



# ENERGY STAR<sup>®</sup> Residential Boilers

## Discussion Guide Webinar

June 21, 2023

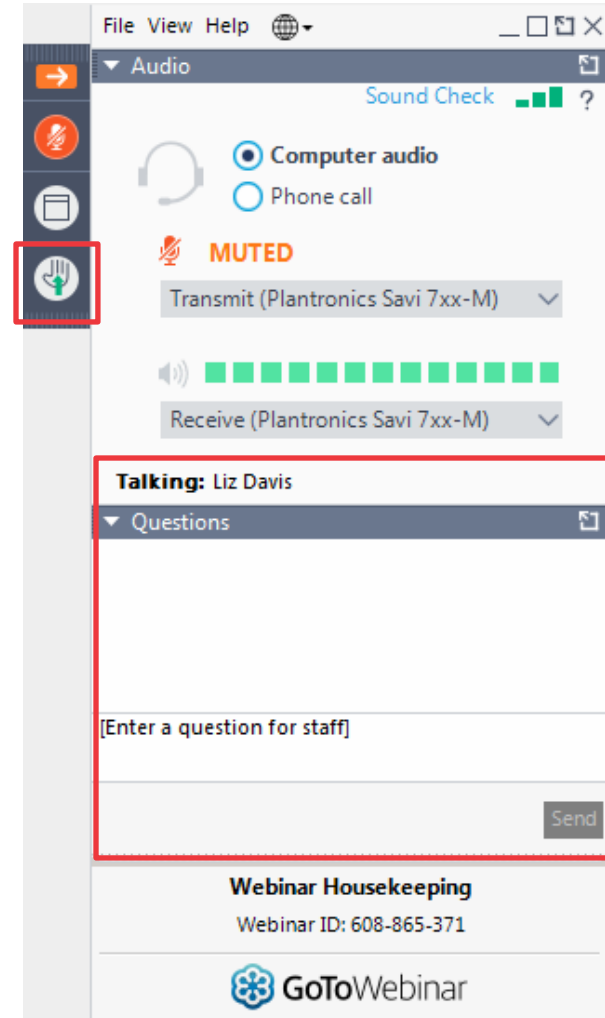


## Webinar Participation

- Please mute yourself when you are not speaking (use local mute or dial \*6)
- Feel free to ask questions anytime

Submit written comments to [HVAC@energystar.gov](mailto:HVAC@energystar.gov) by **July 7, 2023**.

We are aware of issues with the above email. Please CC Abi, Holly, and Megan on all emails to ensure they are received.





## Meeting Agenda

1. **Introductions**
2. Timeline
3. Background, Overview, and Context
4. Naming, Scope, and Definitions
5. Test Methods
6. Specification Requirements
7. Closing - Next Steps & Questions

Numbered questions for stakeholders will appear in green boxes throughout the presentation.



## ENERGY STAR HVAC Team

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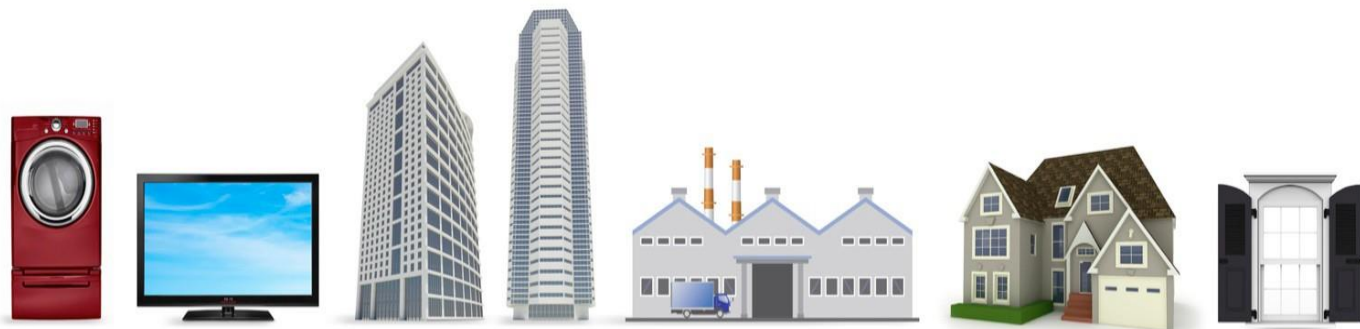
## What is ENERGY STAR?



