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Ms. Abigail Daken
ENERGY STAR Water Heater Program Manager
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Abigail:

We have the following comments on the Draft 1 Version 3.0 specifications for the ENERGY STAR Program for residential water heaters presented in your April 2, 2014 letter.

Product Classes

We support the general concept of restructuring the classification of gas and heat pump storage water heaters into 2 classes based on whether or not the volume is more than 55 gallons (G). Also, except for the proposed energy factor (EF) criterion for gas storage models larger than 55 G, we have no objections to the minimum EFs proposed for these new product classes.

Energy Factor Levels

In the case of gas storage models larger than 55 G, the proposed minimum EF of .80 is too high. Also the criterion should vary by volume size. As noted in the draft specification, there are no gas storage water heaters currently available that meet this proposed requirement. We do not agree with the conclusion that the revised federal standard going into effect in April 2015 will change this current situation.

It should be recognized that in the analysis that was done for the DOE final rule on the revised standards for residential water heaters, the EF value that was used to represent the “maximum technology” level was .77. Furthermore, that efficiency value is for the baseline 40 G model. It is well established that using the current DOE efficiency test procedures, EFs generally get lower as volume increases for models having essentially the same efficiency characteristics. Thus, for a 75 G model the “maximum technology” level of .77 actually tests out several points lower. It is not a coincidence that each specific minimum EF requirement for larger volume gas storage water heaters, shown below, is less than .77.

Volume	.8012 -.00078V
65	.75
75	.74
100	.72

We agree that the Energy Star level should provide a differentiation from minimum efficiency models. In this case the proposed .80 criterion overshoots that objective. We recommend that the level be specified at 4 points above the minimum standard for each volume size. This can be done by specifying the EF criterion as .8412 -.00078V.

The simplicity of having a single EF criterion for these larger volume, condensing gas storage water heaters has value only in its appearance and perception by individuals not involved in the water heater manufacturing industry. Those individuals, and especially consumers, are concerned only with the question “Is this model Energy Star?” They have no interest in the actual efficiency rating of the model. On the other hand the water heater manufacturers who design and build water heaters to comply with the Energy Star criteria are very familiar with the use of a formula to determine the EF requirement for a specific model size. Such standards have been in place for 24 years. Furthermore, specifying the criterion to adjust for the volume is establishing an equitable requirement for each volume. A 100 G condensing gas storage water heater with an EF of .72 is just as efficient as a 65G condensing model that has an EF of .75. The apparent difference in efficiency is a consequence of the test procedure and does not reflect any significant difference in the design of the two models.

Standby Loss for “Light Duty” Models

The proposed revised maximum standby requirement for light duty EPA covered gas water heaters is too drastic. It unnecessarily eliminates many Energy Star models. This is not a slight tightening of the criterion. The draft also indicates that this criterion is intended to reflect annual energy use in residential applications similar to gas storage water heaters larger than 55 G.

The overall daily energy use of a storage water heater is a combination of the thermal efficiency and standby loss. It appears that EPA has miscalculated the level of standby loss that would provide equivalent daily energy consumption as a residential gas storage water heater larger than 55 G. The following table compares the maximum standby loss (Btu/h) for models that are light duty EPA covered gas water heaters as required by DOE federal regulations ($S_{(Fed)}$), Energy Star Commercial Water Heater specification ($S_{(Com E^*)}$), the current Energy Star Residential Water Heater specification ($S_{(Res E^*)}$), and the proposed Energy Star Residential Water Heater specification ($S_{(Prop Res E^*)}$).

Volume	Input or E_t	$S_{(Fed)}$	$S_{(Com E^*)}$	$S_{(Res E^*)}$	$S_{(Prop Res E^*)}$
65G	76 kBtu/h	982	823		
	100 kBtu/h	1012	850		
	90%			380	247
	92%			427	280
	94%			475	313
75G	76 kBtu/h	1048	880		
	100 kBtu/h	1078	906		
	90%			380	247
	92%			427	280
	94%			475	313
100G	76 kBtu/h	1195	1004		
	100 kBtu/h	1225	1029		
	90%			380	247
	92%			427	280
	94%			475	313

This table illustrates how stringent the current standby loss requirement in the Energy Star residential water heater specification is relative to the federal and Energy Star commercial water heater specification requirements as well as the severity of the proposed standby loss criterion.

