October 10, 2024

Ms. Abigail Daken and Ms. Julia Hegarty
U.S. Environmental Protection Agency and U.S. Department of Energy
ENERGY STAR Products Program
Email: HVAC@energystar.gov

RE: ENERGY STAR® Central Heat Pump Water Heater Systems: Draft 1 Test Method and Discussion Guide

Dear Ms. Daken and Ms. Hegarty,

A. O. Smith Corporation ("A. O. Smith" or "Company") appreciates the opportunity to provide comments to the U. S. Environmental Protection Agency ("EPA") and the U.S. Department of Energy ("DOE or Department") regarding on the ENERGY STAR® ("Energy Star") Central Heat Pump Water Heater Systems Draft 1 Test Method and Discussion Guide. A. O. Smith commends the EPA and DOE for their ongoing efforts to promote the adoption of commercial heat pump water heater (CHPWH) systems. The Company has included feedback focused on simplifying the specification approach while maintaining the flexibility of the specification to address varied system applications.

I. About A. O. Smith

A. O. Smith Corporation, with global headquarters in Milwaukee, Wisconsin since 1874, applies technology and energy-efficient solutions to products manufactured and marketed worldwide with operations in the U.S., Canada, China, India, Mexico, the Netherlands, and the UK. Listed on the New York Stock Exchange (NYSE: AOS), the Company is one of the world's largest manufacturers of residential and commercial water heating equipment and boilers, as well as a leading manufacturer of water treatment and air purification products. Along with its wholly owned subsidiaries, A. O. Smith is the largest manufacturer and seller of residential and commercial water heating equipment, high efficiency residential and commercial boilers, and pool heaters in North America.

II. General Comments

A. Maintaining a Component Based Approach

The discussion guide sets the framework of how EPA envisions capturing system performance in the version 3.0 of the specification. In the guide, EPA notes that the current specification is inadequate as it is based only on the efficiency of the heat pump engine at a single set of conditions and in one configuration. EPA also states that the current specification is lacking in that it only covers the performance of the heat pump engine itself, while the achieved efficiency of a CHPWH system depends on multiple components. The framework EPA outlined to address these deficiencies in the next specification includes testing each component (e.g., heat pump engines, storage tanks, and pumps) individually, and using the results used to calculate overall system efficiency.

A. O. Smith recognizes that Energy Star is still developing the methodology that would be used to integrate these subcomponents into an overall system efficiency, as well as the certification

framework that would be used to verify compliance with a future updated specification and is requesting comment from stakeholders on how to best implement such a structure. While Energy Star has not yet outlined these specifics in detail, A. O. Smith has concerns regarding the potential adoption of a system efficiency metric approach in the test procedure and in a future specification.

1. Commercial Heat Pump Water Heater Systems are Unique to Applications

The Company recognizes that standardized metrics provide consumers with clear information to compare products and make informed purchasing decisions. However, CHPWH systems are highly variable and are often custom engineered to meet specific project requirements, especially in the case of retrofit installations. As a result, the majority of CHPWH systems are tailored to the specific needs and constraints of an individual project. For example, the following variables can impact a system design and installation: limitations of existing infrastructure (and thus the placement of the tanks due to space constraints); building type, which would impact pumping needs in high-rise buildings; application (e.g., hot water demand profiles); and location (e.g., climate zone). All of these factors, or a combination thereof, would have an influence in the design as well as the efficiency of the system in the field. Hence, a system-efficiency framework that outlines the efficiency of paired components intended to be sold together is unlikely to provide consumers with clear information. This is because the specific needs and characteristics of each project affect the System Coefficient of Performance ("SysCOP"). As you may know, other programs have tried to address this issue by standardizing comparisons, typically by categorizing and scoping similar systems. For example, they limit comparisons to systems used in new multifamily buildings, making it easier to draw more relevant and accurate comparisons. A. O. Smith is concerned that such an approach is too limiting and could undermine the utility of an Energy Star specification. A specification that rigidly adheres to specific combinations of components (e.g., heat pump engine, unfired hot water storage tank ("UHWST"), and circulator pumps), would be of limited utility for retrofit applications.

