

## TECH HPWH Central MF HPWH Control and Communication Requirements

### Version 1.0 (February 7, 2024)

1. Application of these TECH HPWH Central MF Control and Communication Requirements (CCR)
  - 1.1. The CCR document version that is in place *at the time of project reservation approval* are the requirements that are enforced for that project. Future updated versions of the CCR may be put into place. Those future updated versions will be the basis of requirements for *any reservations approved after* that updated version is made effective.
2. Alignment with Ecosizer TECH HPWH Incentive Calculations
  - 2.1. Systems should perform a Basic or Advanced Load-Up Event of at least 1 hour prior to the Shed Event. The Load-Up shall be conducted during the lowest-GHG hours, which are typically 10am-4pm. The Load-Up event should be conducted during low TOU rate periods.
  - 2.2. Systems should perform a Shed Event during the highest-GHG hours, which are typically between 4pm-11pm. Shed Events may be conducted during additional time periods. Shed Events should be conducted during the high TOU rate periods.
  - 2.3. Systems should be in a Normal Event outside of Load-Up or Shed Events
  - 2.4. Systems shall be programmed to align with these load shift events at the time of system installation.
  - 2.5. At Incentive Claim, participants must submit system schematics noting the specific tank and system location of all temperature sensors and/or aquastats used for Load-Up and Shed Events. Unitary HPWH systems that are used for smaller Central MF applications *and* are JA-13 certified are exempt from this requirement.
  - 2.6. At Incentive Claim, participants must submit a narrative description of Load-Up and Shed Control Logic/Sequence of Operations on the system schematics. Unitary HPWH systems that are used for smaller Central MF applications *and* are JA-13 certified can provide evidence that they are set up to follow a TOU optimization schedule per the following article: <https://frontierenergy-tech.my.site.com/contractorsupport/s/article/Heat-Pump-Water-Heater-Install-Requirements>
3. Two-Way Communication
  - 3.1. All systems shall be capable of receiving remote (off-site) Load-Up, Shed, and Normal requests, in accordance with EcoPort definitions (as defined by CTA-2045b). See Appendix A for a full list of commands and associated definitions.
  - 3.2. Remote connectivity and receipt of commands should be via CTA-2045/EcoPort devices wherever possible. Alternative equivalent communication devices besides CTA-2045/EcoPort devices are permissible for the time being, subject to change.
  - 3.3. Systems shall be capable of storing and reporting data remotely (off-site) in accordance with Section 4. Unitary HPWH systems that are used for smaller Central MF applications *and* are JA-13 certified are exempt from this requirement.
4. External Data Reporting and Storage Requirements
  - 4.1. Unitary HPWH systems that are used for smaller Central MF applications *and* are JA-13 certified are exempt from the following requirements.
  - 4.2. It is required that systems have the following additional power sensors on all water heating devices including HPWHs and electric resistance heaters. See Figure 1 as an example. Data shall be collected at 1-minute increments.
    - 4.2.1. Current transducers and/or power meters:  $\pm 1\%$  accuracy, equipment amperage must not be less than 10% of current transducer rating.

- 4.2.1.1. Current transducers are required on all major equipment<sup>1</sup> for current measurement. Power may be calculated from current using standard line voltage and power factor of 1. Alternatively, a power meter may be used to measure voltage with current transducers to account for power factors less than 1<sup>2</sup>.
- 4.2.1.2. Multiple components may be grouped on a single set of current transducers or power meter.
- 4.3. Systems shall store and report their operating mode (heat pump only, hybrid, other) and temperature/aquastat setpoint at 5-minute or less increments, where feasible.
- 4.4. It is recommended, but not required, that systems have the following additional sensors and associated data records. See Figure 1 as an example.
  - 4.4.1. Temperature Sensors:  $\pm 1.0^{\circ}\text{F}$  tolerance
    - 4.4.1.1. Temperature sensors may be direct immersion, placed in thermowells, or strapped to pipe under insulation. Temperature sensors in thermowells and strapped to pipe must be installed using thermal paste in such a way to minimize errors.
    - 4.4.1.2. Temperature sensor used to record ambient conditions (shown as T4) must be installed in the space from which the HPWH pulls air – outdoors or in a buffer space. If the HPWH is installed outdoors, NOAA data may be used instead of a temperature sensor.
  - 4.4.2. Flow rate sensors / water meters:  $\pm 2\%$  accuracy at minimum and maximum flow rates.
  - 4.4.3. BTU meters may be used in place of a flow meter and two temperature sensors where appropriate so long as accuracy of temperature sensor and flow sensor complies.
- 4.5. Data shall be logged and stored remotely via the two-way communication device
- 4.6. All data shall be uploaded to a centralized database. Data shall be uploaded at least every 3 months and shall continue for at least 24 months from the time of installation, unless otherwise notified by the program. A user-account for the online centralized database will be provided to the Data Provider point of contact described below at the time of Incentive Claim.
- 4.7. The primary contact information for the project's Data Provider shall be supplied to the program at the time of incentive claim, to allow for any follow-up questions, requests, and/or other related data correspondence. This will include Contact Name, Job Title, Company, Email Address, and Phone Number for the person responsible for project data monitoring and submission of quarterly data. This could be the equipment manufacturer, control manufacturer, installation contractor, third party consultant, property staff, or other.
- 4.8. The data file format for submission will be .CSV. The maximum file size per upload will be limited to 25MB. Files may be submitted in a compressed format for faster upload speeds and larger file submissions so long as the compressed file size does not exceed 25MB. Acceptable compressed file formats are .ZIP, GZIP, or .BZIP2.
- 4.9. That Data Provider shall format their report so that it includes all meter and sensor data recorded for the Project. This report should display the readings in their original units, basis and frequency as they were recorded. The fields reported may be more granular than those listed above for more complex systems.
- 4.10. Each entry in the report must include at a minimum:
  - The "TECH Claim ID", which is the TECH incentive claim number assigned to the project that the meter or sensor is associated with.
  - The recorded/measured value of the reading
  - The Unit of Measure for the reading
- 4.11. The reports shall include the Fields shown in Table 1. Files shall be submitted with a header row that matches the Field Names and order as listed below in Table 1. The numbering or naming for each