The original DOE water heater efficiency test procedure, issued in 1997, used the following formula to estimate daily energy consumption (C_x):

$$C_x = (kU\Delta T_1/E_r) + k(V)\Delta T_2(S)[24 - (kU\Delta T_1/E_r P)]$$

where $k = 8.25$

$U = 64.3$ gal (daily hot water use)

$\Delta T_1 = 90$ F (temperature rise of the heated water)

V is measured volume

$\Delta T_2 = 85$ F (difference between ambient and mean tank temperature)

P is hourly input

The underlying principles of this calculation are valid. The daily energy consumption of the models described in the table can be reasonably estimated using this formula and the following modifications: use E_t values for E_r , use a 77 F temperature rise and 67.5 F difference between ambient and mean tank temperature from the current DOE test procedure; and use a daily hot water use of 84 gallons from the high use pattern of the proposed DOE revised test procedure. That estimated daily energy use can then be used to calculate an equivalent EF for the specified daily hot water use. The following table shows the equivalent EFs (EF_{EQ}) for the proposed and current standby loss criterion for the 65 G and 75 G models.

Volume and Input	E_t	$S_{(Prop Res E^*)}$	EF_{EQ}	$S_{(Cur Res E^*)}$	EF_{EQ}
65G, 76 kBtu/h	90%	247	.83	380	.80
	92%	280	.84	427	.80
	94%	313	.85	475	.80
65G, 100k Btu/h	90%	247	.83	380	.80
	92%	280	.84	427	.80
	94%	313	.84	475	.80
75G, 76 kBtu/h	90%	247	.83	380	.80
	92%	280	.84	427	.80
	94%	313	.85	475	.80
75G, 100 kBtu/h	90%	247	.83	380	.80
	92%	280	.84	427	.80
	94%	313	.84	475	.80

When the energy consumption is estimated on a usage that is appropriate for storage models of this size and input, it becomes clear that the proposed revised standby loss requirement goes well beyond the point of providing annual energy use in residential applications similar to that of residential gas storage water heaters larger than 55 G. More interesting is that this table shows that the current standby loss requirement also exceeds that intended level of equivalency.

We recommend that EPA make no change to the standby loss criterion for light duty EPA covered gas water heaters. The current criteria for these models will provide energy consumption equivalent to the revised EF levels that we have proposed for gas storage models larger than 55 G.

Connected Product Criteria

We support the concept of “Connected Product” criteria. However, we do not support the proposal to include it in this draft specification at this time. There are two major problems with these proposed criteria.

There is no distinct benefit or value identified for complying with these criteria. In other Energy Star product specifications there is some quantitative value associated with providing a model that is a “connected product.” This value may be an energy credit or adjustment of the minimum efficiency criterion. In this draft there is no energy efficiency value given to “connected” heat pump water heaters. So, for the manufacturer who makes models to comply with the specification, the criterion establishes a burden with no benefit. Also, there is no recognized methodology to verify compliance with these criteria.

These two issues are critical, foundational aspects for the implementation of this concept. Since these aspects are still to be developed, it is too soon to be adding this concept to the residential water heater specification. We recommend that the “Connected Product” criteria be deleted from the draft Version 3.0 specification. This concept should be reconsidered when the value of “connectivity” has been determined and procedures have been established to validate compliance with the criteria.

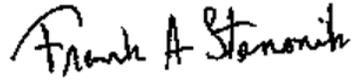
Other Issues

The “Note” beneath Table 3 indicates that EPA has an objective to combine the criteria for gas storage and gas instantaneous water heaters into a single set of criteria. Although this is not an issue for this draft, we must express our concern about this matter. We believe this objective is unobtainable. Furthermore, it has no significant value. It is inherent in the design of storage water heaters that some energy is consumed to maintain a volume of heated water that can be delivered at any time. In contrast, instantaneous water heaters are designed to heat water as a demand is occurring. These two types of water heaters may be able to heat water at the same level of efficiency but their total daily energy consumption will not be equal. As long as that is the case, it will not be possible to have a single set of criteria that is equitable to both types.

We request that the warranty requirements for all models be deleted from the Version 3.0 specification. Based on our review of Energy Star specifications for other residential appliances and heating and cooling equipment, most of the specifications for those products do not include any requirement for a minimum warranty period. The warranty requirements do nothing to differentiate Energy Star models from other models. On a practical basis the warranty requirements in the specification are not necessary to provide some assurance that consumers will get the benefits of energy savings that Energy Star models provide. In this aspect water heaters are no different than the other Energy Star products for which no warranty period is required by the EPA specification. Accordingly, the warranty requirements should not continue forward as part of the Version 3.0 specification.

We appreciate the opportunity to comment on this draft of the Version 3.0 Residential Water Heaters Specification. If you have any questions, please do not hesitate to call me.

Respectfully submitted,

A handwritten signature in black ink that reads "Frank A. Stanonik". The signature is written in a cursive, slightly slanted style.

Frank A. Stanonik
Chief Technical Advisor