DR10SCE1.16.03: DEMAND RESPONSE POTENTIAL OF RESIDENTIAL APPLIANCES: DISHWASHER

OPPORTUNITY

Test and evaluate the capabilities of a Demand Response (DR) enabled Energy Star-compliant dishwasher.

The main objectives of the project were to:

- Quantify the DR potential for dishwasher A and characterize its response to DR signals under varying operational scenarios
- Acquire the power profile data of dishwasher A under various operational settings
- Quantify the demand reduction potential for dishwasher A
- Characterize the response of dishwasher A to DR signals under varying operational scenarios

TECHNOLOGY

What is the next step in improving dishwasher energy use? The inclusion of smart components for greater control.

Demand Response is a resource that allows end-use electric customers to reduce their electricity usage in a given time period, or shift that usage to another time period, in response to a price signal, a financial incentive, an environmental condition or a reliability signal. Demand response saves ratepayers money by lowering peak time energy usage, which are high-priced. A smart appliance is a product that uses electricity for its main power source which has the capability to receive, interpret and act on a signal received from a utility, third party energy service provider or home energy management device, and automatically adjust its operation depending on both the signal's contents and settings from the consumer. To achieve DR goals, dishwasher could either delay its operating wash mode or eliminate an enhanced heated dry mode.

Figure 1 Dishwasher A

Approach

Where did Measurement and Verification occur?

The objectives of the testing were to quantify the DR potential for dishwasher A and characterize its response to DR signals under varying operational scenarios. The project included two types of tests:

- Acquire the power profile data of dishwasher A under various operational settings
- Quantify the demand reduction potential for dishwasher A
- Characterize the response of dishwasher A to DR signals under varying operational scenarios

RESULTS

How did the DR-Capable dishwasher perform delaying wash mode or heated dry?

Critical Event

The dishwasher can reduce wattage by over 50% during the heated dry cycle.

In response to a critical event, the dishwasher responds as with the high event, but also has the capacity to reduce average wattage during its heated dry cycle. Specifically, it can reduce wattage by well over 50% by deactivating the electric heating elements, but only during the heated dry cycle.

High Event

The dishwasher has potential to avoid peak demand of roughly 1kW

The dishwasher responds to a high price signal by delaying the start of a new wash mode during the DR event; the dishwasher does not change a wash mode already in progress. When the duration of the DR event was longer than a user-input delay start mode enhancement, the DR event took priority.