<sup>1</sup> Major equipment is considered anything that draws over 1 kW. Recirculation pumps typically draw 200W and less and are not considered major equipment.

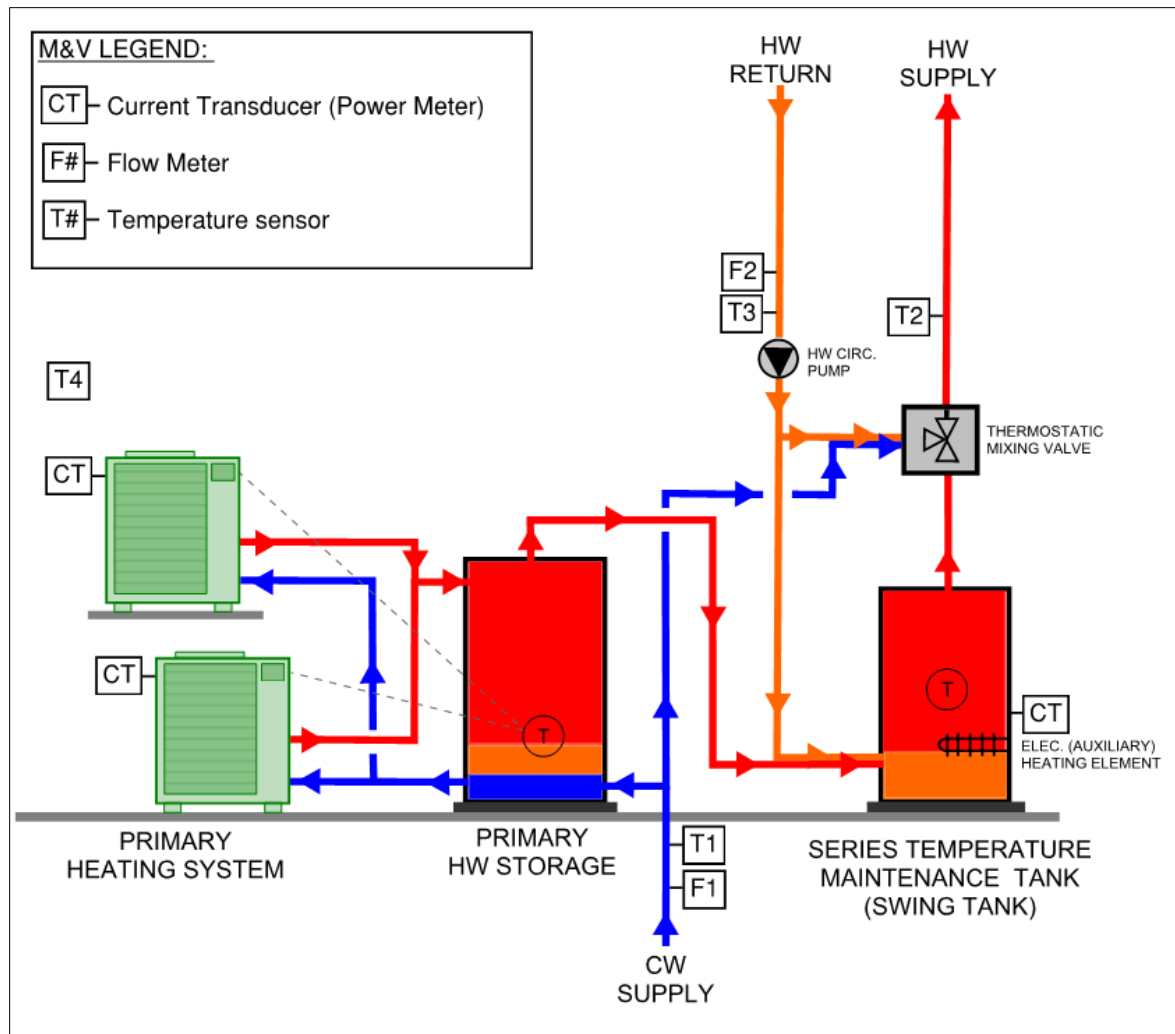
<sup>2</sup> If actual power factor is less than one, assuming a power factor of 1 will increase calculated power draw, and decrease calculated system COP. A power meter is recommended to account for decreases in COP from power factor.

unit, temperature, flow, and heat should match the metering plan. The header row should start in cell A1 and the Entry rows should start in cell A2. All Entries must be normalized to 15-minute intervals.

