RESIDENTIAL BATTERY ENERGY STORAGE:
Demand Response Opportunities with OpenADR 2.0b

OPPORTUNITY

What was the opportunity?

Electric utilities are exploring opportunities to leverage the potential demand response (DR) flexibility offered by energy storage systems and how customers may reduce energy costs and benefit from these grid service offerings.

The Electric Power Research Institute (EPRI) conducted preliminary testing in a laboratory environment and testing at one field site to determine the feasibility of communicating standardized DR signaling via the open automated DR communications standard (OpenADR 2.0b) with residential, behind-the-meter (BTM) battery energy storage systems (BESS).

The project demonstrated successful application of the OpenADR 2.0b communication protocol standard to send and receive load dispatch signals to manage flexibility from an OpenADR certified energy storage system.

TECHNOLOGY

What type of technology was evaluated?

OpenADR standardizes the message format used for Auto-DR so that dynamic price and reliability signals can be delivered in a uniform and interoperable fashion among utilities, ISOs, and energy management systems.

A standard Demand Response server using OpenADR 2.0b was used to communicate with integrating software and hardware to communicate with the Battery Management System and BESS. In this figure the DR Server would represent signals from the utility or the ISO.
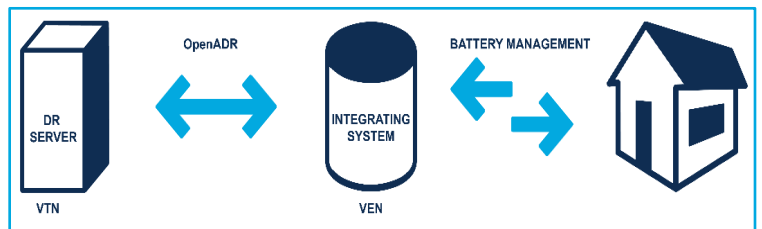

Figure 1. OpenADR Server/Integration System

EVALUATION

How was the technology evaluated?

The laboratory testing looked at several basic BESS control functions: 1) Charge; 2) Discharge; 3) Hold; and 4) Returning to normal operations. The testing also collected time stamps of charging times and kW values.

FINDINGS

What were the major findings from this evaluation?

- The DR server was able to send signals to an interface device then to the BESS controls.
- Signals were successfully sent under all conditions and the BESS was able to charge discharge, hold and return to normal operation as shown in the graph below. The yellow line shows the battery discharging 1kW and later the BES is charging 1kW and then resuming normal control.
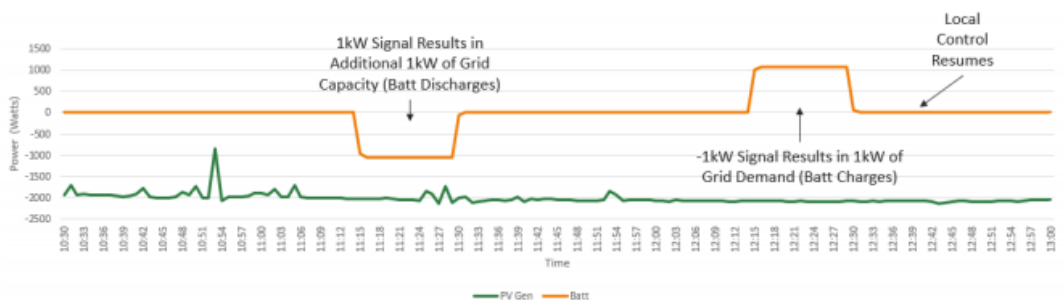

Figure 2. Typical Testing Results

RECOMMENDATIONS

What were the recommendations from this evaluation?

The research performed and testing conducted as part of this effort all confirm that OpenADR 2.0b communication standard can be used to manage residential battery energy storage assets. However, BESS controls will need some integration to OpenADR until plug and play systems enter the market. Aggregating BESS assets in future tests may provide additional insights into the potential complications when controlling multiple assets simultaneously, which may or may not directly relate to the use of OpenADR 2.0b for communication.