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Smart Water Heaters

Ashley Armstrong
CEC Load Management Rulemaking
The Water Heater Advantage

• Low Interruption Annoyance
  – In comparison to most other appliances, lower likelihood that consumer will notice water heater is turned off unless cold water event

• Time Adjustable Power Usage
  – Re-heating of a tank can be done in off peak time
  – Load balancing
  – Reduces the need for spinning reserves

• Energy Storage Device
  – Possibility of loading up the tank (with the addition of a temperature limiting device)
  – Accommodates alternate power generation (renewables)
Layers for Connectivity

- CTA-2045 Connection to 3rd Party
  - Supports OpenADR, Climate Talk, Smart Energy Profile
- OpenADR via A.O. Smith Wi-Fi/BT
  - AO Smith Virtual End Node (VEN)
  - OpenADR to CTA-2045 commands
- Time-of-Use Pricing
  - Local pricing schedule
  - No connectivity required
  - Thermal management based on price
Basic Demand Response Control

- Shed Load / Critical Peak
  - Turn off until energy in tank too low to satisfy customer
- Load-up
  - Top-off heater to set temperature
- Grid Emergency
  - Heater off

ANSI/CTA Standard

Modular Communications Interface for Energy Management

ANSI/CTA-2045-A

March 2018
BPA CTA-2045 Water Heater Demonstration

• 2 Primary Objectives

• **Run DR Events:** Recruit and install communications on residential CTA-2045-equipped water heaters, followed by running a set of demand response events from winter through summer season.

• **Create a market transformation plan and a business case to justify the cost:** The project was initiated because BPA anticipated if market transformation caused every water heater purchased in the next 15 years to be a CTA-2045-equipped water heater, then BPA could create a large cost-effective demand response resource that could be used on a daily basis.

CTA-2045 Water Heater Demonstration Report

Including

A Business Case for CTA-2045 Market Transformation

*BPA Technology Innovation Project 336*

November 9, 2018
Smart Water Heater Activities

Need for Harmonization

- States are Adopting Demand Response Requirements for Water Heaters
  - Washington State (HB 1444) and Oregon
  - California (JA13) Title 24 Alternative Compliance Measure for New Residential Construction
- ENERGY STAR Connected Water Heater Specification and Test Procedure in development
- NEEA (Northwest Energy Efficiency Alliance) Advanced Water Heating Specification
  - Version 7.0 of Tier 3 and above includes CTA-2045 requirement
- AHRI 1430 – Standard for Demand Response Electric and Heat Pump Water Heaters in development
A. O. Smith’s HPWH with iCOMM Smart Connectivity

- Wi-Fi and Bluetooth capable
- Includes Leak Sensor and Reporting
- Free A. O. Smith app
  - Control temperature and mode
  - Monitor water heater status
  - Fault and Maintenance notifications
- California Title 24 – JA13 Compliant
  - Easily load utility Time of Use rates
  - Demand Response: OpenADR 2.0b VEN certified
- Factory Installed
  - Also available as an accessory kit. Backwards compatible on all series 130 heat pumps.
IoT Controls

Notifications

Low battery warning
May 10, 2020 | 4:30 PM

Water Leak Detected
May 10, 2020 | 4:30 PM

115°F

Mode: Efficiency

116
117
118
119

120°F

121
122
123
124

Save Temperature

Efficiency

Hybrid
Electric
Vacation (60°F)

Operating Mode
Utility Time of Use Rates

• Easily load ToU rates by utility name or zip code
Utility Demand Response

• OpenADR 2.0b VEN certified
Smart Water Heaters – What’s Needed?

• Move to Sustained Large Scale Deployments
• Stick to Uniform National Standard(s) – CTA 2045 preferred
• Avoid Custom One-off DR Integrations
• Make it Worth Consumers’ Effort to Participate in the Program
  – Properly Structured Incentives and Rate Tiers
• Ratepayer Satisfaction with the Program is Critical
  – Minimal no Hot Water Events and Show the Savings Realized
Thank You!

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