

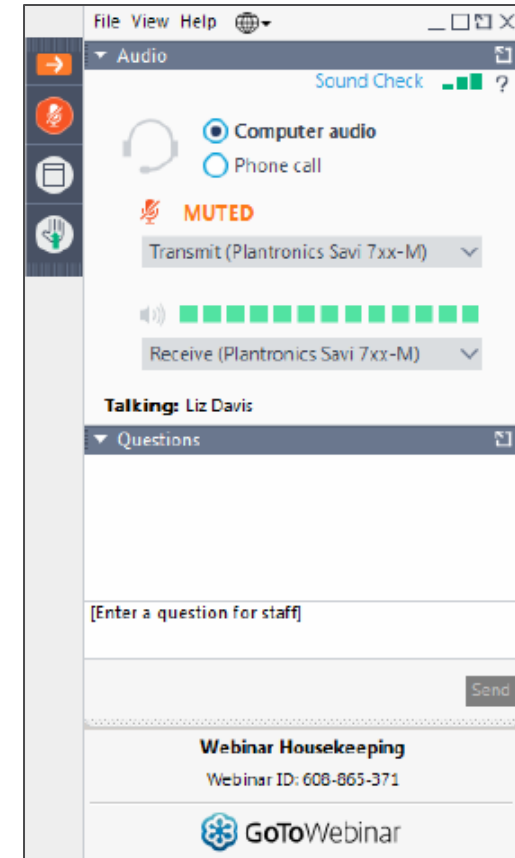


ENERGY STAR[®] Version 1.0 Commercial HPWH Draft 1 Specification

Stakeholder Webinar - January 29, 2025

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Introductions

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What is ENERGY STAR?



The simple choice
for energy efficiency.

- Influential and trusted symbol of **energy efficiency**
- Available across **75+ product categories**
- Since 1992, a voluntary **partnership** among government, business, and consumers
- Products are independently certified to meet strict energy-efficiency guidelines set by the **U.S. EPA**
- **Utilities** offer **rebates** on ENERGY STAR certified equipment
- **Saves** end-users **energy, water,** and **money**
- Helps protect the **climate**



Specification Development

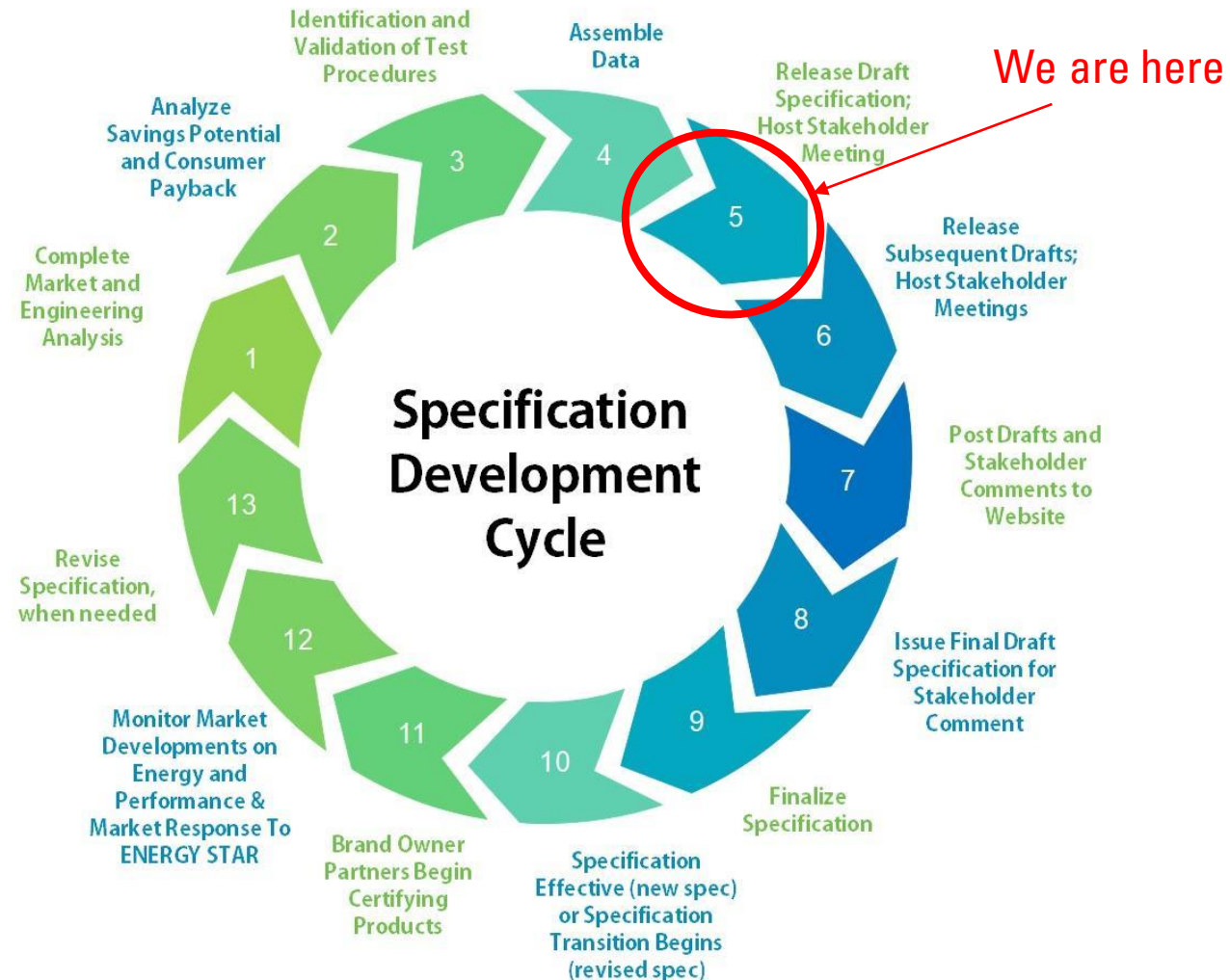
- ENERGY STAR follows [EPA's Standard Operating Procedure](#) through the specification development or revisions process, balancing:
 - The need to keep pace with evolution among leading products and continue to effectively differentiate for consumers
 - Production cycles, other factors important to the industry
- 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 displays the ENERGY STAR website's 'Products Partner Resources' section. The main heading is 'ENERGY STAR Product Specification Development Efforts'. Below this, a paragraph explains the program's history and the importance of stakeholder engagement. A search bar for 'ENERGY STAR Specifications' is provided. To the right, there are sections for 'PLANNING' (Business Plan, Quarterly Update, Product Development Contacts) and 'OTHER PRODUCT INFORMATION' (Product Finder, API Datasets, Unit Shipment Data, Third-Party Certification, International Agreements). Below the main content, a 'Products Partner Public Notices' section lists various documents from 2024 and 2023, including cover letters, draft test methods, and final specifications for different product categories.

