

## Naming, Scope and Definitions

- Question 1: Is the name “ENERGY STAR Heat Pump Boilers” for the new specification preferable to “ENERGY STAR Air-to-Water Heat Pumps”? Is there another name that would better align with customer expectations of the product?

### **ENERGY STAR Air to Water heat pumps would be preferable**

- Question 2: Are there broadly accepted industry definitions of air-to-water heat pumps or heat pump boilers?

### **Yes, especially within the hydronic community.**

- Question 3: Is there any need to distinguish boilers that are used with hydronic coils in a forced air distribution system from those used with hydronic distribution? Are the same products used in both situations?

**If you're using a hydronic (water or glycol/water) air handler or fan coil, you can use the same fan coil with a hydronic boiler or an A2W heat pump. You can have higher supply water temperatures with the boiler, so the contractor/designer would need to look at the outputs on the air handler/fan coils at different water temperatures and adjust the size depending on using a boiler or an A2W heat pump. With A2W heat pumps, contractors are choosing low water temperature fan coils for heating and cooling, or in-slab radiant heating and radiant cooling systems with air ventilation.**

- Question 4: EPA believes that products that can serve as domestic water heaters or as air-to-water heat pumps for space heating could simply be tested and rated for each use. Is there any need for a definitional distinction between heat pump water heaters and air-to-water heat pumps for space heating? If so, what would the distinction be?

**Yes, you would want to separate heat pump water heaters (domestic hot water heaters only) from an A2W heat pump that has the logic built in that can heat an indirect water heater for domestic hot water as well as provide heated or chilled water for heating or cooling a residence or commercial property.**

- Question 5: EPA is interested in additional information about dual fuel boilers particularly market, cost, and performance information.

**Some A2W heat pumps have the ability to send a signal to a back up boiler if the heat pump cannot keep up with the current load. It will definitely add quite a bit to the overall cost of the system to add a back up boiler, but there are areas that will need backup heat when temperatures fall below 5F. The reason they would need backup heat is because the home's are very large in some of the cold climate areas and have a lot of windows in the living rooms & main areas.**

Test Methods

- Question 6: As the evaporators are likely to be located outdoors, what range of outside air conditions are most representative to determine overall performance?

**Varies by climate region. Most A2W heat pumps (one unit) can provide enough heating and cooling for the SF Bay Area, but you might need multiple A2W heat pumps in Truckee**

- Question 7: At very low outside temperatures, the compressors for ATWHPs and dual fuel HPs may no longer provide useful efficient heat. We assume ATWHPs will include backup heating for this circumstance. Ideally, the test method would capture this behavior and incorporate it into an estimate of annual energy use. What is the best way to include backup heat in the test method?

**You would be looking at using a back up electric element in your buffer tank and your indirect water heater (3.5kW), or supplementing the heat with a back up gas fired boiler or an electric boiler. For testing when you would need backup heat/cool, you would need to look at your design temperatures for heating & cooling in each region and your inlet water temperatures (ground temperatures) when using an A2W heat pump with an indirect water heater for domestic hot water.**

What other testing considerations should be evaluated for performance in cold climates?

**Balance point - The point when you'll need to shut off your compressor and provide back up heating/cooling and does the heat pump do that efficiently.**

- Question 8: How often are air-to-water heat pumps applied in combination systems that also provide domestic hot water? For these applications, can they use the test and metric for domestic hot water delivery efficiency found in 10CFR Part 430 Subpart B Appendix E? Would

this test fully capture the performance of the product in space and water heating modes?

**Yes, they are being used for space heating/cooling and domestic hot water production. Homeowners like only having one piece of equipment that can do heating/cooling & DHW. I have not seen Appendix E, so I cannot comment on that part.**

● Question 9: Air-to-water heat pump systems can be designed to offer load shifting in addition to their other functions. Are there products offered that are specific to such applications? In other words, are systems that provide these functions designed and assembled on site using any air-to-water heat pump, or is there something specific about the product as it leaves the factory that enables this? Are there metrics appropriate for evaluating these capabilities in a product?

**We're seeing most A2W heat pumps systems being built on site. We now have a new A2W heat pump coming into the market that already has the logic built in to do load shifting as well as bring on back up heat only when needed.**

● Question 10: Are there additional considerations for the test method for air-to-water heat pumps?

**Heat pump systems are great, but they cannot be thought of as a "quick" swap out for an older hydronic system that was designed for higher water temperatures. The tests need to have good data for the btu outputs of A2W heat pumps at different ambient outdoor temperatures for both heating/cooling & DHW.**

Specification Requirements

● Question 11: Do air-to-water heat pumps generally use multiple speed, variable speed, or inverter-driven compressors? For these products, do part-load tests in AHRI 550/590 reflect field operation?

**Yes, some use multiple stage compressors but they should all be using inverter-driven compressors.**

● Question 12: If units are sized for design conditions, what does that mean for their

part-load  
heating performance? What have users' experiences been in the field?

**With the right sized buffer tank we're seeing really good performance at part load conditions.**

- Question 13: This test defines performance with 110F leaving water temperature. This will not provide sufficient heat when used in legacy heat exchangers, typically designed for 160-180F water. Do manufacturers recommend using these products in retrofit situations? If so, is there anything special they recommend making sure residents have enough heat?

**A contractor would want to provide a heat loss calculation and possibly change out existing heat emitters if they're designed for 160-180F water temps. Otherwise you would need to have a backup gas fired or electric boilers or some other form of backup heat when you reach outdoor design conditions.**

- Question 14: Many hydronically-heated homes are located in cold climates in the US. Is there a need for separate criteria for cold climate ATWHPs?

**Possibly...you really need to look at each A2W heat pump and their performance in those cold climates.**

- Question 15: Would it be useful for EPA to define connected criteria for air-to-water heat pumps, given that they can be deployed in systems that offer load shifting? How would the needed criteria compare to those in AHRI 1380 or AHRI 1430?

**I will need to do more research on AHRI 1380 & 1430**

- Question 16: What is the cost of air-to-water heat pump systems? Does this provide the same service (e.g., covers full heating load, provides cooling, etc.) as competing systems? What are the design and installation costs for these systems in new construction and in a replacement scenario?

**These systems are being used in the higher end homes. The cost is too much for the typical family in a subdivision. They would work really well in those 1700-**

**2500 sqft homes, but without a rebate program and some incentives they'll only be used in the higher end homes.**

- Question 17: Are there any other considerations about the implementation of an air-to-water heat pumps specification that EPA should be aware of?