

Transactive Oriented Grid Architecture

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The future architecture of transactive distributed power systems will be influenced by continued population migration to cities and the expanding global use of transit-oriented development (TOD). TOD is a type of community development that includes a mixture of high density housing, commercial and public space integrated into a walkable neighborhood and quality electrified public transportation. In TOD, the confluence of housing and commerce form economic hubs within metro centers. Similarly, distributed energy systems in these buildings create opportunities to develop transactive energy hubs that power these urban economic hubs. This is likely as the cost and practicality of transporting renewable energy from remote areas to urban centers will increasingly become more difficult and continued improvements in distributed energy resources and customers' economic and resiliency interests will make local development more attractive.

However, to enable the development of these transactive energy hubs, it is necessary to consider structural changes in the architectural of urban distribution systems and the "customer to distribution" operational coordination necessary to align with TOD. Insights from transportation network architecture in a TOD context will be discussed. For example, transportation planning concepts of connectivity and accessibility to markets have implications for structural changes to distribution grid architecture. A transactive oriented grid architecture (TOGA) would involve a proactive architectural approach to engage TOD efforts to align the structure of a distributed energy ecosystem to the urban plan. The TOGA would inform electricity market designs, grid investments, operational coordination (including interoperability) and public policy shaping DER adoption. Examples of the implication of TOGA on each of these dimensions will be provided. This paper will build on prior research on network and convergent value with recent consulting work on TSO-DSO-Customer (TDC) operational coordination and transactive oriented grid architecture value creation aligned to transit oriented development.