[ENERGY STAR Product Specification Development Efforts](#)
[Products Partner Public Notices](#)



Specification Development Cycle



Meeting Agenda

1. Background
2. Test Method
3. Drivers: How to Capture System Performance?
4. Scope
5. Requirements for Commercial Integrated HPWHs
6. Requirements for Commercial Central HPWHs
 - i. System Requirements
 - ii. Market Delivery Mechanisms
 - iii. Piping Configurations
 - iv. Component Requirements
 - v. Additional Reporting Requirements
 - vi. Verification
7. Effective Date
8. Request for Feedback
9. Timeline & Open Discussion

Background

- Central heat pump water heaters (HPWH) are **not** in scope for the ENERGY STAR Version 2.0 Commercial Water Heaters specification – only the HP unit is in scope.
 - Performance of the HP unit is only characterized at a single set of conditions and in one configuration rather than covering the range of common conditions affecting the units.
 - The EPA and DOE recently finalized the [ENERGY STAR Test Method for Central HPWH Systems](#), which was developed to understand the performance of the HP unit within a wide variety of systems and climates.



ENERGY STAR Test Method for Central HPWH Systems

Established the following (January 2025):

- Commercial HPWH Unit Types
 - Type A: unit does not have active defrost or for which the specified compressor cut-in and cut-out temperatures are not both less than 40°F
 - Type B: unit has active defrost and for which the specified compressor cut-in and cut-out temperatures are both less than 40°F but not both less than 17°F
 - Type C: unit has active defrost and for which the specified compressor cut-in and cut-out temperatures are both less than 17°F but not both less than 5°F
 - Type D: unit has active defrost and for which the specified compressor cut-in and cut-out temperatures are both less 5°F
- Evaporator test conditions and condenser entering and outlet water temperature conditions
- Water Heating Energy Efficiency Ratio (WHEER)



Drivers: How to Capture System Performance?

- The achieved efficiency of a HP unit depends on the system it works within and other components in the system.
- Most central HPWH systems are custom designed for a specific building.
- A specification is needed to define product models with flexibility to adapt to the needs of the building while still assuring efficient performance.
- EPA regards this Draft 1 as part of an ongoing discussion of how best to do this.

- If all buildings that use central electric resistance water heating exclusively installed central HPWH systems with a seasonal COP of 1.5, national annual savings would be in the order of 10 TWh. (based on CBECS data)
- Several elements of the system specification rely on the model work completed by the Northwest Energy Efficiency Associates (NEEA).



