

Nov. 11, 2021

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Comments on ENERGY STAR Program Requirements for Residential Water Heaters, Version 5.0, Draft 1

On behalf of the Natural Resources Defense Council (NRDC) and our 3 million members and online activists, the Rocky Mountain Institute, and 34 additional national, regional, and local organizations, we offer the following comments on ENERGY STAR's version 5.0, draft 1, specification for residential water heaters.

We commend EPA for its commitment to the residential water heaters specification and appreciate the work that went into this proposal so soon after the version 4.0 specification was published. This commitment befits the importance of the work. Today's ENERGY STAR specification shapes tomorrow's DOE energy conservation standard; tomorrow's standard likely won't be enforceable until 5 years after it is adopted; an enforceable standard itself will take time to turn over the inventory of products. Strong action today is therefore essential to set the United States on a path to achieve the President's climate commitments.

This draft is a step in the right direction, but we believe that EPA can and must go further. In short, we urge EPA to: 1) continue to act with a forward-thinking strategic vision aligned with decarbonization; 2) strengthen the proposed Uniform Energy Factor (UEF) requirements for all gas-using products; and 3) reject erroneous arguments presented by some commenters on the webinar.

Strategic Vision

On the webinar discussion for this draft, several questions relating to EPA's strategic vision were raised. We offer our thoughts on this issue below.

This revision is occurring in the context of a federal administration that has repeatedly stated its commitment to decarbonization of the U.S. economy.¹ Water heating is the largest emissions reduction opportunity in buildings.² The draft specification, with improvements described below and with similarly forward-thinking action on other products, is poised to be an important part of that commitment.

As EPA acknowledged on the webinar, it is not always possible to fully satisfy all 6 ENERGY STAR Guiding Principles.³ Decisions about how to balance the principles must be guided by technological and market developments, as well as our evolving energy system and the imperative to address the climate crisis.

¹ See <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>.

² See Appliance Standards Awareness Project, A Powerful Priority: How Appliance Standards Can Help Meet U.S. Climate Goals and Save Consumers Money, available at: https://appliance-standards.org/sites/default/files/Powerful_Priority_Report.pdf (hereinafter "ASAP Report").

³ See https://www.energystar.gov/ia/partners/prod_development/downloads/guiding_principles_2012.pdf.

The guiding principles are meant to serve the program, not to constrain it. For example, there are no gas products with UEFs greater than 1.0 currently on the market, though such products have been demonstrated in the field. This is not unprecedented for an ENERGY STAR specification and was the case for, e.g., gas clothes dryers. On the other hand, this specification would greatly advance national energy savings, another core principle.

This tension between principles is not a reason to retreat from this proposed specification. As the market approaches the maximum efficiencies that can be provided by conventional technologies, such tension will be inevitable. EPA is not in a position to decide *whether* to balance the principles, but *how* to do so. The increasing urgency of the climate crisis and ongoing changes to our energy system must inform how EPA does so. With bold action on the water heater specification and recent revisions that focus the ENERGY STAR Most Efficient designation on the highest-efficiency electric appliances rather than less efficient gas appliances, EPA has begun to chart a path that will ensure the ENERGY STAR label will continue to be a guide for consumers to find truly efficient, pollution-reducing, and climate-friendly products. This path will certainly include electric heat pump water heaters, which are several times more efficient than traditional gas storage water heaters, and which can be powered by increasingly clean and eventually carbon-free renewable energy.⁴ The potential role of gas-fired water heaters in this path forward is far more uncertain. But if gas-fired models are to play any role at all, they must achieve the heat pump-level efficiencies that are now commonplace among electric models. This is why the proposed specifications represent such a crucial step forward.

ENERGY STAR can and must play a transformative role in demonstrating to consumers the levels of efficiency that are possible with appropriate market transformation policies. Strong action with this specification and beyond will help decarbonize water heating, the second largest source of carbon and air pollution in buildings, and one of the largest emissions reduction opportunities by far.⁵ Indeed, success here is essential to meeting the nation’s carbon reduction goals and to addressing the climate crisis, one of the most pressing challenges of our time.

However, we note that this vision should not be seen as being in tension with delivering savings to consumers. As gas usage declines, due to a warming climate, and to more consumers switching to electric appliances—an inevitability if we are to meet our climate goals—gas will become increasingly expensive. Efficiency will be all the more important in the face of these rising costs. While these expected major increases in gas costs will take time to kick in, roughly in the late 2020’s according to analyses,⁶ water heaters installed over the life of the version 5 specification, i.e. from 2023 onward, will operate well into the late 2030s and 2040s, when these price effects will be in full swing.

