Clean Energy & Transactive Campus

CHALLENGE

Vast opportunities for improved reliability, consumer benefits, and energy efficiency exist at the buildings-to-grid nexus. Realizing those benefits, however, requires research, development, and testing of transactive controls for energy management. Greater understanding and implementation of transactive controls at the single building, single campus, multi-campus, and community microgrid scale will help lead to a more reliable, resilient grid.

On PNNL's campus, the Building Operations Control Center tracks building energy use and serves as the "nerve center" for the multi-campus project.

APPROACH

Pacific Northwest National Laboratory (PNNL) is leading a three-site project with Washington State University (WSU) and the University of Washington (UW). This is the first time researchers will test the use of demand-side transactive controls ("behind the meter") at this scale, involving multiple buildings and devices. Primary activities at each campus include the following:

- PNNL – multi-campus network operations; transactive campus/building response applications; transactive/advanced buildings controls testbed
- WSU – microgrids as a resilience resource/smart city; solar and battery in microgrid operations; flexible loads; thermal storage
- UW – energy efficiency applications, leveraging transactive network; smart solar inverter integration with distribution; transactive grid controls.

Another key objective is the establishment of a transactive energy system testbed. The partners will examine how the testbed can be operated as both a flexibility resource to help manage electricity loads and bring intermittent renewable energy onto the power grid, and as a platform for future research and development in the emerging buildings-grid discipline. A second phase of this project expands to new partners Case Western Reserve University and the University of Toledo in 2017.

At-A-Glance

PROJECT LEAD

- **Srinivas Katipamula**
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PARTNERS

- Washington State University
- University of Washington
- Case Western Reserve University
- University of Toledo

TECHNOLOGY

- VOLTTRON™
- Transactive Controls
- Microgrids
- Smart Solar Inverter
- Energy Storage

BUDGET

$4.5 million

- $2.25 million (U.S. Department of Energy)
- $2.25 million (Washington State Clean Energy Fund)

DURATION

October 2015 – October 2017

TECHNICAL AREA

Systems Operations and Control

Lead: Jeff Dagle

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EXPECTED OUTCOMES

Using transactive controls to manage devices, data, and decision making, buildings will automatically adjust energy loads based on pre-determined criteria such as cost, essential services, and comfort levels.

Knowledge gained from this activity informs responsive load management, energy conservation, and future grid modernization decision making, regionally and nationally. This is a key step forward in achieving a more modern, efficient, and reliable power grid.

LAB TEAM

Pacific Northwest
NATIONAL LABORATORY

Launched in November 2014 under the U.S. Department of Energy's Grid Modernization Initiative, the GMLC is a strategic partnership between DOE Headquarters and the national laboratories, bringing together leading experts and resources to collaborate on national grid modernization goals. The GMLC's work is focused in **six technical areas** viewed as essential to modernization efforts:

Devices and Testing | Sensing and Measurements | Systems Operations and Control
Design and Planning | Security and Resilience | Institutional Support