



Title of Proposed Initiative:

Transactive Energy for Bilateral and Coordinated Retail Operations

Investment Areas:

- Technology Demonstration and Deployment
- Market Facilitation

Electricity System Value Chain:

- Demand-side management

Issues and Barriers:

Currently, there are no established models or business practices to support bilateral or market-based arrangements between two or more retail customers, e.g., two or more large commercial buildings for sharing utilization of their Distributed Energy Resources (DER). Establishing mechanisms to facilitate sharing of these and similar capabilities as on-site storage can enhance deployment of such technologies and their benefit to cost ratio.

Initiative Description and Purpose:

There are well established business practices and mechanisms for bulk power bilateral trading, scheduling, and utilization of energy resources, e.g., bulk generation while addressing transmission requirements and congestion. However, there are no established capabilities for scheduling and sharing distributed resource capabilities on the distribution grid or among owners of distributed resources (prosumers). With high penetrations of clean distributed energy, e.g., solar PV and the cost electric storage capabilities, it is beneficial for mechanisms to be put in place to facilitate sharing capabilities of such resources while also considering distribution grid utilization and constraints. The shared capabilities will facilitate building-to-building, microgrid-to-microgrid, or related types of transactions on the distribution grid, and also will enhance the provision of energy and reserves from building or micro-grids to the distribution and transmission grids.

The proposed Transactive Energy project provides the framework and tools, and it defines business rules for energy transactions between two or more parties or systems, while considering distribution grid and operational constraints. The business rules identify the type of transactions and associated stakeholders, in addition to defining the initiation and approval process by impacted stakeholders as well as financial elements, transactable products, applicable distribution grid charges, measurement and verification requirements, and settlements. Rules also define distribution grid-related issues associated with such transactions and the need for transmission or other grid services for transactions across two entities on different distribution circuits.

This project will establish straw-man rules for Transactive Energy at distribution grid and retail operation level, and it will develop and demonstrate Transactive Energy operation in a pilot project involving several buildings with diverse load profiles, resources, and distribution utility companies. The funding requirements for this project range from \$750,000 to \$1,500,000 USD.

Stakeholders:

The following stakeholders support the initiative:

- Commercial buildings, industrial customers, campuses, and microgrids
- Residential customers
- Distribution utilities
- Public Utilities Commission
- Transactive Energy Service Providers

Background and the State-of-the-Art:

The Department of Energy (DOE) has sponsored a number of projects in this area, including the ARRA funded Pacific Northwest Smart Grid Demonstration project led by Pacific Northwest National Laboratories (PNNL) and supporting initiatives for Building-to-Building (B-2-B) integration. These initiatives have led to conference

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publications, panel sessions, workshops, and a conference resulting in industry interest and several different models for Transactive Energy operations.

The DOE/PNNL Pacific Northwest demonstration project has increased industry awareness, though its acceptance by participating utilities has been limited due to the R&D nature of the project and the lack of alignment with regulatory frameworks.

The bilateral trading and scheduling model has been successfully in use in wholesale operations with energy tagging, transmission capacity reservations, and transmission congestion management, along with the tag and reservation approval process by all impacted stakeholders. Thus, it acts as a good reference model for similar concepts in distribution and retail operation. Lessons learned from over 17 years of successful bulk power operations in this area can be applied to the retail space.

As indicated above, DOE has an on-going research initiative for Transactive Energy.

Justification:

The proposed initiative will allow for minimizing costs associated with variable load with high demand periods and variable on-site generation resources for consumers with demand charges or who might become subject to balancing energy charges. This also allows coordinated operation of DER, benefiting communities and utilities by shaping load profiles and minimizing balancing energy charges.

The opening of transmission access and resulting bilateral wholesale energy markets has caused a more efficient and economic utilization of available grid resources. The proposed Transactive Energy initiative will enable similar operations on the distribution grid, while enabling distribution grid operators to maintain grid reliability and cover capital and operational costs associated with maintaining a reliable distribution operation.

Ratepayer Benefits:

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|---|---|
| <input checked="" type="checkbox"/> Promote greater reliability | <input checked="" type="checkbox"/> Environmental benefits - specify: allow for greater penetration of solar PV |
| <input checked="" type="checkbox"/> Potential energy and cost savings | <input checked="" type="checkbox"/> Economic development |
| <input checked="" type="checkbox"/> Societal benefits | |

Specific benefits (qualitative and quantitative of the proposed initiative):

By enabling the sharing of capabilities of DER, e.g., PV generation and storage, or by allowing one customer to purchase available generation or Demand Response (DR) from another customer to avoid excessive demand, the power system can operate at greater levels of economic efficiency

Public Utilities Code Sections 740.1 and 8360:

This initiative will address the impact of the following elements of the PUC Code sections 740.1 and 8360:

- Increased use of cost-effective digital information and control technology to improve reliability, security, and efficiency of the electric grid
- Dynamic optimization of grid operations and resources, including appropriate consideration for asset management and utilization of related grid operations and resources, with cost-effective full cyber security
- Deployment and integration of cost-effective distributed resources and generation, including renewable resources
- Development and incorporation of cost-effective DR, demand-side resources, and energy-efficient resources
- Deployment of cost-effective smart technologies including real-time, automated, and interactive technologies that optimize the physical operation of appliances and consumer devices for metering, communications concerning grid operations and status, and distribution automation
- Deployment and integration of cost-effective advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles and thermal-storage air-conditioning