Scope

- Included Products

- Air source commercial HPWHs marketed for sale in the commercial market.
- For central HPWH systems, fully packaged and fully specified systems for which a single market entity can be identified as an ENERGY STAR partner.
- Custom designed systems **may** be able to participate, if the business model of the designer allows them to be characterized as fully specified.

- Excluded Products*

- Products that are covered under other ENERGY STAR product specifications, including residential water heaters and commercial gas-fired water heaters.
- Custom Engineered Central HPWH Systems.
- Combined heating/cooling and hot water systems.
- Systems in which the main fuel is gas or oil.

*The V2 Commercial Water Heater specification will continue to be available for non-heat pump products. For heat pumps, requirements in this specification will supersede those in the V2 CWH specification after an appropriate transition period.



Requirements for Commercial Integrated HPWHs (Electric HPWHs)

- Integrated HPWHs have a built-in storage tank contained within the same casing.
- V1 requirement: $COP_h \geq 3.0$ (unchanged from the V2 CWH spec)



Requirements for Commercial Central HPWHs



Overview

Types of Requirements:

- A. Performance, by component
 - » While not all systems will include all components, if a component is part of the system specification, it must meet these requirements.
- B. System product models and families
 - » Grouping models into families allows for easy certification of related system designs
- C. System design
 - » System design and application determines the efficiency of the overall system, if the components are reasonably efficient and are chosen with the correct capacity for the application.
- D. Purchaser information

Appendix A contains the qualified system piping configurations.



System Product Models and Families

- Each product model is a system including the heat pump unit(s) and any ancillary equipment including storage tanks, fans, pumps, blowers and controls.
- There may be variations within product models serving different capacities by using additional HP units and storage tanks, but the efficiency performance shall be the same for all instances of a product.
- The product model is defined by a document package described on the next slide
- Product families include the same major system components but are designed to serve different applications and may have different configurations.

The EPA welcomes feedback on how product models and families can be best used to minimize certification burden while maintaining the integrity of ENERGY STAR certification.



System Product Models and Families: Document Package Includes

- Summary of system including piping configuration and all required system components.
- Detailed system schematics reflecting one of the qualified system configurations showing how the system is connected to the building and the location of all components for operation and maintenance.
- Specification of unfired tanks and of any backup or temperature maintenance tanks by part number(s), as needed; specification of controls by part number(s).
- Specification of ancillary components such as isolation valves, check valves, balancing valves, wye strainers, unions, T&P valves, and air vent, including sizing and performance requirements, or lists of acceptable part numbers.
- Sizing guidelines for output capacity and storage volume based on design loads and (if applicable) load shift requirements.
- Electrical specifications including all available voltage and phases, full load amps (FLA), minimum circuit ampacity (MCA), maximum overcurrent protection (MOP).

System Design Requirements

- Insulation for hot water pipes between elements of the central water heating system shall be specified to meet the requirements of the IECC Table C403.13.3(1) Minimum Pipe Insulation Thickness.
- The system controller whether part of the heat pump unit or separate, shall include control of any backup (i.e. non-heat pump) heating included in the system, including in separate recirculation reheat tanks. These elements may also have their own controls which operate unless over-ridden by the system controller. The system-imposed control may be as rudimentary as a power switch.
- The system shall include water temperature read-outs at a minimum of three different levels in the water storage volume, so as to detect different temperatures from stratified tanks. Best practice is to include one sensor per HP unit.

System Design Requirements (continued)

- Minimum requirements for the master mixing valve (if present), to include ANSI/ASSE 1017-2009.
- The system shall provide a visible alarm for any compressor that is not operating when called, as well as an additional alarm that is either audible or electronic.
- All installations shall be carried out by a factory-authorized installer. Factory authorized commissioning and/or system monitoring for the first 30 days shall be offered for all installations.
- Vendors shall provide a three-year warranty on any parts they provide and a three-year labor warranty, commencing upon startup.

Purchaser Information Requirements

- Documentation shall indicate to the purchaser that the efficiency of the system may be strongly affected by the flow rate of the recirculation loop (if present), and that well-balanced and well-insulated recirculation loops will have lower flow rates and result in higher efficiency. Refer to IECC Table C403.13.3(1) Minimum Pipe Insulation Thickness for recirculation loop insulation, or to similar reference.
- Maximum water flow through HPWH, at maximum operating outside air temperature and minimum temperature lift.
- Documentation shall clearly indicate any wiring needed to control backup (i.e. non-heat pump) water heating.

