2015 Hot Water Forum

NEEA's HPWH DR & ES Field Study

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DR & ES Field Research Project

The project tested the ability to both decrease and increase water heater electric loads and store energy in response to a communication signal—all without affecting the quality of water heating service as perceived by the end-user.

- 2-month period during winter of 2013 / 2014
- 20 households (10 existing installations, 10 new)
- GE 50-gallon Geospring HPWHs
- Tempering valves & flow meters in the 10 new installations
- Control through GE cloud server, altering tank setpoint
- 1-minute data collection
  - Power
  - Hot water outlet temperature

Primary Findings

- HPWHs:
  - can be controlled in a such a way as to reduce peak demand and to take advantage of the inherent storage capacity of hot water
  - inherently reduce demand significantly when operated in the compressor mode
  - may not lose efficiency when in the high temperature energy storage mode
  - inherently store less energy in compressor mode
- Thoroughly reliable 2-way communication with and control of the water heaters is essential.

Other Findings

- Two-way communication with the HPWHs can diagnose many operational problems.
- Many homeowners don't understand the modes on their HPWHs.
  - Homeowners should be able to override the program but may not know how.
- HPWH storage volume, setpoint temperature capabilities, and mode management will impact energy efficiency/savings
- Mode management optimization research and testing / certification protocols are still needed.

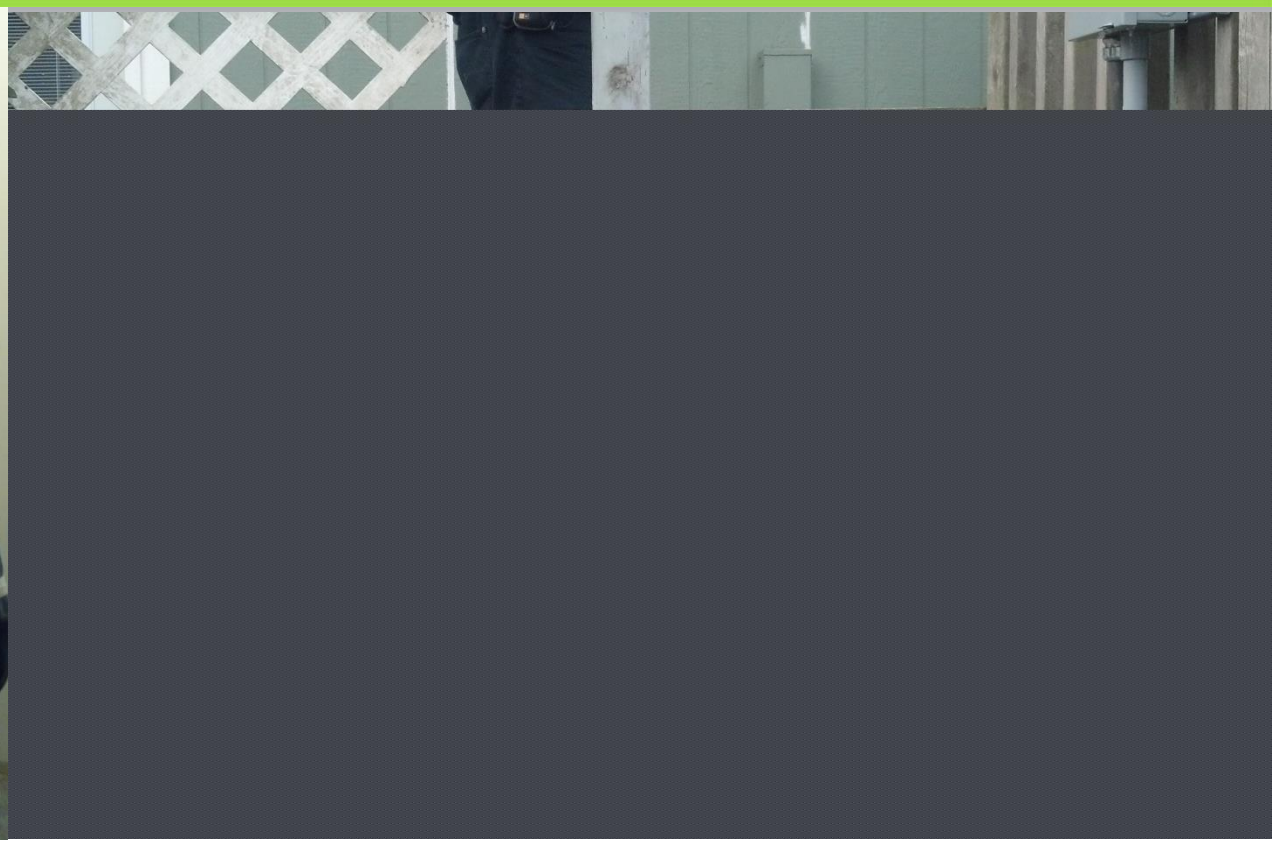
Control

- Demand response tested by reducing target tank temperature during host utility peak hours, 2 hours in the morning, 3 hours in the evening
- Energy storage tested by raising tank setpoint during night-time hours to “charge” the tank in anticipation of morning hot water usage

Issues

- Internet connections less than reliable
- Control through GE cloud had shortcomings
  - Limited control over the water heater
  - No way to verify that control signal received
  - No way to verify water heater mode, setpoint
  - Commands issued on a schedule
  - Water heater model changes
- Some participants attributed *any* problems or degradation of service to the project

Newer Technologies



15kBtu/hr capacity, 150F storage

Management of Combined Systems

Demand Response & Energy Storage, PLUS:

- All-climate (from air as cold as -15F)
- The Right Refrigerant (R-744)
- Very High Efficiency (COP 3.5+)
- High temperature water capability (195F)
- Larger storage volumes
- Little or no impact on indoor environment

Questions or Comments

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