



TIP 272a: EPRI P170 Supplemental: CTA 2045 Standard Modular Communications Interface for Demand Response

Context

The Consumers Technology Association (CTA) has released a new standard for a modular communication interface for demand response. The ANSI/CTA-2045 Modular Communication Interface Standard defines a port/plug that enables off-the-shelf consumer products to be compatible with multiple utility demand response systems through utility provided customer-installable plug-in communication modules.

Prior EPRI projects, in collaboration with several appliance manufacturers, retail electric utilities, and other constituents, have contributed to the development and evaluation of this standard by conducting laboratory interoperability demonstrations. Those projects found the standard to be sufficiently complete and capable of achieving the intended goals.

Description

This supplemental project was designed to provide utilities a means of working together in a coordinated fashion to test the concepts behind the standard in field deployments and under actual demand response program requirements.

The project set out to determine if the CTA-2045 standard can deliver on its intended purposes:

- To enable a standard product design to be compatible with any communication technology and to work in DR programs everywhere
- To enable a communication module to work on any end use device

The Bonneville Power Administration (BPA) participated in the Electric Power Research Institute (EPRI) supplemental project, which was a field demonstration of 2-way communication from utility dispatch server to end use appliances. BPA's technology was heat pump water heaters (HPWH).

10 demand-response enabled HPWH were distributed in the Coos-Curry Electric Cooperative Service Territory (on the Oregon Coast) to utility friends and family. Volunteers received a 50 gallon AO Smith heat pump water heater for use in their homes. These water heaters had firmware to enable them to respond to a variety of demand response commands.

In return, these households participated in demand response events, using a manufacturer-supplied adapter to translate from the proprietary language in the water heater to CTA (formerly CEA) 2045 open source demand

response commands. A communication device manufactured by e-radio received events (designed by BPA) to them via radio using FM RDS. The houses had their water heater energy usage logged using on-site interval meters, in addition to the backhaul information reported by the water heater via WiFi the e-Radio interface.

The project was fully installed and operational Sept 1, 2016. The team ran DR events from Oct 2016 – April 2017. After the units are deployed in the field, which included 10 HPWH units in BPA territory, EPRI monitored communications across the CTA-2045 communication port using an instrumentation packaged developed specifically for this purpose. The data collected throughout the field demonstration was used to evaluate the CTA-2045 standard. Another aspect of the CTA-2045 interface that was evaluated is its self-install capability, or “ease of installation.”

Benefits

With the success and wide adoption of the CTA-2045 standard, BPA benefits by ultimately having all water heaters DR capable with an off-the-shelf technology compatible with a broad range of demand response systems. This would enable equipped appliances (first water heaters, and later other equipment) to be able to participate in a large scale DR program offers when needed. The alternative, as implemented today, requires more cumbersome recruiting, and custom control equipment and communication protocols (different for each controls manufacturer) installed on site by contractors.

Achievements

The objectives achieved by this pilot study were:

1. Test acceptance to build CEA 2045 port by equipment manufacturers
2. Test acceptance to build CEA 2045 port by communication module manufacturers.
3. Test execution of DR Event commands:
 - a. Equipment load curtailment as requested
 - b. Information passed back to dispatch server

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Project Start Date: September 9, 2013

Project End Date: December 31, 2018

Reports, References, Links

Study results are available through EPRI

Funding

BPA EPRI Membership

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Participating Organizations

Electric Power Research Institute (EPRI)

Portland General Electric, (PGE)

Tennessee Valley Authority (TVA)

American Electric Power (AEP)

Southern Company

Duke Energy

Electricite de France (EdF)

Hawaiian Electric

Hydro One

National Grid

Southern California Edison (SCE)

SMUD

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Conclusions:

The study's sample sizes are very small, but these initial results are promising. This technology merits further study – ideally with a larger sample size and more events to refine these numbers.