The simple choice for energy efficiency.

EPA's ENERGY STAR identifies the most energy-efficient **products**, **buildings**, **plants**, and **new homes** – all based on the latest government-backed standards.

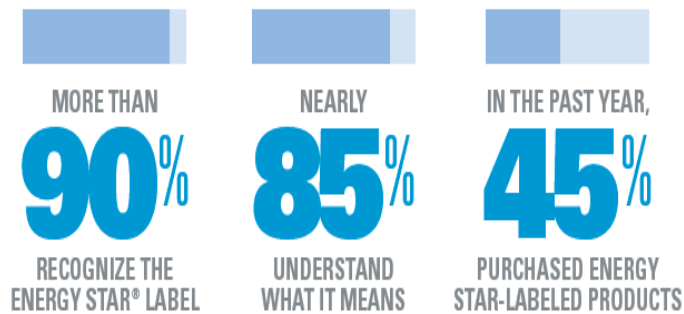
Today, every ENERGY STAR label is verified by a rigorous third- party certification process.





## Benefits to joining ENERGY STAR

### In American Households:



- Access a network of over 700 utilities
- Leverage the label recognition
- Access customer support teams at EPA
- Use co-brandable materials
- Participate in promotional events
- Get listed on publicly-available ENERGY STAR search tools
- Apply for the ENERGY STAR Partner of the Year Award
- Receive email notifications about program activities



## ENERGY STAR Partnership Types



The simple choice for energy efficiency.

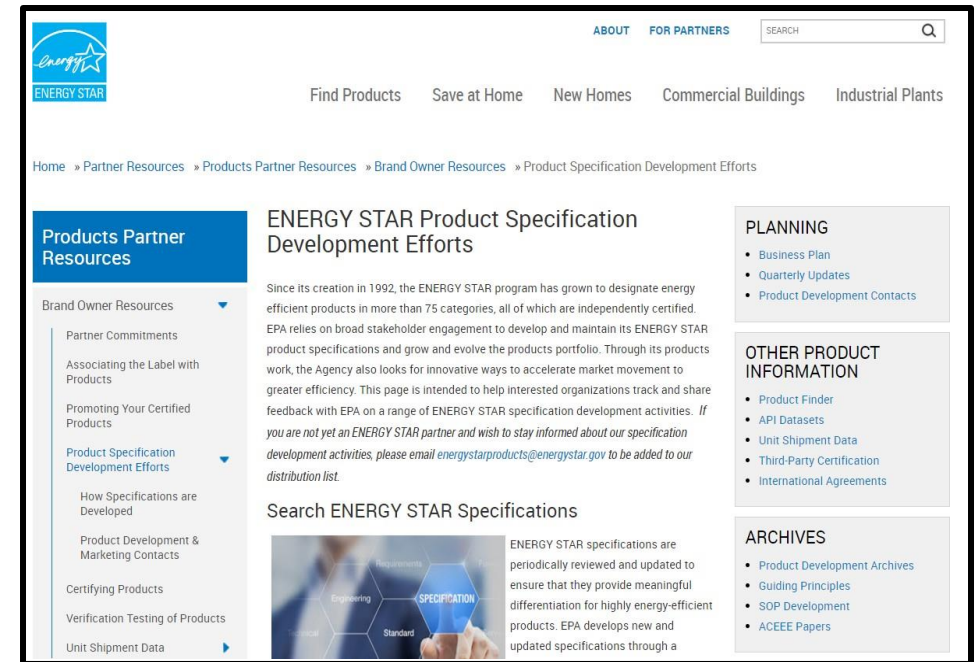
- Brand owner
- Retailer
- Residential building
- Commercial building, service, product, or association
- Industrial plant, service, product, or association
- Energy Efficiency Program Sponsor

For more information on joining as an ENERGY STAR partner visit this webpage

[https://www.energystar.gov/partner\\_resources/join-energy-star](https://www.energystar.gov/partner_resources/join-energy-star)