Purchaser Information Requirements (continued)

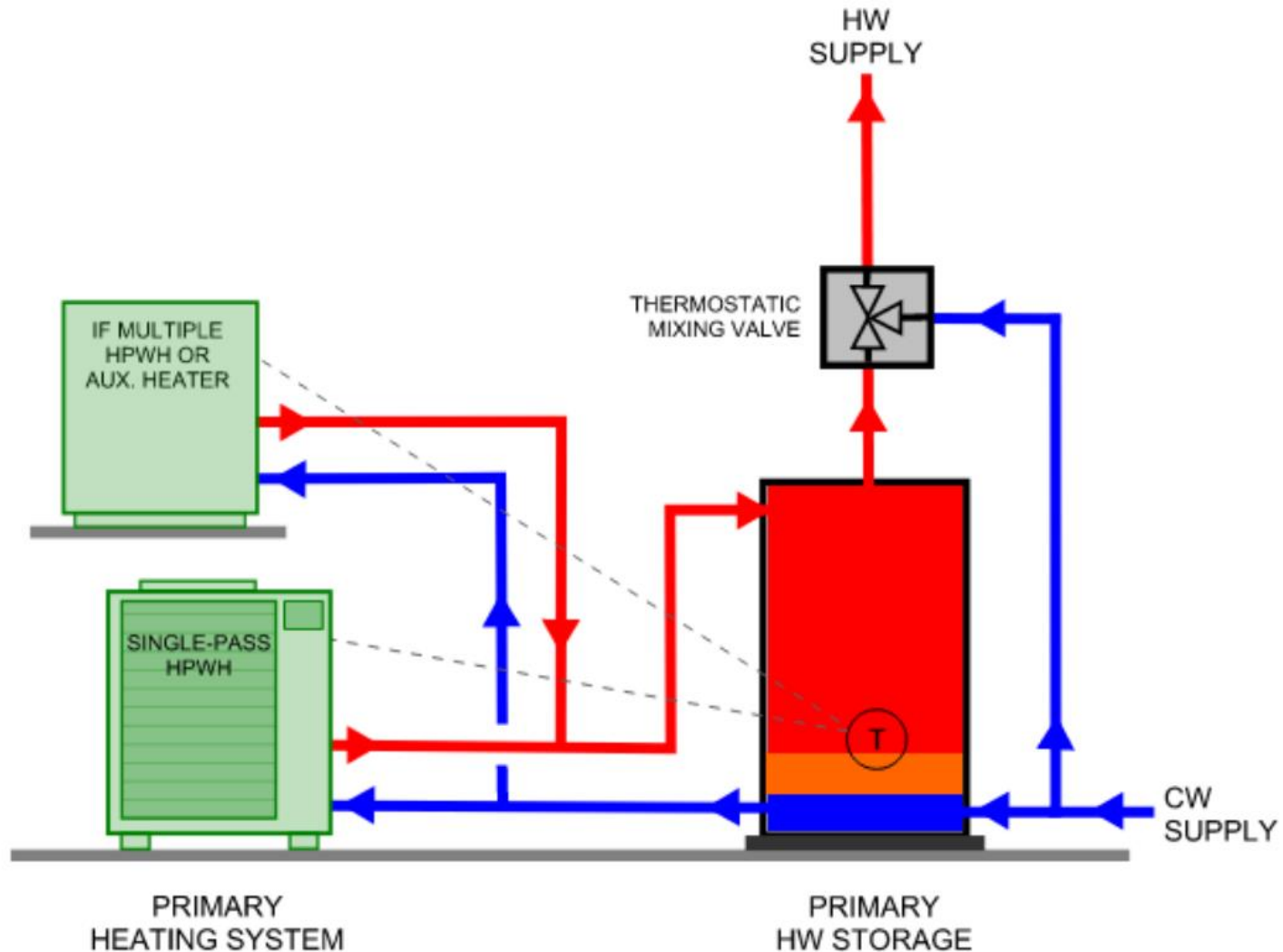
- Air source design guidance such as minimum airflow, maximum allowable static pressure as applicable, best practices for placement and orientation of outdoor units, and ductwork connection details if applicable. Physical installation requirements.
- Maintenance checklist including detailed description of task and recommended cadence for performing tasks, include recommended maintenance for the entire system and for all components.
- Equipment operating manuals and warranty documentation, including detailed startup procedures for the system.