Therefore, A. O. Smith recommends that the EPA maintain a component-based approach in their specification and encourage the use of efficient Commercial Heat Pump Water Heating system elements (e.g., heat pump engine, UFHWST, and circulator pumps) by structuring the commercial heat pump water heater specification in the same manner as it does for residential windows, doors and skylights, which set minimum levels for eligibility for each component, but not requiring that each component be paired or sold together.[1]

Such an approach would provide an incentive structure for this equipment, such as well-designed UFHWSTs, without the certification and administrative concerns associated with a system efficiency metric. Since manufactures do not have line-of-sight as to what pieces of individual equipment are ultimately installed into a building, or what existing system may already be installed and added to, a component-based approach allows manufacturers to know if a piece of equipment meets the specification when it leaves the factory. Moreover, this structure is also favorable for retrofit projects in the case where a building is transitioning from their existing central water heating system to a heat pump water heating system – building owners may prefer to maintain components of their existing system infrastructure where possible to reduce cost and they would therefore not be installing an entirely new "system". When that component reaches the end of its useful life – that building owner would have the opportunity to upgrade to more efficient equipment (for example variable speed

[1]https://www.energystar.gov/sites/default/files/asset/document/ES_Residential_WDS_V7_Final%20Specification%202022.pdf

circulating pumps) and could reference the ENERGYSTAR certification list and may be eligible for an incentive for the use of the more efficient component.

B. Addressing Custom CHPWH Systems

While A. O. Smith recognizes that Energy Star may see value in establishing certifications for "common configurations" the Company has concerns that this approach may lead to custom designed systems to be left out of qualifying for Energy Star and may prevent them from being able to apply for rebates.

A. O. Smith requests clarification regarding how custom systems will be handled, and who will be responsible for certifying a bespoke system. As noted previously, manufactures do not have line-of-sight as to what was ultimately installed into a building. For example, would Energy Star expect another party such as a specifying engineer to validate compliance and certify a bespoke system?

Therefore, the Company recommends that Energy Star consider these practical implications and explore ways to accommodate custom-engineered systems in a way that does not cause unnecessary administrative or certification burden. The Company asserts that a flexible, component-based approach, combined with the promotion of best practices and performance-based criteria, will better serve the goals of the Energy Star program, while recognizing variability in system designs dictated by individual project requirements.

C. Testing and Certification of UFHWSTs

One of the key challenges in the proposed approach is the requirement for standardized testing and certification of UFHWSTs, particularly ones that are customized. A significant portion of storage tanks are custom-designed to meet specific project requirements. These custom tanks can vary widely in dimensions, fittings, and insulation, all of which can impact performance characteristics such as heat loss. As EPA is aware, UFHWSTs energy conservation standards are based off a minimum R-value and do not undergo standby loss testing to certify compliance with DOE energy conservation standards. Testing each UFHWST including custom tank design for system efficiency would be impractical and costly. Therefore, A. O. Smith recommends that rather than requiring detailed testing of every custom tank and system configuration to determine standby loss, EPA consider focusing on more straightforward metrics, such as R-value for insulation. This could provide a reasonable estimate of performance without the need for extensive testing. This would also limit certification and testing burden on manufacturers as information from existing certification databases could be leveraged.

In the alternative, EPA could also consider a more useful measure in the context of use with HPWHs is the usable hot water volume the UFHWST can store. A. O. Smith suggests that ENERGY STAR consider developing a methodology for quantifying usable hot water volume. Such a measure would be able to quantify the benefit of UFHWST features that improve stratification and limit mixing which is absent from a standby loss metric. Accounting for a UFHWST's ability to stratify promotes greater system efficiency, as it allows higher temperature water to be drawn from the top of the tank, and lower temperature water can be drawn from the bottom of the tank, leading to the heat pump engine operating more efficiency. This could be done through simulation models validated by an Alternative Efficiency Determination Method (AEDM), which would allow manufacturers to estimate performance without physical testing of every UFHWST.