## Specification Development

- [ENERGY STAR follows EPA's Standard Operating Procedure through](#) the specification development and revisions process, balancing:
  - The need to keep pace with evolution among leading products and continue to effectively differentiate for consumers
  - Production cycles and other industry factors
- Key elements of the stakeholder process:
  - Consistency, transparency, inclusiveness, responsiveness, and clarity
  - Stakeholder engagement is a vital aspect to the success of the ENERGY STAR program



The screenshot shows the ENERGY STAR website's "Product Specification Development Efforts" page. The page features a navigation bar with "ABOUT" and "FOR PARTNERS" links, a search bar, and a main menu with "Find Products", "Save at Home", "New Homes", "Commercial Buildings", and "Industrial Plants". The breadcrumb trail reads: Home » Partner Resources » Products Partner Resources » Brand Owner Resources » Product Specification Development Efforts.

The main content area is titled "ENERGY STAR Product Specification Development Efforts". It includes an introductory paragraph: "Since its creation in 1992, the ENERGY STAR program has grown to designate energy efficient products in more than 75 categories, all of which are independently certified. EPA relies on broad stakeholder engagement to develop and maintain its ENERGY STAR product specifications and grow and evolve the products portfolio. Through its products work, the Agency also looks for innovative ways to accelerate market movement to greater efficiency. This page is intended to help interested organizations track and share feedback with EPA on a range of ENERGY STAR specification development activities. *If you are not yet an ENERGY STAR partner and wish to stay informed about our specification development activities, please email [energystarproducts@energystar.gov](mailto:energystarproducts@energystar.gov) to be added to our distribution list.*"

Below the text is a section titled "Search ENERGY STAR Specifications" with a small image of a person holding a tablet displaying a hexagonal diagram with "SPECIFICATION" in the center. To the right of the image, it states: "ENERGY STAR specifications are periodically reviewed and updated to ensure that they provide meaningful differentiation for highly energy-efficient products. EPA develops new and updated specifications through a..."

The left sidebar contains a "Products Partner Resources" menu with the following items: Brand Owner Resources (expanded), Partner Commitments, Associating the Label with Products, Promoting Your Certified Products, Product Specification Development Efforts (expanded), How Specifications are Developed, Product Development & Marketing Contacts, Certifying Products, Verification Testing of Products, and Unit Shipment Data.

The right sidebar contains two sections: "PLANNING" with links for Business Plan, Quarterly Updates, and Product Development Contacts; and "OTHER PRODUCT INFORMATION" with links for Product Finder, API Datasets, Unit Shipment Data, Third-Party Certification, and International Agreements. Below these is an "ARCHIVES" section with links for Product Development Archives, Guiding Principles, SOP Development, and ACEEE Papers.

View at: [ENERGY STAR Product Specification Development Efforts](#)

