Transactive Energy Operations Cost-Benefit Alignment

Farrokh Rahimi, Senior VP, OATI

Abstract: Transactive Energy (TE) provides a venue for decentralized (peer-to-peer) transactions of "energy" products. The transacting parties are generally prosumers (consumers with the ability to generate power), but may include a variety of actors including Microgrid Operators, Building Energy Management Systems, grid-edge intelligent devices, Aggregators of Distributed Energy Resources (DERs), Energy Service Providers, Community Choice Aggregations (CCAs), Retailers, Electric Utilities, and Grid Operators. The product being transacted is generally electric energy (in kWh or MWh), but could also include derivative products such as "capacity" (in kW or MW), reactive power (in kvarh or Mvarh), or grid services (in kW/hr or MW/h).

Transactions generally include a quantity and price agreed upon between the transacting parties, but may also include delivery time, duration, and location. While financial transactions among transacting parties have no impact on the distribution grid, physical transactions generally do unless parties to the transaction are physically divorced from the grid (e.g., all are within the boundaries of a microgrid). An important issue when TE parties use the grid to inject or withdraw energy to support their transactions is to ensure their transactions do not have adverse consequences for the consumers who are not involved in bilateral transactive exchanges, or do not have any DERs at their facilities.

This presentation lays out an incentive-compatible Transactive Energy Systems design to ensure while a level playing field is provided for the transactive agents, such standby/passive consumers are protected both financially (with respect to their electricity bills) and with respect to the level of service they receive.

The proposed design includes provisions for value maximization in peer-to-peer and peer-to-market transactive exchanges, as well as mechanisms for cost allocation based on cost causation. It provides for advisory information dissemination by the grid operator for the transacting parties to adjust their transactions to avoid or minimize their exposure to grid related transaction (transport) costs. In cases where Transactive Exchanges improve grid operation or results in reduced grid costs, there would be allocation of benefits rather than costs to the TE parties.

Regulatory provisions and associated metrics to enable such cost or benefit allocation mechanisms will be discussed.

Illustrative examples and use cases will be provided. These include peer-to-peer energy transactions and peer-to-market transactions involving various products (Energy, Capacity, Reserves, Regulation, Voltage support, etc.).