kWh_Savings
F Gen Equip PCKW 2 (PC_kW_Customer)	= I_Qty_Prop_Equip * Eq.PC_kW_Customer
Eq.kW_Savings	= (tons / EER) * 12
Smart Thermostats	
F Smart Tstat kW (Customer_kW)	= Min(I_Qty_AC_Units , Pm.Eq.Maximum_Quantity) * Pm.Eq.kW_Savings * Cooling Scaling Factor
F Smart Tstat kWh (Customer_kWh)	= Min(I_Qty_AC_Units , Pm.Eq.Maximum_Quantity) * Pm.Eq.kWh_Savings * Cooling Scaling Factor
F Smart Tstat pckW 2 (PC_kW_Customer)	= Min(I_Qty_AC_Units , Pm.Eq.Maximum_Quantity) * Pm.Eq.PC_kW_Customer * Cooling Scaling Factor
Eq.kW_Savings	= (tons / EER) * 12
Heat Pump Water Heater	
HPWH Load Shift kW (Customer_kW)	= Qty_HPWH_Units * HPWH_Load_Shift_DR_kW
HPWH Load Shift kWh (Customer_kWh)	= Qty_HPWH_Units * HPWH_Load_Shift_DR_kWh
HPWH Load Shift PCkW @ Customer	= Qty_HPWH_Units * HPWH_Load_Shift_DR_kW * HPWH_CF

Variable ID	Value	Description
Common Assumptions		
tons	2.50	Deemed Capacity of average residential AC Unit in tons.
EER	11.05	Deemed Energy Efficiency Ratio (EER) of average residential AC Unit.
Saver Switch		
I_Qty_Prop_Equip	Customer Input	Quantity of smart saver switches installed.
Eq.kW_Savings	2.715	kW savings per average res AC Unit with a smart switch.
Eq.kWh_Savings	4	kWh savings per year per average res AC Unit with a smart switch (Reference 1 & 2).
Eq.PC_kW_Customer	0.930	Peak Coincident kW savings per average res AC Unit with a smart switch (Ref 4).
Lifetime	15	Length of time the switch will be operational.
NTG	100%	Net-to-Gross factor for Saver's Switch will be 100% as customers would not have the ability to install a switch without the program.

Smart Thermostats		
I_Qty_AC_Units	Customer Input	Quantitiy of AC Units being controlled
Pm.Eq.Maximum_Quantity	See Table 1	Maximum quantity of smart thermostats that can be rebated.
PM.Eq.kW_Savings	2.715	kW savings per average res AC Unit with a smart switch.
PM.Eq.kWh_Savings	4	kWh savings per year per average residential AC Unit with a smart thermostat (Reference 3 & 2).
PM.Eq.PC_kW_Customer	1.164	Peak Coincident kW savings per average residential AC Unit with a smart thermostat (Reference 3).
Life_ResST	5	Length of time the smart thermostat will be operational.
NTG - DR	100%	Net-to-Gross factor for DR smart thermostat will be 100% as customers would not have the ability to install a DR smart thermostat without the program.
Cooling Scaling Factor	Table 2	Cooling Scaling factor based on home type
Heat Pump Water Heater Load Shift & DR		
HPWH_Load_Shift_DR_kWh	118.401	Annual kWh savings due to daily load shifting control of HPWH tank set point temperature.
HPWH_Load_Shift_DR_PCkW	0.076	Peak Coincident kW savings per average residential HPWH Unit with a smart switch.
HPWH_Load_Shift_DR_kW	0.536	kW savings of average residential HPWH Unit operating in HP only mode.
HPWH_CF	0.142	Coincidence Factor for DR or Load Shifting event of Heat Pump Water Heater.
Incremental Cost of HPWH Controls	$325.00	Cost of CTA module and adapter plus cost of 3-way hot water mixing valve.
Lifetime	1	Annual update of customer enrollment
NTG - HPWH DR	100%	Net - To - Gross factor for DR and Load Shifting of smart HPWH as the load shifting will allow the customer to use new time of use rates and reduce demand during the peak of the day.

Table 1

Smart Thermostat Type	Cost	Pm.Eq.Maximum_Quantity
Smart Thermostat - DR - Direct Install - CO	$225.00	2
Smart Thermostat - DR - BYOT - CO	$0.00	4

Table 2

Smart Thermostat Type	Single Family	Multi-Family	Townhome/Duplex
Cooling Scaling Factor	100%	35%	64%

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Inputs:

Provided by Customer:	Verified during M&V:
Number of Saver Switches installed.	Yes
Number of Smart DR Thermostats installed.	Yes
Number of Smart HPWH's Installed / Enrolled	Yes

Assumptions:

Savings are calculated at system peaking conditions of 95 degree Fahrenheit dry bulb.

References:

(1) DNV GL & AEC, January 2016. Saver's Switch Program, Residential Program, 2015 Impact Evaluation Report.
(2) Xcel Energy, May 2018. Saver's Switch Control History.
(3) Nexant, 2017. Evaluation of 2016 Smart Thermostat Pilot.
(4) DNV GL & AEC, January 2018. Saver's Switch Program, Residential Wireless Modeling & Event Day Report, Version 8.

Changes from 2017 / 2018 Plan

Added Smart Thermostats to the program offering.
Removed self-install offering from smart thermostats product.
Updated kWh savings based on average number of events called per year.
Added HPWH DR and Load Shifting measures