



## COALITION FOR ENERGY EFFICIENT ELECTRIC TANKLESS WATER HEATERS

---

June 24, 2011

Abigail Daken – EPA

Craig Haglund – D&R International

RE: Comments on the Energy Star Water Heaters – Product Specification Framework Memo dated May 2011

Thank you for providing us the opportunity to comment on the Energy Star Framework recently issued. The Coalition for Energy Efficient Electric Tankless Water Heaters believes electric tankless water heaters can provide a significant savings in both energy and water. We'd like to address the general water heating questions and those specific questions aimed at electric tankless water heaters.

### **Responses to questions from members of the Coalition for Energy Efficient Electric Tankless Water Heaters**

#### **1. Do consumers set out to buy water heaters specifically with a tank, or are they indifferent?**

Answer:

- Consumers want to know about their options to obtain energy savings any way they can, tank or tankless does not really matter.
- Because the majority of current installations are tank type heaters many consumers simply want a replacement for such unit but because of the high awareness of tankless technology they often request specifically for the tankless because of the energy savings.
- If consumers are presented with the option they are willing to spend more for tankless technology. Especially with “empty nesters” who are willing to pay slightly more now to save in the future when they will be on a fixed income.
- Tankless has become a “buzzword” for the consumer, and many in fact do start their search for a new water heater requesting information on a tankless model.
- The installing plumber in most cases chooses the path of least resistance with respect to what type of water heater to offer the homeowner. A contractor is very sensitive to increasing his installation cost to the homeowner and lacking any type of financial incentive for the homeowner, is generally unwilling to offer more expensive technology despite the possible energy saving benefits that technology may offer. However, in most cases a contractor is very willing to promote a product type to a homeowner if the product is supported with financial incentives (tax credit, incentives, etc...)

## **2. Is it appropriate to assess tankless and storage technologies based on one EF level?**

Answer:

- With regard to electric... Yes, but because electric tankless can be more easily located at the POU and thus hot water will arrive earlier than a with a central tank system the additional efficiency savings must be accounted for.
- It will be somewhat comparable if they both had same type technologies, but tanks regardless of EF, still need to draw power for a longer period of time to recover and to also keep up with the standby losses. Tankless seems to be the more efficient way to heat water and should always have a higher EF than tank type technologies.

## **3. How might we compare system sizes between tank and tankless units?**

Answer:

- The EPA may want to consider all types of heaters that can heat the water at the POU to take advantage of less “distribution” losses.
- An electric tankless system should store less than 2 gallon of water and not have greater input power of 25 kW.
- A POU storage heater should be any tank < 6 gallons. This is the practical limit to install the device under a counter – bathroom, kitchen and laundry room.
- It should not be system size, beyond the minimum capacity needed for one shower. The rest of sizing is really a life style. A sufficient supply for one shower should be defined by GPM, hot water temperature and hot water supply time. For example, 2GPM at 110F should be good for tankless installed close to the fixtures.

## **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?**

Answer:

- This is not really our Coalition’s issue.
- Given EPA’s desire to be technology neutral, all water heater types that are efficient should be considered.
- There is currently no test procedure for these products although the one for storage water heaters could be adapted.
- Recommend thinking through this category’s definition carefully. Could include bigger burners and modest tanks too.

**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?**

Answer:

- Much thought has gone into how we strive for POU applications as this allows for additional opportunity to save water which provides additional energy savings versus placing the units at a central location or whole home. Working with ACEEE, NRDC, and EEI we've established a 25 kW maximum. This is the smallest unit that would serve to boost 2.2 gpm by 77F.
- Using the 25kW maximum to be Energy Star certified will force the installation to be virtually be at the POU as whole home units must be much larger to serve an entire home. 25 kW was chosen as this provides hot water for a small cluster of appliances – example – shower, tub, & lavatory.
- Recommend staying with the < 2-gallon storage requirement to be a tankless water heater.
- The unit's physical dimension is more than likely to be the determining factor for suitability on POU. POU is really about if there is space to install at that close location, regardless of method of heating the water. All electric tankless on the market are wall-mounted installation therefore no floor space is required thus a requirement on physical dimension may not necessary.
- There is no design feature that specifically makes an electric tankless water heater suitable for either whole house or POU. However, because the power rating (kW) necessary for an average home would likely be greater than the kW necessary for a typical POU application, and due to the lack of any other differentiating design feature, it seems reasonable to use kW as a feature that distinguishes between the two types of installations.
- The same argument holds for storage tank water heaters. However, it is reasonable to assume that storage units under 20 gallon capacity are most likely servicing a POU application as opposed to whole house.
- The key for POU water heaters is that they must be sized to provide for the heating requirements of the fixtures they serve, regardless of how they heat the water.
- If limits to physical dimension are used, they should be chosen carefully. For example, a physically larger unit could be beneficial in terms of efficiency, in that a manufacturer could add insulation to the product (and thus increase its physical size) and reduce stand by heat loss.

**21. How can the efficiency of POU systems be characterized? Are the current test procedure and existing metrics sufficient?**

Answer:

- The efficiency of the water heater itself can be characterized by using the current method – Energy Factor. We recommend the minimum Energy Factor for Energy Star be rated at 0.97.
- The current minimum efficiency standard for 12 kW and below is approximately 0.93. There is a need to increase the capacity to 25 kW and the EF should be increased to be in line with the new EF for electric storage water heaters, 0.95.
- The current test procedures are adequate but we are working to improve the procedures and clarify the language. Much of the text was written with gas tankless in mind. We have a proposal in a consensus agreement we'll be introducing to Congress to change the test procedures. Until then, the current test procedures for Energy Factor are sufficient.
- The procedures need to be revised to account for the water and energy savings that are due to locating the heater closer to the fixtures it serves. Also, because electric tankless

only heats water to the desired temperature the water is not over heated as in a tank heater resulting in additional savings. Taking all these savings into account the total savings can be up to 43%.