Market Delivery

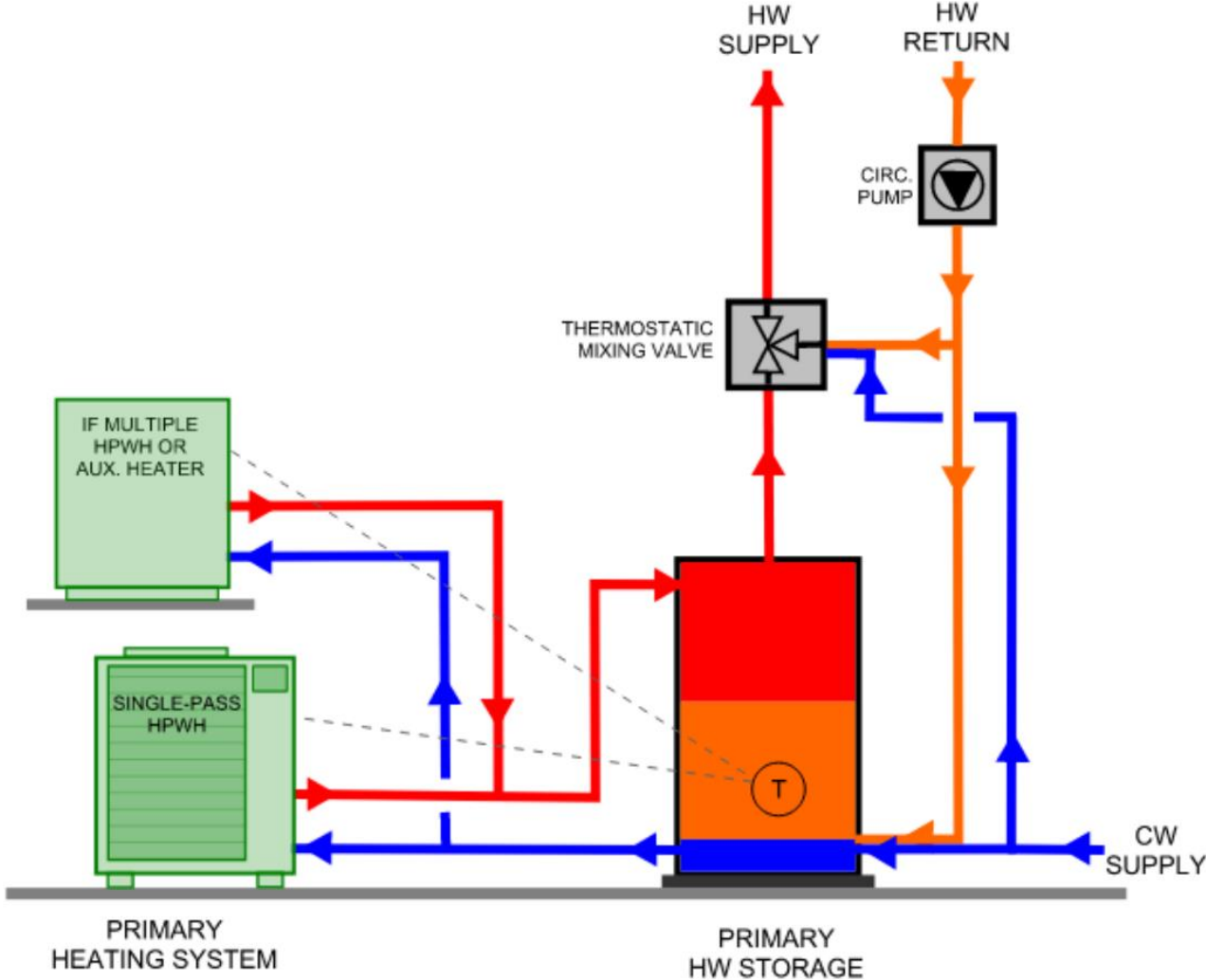
- The entity that specifies the system will be the ENERGY STAR partner and will ultimately be responsible for the performance of subsequent system installations and their components under a particular ENERGY STAR certification.
- To allow providers maximum flexibility in specifying models, the EPA is not proposing a requirement that all components are sourced from or branded by a single manufacturer.
 - The EPA encourages system providers intending to certify systems to consider what business model will best allow them to feel confident in the performance and efficiency of the systems they specify.