**Table 1: File Format for Data Report**

Field No.	Field Name	Data Type	Units	Required or Optional
1	TECH Claim ID	VarChar(18)		Required
2	Date & Timestamp	VarChar(19)	YYYY-MM-DD HH:MM:SS	Required
3	Month of Data Reporting	Int (2)		Required
4	Unit 1 Energy Consumed (Interval)	VarChar(8,3)	kWh	Required
5	Unit 1 Energy Consumed (Cumulative)	Num(15,3)	kWh	Required
6	Unit 1 Power Consumed	Num(15,3)	kW	Required
Duplicate Rows 4-6 as appropriate for Each Metered temperature, flow, and/or heat point				
7	Operating Mode	VarChar(18)		Required
8	Temperature 1 (Average)	Num(3,2)	Deg F	Optional
9	Flow 1 (Interval)	Num(12,3)	Gallons	Optional
10	Flow 1 (Cumulative)	Num(12,3)	Gallons	Optional
11	Heat 1 (Interval)	Num(12,3)	BTU	Optional
12	Heat 1 (Cumulative)	Num(12,3)	BTU	Optional
Duplicate Rows 8-12 as appropriate for Each Metered temperature, flow, and/or heat point				

**Figure 1: Example Measurement Locations**



Source: NEEA Advanced Water Heating Specification Version 8.0

## Appendix A. Management with CTA-2045-B (Aligns with JA13)

Function	CTA-2045-B Message	CTA- 2045-A Reference	Usage and Purpose
General Curtailment (Shed/Light Shed)	Shed (request) and Light Shed (request) and Basic Application ACK (response) Messages	Table 8-2	General curtailment directs the water heater to avoid using energy that the device otherwise would have used under normal operating conditions by using stored thermal energy in the tank to supplement. For heat pump water heaters and electric water heaters with resistive elements, the water heater shall avoid use of resistance elements during and immediately after the event unless user needs cannot be met. The water heater shall respond with an application "Acknowledge (ACK)," verifying receipt and support of the request.
Critical Curtailment (Deep Shed)	Critical Peak Event (request) (aka Deep Shed) and Basic Application ACK (response) Messages	Table 8-2	Critical curtailment directs the water heater to avoid using energy that the device would have used under normal operating conditions by using stored thermal energy in the tank to supplement up to a lower depleted level than for General Curtailment. For heat pump water heaters and electric water heaters with resistive elements, the electric resistance element may not be used. Heat pump-only operation is allowed. The water heater shall respond with an application "Acknowledge (ACK)," verifying receipt and support of the request.
Off Mode (Grid Emergency)	Grid Emergency (request) Full Shed/Off and Basic Application ACK (response) Messages	Table 8-2	Grid emergency directs the water heater to immediately, stop using energy for water heating when it is safe to do so. The water heater shall respond with an application "Acknowledge (ACK)," verifying receipt and support of the request.
Basic Load-Up	Basic Load-Up (request) and Basic Application ACK (response) Messages	Table 8-2	Basic Load-Up directs the water heater to use and/or store additional thermal energy that the device would not have used/stored under normal operation. Basic Load-Up allows the stored thermal energy to increase, within safety parameters set by the manufacturer, up to user set point.
Advanced Load-Up	Advanced Load-Up (request) and Basic Application ACK (response) Messages	Table 9-2	Advanced Load-Up directs the water heater to use and/or store additional thermal energy that the device would not have used/stored under normal operation. Advanced Load-Up allows the stored thermal energy to increase, within safety parameters set by the manufacturer, beyond user set point. This solution can leverage mixing valve technology.
Return to Normal Operation	End Shed/Run Normal Operation (request) and Basic Application ACK (response) Messages	Table 8-2	In the event an ongoing event is cancelled for any reason, the water heater shall return to normal operation. The water heater shall respond with an application "Acknowledge (ACK)," verifying receipt and support of the request resuming Run Normal operation.
Customer Override	Customer Override Message (initiated by the water heater) and Basic Application ACK Messages	Table 8-2	Customer override is sent by the water heater to notify that a customer override has occurred. Note: in accordance with the CTA-2045-A standard, the water heater shall send this message when override is first initiated and following incoming energy management messages while override is in effect.

Source: NEEA Advanced Water Heating Specification Version 8.0