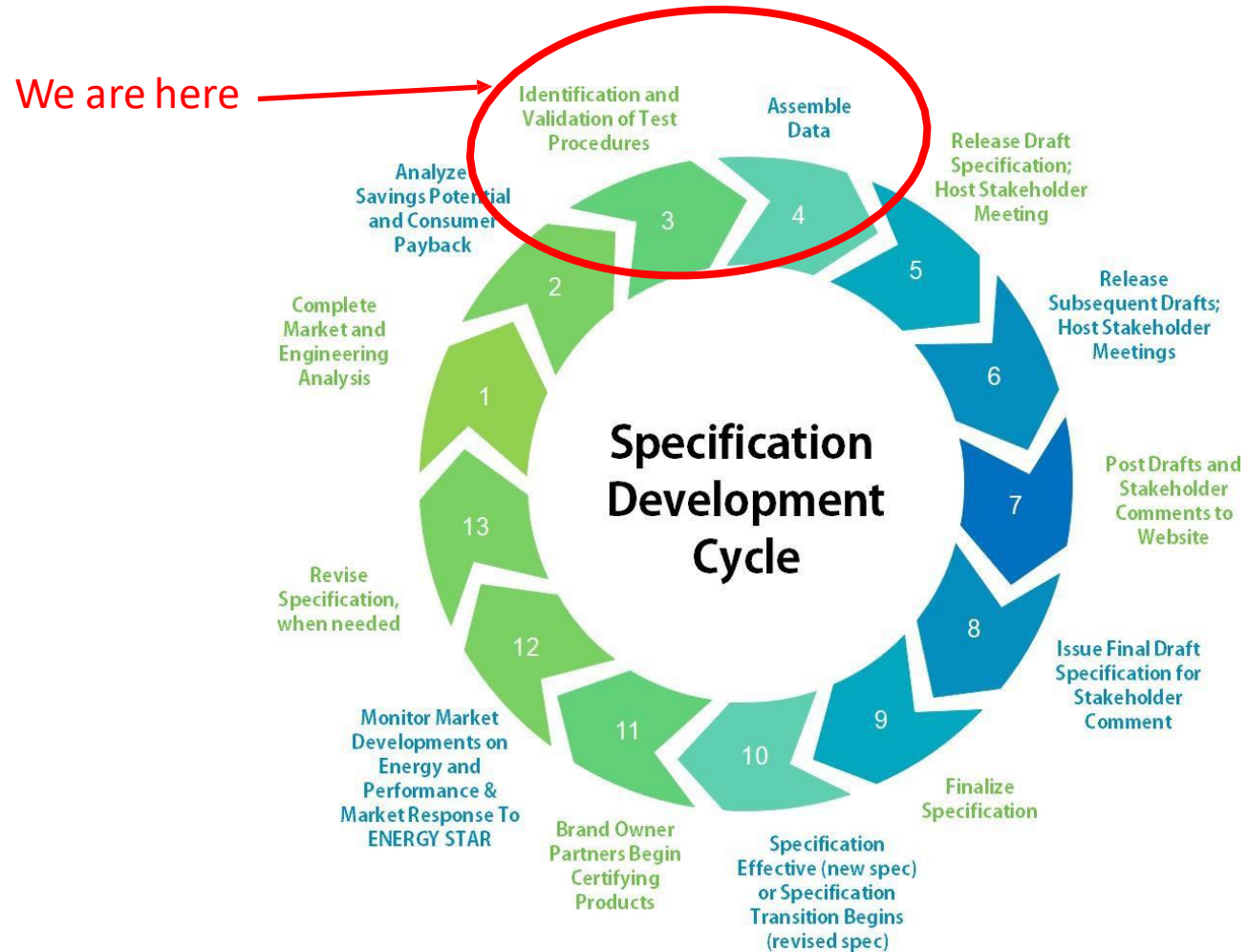




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# ENERGY STAR Specification Development Process





## Current Timeline: Residential Boilers

- Discussion Guide published – June 5, 2023
- Discussion Guide webinar – June 21, 2023
- Discussion Guide comments due – July 7, 2023

### POTENTIAL TIMELINE

Draft 1 Test Method – Q4 2023

Final Draft Test Method, Draft 1 Specification – Q2 2024

Final Version 1.0 – Q4 2024 (effective immediately)

\* This timeline is subject to change



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## Background, Overview, and Context

### Sunset of ENERGY STAR Boilers Product Category

- Version 3.0 ENERGY STAR Boilers specification took effect October 1, 2014
- A 2017 EPA review found that:
  - Significant market share of ENERGY STAR boilers
    - 57% of gas and 77% of oil boilers are ENERGY STAR certified
  - There were no opportunities to identify more energy efficient models
    - Analysis shows that there is no meaningful and cost-effective differentiation among fuel powered products
- DOE finalized residential boiler test methods updates on February 21, 2023, with a compliance date of April 13, 2023
  - DOE determined that the revisions made did not provide further differentiation among boilers covered by the ENERGY STAR specification



## Background, Overview, and Context

### Sunset of ENERGY STAR Boilers Product Category

- EPA sees an unprecedented opportunity for the ENERGY STAR program, following Administration priorities, to support the efficient electrification of residential space conditioning
- Incentive Programs
  - Incentive programs encouraging consumers to purchase more efficient, cost-effective products do not need to rely on ENERGY STAR certification
- The sunset of ENERGY STAR Residential Boilers product category will **not** affect consumers' access to, or the availability of, residential boilers
- Alternative methods to heat hydronic homes becoming more available on the market



