



I. Introduction

The introduction of the ENERGY STAR Water Heater program in 2009 provided consumers with an independent validation of water heater efficiency claims, and has helped manufacturers, distributors, plumbers, and retailers promote these products. Even though total unit shipments of all water heaters began declining in 2006, the market share of ENERGY STAR qualified and equivalent water heaters grew from 7 to approximately 13 percent in the first year of labeling. To build on this initial success, EPA is interested in refining and expanding the current criteria to add clarity and simplicity to existing categories as well as provide an opportunity for new technologies to participate in the program. EPA estimates that approximately 37 million residential water heaters will be replaced in the next five years creating an opportunity to substantially increase energy savings.

EPA prepared this framework document to engage interested parties early in the shaping of this specification revision. This specification framework outlines EPA's re-assessment of the ENERGY STAR Water Heater program and describes ways in which the program may be revised and updated. Included in this document are EPA's initial thoughts on eligible products, test protocols, and revisions to program requirements. At the end of each section is a set of questions designed to facilitate discussion with stakeholders and further EPA's understanding of issues facing the water heater product category. EPA will host a stakeholder discussion and webinar on June 22, 2011 focused on this framework and will also consider all written comments received by June 24, 2011.

II. Technology Neutral Approach

The ENERGY STAR Program has a long history of setting technology-neutral performance specifications. This approach aligns with how consumers buy products—they shop for a TV or a light fixture vs. a specific TV or lighting technology. A technology neutral approach also allows manufacturers across various technologies to compete on a level playing field and ensures that consumers are provided clear and consistent information on energy efficient products. For example, the ENERGY STAR Television specification evaluates products based on screen size. Each size category has specific energy use requirements, however, there is no distinction based on technology. LED backlit LCDs, OLED, plasma and projection televisions are evaluated against the same requirements.

EPA is considering a shift of the current water heater specification towards a similar technology neutral approach. Because consumers shop for water heaters, not for water heater technologies, it is important for the ENERGY STAR label to mean the same thing in terms of energy savings, regardless of technology. Furthermore, continuing on a path where different technologies are subject to differing

expectations puts the government in the role of potentially choosing technology winners and losers, which is not an appropriate or desirable use of the ENERGY STAR Program.

Specifically for this product category, EPA is proposing that products be categorized by fuel source, and further subdivided by functions related to consumer purchasing, regardless of technology. Subdivisions that relate to consumer purchasing might include whole home vs. point-of-use (POU) and storage vs. tankless.

	Electric	Gas
	Electric heat pump (20-100 gal) Electric resistance (20-100 gal) Solar with electric backup	Condensing gas storage (20-100 gal) Gas storage (20-100 gal) Solar with gas backup
Do tankless need to remain separate?	Electric tank/tankless hybrid Electric tankless	Gas tank/tankless hybrid Gas tankless (<200 kBtu/h)
May need to split out as point of use.	Small electric tankless (POU) Small electric storage (POU)	V1.0 included product Not included Under consideration

Questions for Discussion

1. Do consumers set out to buy water heaters specifically with a tank, or are they indifferent?
2. Is it appropriate to assess tankless and storage technologies based on one EF level?
3. How might we compare system sizes between tank and tankless units?
4. Should hybrid systems (more than 1 gal storage per 4,000 btu/hr input, but less than 20 gallons total) be considered? Is there a test method for these products?

III. Revisions to Existing Product Categories

Purpose: This section describes identified issues and opportunities that might call for modifying the requirements of existing product categories. Specifically, alterations to the solar water heater, gas condensing and gas tankless categories are being considered.

a. Heat Pump Water Heaters

EPA is not aware of any opportunities or issues in this category, but welcomes stakeholder to flag them should they know of any. As part of moving toward a more technology neutral specification, EPA may propose renaming the category “whole home electric water heaters” or “electric storage water heaters”.

b. High Efficiency Gas Storage Water Heaters

EPA is not aware of any issues or opportunities in this category, but again welcomes stakeholder to flag them should they know of any.

c. Gas Condensing Water Heaters

EPA is considering combining gas condensing water heaters and high efficiency gas storage water heaters into a single category, consistent with a technology neutral approach. These products would have to meet the performance requirements of the high efficiency gas storage category to be eligible for the ENERGY STAR label. The proposed change would mimic the structure of the Gas Tankless product category which allows for tankless condensing models. As there are currently no products qualified in the gas condensing product category, EPA expects that such a transition would be reasonably straightforward.

d. Gas Tankless Water Heaters

In 2009, ENERGY STAR qualified products accounted for 30% of all gas tankless units sold in the US, and we expect that the market share was even higher in 2010. However, as tankless water heaters represent a small proportion of total water heater sales (<15%), we do not intend to raise the required level at this time.

Questions for Discussion

7. What is the potential for gas condensing storage products to be developed at or below 75,000 Btu/hr input rating?
8. What is the range of projected installed costs for gas condensing storage units? What are the associated maintenance costs over a product's lifetime?
9. Do gas condensing storage water heaters reliably draw enough energy out of flue gas to condense, or is there an issue with partial load that affects efficiency under field load conditions?

e. Solar Water Heaters

In the spirit of technology neutrality, EPA is exploring the possibility of using an energy factor metric to directly compare solar water heaters to other technologies. In addition, EPA is aware of two specific challenges with the solar water heater requirements as written. In this section, we will review the issues and present questions to help resolve these issues.