**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?**

Answer:

- Jim Lutz, LBL conducted study that showed 20% of hot water goes down the drain unused. This represents approximately 6,000 gallons per year for a household of four. (National average is under 3 people per household so this number should be reduced to about 4,000 gallons per year.) When heating at the POU, it is reasonable to assume that ½ of this water can be saved. Water can be heated with either a storage or tankless water heater.
- DOE/ORNL estimated much more water waste; as much as 12,000 gallons per year for a household of four. (*Water and Energy Savings using Demand Hot Water Recirculating Systems in Residential Homes: A Case Study of Five Homes in Palo Alto, California*, Moonis Ally, ORNL September 2002)
- Water savings has to do with hot water delivery time and time to take for temperature adjustment. Energy savings in the field should consider EF, standby loss, loss along the pipes, and hot water delivery delays.
- In addition to water savings by moving the heat source closer to the use, there are energy savings due to shorter pipe runs, a lower water heater temperature and a smaller volume of water that will eventually cool down and the heat in the water will be lost to the environment. These piping related savings can be compared to water heater standby losses.
- The key to water savings is the volume in the pipes between the source and the use. Right now it is reasonable to assume that the “typical” home has between 0.5 and 2.0 gallons of water in the piping from the central water heater to the fixtures. There is a very large standard deviation, but the average is around 1 gallon, or roughly 40-50 feet of piping.
- For a tankless water heater to save water, it must be located closer to the fixtures it serves than the water that runs through it while it ramps up to full temperature.

**23. Can the efficiency of whole home and POU systems be compared? If so, how?**

Answer:

- The Energy Factor of the water heater, whether it's at POU or at a central location (whole home) will be the same, but the savings from less wasted hot water and less wasted energy in the piping must be factored into the POU application.

**24. What additional performance requirements should be considered for the point-of-use category? How should those factors be verified?**

Answer:

- We recommend several product attributes be added to electric tankless products that can achieve the Energy Star label. It's our intent to assure products meet key performance criteria as any product that has the Energy Star label should be a premium product. Such product attributes are defined below and how it will be verified by a 3<sup>rd</sup> party:

- A. Electric instantaneous water heaters shall be capable of automatically adjusting input power relative to the heat needed at any flow rate. Verified via a specific test procedure to be completed at time of Energy Factor testing.
  - B. Electric instantaneous water heater shall have a feature that allows the user to adjust the temperature. Verified via examination.
  - C. Electric instantaneous water heaters shall meet Lead Free law per California AB1953. Verified via CA AB1953 practices. After Jan. 2014 verified via Federal requirements for "Lead Free" products.
  - D. Power quality/flicker: Units shall perform within the acceptable region defined by the IEC and IEEE. Verified through passing test per IEC/IEEE test procedure.
  - E. Units must meet the applicable requirements of UL 499 Electrical Heating Appliances. Verified via examination of Safety certification on the product.
- The above product attributes should be verified by an independent testing agency preferable at same time when the Energy Factor testing is completed by the same agency.

**25. In what situations are POU water heaters actually used? Are there situations in which they compete directly with whole home units?**

Answer:

- POU electric tankless water heaters are used in many applications in the home for heating water including:
  - Single Hand-washing sink
  - For a single shower
  - For a cluster of appliances – bathroom, kitchen, laundry.
  - Condos - single bathroom and kitchen
  - Boosters: utilized to boost hot water. Units turn on when needed to heat water and turns off when hot water from a central source arrives
- They can compete with whole home electric tank units when several are placed at the POU versus a single whole home unit. Again, by limiting the capacity to 25kW will drive their use at the POU vs. whole home.
- We do not recommend electric tankless be used as a central heating system for large homes as we encourage POU applications to achieve energy and water savings.
- In Europe and Asia, there are rarely whole home units. The POU units are used for showers, hand washing, dish washing, and washing machines. They are used anywhere hot water is needed. So, yes, they can compete directly with whole home units.
- POU heaters are mainly used in situations where the tank water heater is too far, and it takes too long for the water to reach the faucet, to be able to cut the time in which you need the hot water.
- POU heaters are commonly used in residential projects when bathrooms and kitchens are remodeled or added to a home. It is during this type of construction when the contractor and homeowner are performing enough remodeling that it makes sense to rethink the way hot water is delivered to the fixture.
- POU heaters are also used during new build projects when the builder/owner desires an energy saving approach to water heating while at the same time improving customer satisfaction (i.e. quicker delivery of hot water to the fixture).
- In many cases, the most preferred hot water system for a builder/owner is a combination of a whole house and POU system. In this case, the POU heater does not necessarily compete with the whole house heater, as both are deemed necessary to optimize efficiency and user satisfaction. The whole house heater may service 85% of the fixtures

in the house due to their relatively close proximity to an ideally located central whole house heater, but for the 15% of the fixtures located at the furthest points from the whole house heater it makes sense both from an efficiency perspective as well as from a user experience perspective to utilize a POU heater for that remote location.

**26. Are there any differences in the distribution channels of point of use units vs. whole home?**

Answer:

- The majority of the distribution of tankless electric water heaters is a combination of plumbing wholesale (typically through a plumbing contractor) and direct to consumer (typically via the internet). Other distribution channels include appliance retailers, big box retailers, hardware retailers among others. The distribution channel for POU and whole home electric tankless water heaters is essentially the same.

**Coalition Member Companies include:**

- American Heat
- AHI Technologies
- Bosch
- EcoSmart
- Eemax
- Hubbell

For additional information go to: [www.cceetwh.org](http://www.cceetwh.org)