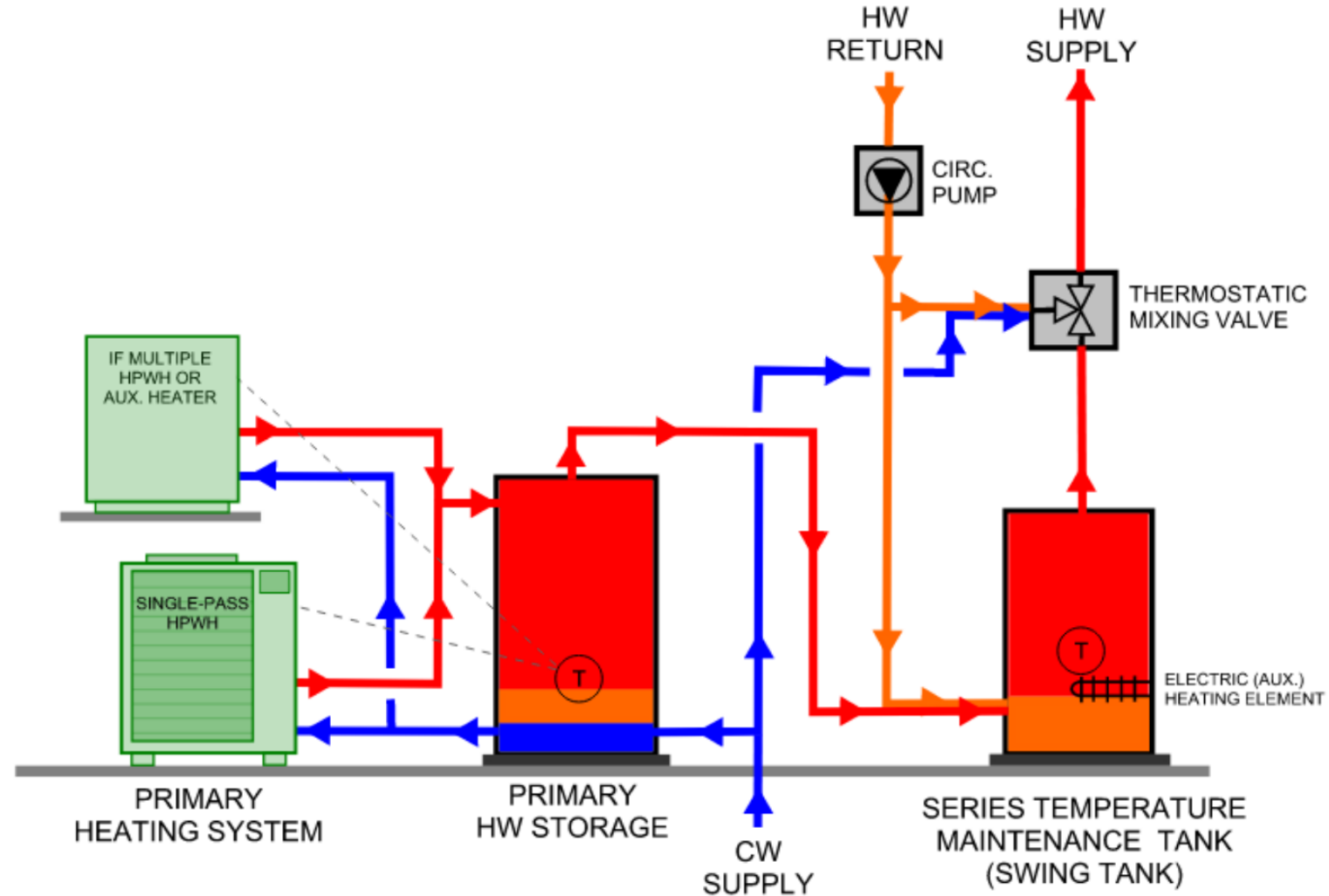
Piping Configuration 1: Single-Pass Primary HPWH System without HW Circulation



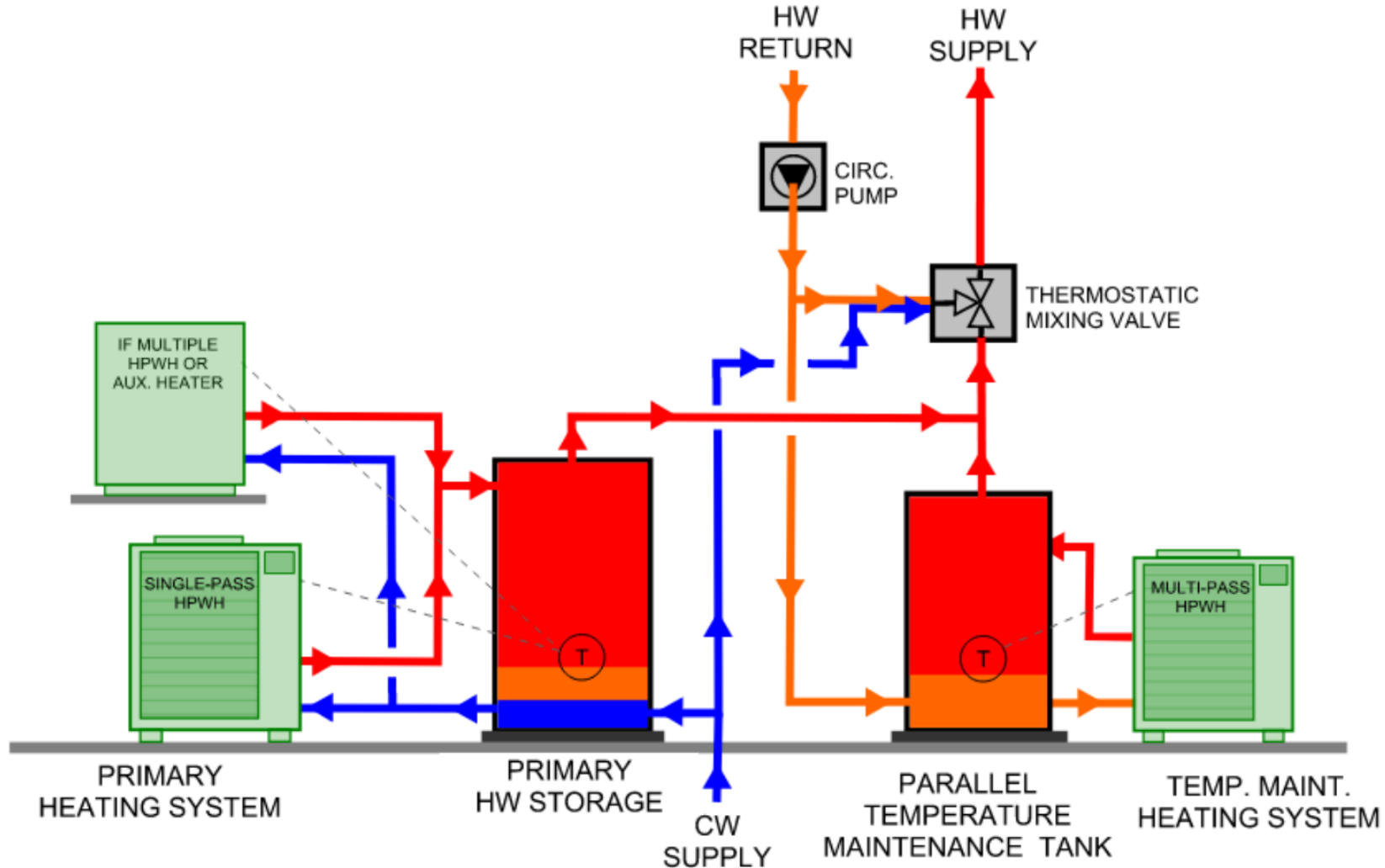
Piping Configuration 2: Single-Pass Returned to Primary



