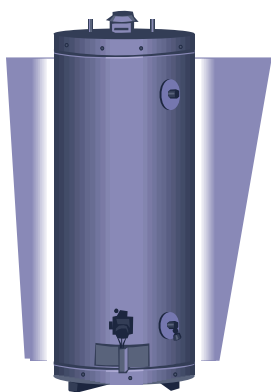


Efficiency Standards Questions and Answers Water Heaters

What is an efficiency standard and who sets it?

The Congress established initial minimum efficiency standards for many residential and commercial products and charged the U.S. Department of Energy (DOE) with periodically updating them. In a few cases, DOE establishes the initial standard. These standards apply to new products manufactured for sale in the United States. DOE must update the existing standard for residential water heaters by March 31, 2011. (DOE last updated the water heater standards in January 2001, effective 2004.) Usually, once DOE announces an updated standard, the manufacturers have about 3 years until new products must comply. For the pending revision to the water heater standard, DOE is considering a 5 year lead time before the new standard takes effect.



Which products will be covered under the new standard?

The rulemaking covers two main types of water heaters: typical storage units, usually between 20 and 80 gallons, and instantaneous gas water heaters (also known as “tankless”) which heat water as it is needed.¹ Only 3.5% of water heaters sold in 2007 were tankless. DOE will also update standards for direct heating equipment and pool heaters as part of this rulemaking.

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 2008¹). Three major domestic manufacturers hold over 90% 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. According to DOE’s analysis, a baseline gas water heater consumes around 16.6 million Btu/yr. An electric water heater consumes just over 2,600 kWh/yr. The average annual household cost to operate a new water heater which meets but does not exceed the current minimum standards is just over \$200 for gas and \$300 for electric (based on 2009 national average residential retail energy prices²).

What has DOE proposed?

In December 2009, DOE proposed new standards based on incremental improvements to conventional technology. The standard proposed by DOE, Trial Standard Level 4, would save about 6% and 4%, respectively, relative to gas and electric products just meeting the existing standards. Manufacturers could meet the standard using incremental improvements such as increased insulation or power vents. The following table shows the current and proposed Energy Factor (EF) for average sized storage units:

Type of unit	Current Standard (average size) Energy Factor (EF)	Proposed Standard (average size) Energy Factor (EF)
Gas-fired storage (40 gals.)	.59	.63
Oil-fired storage (32 gals)	.53	.62
Electric storage (50 gals.)	.90	.95

The EF changes as a function of size, allowing for slightly higher efficiency levels at the smaller sizes.

¹ DOE has determined that solar water heating systems are not included in these standards.

What are the savings and benefits from the proposed new standards?

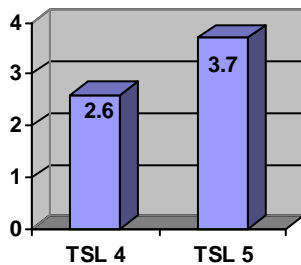
DOE estimates that the proposed new efficiency standards for water heaters, over 30 years, would:

- Save 2.6 quads of cumulative energy or enough to power 13 million typical U.S. homes for one year.
- Produce net present value benefits for consumers and businesses of about \$15.6 billion.
- Reduce greenhouse gases by approximately 154 million tons of CO₂ or the equivalent annual emissions of nearly 30,000,000 million passenger cars.

Are greater savings feasible?

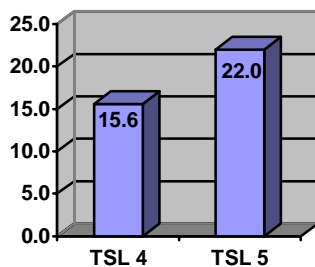
YES. While the savings from the proposed rule are significant, large additional savings are possible. ASAP recommends that DOE adopt final standards requiring limited application of next generation water heater technologies (i.e.: heat pump water heaters, condensing gas products) in the largest volume tanks (55 gallons and above). **If DOE required this shift for the largest water heaters, the energy, economic, and CO₂ savings would increase by about 40% compared to the Department's proposal.** Even larger savings are achievable by requiring these next generation technologies across the board for all tank volumes, but would be a far more challenging transition for manufacturers and other market participants in the time frames envisioned for this rule.