⁴ For example, the current ENERGY STAR specifications require 2.2 to 3.3 UEF for electric water heaters, which is over two and a half to five times more efficient than the 0.64 to 0.8 UEF required for gas-fired storage water heaters. EPA, *ENERGY STAR Version 4.0 Water Heaters Final Specification 3*, https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Version%204.0%20Water%20Heaters%20Final%20Specification%20and%20Partner%20Commitments_0.pdf.

⁵ ASAP Report at v.

⁶ E3, *The Challenge of Retail Gas in California’s Low-Carbon Future – Technology Options, Customer Costs, and Public Health Benefits of Reducing Natural Gas Use*, available at: <https://www.ethree.com/at-cec-e3-highlights-need-for-gas-transition-strategy-in-california/> (hereinafter “E3 Report”).

Requirements

In a broad sense, we are supportive of this draft. It is a step towards the vision we have described above, but more can and should be done. EPA should set a level playing field for all gas technologies. In other words, gas tankless water heaters should not be singled out for a lower UEF threshold. Not only are they less efficient than gas heat pump products, they also emit a lot more methane, a powerful greenhouse gas. A lower threshold is therefore particularly inappropriate.⁷

We also urge EPA to strengthen the UEF requirements more generally. Simply requiring a UEF greater than 1.0 would allow virtually any gas heat pump to qualify. However, EPA should set a level that requires an *efficient* gas heat pump. We believe that setting the level at UEF 1.2 for all products would accomplish this goal.⁸

Finally, we propose that EPA add low NO_x emission requirements as well, specifically a limit of 10 nanograms per Joule (ng/J).⁹ Cleaner air has always been an important benefit of the ENERGY STAR program and an ultra-low NO_x requirement would help advance this goal.

Additional issues

A number of commenters spoke on the EPA webinar. While we value comments from all stakeholders, there were arguments presented that were misguided and which would send the program down the wrong path. Specifically, we take issue with arguments that: 1) this specification would lead to problems with a winter-peaking electric grid; 2) this specification would ignore the role lower-carbon gas will play in the future; and 3) problems will arise from the fact that no gas storage water heaters currently on the market can achieve the proposed specification. As we detail below, these arguments are founded on misconceptions.

Regarding winter peaking, if this specification drives more consumers to purchase electric heat pump water heaters rather than gas products, there is little reason to fear that problems with a winter-peaking grid would result. Alongside switching from gas to heat pump water heaters, the market is also

⁷ <https://www.nrdc.org/experts/pierre-delforge/methane-math-gas-tankless-water-heaters>.

⁸ Gas heat pump water heaters have already been reported to achieve UEF 1.2-1.3 for years, and further improvements could make even greater efficiencies possible as the technology is brought to market. UEF 1.2 is therefore an appropriate ENERGY STAR threshold. See Paul Glanville, *Gas Heat Pump Water Heaters in CA: Field and Laboratory Results*, slide 6 (March 13, 2019), <https://www.aceee.org/sites/default/files/pdf/conferences/hwf/2019/6a-glanville.pdf>; Paul Glanville, *Field Evaluation of Pre-Commercial Residential Gas Heat Pump Water Heaters*, slide 2 (Feb. 22, 2016), https://www.aceee.org/sites/default/files/files/pdf/conferences/hwf/2016/Glanville_Session3B_HWF16_2.22.16.pdf.

⁹ Several air agencies have enacted low-NO_x water heater standards with thresholds of 10 ng/J. See, e.g., 30 Tex. Admin. Code § 117.3205(a)(2)(A), [https://texreg.sos.state.tx.us/public/readtac\\$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=117&rl=3205](https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=117&rl=3205); Utah State Construction and Fire Codes Act § 15A-6-102(2)(a)(i), https://le.utah.gov/xcode/Title15a/C15A_1800010118000101.pdf; Bay Area Air Quality Management District, Rule 9-6-301.4, <https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID418.pdf>; San Joaquin Valley Air Pollution Control District, Rule 4902 § 5.4, <https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID3346.pdf>; South Coast Air Quality Management District, Rule 1121(c)(3)(A), <https://ww2.arb.ca.gov/sites/default/files/classic/technology-clearinghouse/rules/RuleID2696.pdf>.

transitioning from electric resistance water heating to electric heat pumps. This will free up significant capacity on the grid to accommodate heat pump water heaters.

Further, the ENERGY STAR 4.0 specification contains connectivity criteria that will help utilities operate heat pump water heaters in a grid-friendly manner. This includes leveraging heat pump water heaters' thermal storage capabilities to pre-heat water ahead of peak demand times as well as minimizing use of electric resistance heating during these periods. Heat pump water heaters are three times more efficient than electric resistance models, and they draw approximately one tenth of the power, so each conventional electric water heater upgraded to a grid-flexible heat pump water heater that doesn't use its resistive element on-peak makes room for roughly 10 heat pump water heaters on the grid.