When we calculate the savings of solar water heaters, we compare them to unassisted electric or gas tanks. Unless they also have the same efficiency requirements as unassisted tanks, EPA may be in the position of picking winning technologies, which we believe is better done through market mechanisms. Thus, we are exploring a different efficiency metric for solar water heaters. The metric would measure the electricity or gas used to deliver a certain amount of hot water, recognizing that a substantial fraction of the heating would be done by the sun. The EF calculated from that would be directly comparable to that of a storage water heater, though of course much higher. EPA is currently evaluating whether the industry accepted metric Solar Energy Factor (SEF) is

in fact comparable in this way. This would also answer one of the known issues with the specification, which is industry feedback that the current use of solar fraction (SF) in the ENERGY STAR specification is not in line with industry practice.

In addition, the current specification requires a proprietary test method, OG-100, the results of which are used in applying the OG-300 rating method. At the moment, only the Solar Rating Certification Corporation (SRCC) sees test reports against the OG-100 test method, which is performed at SRCC accredited laboratories. Generally, EPA seeks competition among labs and certification bodies in the interests of controlling costs and ensuring quality.

Questions for Discussion

10. How do consumers make a decision to purchase a solar water heater? What do they compare it to for cost and operational savings?
11. How does the SEF metric compare to EF metric? Could they be considered equivalent compared? Does the SRCC calculate a First Hour Rating parameter that could be compared to that from the DOE test?
12. What are the sales channels for solar water heaters?
13. Are there any alternatives to the OG-100 test and/or OG-300 rating method?

IV. Consideration of New Product Categories

Purpose: This section outlines product categories which have not been eligible for the ENERGY STAR Program. EPA is now considering expanding the program in an attempt to capture additional energy savings and provide consumers with additional choices for energy-efficient water heaters.

a. Add-On Heat Pump Water Heaters

Currently, the specification only allows for the qualification of integrated heat pump units. In the last few years, industry has worked to address reliability concerns about Add-on Heat Pump units. Reliable add-on units have the potential to increase the efficiency of the installed base of water heaters, with benefits to the consumer and the environment.

If add-on units are included in the program, they could be tested using the DOE test method for EF using a storage tank meeting minimum efficiency requirements. On the other hand, the rated system would then include equipment not sold or controlled by the add-on heat pump water heater manufacturer. While this uncertainty does reflect field installations, EPA is investigating the possibility of introducing Coefficient of Performance (COP) metric for Add-on Heat Pump units. COP may prove to be a more objective way to measure efficiency for this product type because it measures efficiency of the electrical unit itself, and not the tank that it is retrofitting. The COP could be calculated from additional measurements made during the DOE test procedure. Both COP and estimated system EF for various tank efficiencies could be displayed on the qualified product list, and either (or both) could be used to determine qualification.

Questions for Discussion

14. In what situations are add-on heat pump water heaters actually used? Are there situations in which they compete directly with new units, particularly new integrated heat pump units?
15. What are the distribution channels for add-on electric heat pumps?
16. Is COP the most appropriate metric for assessing the efficiency of Add-On Heat Pump water heaters? How could COP be used in conjunction with the EF of the tank to determine total system efficiency?
17. At what performance level would a COP requirement be set so as to assure the consumer of significant energy savings? What are the costs associated with this?
18. What additional performance requirements should be considered for the add-on heat pump category? How could those requirements be verified?
19. What are the appropriate warranty requirements to assure consumers a reliable product?

b. Point-of-Use Electric Water Heaters

During the final criteria analysis in 2008, DOE determined that whole home electric tankless water heaters offered limited savings over conventional water heaters and that there was limited technical potential for additional energy savings in the future. Since then, industry members and advocates have come together to make a case for electric tankless products appropriate for point of use (POU) to be included in the ENERGY STAR program.

EPA is considering this request for several reasons. Concentrating on POU units avoids the problems of increased peak load and the need for upgraded electrical capacity during installation due to their smaller size. In addition, increased peak load may not be an issue due to the absence of a long recovery period for tankless products. Since tankless units only use energy during the draw, there will not be the compounding effect of the overlapping recovery cycles. Concerns related to the load surge of higher power units causing electricity or light flicker are also being addressed by manufacturers through accepted electrical tests.

Consideration of POU units calls for an updated analysis of energy savings and payback. The DOE test procedure may not take into account the in-field energy savings potential for point-of-use units, and therefore, original assessments of savings may have been understated. Also, the original conclusions were based on energy savings alone, and did not factor in water savings the POU units might enable. To maintain a technology neutral specification, EPA would also consider including other technologies appropriate for POU, such as electric tank units smaller than 20 gallons.

Questions for Discussion

20. How would models appropriate for POU be distinguished from whole home models? Maximum input power? Storage capacity as well or instead? Should there be a limit on physical dimensions?
21. How can the efficiency of POU systems be characterized? Are the current test procedure and existing metrics sufficient?

22. How would water savings be measured for point-of-use products? How can in-field energy savings best be quantified? Would the savings be compared to other point of use products?
23. Can the efficiency of whole home and POU systems be compared? If so, how?
24. What additional performance requirements should be considered for the point-of-use category? How should those factors be verified?
25. In what situations are POU water heaters actually used? Are there situations in which they compete directly with whole home units?
26. Are there any differences in the distribution channels of point of use units vs. whole home?

V. Stakeholder Feedback

Stakeholders are encouraged to provide feedback on the concepts presented in this document, and other initial input EPA should consider at the start of this process. Any and all creative suggestions for improvements to the basic approach outlined in this document will be considered for inclusion in future specification drafts. EPA will host a stakeholder discussion and webinar on June 22, 2011 focused on this framework and will also consider all written comments received by June 24, 2011. In addition, program representatives are available for additional technical discussions with interested parties at any time during the specification development process. To schedule a discussion please contact Abigail Daken (EPA) at (202)-343-9375 or Daken.Abigail@epamail.epa.gov, or Craig Haglund (D&R International) at (301)-588-9387 or chaglund@drintl.com. EPA expects to follow this framework with a Draft 1 Version 2.0 specification within two months.