## Background, Overview, and Context

### Launch of Air-to-Water Heat Pumps Specification

- Alternate products for hydronically heated homes:
    - Ductless Air-to-Air HPs are covered in the ENERGY STAR CAC/HP specification
    - Air-to-water HPs entering US market in greater numbers
      - Can serve hydronic homes and
      - Meet the DOE definition of a boiler, but
      - Can't use the same test method as current boilers, and
      - Have distinct application considerations
- Launch new specification**
- Could potentially include electric, dual fuel, and fuel fired air-to-water HPs
  - Hydronic heating (e.g. with a hydronic coil in homes with air distribution) may eventually be more common, and they are well suited for load shifting with thermal storage



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## Naming, Scope, and Definitions

- EPA seeks information on several issues to support the development of a draft 1 proposal, the first of which regards the name of the new specification
  - EPA proposes “Heat Pump Boilers” to make the connection to boilers more obvious to consumers
  - Understand “air-to-water HP” has become familiar in Europe, but
  - Would like “ENERGY STAR boiler” search term to pull up specification.

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?



## Naming, Scope, and Definitions

- Intent of the new specification is focused on recognizing products now entering the market to serve hydronically heated homes
- DOE's 10 CFR 430.2 includes boilers in the definition of "furnace"
  - This also includes combination products that provide domestic hot water and water for space heating, and products that work with a hydronic coil in a forced air distribution
- DOE has concluded that hydronic air-to-water and water-to-water heat pumps meet the definitional criteria to be classified as a consumer boiler



## Naming, Scope, and Definitions

- EPA will adopt the 10 CFR 430.2 definition in the Version 1.0 specification, and since it is for specifically hot water boilers, EPA will include that: an “electric boiler” means an electrically powered furnace designed to supply low pressure steam or hot water for space heating application. A hot water boiler operates at or below 160 psig water pressure and 250 degrees Fahrenheit (°F) water temperature.
- DOE has not provided a specific definition of a heat pump boiler or an air-to-water heat pump, should that be needed to distinguish performance levels or test methods



## Questions for Stakeholders

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



## Naming, Scope, and Definitions

- Two other product types entering the market able to serve hydronically heated homes are:
  - Dual fuel boilers: A single appliance containing an electric air-to-water heat pump and a burner to provide backup heating capability
  - Gas powered heat pumps, usually using a sorption-type cycle which includes a step with direct heating of the refrigerant, done by a gas burner
    - On a site energy-basis, gas-powered heat pump products do not achieve as high efficiency as electrically powered alternatives
    - EPA is unaware of a clear path to cost-effectiveness for this product type

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



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## Test Methods

- March 2023 Final Rule released by DOE relocated the test procedure for consumer boilers to a new appendix (EE) and made several updates to the definitions and referenced industry standards
  - The new ratings do not produce additional difference in product performance.
  - DOE recognizes that hydronic heat pump products differ significantly from non-heat pump boilers and did not establish a separate test procedure for hydronic heat pumps in the March 2023 final rule
- DOE and EPA will establish an ENERGY STAR test method for them
  - Note: both the Efficiency Vermont rebate program and the ENERGY STAR Emerging Technology Award tested them based on AHRI 550/590, which is intended for chillers but also defines tests in heating mode



## Questions for Stakeholders

DOE requires more information in order to determine a representative approach for testing

6. As the evaporators are likely to be located outdoors, what range of outside air conditions are most representative to determine overall performance?
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? What other testing considerations should be evaluated for performance in cold climates?





## Questions for Stakeholders

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 4 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?

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? 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?

10. Any additional considerations for the test method for air-to-water heat pumps?



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## Specification Requirements

- If the test method is similar to AHRI 550/590, EPA could use the same criteria identified for the ENERGY STAR Emerging Technology Award from 2019-2020 (COP<sub>H</sub> ≥ 1.7 at 5°F outdoor dry bulb and leaving water temperature at 110°F)
  - A number of other quantities were reported, including:
    - Capacity in those conditions
    - COP and capacity at 47°F and 17°F
    - Integrated Part Load Value (IPLV) for products with cooling
- These efficiency criteria mimic the 2019 NEEP Cold Climate Heat Pump Specification
  - Since then, EPA has defined cold climate heat pumps, including both COP at 5°F and maximum capacity at that temperature compared to rated capacity at 47°F
    - Intention of this requirement is to ensure that a unit selected for low ambient performance will also provide efficient, comfortable heat at low loads
  - Additionally, DOE and EPA developed a Controls Verification Procedure (CVP) that ensures performance measured in the laboratory with the fan and compressor speeds fixed are achievable in the field when both are controlled by the unit (or its controller)



## Questions for Stakeholders

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?