The following graphs show the additional savings that would be possible at TSL 5, a middle ground standard relative to an across-the-board standard because it would require the use of the newer, more efficient technologies only for water heaters larger than 55 gallons. These larger tanks represent 4 and 9 percent of the gas and electric water heater markets, respectively but a larger proportion of total energy use. Over 30 years, the additional savings per DOE estimates are as follows:



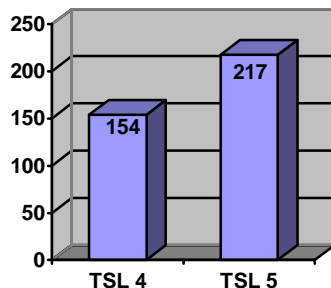
■ Energy - 1.1 quads add'l savings

1.1 quads in additional savings is enough to power more than 5 million typical U.S. homes for a year



■ Monetary - \$6.4 billion add'l savings

\$6.4 billion in additional savings



■ CO₂ - 63 million metric tons add'l reduction

63 million metric tons of CO₂ is equivalent to the emissions of 25 coal-fired power plants

ASAP strongly recommends Trial Standard Level 5 which would capture these additional savings.

What are the ‘next generation’ technologies?

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 condensing water vapor in the flue gases. While incremental improvements can save a few percentage points, condensing water heaters can save about 30%² and heat pump water heaters over 50%³. DOE’s technical documents list both technologies as the maximum technically feasible levels for their class. Multiple makers have qualified heat pump water heaters for sale under the federal Energy Star program (i.e. EF at least 2.0) as of the end of 2009. 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 are the key issues?

The key issue before DOE is whether to require heat pump and condensing gas technologies for at least some size categories. The key concerns regarding the advanced technologies include consumer acceptance, training of installation and service personnel, product substitution and impacts on manufacturers. A standard which requires the advanced technologies for only a small portion of the total market addresses these concerns. The affected larger water heaters are more likely to be found in large homes, where added space and higher home prices tend to make these high-efficiency technologies more feasible to install and less of a first-cost burden to the buyer. The actual daily hot water use tends to be greater in homes with a larger capacity water heater, thus further increasing the actual energy savings to consumers. Finally, the limited scope (combined with the five year lead time before the effective date) will make the new standards more manageable for manufacturers, equipment installers, and service personnel than standards which effectively require heat pump water heaters and condensing gas products in all sizes. With respect to product substitution, it is possible that some portion of purchasers will elect to buy a smaller or larger water heater or even install two smaller units to avoid buying the more efficient but more costly products. However, even if a significant portion of consumers change their purchasing decisions to avoid the more efficient products, the net impact will still be improved relative to DOE’s proposed standard.

What is the timeline for the water heater standard?

DOE released a proposal for the new standard on December 11, 2009 and plans to hold a hearing in Washington, DC on January 7, 2010. The 60-day comment period will end on February 9, 2010. DOE is required by court order to publish the final standard, based on the proposal and public input, by March 31, 2010. Water heaters must comply with the new standards five years after the final rule is published. For direct heating equipment and pool heaters, the period is three years.

For more info on water heaters, [click here](#) or contact:

Marianne DiMascio, Outreach Director
Appliance Standards Awareness Project
mdimascio@standardsasap.org

¹ Energy Information Administration, 2008. *Residential Energy Consumption Survey 2005*. <http://www.eia.doe.gov/emeu/recs/contents.html>. Washington, D.C.:U.S. Department of Energy.

² EIA, 2009. *U.S. Short Term Energy Outlook, December 2009*. <http://www.eia.doe.gov/emeu/steo/pub/contents.html>

² Average annual consumption of baseline gas-fired storage units per DOE is 16.6MBtu/y - **condensing storage** average energy savings are estimated at 5.3MBtu/yr.

³ Average annual consumption of baseline electric storage units per DOE is 2618kWh/year. **Heat pump water heater** average energy savings are estimated at 1336kWh/year.