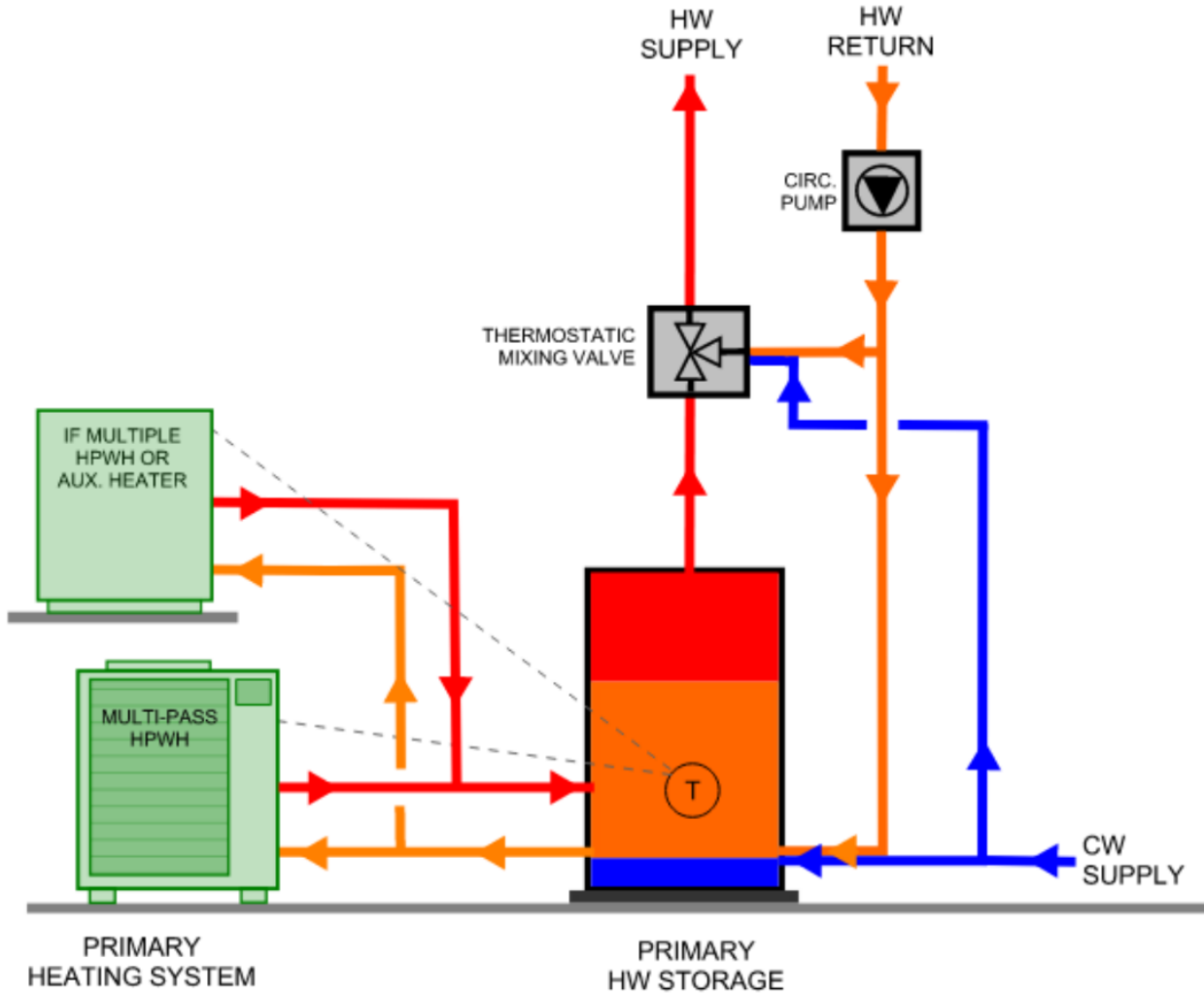
Piping Configuration 3: Single-Pass with Swing Tank