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?

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?



## Questions for Stakeholders (cont'd)

14. Many hydronically-heated homes are located in cold climates in the US. Is there a need for separate criteria for cold climate AWHPs?
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?
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?
17. Are there any other considerations about the implementation of an air-to-water heat pumps specification that EPA should be aware of?

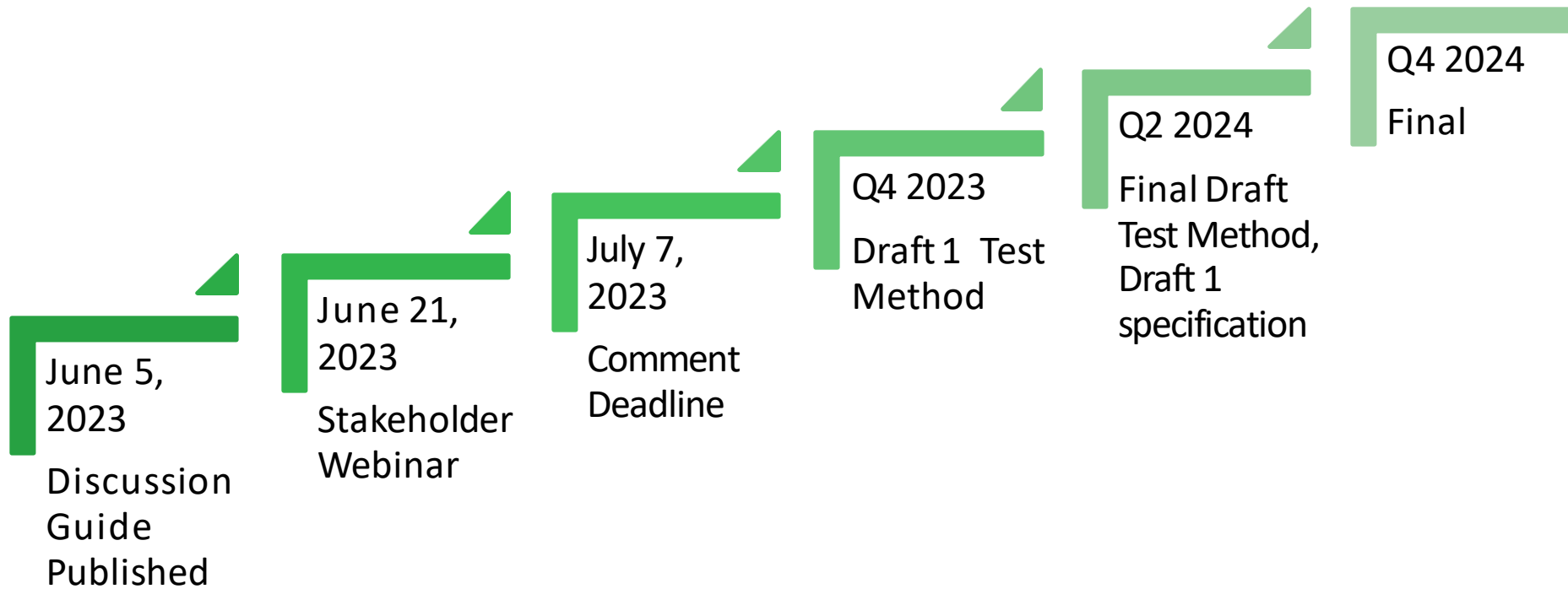


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## Next Steps





## Questions

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Stakeholders are encouraged to provide written comments for consideration to [HVAC@energystar.gov](mailto:HVAC@energystar.gov) by **July 7, 2023**.

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