



TIP 308: Demonstration of Demand Response Solutions for RTU and Lighting Retrofits

Context

BPA experiences significant demand from commercial building HVAC, lighting, miscellaneous electric loads (MELs), and electric hot water heaters. Consequently, BPA could add significant ancillary services by controlling these end-use assets through communication with a building management system (BMS) customized to BPA's demand response (DR) criteria.

BPA and BPA member utilities currently provide aggressive incentives from an energy efficiency (EE) perspective for Roof Top Units (RTUs), lighting, and electric water heating, and may soon become available for the new wireless plug load strips to control MELs. Yet there have been few demonstrations to evaluate the ability to leverage these end-uses as DR assets, and none to date that have packaged these end uses into a single, turnkey DR investment.

Description

The project will demonstrate Transformative Wave Technology's (TWT) eIQ Building Management System (BMS) to reliably control multiple commercial building assets year round. The eIQ BMS will be evaluated as a part of a turnkey, single investment solution that includes all the necessary hardware and software

Through six separate proof-of-concept retail pilots, NREL and TWT will quantify the DR performance of the eIQ BMS for each end-use; HVAC, lighting, MELs, and electric hot water heaters. The final report will also compare the cost effectiveness and scalability of this single investment across multiple building portfolios against pumped storage or new/existing turbines.

The project has four phases. The first phase establishes the communication protocols and DR control algorithms for each end-use asset, conforming to accepted standards such as OpenADR. The second phase will be the installation into all five pilot stores. The third phase will test and evaluate the DR control algorithms. The fourth and final phase will be a full demonstration year.

For the demonstration, NREL and TWT will install the eIQ BMS and the hardware/software for controlling lighting, MELs, and hot water heaters at six retail locations. A DR control strategy will be developed for each end-use asset based on BPA's DR criteria—day-ahead requests, response times within 10 minutes to increase or decrease loads, and permanent load shifting.

They will work with the business owners to develop the operational requirements of each asset. During the demonstration, NREL and TWT will vet the control strategies to determine how to maximize DR without deviating from the operational requirements. For example, the lighting serving a retail space will be evaluated on how much the lighting can be dimmed while still meeting the vertical foot-candle illuminance requirements (ie 50 foot-candle at 3 feet off the floor) per the owner's requirements.

At the end of the demonstration period, NREL will quantify the DR potential of controlling each commercial building asset at all six demonstration locations. Then using the known installed costs, NREL will evaluate the feasibility, scalability, DR potential, and programmatic requirements for BPA to incentivize a BMS that can deliver DR and EE through multiple commercial building assets packaged in a single, turnkey investment.

Why It Matters

BPA has identified the need for a single investment that provides, "both valuable and low cost solutions for BPA, benefits to local utilities, potential capital deferral benefits to BPA ... and/or EE benefits." TWT's eIQ and CATALYST system has proven its marketability as an EE product and is now looking toward encompassing DR assets. Companies with large building portfolios (Whole Foods, Rite Aid) as well as energy service companies (ESCOs) are working with TWT because they see the eIQ and CATALYST systems as a "go-to" retrofit measure to reduce RTU energy usage.

By acting upon this demonstration, BPA gains the opportunity to influence a combined EE and DR solution that is effective in the Pacific Northwest

Goals and Objectives

NREL and TWT's goal is to demonstrate the applicability of a single investment that uses the eIQ BMS to control RTU, lighting, MELs, and hot water heaters according to BPA's DR criteria.

The project objective is to leverage the EE cost effectiveness to meet a six year simple payback without utility incentives to provide a path to market for a comprehensive BPA customized DR solution.

TIP 308: Demonstration of Demand Response Solutions for RTU and Lighting Retrofits

Project Start Date: December 1, 2013

Project End Date: September 30, 2015

Funding

Total Project Cost: \$918,400

BPA Share: \$459,000

External Share: \$459,000

BPA FY2015 Budget: \$155,272

Reports & References (Optional)

Links (Optional)

For More Information Contact:

BPA Project Manager:

Janice Peterson, jcpeterson@bpa.gov

Participating Organizations

National Renewable Energy Laboratory:
Electricity, Resources, and Building Systems
Integration Center (ERBSIC) Commercial Buildings group

Transformative Wave Technologies

