

Heat Pump Water Heater Monitoring and Verification for Utility Rebate Programs

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Introduction

This poster presents an option to evaluate heat pump water heater energy usage in a residential application. Heat pump water heaters are the latest in water heating technology. Because of the promise of up to 62% energy savings over electric resistance water heating, they are a prime candidate for the next generation utility rebate programs. They do however raise special issues for monitoring and verification. Electrical energy, water flow, water temperature (input and output), as well as ambient air temperature and relative humidity are the key components to perform an effective evaluation of a heat pump water heater upgrade. Another important factor of data collection is logging season. Hot water usage as well as input water temperature and ambient air temperature will also vary by season.

This poster focuses on the replacement of a standard 50-gallon electric resistance water heater with a General Electric hybrid electric water heater model GEH50DNSRSA. Usage data was collected one month prior to replacement to serve as a baseline for this study. During replacement a water flow meter, temperature probes on input and output, kWh transducer, as well as ambient air temperature/relative humidity sensors were installed. Data is collected at 5-minute intervals to a logger that is connected to the internet.

The GE hybrid electric water heater has 3 modes, hybrid, eHeat, and electric resistance. The standard mode is hybrid which includes both heat-pump and electric resistance depending on demand. The most efficient mode is eHeat which is completely heat-pump however it takes the longest time heat the water. Smaller households could take advantage of eHeat mode, but larger households would be best with hybrid mode. This poster compares the energy consumption between all three modes during various seasons. This poster is intended to help utilities with their M&V planning and application for heat pump water heater programs.

HPWH M&V Best Practices

- 1) **BASELINE ENERGY USE:** Most HPWH can be run in a standard electric hot water heater mode. Take readings while the unit is in this mode to establish a baseline for energy savings. This baseline can be substantially different than test ratings.
- 2) **WATER USE:** As installed Energy Factors (EF) (COP) vary with hot water use, always take measurements of water flow.
- 3) **DEHUMIDIFICATION:** Where possible, measure the condensate form the HPWH to establish the dehumidification benefits.