Piping Configuration 4: Single-Pass Parallel Loop Tank



Piping Configuration 5: Multi-Pass with Return to Primary



Component Requirements for Commercial Central HPWHs

Component	Metric	V1 Requirements
HP Unit	WHEELER	$WHEELER_{SP} \geq 7$
		$WHEELER_{MP} \geq 5$
	WHEELER _c	$WHEELER_{SPC} \geq 5$
		$WHEELER_{MPC} \geq 3.75$
	COP _{Hk}	$COP_{H95} \geq 3.25$
		$COP_{H68} \geq 2.5$
		$COP_{H47} \geq 2.0$
		$COP_{H35} \geq 1.75$
		$COP_{H17} \geq 1.5$
	$COP_{H5} \geq 1.25$	

Component Requirements for Commercial Central HPWHs (continued)

Component	Metric	V1 Requirements
Electric and Gas Fired Storage Backup Tanks	Maximum Standby Loss	$SL \leq 0.84 \times [(Input\ Rate / 800) + 110 \times (Volume_r)^{1/2}]$
Unfired Tank(s)		$SL \leq 0.84 \times 110 \times (Volume_r)^{1/2}$
Internal Pump	Circulator Energy Index	$CEI \geq 1.0$

Rationale

- The proposed values can be met by most HP units on the market.
- COPs were derived from an analysis of units listed on the AWHS QPL.
- WHEERs come from preliminary lab testing related to the test method development.
- Standby loss requirements are based on ENERGY STAR requirements for commercial gas storage water heaters.
 - Unfired tanks assumed to have an input rate of zero.

The EPA welcomes feedback specifically on the use of WHEER as a seasonal metric and the proposed standby loss requirements.

Additional Reporting Requirements

- All refrigerants used in the HPWH unit, and their charge.
- Demand flexibility:
 - AHRI 1530 compliance;
 - Ability to store time of use utility rates and control based on them; or
 - Other demand flexibility functions.
 - Optional reporting of fault detection and display, performance reporting, energy savings reported, and predictive maintenance alerts.

The EPA welcomes feedback about additional features purchasers may be interested in.

Verification

- Considering adjustments to the usual verification test procedures to accommodate the uniqueness of central HPWH systems

The EPA welcomes discussion about appropriate verification procedures for certified products.

Effective Date

New specifications are effective once they are finalized, and products may be certified to them immediately.

- In cases such as this with new partners and new test methods, it typically takes some time for laboratories to gain accreditation, companies to conduct testing, and CBs to prepare to certify models.
- As the specification nears completion, the EPA will work with interested labs and CBs to minimize the delay.
- The EPA will provide a transition period before removing currently certified Commercial HPWHs from the qualified product list under the Commercial WH Version 2 specification.

Webinar Wrap-up and Comment Deadline

- EPA appreciates the opportunity to discuss the Version 1.0 Draft 1 proposal with stakeholders today
- Comments are due on **February 13, 2025**
 - Please send all comments to: HVAC@energystar.gov
 - Unless commenters indicate that written feedback is confidential, all comments will be posted to the [Commercial Heat Pump Water Heaters Version 1.0](#) product development page.

Timeline

Event	Date
Draft 1 Version 1.0 Specification	January 15, 2025
Draft 1 Version 1.0 Webinar	January 29, 2025
Draft 1 Comments Due	February 13, 2025
<i>Release Subsequent Drafts</i>	<i>Q2-Q3 2025</i>
<i>Publish Final Version 1.0 Specification (effective immediately)</i>	<i>Q4 2025</i>

Open Discussion



Thank you!