



CAPACITY AND ENERGY ISSUES IN THE INTEGRATED GRID? AN EPRI PERSPECTIVE

A recent report published by the Electric Power Research Institute (EPRI), titled, “The Integrated Grid: Capacity and Energy in the Integrated Grid,” attempts to address the following issues:

- How individual resources may contribute differently to the system’s capacity to deliver energy.
- How changing supply and load characteristics make it necessary to distinctly address both energy and capacity on wholesale and retail levels.
- The cost of capacity, based on an assessment of cost structures of several U.S. utilities.
- Emerging needs in wholesale markets and retail rate structures to value capacity and energy as distinct elements of those markets/structures.
- Key research to enable distributed energy resources (DER) to provide both capacity and energy.

To meet demand reliably, according to the report, the system’s resources must be able to do more than just steadily generate power. Together, they must be flexible enough to react to sudden changes in load or generation, such as when a large generator is suddenly forced off-line. This required flexibility from generators may be characterized by a series of “ancillary services,” such as frequency regulation, voltage support, load following/ramping, inertia, and several categories of operating reserves.

Capacity, in this context, represents more than a power-output rating, having multiple attributes that are required by a power system for reliable operation. In addition, this capacity must be planned to support the expected maximum demand over a long-term horizon.

Informing all stakeholders of the importance of capacity and energy in an integrated grid will be an important step as various jurisdictions consider policy and regulation that reflect the influence of renewable resources, distributed generation, energy storage, and new more efficient loads.

EPRI research has led to several key insights related to the importance of addressing capacity and energy issues in an integrated grid. These are:

- New trends in interior climate control, such as heat pumps,

are often more energy-efficient devices, but do not necessarily reduce peak demand.

- Completely displacing a consumer’s energy requirements with - in some regions of the U.S. and other countries, peak system load is increasing at a faster rate than overall energy consumption.
- Variable, supply-side resources (such as wind and solar) can supply energy at low or zero variable cost, but alone are generally not sources of firmly-available capacity.
- Emerging energy storage and energy management systems (capable of reducing peak demand, for example) provide flexible capacity for short periods of time, but do not currently serve as long-term energy resources.
- Fixed capacity costs for supply and delivery could represent for individual utilities between 35 and 75 percent of their average residential electricity bill.

In general, generating units designed to be quickly and sparingly dispatched receive a large percentage of their income from transactions outside of the energy market. For instance, in the ISO New England market, it is estimated that 80 percent of revenue for a combustion turbine generating unit comes from capacity/ancillary service payments.

Recently, an increasing portion of total central generation revenue is coming from capacity-related payments in some areas, especially those with significant variable generation.

Centralized capacity markets have existed in some areas for decades or more, with the objective of long-term resource adequacy. While they have provided a mechanism for encouraging capacity additions when needed, they have exhibited some price volatility as market rules have evolved.

Significant R&D progress has been made in developing open standards, protocols, and tools for integrating distributed energy resources. However, before such resources can be considered reliable for long-term capacity at scale, additional R&D is needed in order to assess the interoperability and cyber security of proposed solutions. A better understanding of consumer behavior is critically important for many of these resources, and this is a key research imperative at EPRI.



About The Author

Phil Carroll, Vice President of the Energy Group for Finley Engineering, has been involved in the electric utility industry for the past 21 years. Managing multi-million dollar projects around the country, Carroll has been responsible for the design of distribution and transmission lines, material specifications, contract administration, final acceptance, and close-outs. He is also a registered Professional Engineer in the states of Nebraska, Oklahoma, Texas, Washington, Oregon, California, New Mexico, Nevada and Arizona.

For more information, you can contact Phil at p.carroll@fecinc.com or 417-682-5531.