EPA WaterSense

A partnership program of the U.S. Environmental Protection Agency

Methodology and Assumptions for Estimating WaterSense® Annual Accomplishments (updated June 2015)

Each year WaterSense collects product shipment data for WaterSense labeled products from all of our manufacturer partners. This data set is then aggregated and entered into the National Water Savings (NWS) model to measure the impact of the WaterSense program on the market and estimate annual water savings. The annual water savings data is in turn used to calculate associated energy, carbon dioxide, and dollar savings.

Water Savings

The NWS model was developed to estimate the national water savings attributable to WaterSense. The model uses market penetration data of WaterSense labeled products in both existing and new construction combined with an accounting analysis of water-using equipment and of building stock to replicate the likely usage of products.

Calculating the total gallons of water WaterSense saves nationwide involves comparing two scenarios. First, the model uses the data from multiple sources[1] pertaining to the baseline national water use of typical fixtures, fittings, and appliances that existed prior to the program's inception in 2006, as well as trends in efficiency for water-using products to establish a business-as-usual scenario (i.e. the market if the WaterSense program did not exist). Next, the NWS model uses product shipment data, as reported by WaterSense partners, to create a program scenario that estimates the overall efficiency of the stock in use today (as it is influenced by WaterSense). The NWS model then compares the business-as-usual scenario with the program scenario to calculate total gallons saved by the WaterSense program.

Based on the calculations in the model, we can project a timeline of water savings attributable to the WaterSense program. The savings increase each year as more consumers purchase and install WaterSense labeled products, which results in a greater number of efficient products comprising the product stock in use throughout the United States.

Energy Savings

There are two types of energy savings associated with the water saved by WaterSense labeled products. All water delivered from a public supply system requires energy for conveyance and treatment. Based on publicly available data, WaterSense estimates that it takes 2.1 kilowatt hours of electricity to supply one thousand gallons of water to households from the public supply. This includes energy required for pumping raw water, water filtration, treatment, and

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[1] American Housing Survey 2007
American Water Works Association Research Foundation, (AWWARF). *Residential End Uses of Water.* 1999
Catalina Resarch. U.S. Toilet Market Profile. Published May 1,, 2007
D&R Int'l. Plumbing Fixtures Market Overview: *Water Savings Potential for Residential and Commercial Toilets and Urinals*. Published September 30, 2005. D&R International; Koeller and Company; and Veritec Consulting, Ltd.
Specialists in Business Information (SBI). *Kitchen and Bath Fixtures and Fittings in the U.S*. Published February 2007

distribution. Many products generate wastewater as well, and WaterSense estimates that it takes an additional 2.5 kilowatt hours of electricity to treat one thousand gallons of residential wastewater at a treatment plant.[2] Therefore, the embedded energy footprint of water from the public supply is 4.6 kilowatt hours of electricity per thousand gallons supplied for products that create wastewater.

There are additional savings realized by WaterSense labeled products that reduce household hot water use. By reducing the amount of hot water used, a portion of the energy (commonly electricity or natural gas depending on heating type) is abated.

In order to estimate the energy saved by the reduced use of household hot water, WaterSense assumes the following:

- Heating water is 100 percent efficient for an electric hot water heater.
- Heating water is 75 percent efficient for a natural gas water heater.
- Incoming water temperature is raised 75ºF by a hot water heater.
- Water used at the lavatory faucet and from showerheads is, on average, approximately 73 percent hot water and 27 percent cold water.[3]
- Water used by commercial pre-rinse spray valves is 100% hot water.

Using the specific heat of water (equal to 1.0 British thermal units (BTU) per one pound of water raised one ºF), WaterSense estimates that heating water requires about 0.18 kilowatt hours of electricity per gallon of hot water for an electric powered water heater, or about 0.8 cubic feet of natural gas per gallon of hot water for a natural gas fired water heater. For the purposes of reporting in a single unit, WaterSense converts natural gas savings to the equivalent units of kilowatt hours using the following conversion factors:

1 therm = 29.3 kilowatt hours
1 Mcf of natural gas = 10.307 therms

WaterSense uses data collected by the American Housing Survey to estimate the percentage of households that heat with either electricity or natural gas. WaterSense assumes that the stock of WaterSense labeled products in service are distributed according to these percentages for the purpose of estimating the amount of energy saved. Other methods of heating hot water are not considered in this calculation. However, households using electricity or natural gas to heat water currently account for more than 95 percent of all occupied households in the United States.

Carbon Dioxide Savings

[2] EPRI, 2013. Electricity Use and Management in the Municipal Water Supply and Wastewater Industries, Electric Power Research Institute, Palo Alto, California, November 2013 Report 3002001433..
[3] Mayer, Peter W. and William B. DeOreo. The End Uses of Hot Water in Single Family Homes from Flow Trace Analysis. Aquacraft, Inc.

Once the associated energy savings is calculated, WaterSense uses the best available estimates for the equivalent amount of carbon dioxide that has been eliminated from abating this energy use:

6.89551×10^{-4} metric tons of carbon dioxide per kilowatt hour
0.005302 metric tons of carbon dioxide per therm

These figures are publicly available on EPA's Clean Energy Calculations and References page.

Cost Savings

Much like the energy savings, consumers save money on their utility bills in two ways: reduction in water bills (drinking water and wastewater) and reduction in energy bills (electricity and/or natural gas) used to heat water.

The cost savings attributable to reduction in water bills is calculated by the NWS model using an analysis of rate information reported in the American Water Works Association's (AWWA) Rate Survey. The average cost of water and wastewater in the year that the savings occurred is applied to the total water savings, the total is then discounted to the current year.

The cost savings attributable to reduce energy bills are calculated for each type of hot water heating units are calculated by applying the average cost of energy supplied by the U.S. Energy Information Agency's Short-Term Energy Outlook to the total amount of hot water saved. Only products that typically are supplied hot water are taken into account for the savings attributed to reduced energy costs. Energy that is saved as a result of total water savings but not associated with heating water (e.g. the energy embedded in water that is publicly supplied and treated) is not added to the cost savings.

WaterSense represents dollar values discounted to the current year and continually reviews the available data as well as the methodology used in its savings calculations to improve accuracy. As a result, comparisons of the data in the WaterSense annual reports from one year to the next cannot be used in direct calculations to estimate cumulative savings. WaterSense will continue to publish updated cumulative savings numbers as they become available.