

DEEMED SAVINGS TECHNICAL ASSUMPTIONS

Product: Energy Efficient Showerheads

Residential customers are eligible to receive a free high-efficiency showerhead to reduce energy and water use.

Algorithms:

Showerhead Natural Gas Savings (Gross Dth/unit)	= ((GPY_Saved x Delta_T x 8.33) / HGE / 1,000,000) x (Gas_Electric_Split_Factor)
Net Dth	= Gross Dth x NTG
Showerhead Energy Savings (Customer kWh/unit)	= (GPY_Saved x Delta_T x 8.33) / (3412 x HGE) x (1 - Gas_Electric_Split_Factor)
Showerhead Energy Savings (Gross Generator kWh)	=(Customer kWh)/(1 - TDLF)
Net generator kWh per showerhead retrofit	= Gross Generator kWh x NTG
Showerhead Demand Savings (Customer kW)	= 0.0 kW Customer kWh / 238 hours = 1.80 kW
Showerhead Demand Savings (Gross Generator kW)	= ((GPY_Saved x Delta_T x 8.33 x CF) / (3,412*(1-TDLF))) = 0 kW
Net generator kW per showerhead retrofit	= Gross Generator kW x NTG = 0 kW

Variables:

GPY_Saved	= Gallons per year of hot water saved with high-efficiency showerhead. Showerhead = 3,084-2135 gallons per year per showerhead (References 1, 2)
Delta_T	= Change in temperature of water from incoming water temperature to water heater temperature setting. Delta_T is 74 degrees F. (Reference 1,2)
HGE	= Heat generation efficiency based on Minimum Federal Efficiency Standards for water heater efficiency. Used value of 0.59 for gas; value of 0.90 for electric (Reference 6)
CF	= Coincidence Factor, the probability that peak demand of the measure will coincide with peak utility system demand. A CF of 0.0 will be used for showerheads.
Gas_Electric_Split_Factor	Gas_Electric_Split_Factor is based on customer response to showerhead post card. The customer selects from three options for water heating fuel. Selected choice yields the factor as follows: = gas water heater = 1 = unknown water heater = 0.89 = electric water heater = 0
8.33	Heat content of 1 gallon water; Btu/gal -F
3,412	Conversion from Btu to kWh; 1 kWh = 3,412 Btu

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Dth	= 1,000,000 Btu
Incremental Costs	= actual costs provided by vendor; \$2.75 per showerhead in 2012 and \$2.90 per showerhead in 2013 are assumed for the material costs for cost/benefit calculation purposes
NTG	= Net-to-Gross Factor = 99%. The actual installation rate for 2012 and 2013 will be used to determine net savings.
O&M savings	= Water & Sewer savings are assumed to be 4,754 3,805.7 gallons per year @ \$0.00482/gallon. O&M savings = \$ 22.91 \$18.34 per shower head *(Reference 7)
Measure Life	= 6 years (Reference 5)
Transmission Distribution Loss Factor (TDLF)	Transmission Distribution Loss Factor = 7.69%, the percentage loss of electricity as it flows from the power plant to the customer, calculated using factors from Enhanced DSM Filing - SRD-2

Provided by administrator:	Verified during M&V:
Showerhead received by customer	Yes
Showerhead installed by customer	Yes
Water Heating Fuel provided by Customer	Yes

Assumptions:

Showerhead replacement	2.5 gpm(Federal Standard) showerhead replaced with 1.5 gpm in 1 shower in home
Water heating efficiency - natural gas	59% federal minimum manufacturer's standard
Water heating efficiency - electric	90% federal minimum manufacturer's standard
Gas/Electric split	We will request information to determine what type of fuel is used to heat water in each house that receives a showerhead. From 2010 Xcel Energy Colorado Home Use Study (PS Co Service Area), 89% of the houses use gas to heat water and 11% of houses use electric to heat water (Reference 8). For homes that do not know or do not respond to the query, but receive a showerhead we will take credit equal to 11% of the electric savings and 89% of the gas savings.

Changes From 2010:

No changes.
Request water heating fuel from the customer

References

1. Xcel Energy New Mexico Residential Shower Use Study

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2. Japanese study: "The effects of variation in body temperature on the preferred water temperature and flow rate during showering"; Authors: Tadakatsu Ohnaka, Yutaka Tochiyama, Yumiko Watanabe. Affiliations: a) Department of Physiological Hygiene, The Institute of Public Health, Minato-ku, Tokyo, Japan; b) Faculty of Home Economics, Jissen Women's University, Hino, Tokyo, Japan.
3. Handbook of Water Use and Conservation, Denver Water Conservation
4. Xcel Energy Customer End Use Study 2006
5. California Measurement Advisory Committee (CALMAC)
6. http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/htg_products_frmwk_presentation_2007-01-10ver4.pdf
7. http://www.denverwater.org/rateinfo/rates08_vs_09approved.html
8. 2010 Xcel Energy Colorado Home Use Study (PS Co Service Area)