Finally, we also note that the power usage of a heat pump water heater operating in compressor mode, which is on the order of 300-500 watts, is orders of magnitude smaller than other end uses such as electric tankless water heaters (often in the 13-36 kW range), electric stoves (10 kW), electric vehicle charging (approximately 7 kW), or electric resistance clothes dryers (6 kW). There are numerous opportunities to reduce grid demand before worrying about the impact of heat pump water heaters.

With respect to low-carbon gas, it would simply be a mistake to consider it as a feasible alternative to a transition to heat pump technology. What lower-carbon gas will be available will be in very limited quantities, it will be expensive (substantially increasing costs for consumers), and it will not provide the air pollution and methane emissions reduction benefits that electric appliances provide.¹⁰

There would also be a *colossal* opportunity cost to using the limited quantities that will be available on residential and commercial appliances. Residential water heating already has the technology needed to reduce carbon emissions—heat pumps. Other sectors, such as industry, air travel and cargo shipping, will be harder to abate and may have to rely more heavily on cleaner fuels. Whatever lower-carbon gas can be affordably produced should be used in these sectors rather than in a sector that has more cost-effective and scalable decarbonization solutions.

Regarding the lack of gas storage water heater models that meet the proposed specification, this is not cause for concern, but rather an indication that the specification will fulfill its role in advancing the market toward higher-efficiency products. The Version 4.0 specifications for gas-fired storage water heaters are just 2 to 14 percent more efficient than DOE minimum efficiency standards.¹¹ Significantly stronger specifications like the proposed Version 5.0 are needed to advance the ENERGY STAR guiding principles of meaningfully differentiating products and achieving significant energy savings, especially in

¹⁰ E3 Report.

¹¹ Gas storage water heaters that receive the ENERGY STAR label under the Version 4.0 standards range from 20- to 50-gallon storage volumes and include medium and high draw patterns. See ENERGY STAR, *Product Finder*, <https://www.energystar.gov/productfinder/product/certified-water-heaters/results>. The Version 4.0 standards require a UEF of 0.68 for a 20-gallon high draw pattern gas storage water heater, which is 2% higher than the UEF of 0.66 required under DOE's minimum efficiency standards. See 10 C.F.R. § 430.32(d). The Version 4.0 standards require a UEF of 0.64 for a 50-gallon medium draw pattern gas storage water heater, which is 14% higher than the UEF of 0.563 required under DOE's minimum efficiency standards.

light of the need to rapidly decarbonize the buildings sector to achieve climate targets set by the Biden Administration.¹²

Moreover, the proposed specifications will *not* result in a lack of available water heaters that qualify for the ENERGY STAR label. Hundreds of electric heat pump models meet the current ENERGY STAR specifications, and this will not change under the proposed specifications.¹³ These electric models are substantially more efficient than currently available gas-fired models. The proposed Version 5.0 specifications reflect the reality that if gas-fired appliances are to play a role in the transition to a decarbonized buildings future, they must become significantly more efficient than current market offerings and begin to approach the efficiencies already achieved by electric alternatives. If gas-fired water heaters fail to achieve the proposed specifications and keep pace with developments in electric heat pump water heaters, that will be a signal that ENERGY STAR should no longer recognize them at all—just as the program does not recognize oil-fired water heaters.

Conclusion

We thank EPA for their work on the v5.0 draft specification, and for the opportunity to comment. The time to act to improve water heater efficiency is today. While the current draft is a strong start, it should be strengthened by creating a level playing field among gas products, increasing the UEF requirement to 1.2, and adding ultra-low NOx requirements. We also urge EPA to reject any arguments to weaken the specification, particularly arguments relating to winter peaking, lower-carbon gas, and the lack of gas heat pump products currently on the market.

Thank you for your consideration of these comments.

Sincerely,

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¹² See EPA, *ENERGY STAR Version 5.0 Residential Water Heaters Draft 1 Specification Memo* (Oct. 5, 2021) (referencing the Biden Administration’s commitment to decarbonization as one motivation for the proposal to strengthen the criteria for gas-fired water heaters), <https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Version%205.0%20Residential%20Water%20Heaters%20Draft%201%20Specification%20Memo.pdf>; EPA, *ENERGY STAR Version 5.0 Residential Water Heaters Draft 1 Specification 3* (same, and noting that while the proposed standards could be met with gas heat pump models, criteria based on current market offerings would not provide meaningful differentiation), https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Version%205.0%20Residential%20Water%20Heaters%20Draft%201%20Specification_5.pdf.

¹³ See ENERGY STAR, *Product Finder*, <https://www.energystar.gov/productfinder/product/certified-water-heaters/results>.

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