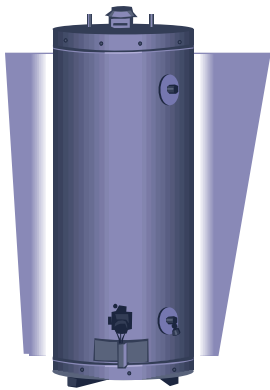




Efficiency Standards Questions and Answers Water Heaters

What is an efficiency standard and who sets it?

The U.S. Department of Energy (DOE) establishes and periodically updates minimum efficiency standards for many residential and commercial products. These standards apply to new products manufactured for sale in the United States. Usually, once DOE announces a new standard, the manufacturers have about 3 years until new products must comply.



What products will be covered under the new standard?

This rulemaking will set standards for residential water heaters, which provide hot water for consumer use, appliances, and other functions. There are two main types of water heaters: typical heater/storage units, usually between 20 and 80 gallons, and instantaneous water heaters (known as “tankless”) which heat water as is it needed. Only 3.5% of water heaters sold in 2007 were tankless. This rulemaking will also set standards for pool heaters and direct heating equipment.

How much energy do water heaters consume now?

Water heating is the third largest household energy expense, representing 20% percent of total annual household energy consumption in the U.S. About 53% of U.S. households use natural gas water heaters, while 38% use electric and less than 4% use oil (EIA 2008). Three major domestic manufacturers hold over 90 percent of the storage water heater market. In 2007, manufacturers sold 4.4 million gas-fired; 4.5 million electric; and 24,000 oil-fired water heaters. DOE last updated the water heater standards in January 2001. For an average-sized unit, the current required energy factor (EF) is .59 for gas, .53 for oil, and .90 for electricity. A baseline .59 EF gas water heater consumes around 16.7 million Btu/yr. A .90 EF electric water heater consumes around 2,700 kWh/yr (DOE 2009). The average annual household cost to operate a new water heater which meets but does not exceed the current minimum standards is just over \$220 for gas and \$300 for electric (based on 2008 national average retail energy prices).

What are the potential savings and benefits from new standards?

Based on DOE’s initial analysis, ASAP recommends new standards increasing the Energy Factor (EF) to .63 for natural gas water heaters, .62 for oil, and .95 for electric. Setting the standards at this level would:

- Save 158 billion kilowatt hours cumulatively by 2030 or nearly enough to meet the electricity needs of all the homes in the northeast for one year;
- Save 920 billion cubic feet of natural gas by 2030 or enough to heat all the homes in Illinois, Indiana, Michigan, Ohio, and Wisconsin for one year;

- Save consumers \$14.4 billion in net present value savings; and
- Reduce CO2 emissions by over 7.7 million metric tons in 2020 and 15.5 MMT in 2030

At ASAP's recommended standard levels, a typical household would likely see a decrease of \$20-25 per year in gas or electric bills due to the more efficient product. Based on DOE cost estimates, consumers will earn back the incremental cost to make water heaters more efficient in about 2.6 years for electric and about 1.6 years for gas.

The standards ASAP recommends are based on incremental improvements to conventional technology. However, DOE should also seriously consider standards requiring limited application of next generation water heater technologies (i.e.: heat pump water heaters, condensing gas products). These advanced efficiency products make the most sense in the largest volume water heaters and in new home construction and would be an effective way to build an initial market for these products.

What are the key issues?

All water heaters generally waste a portion of fuel they use to heat water and, for most products, store it. For example, in a conventional gas water heater only 43% of the fuel energy actually reaches the point of use. The remaining 57% dissipates through standby losses, distribution losses, or combustion losses (ACEEE 2007). Though electric water heaters are rated with higher energy factors than gas or oil, these ratings do not account for the fact that about 3 Btu's of fuel need to be burned to generate 1 Btu of electricity. Thicker tank insulation can increase the efficiency of all types of water heaters, but as thickness increases, product dimensions can increase making installations in tight locations more difficult. Manufacturers and installers can adjust for tight spaces by installing smaller water heaters, adjusting up set points and using tempering valves to avoid scalding. In effect, a smaller volume water heater can deliver the same water heater service. In gas water heaters, heat traps are another technology enabling improved efficiency. The current rulemaking will essentially exhaust the efficiency potential of conventional tank gas and electric water heater technology.

Two viable technologies for achieving significantly greater water heater efficiency are heat pump water heaters (for electric), which transfer heat from the surrounding air and are most effective in warm climates, and condensing units (for gas), where heat is captured from the condensing water vapor. While incremental improvements can save a few percentage points, condensing water heaters can save between 27% (storage)¹ and 37% (instantaneous)² and heat pump water heaters over 50%³. DOE's preliminary technical analysis lists both technologies as the maximum technically feasible levels for their class. One major company plans to market a heat pump water heater in late 2009 with an EF factor of at least 2.0. For the natural gas condensing units, several commercial condensing units, just above the residential size limit of 76,000 Btu/hr have been installed in residences and are marketed for high-efficiency residential applications.

What is the timeline for the water heater standard?

Under a court order, DOE must decide by March 31, 2010 if revised standards are warranted, and, if so, what the new standards will be and when they will be implemented. A Notice of Proposed Rulemaking is expected in September 2009, followed by a 60-day public comment period.

For more info on water heaters, click on link to DOE:

http://www1.eere.energy.gov/buildings/appliance_standards/residential/water_pool_heaters_nopm.html



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¹ Average annual consumption of baseline gas-fired storage units is 16.7MBtu/y - **condensing storage** average energy savings are estimated at 4.6MBtu/yr. Condensing storage have an added estimated electricity consumption of 61kWh/yr.

² Average annual consumption of baseline instantaneous gas-fired units is 17.0MBtu/yr –**condensing instantaneous** average energy savings are estimated at 6.4MBtu/yr. Condensing instantaneous units have an added estimated electricity consumption of 29 kWh/yr.

³ Average annual consumption of baseline electric storage units is 2703kWh/year. **Heat pump water heater** average energy savings are estimated at 1361kWh/year.