III. Test Method

A. Ducting Requirements

A. O. Smith does not support EPA's proposal that requires that CHPWHs that offer ducting configurations must be tested in the ducted configuration. These requirements will ultimately just promote the creation of additional individual models that are "ducting specific" that will lead to SKU proliferation increase complexity and potentially limit availability for those customers who need ducting based on their specific installation considerations.

B. Heat Pump Engine Test Conditions (Air Source Central HPWHs)

The performance of a heat pump unit will vary depending on the ambient air, entering water, and outlet water temperature conditions. Therefore, A. O. Smith believes it is appropriate for commercial heat pump water heater units to be tested at a set of standardized test points, providing designers with the necessary information to select the most suitable unit for a specific project. However, A. O. Smith requests that the test points prioritize the most informative conditions, ensuring the majority of value is captured with a focused set of tests, while minimizing unnecessary testing burdens. In the same vein, A. O. Smith strongly encourages Energy Star to collaborate with partners to align on a consistent set of test conditions. By adopting unified test points across programs, manufacturers can avoid redundant testing requirements, reducing unnecessary burden without sacrificing any additional benefit.

The evaporator entering air temperatures outlined in EPA's proposal appear to focus on the very high, and low temperature conditions and do not focus on areas where a CHWPH would expect to spend the majority of its time in operation. A. O. Smith suggests EPA re-examine these conditions and shift them accordingly to allow for test points in the large gap that exists between a 50F degree and 17F-degree test point. As proposed, an eventual seasonal efficiency metric at the test conditions EPA outlined would not differentiate between a product whose minimum ambient air temperature is 49 and one in which the minimum temperature is 25F.

The evaporator entering air temperatures in EPA's proposal seem to overly focus on extreme high and low temperatures, which do not represent where a CHWPH would operate most of the time nor where there likely minimum point of interest may be. A. O. Smith recommends that the EPA re-evaluate these conditions and consider adjusting the test points to better reflect the temperatures where the majority of operation occurs and temperatures of interest. For example, there is a significant gap between the 50F-degree and 17F-degree test points that should be addressed. As the proposal stands, a future seasonal efficiency metric based on these test conditions might fail to distinguish between a product with a minimum ambient air temperature of 49F degrees and one with a minimum of 25F degrees.

C. Circulator Pump

The discussion guide and draft test procedure include measurement of the energy consumption of circulator pumps including additional circulator pumps in the CHPWH system other than the unit circulator pump. The draft test procedure references appendix D to subpart Y of 10 CFR 431 to determine the circulator energy rating ("CER") hp.

As noted previously, A. O. Smith has concerns that a system-efficiency based approach fails to appropriately differentiate products due to the variability within CHPWHs. A system designed for a project that has greater pumping needs than the assumed standard project would have a worse sysCOP. A. O. Smith recommends DOE instead utilize a component-based approach and base the pump metric on an efficiency metric rather than an energy consumption metric.

Also, it is A. O. Smith's understanding that the CER is an input to the circulator energy index ("CEI") metric which will be used for circulator manufacturers to certify compliance with the recently published circulator final rule once those standards become effective on May 22, 2028. A. O. Smith has concerns regarding the availability of this data and how data availability will impact the certification to a future CHPWHS specification.

IV. Conclusion

In conclusion, the company supports Energy Stars consideration of the entire Commercial Heat Pump Water Heating System in future test procedures and specifications. However, A. O. Smith strongly encourages Energy Star to maintain a simple and effective component-based approach in lieu of a complicated a burdensome system efficiency approach. This approach reduces administrative burden, accommodates the variability inherent in CHPWH systems, and encourages broader adoption of energy-efficient technologies without imposing unnecessary complexities. If EPA or DOE have any additional questions or need additional information, please do not hesitate to contact us as we would welcome the opportunity to further work together.

Sincerely,

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