ESIG
ENERGY SYSTEMS
INTEGRATION GROUP

The Importance of Capacity Accreditation

Coupling Economic Efficiency and Reliability

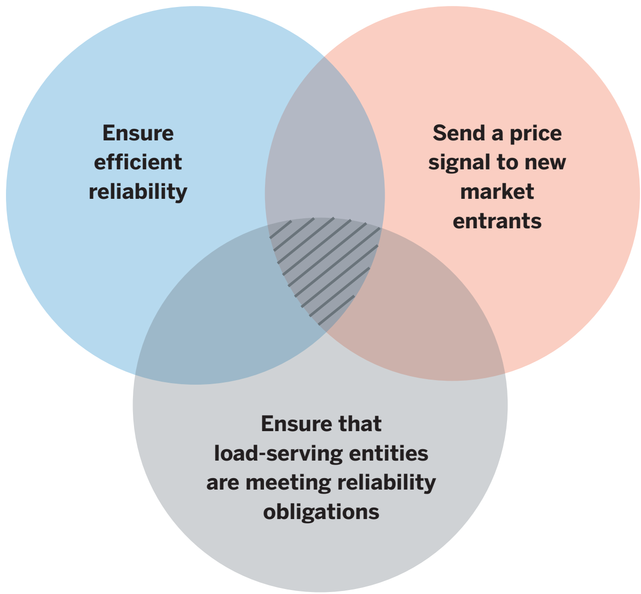
FACT SHEET

A megawatt-hour of energy on the grid is indistinguishable based on its source, but the same is not true for a megawatt of capacity for resource adequacy. When and where resources are able to generate those megawatts can differ significantly, leading to some resources providing more reliability benefits than others. Capacity accreditation establishes a way to measure the reliability contributions of individual resources to collectively meet the resource adequacy needs of the entire system.

Typically, grid planners add up resources' capacity credits to meet a planning reserve margin. The planning reserve margin determines the amount of surplus capacity needed on the grid to maintain reliability in the face of myriad uncertainties arising from load fluctuations, weather, and generator outages. Capacity accreditation, if done well, allows grid planners to exchange megawatts of firm (or effective) capacity from one resource type to another, while maintaining resource adequacy.

The accreditation process helps ensure that replacements for generator retirements bring comparable resource adequacy benefits to the system. Accreditation allows grid planners or market designers to remove blocks of capacity (representing generator retirements) and replace them with different types of resources, in different locations,

FIGURE 1
The Nexus of Capacity Accreditation



Source: Energy Systems Integration Group.

with different operating characteristics. A robust capacity accreditation framework, therefore, accomplishes three goals of planning: (1) to secure reliability in an economically efficient manner, (2) send a price signal to new market entrants, and (3) ensure that load-serving entities are equitably meeting their obligations to reliably serve load (Figure 1).

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But the accreditation process is becoming increasingly complex. Imagine a tower made of uniform blocks, each the same size, shape, and material. Replacing one block with another is straightforward. Imagine the same tower, but with blocks of different shapes and sizes that aren't immediately comparable to the uniform blocks they replace. Even worse, consider a tower where the

This fact sheet is adapted from the ESIG report Ensuring Efficient Reliability: New Design Principles for Capacity Accreditation.

blocks change shape and size as time progresses and weather changes. This analogy for grid planning in today's energy transition highlights the importance of capacity accreditation—of being able to measure the resource adequacy contributions of individual resources, such that the portfolio meets reliability needs and new additions and retirements can replace one another reliably.

Ensuring Reliability with New Resource Mixes

The power system's changing resource mix—shifting away from baseload fossil generation and toward a portfolio of wind, solar, storage, and load flexibility—has large implications for how the system ensures that reliability needs are met. Traditionally, these new resources have been procured primarily to produce energy, displace fuel, and reduce emissions, but the next phase of the energy transition will increasingly look to them to ensure reliability.

In addition to the shifting resource mix, the timing, location, and causes of reliability risk and tight supply conditions are also changing. In the past, peak risk and tight supply conditions occurred when load was highest. But risk is shifting out of these peak load periods and into periods when load is lower but resource availability is also lower, due to weather (i.e., low wind and solar periods) or correlated outages due to extreme weather and fuel supply disruptions. Load profiles are also changing due to increased electrification, climate change, and structural changes in the economy. These changes to both the resource mix and the load profile are shifting risk away from the conventional risk periods (e.g., summer afternoon peak in much of the United States) and toward new periods, underscoring the importance of understanding the resource adequacy of different resources.

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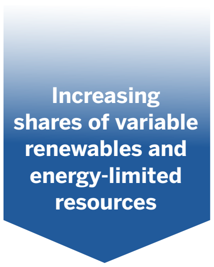
Five Phases of Capacity Accreditation

These changes can be described in five phases according to the way that resources have been, are, and will increasingly be accredited for their contribution to resource adequacy. Different power systems are transitioning through the phases of the accreditation process based on their unique resource mix, load profiles, and risk

FIGURE 2

Transition of Capacity Accreditation Methods



1. Nameplate capacity of resources
2. Expected capacity available at the time of peak load
3. Expected capacity available at the time of peak net load
4. Expected capacity available at the time of high risk
5. Expected capacity and energy available from resources during periods of high risk

Source: Energy Systems Integration Group.

composition, but the general transition between phases can be described as shown in Figure 2.

In order to address the accreditation challenges, grid planners and utilities across the world are adjusting their capacity accreditation methods, resource procurements, and capacity markets with new frameworks, rules, and metrics. However, while there have been some lessons learned among different jurisdictions and some cross-examination of resource adequacy methods, there is no uniform set of best practices for capacity accreditation.

Using the Same Accreditation Methods for All Resource Types, and Linking Accreditation to Operations

Given the unique resource mix and regulatory regimes in each region, uniformity may not be desirable or feasible, but foundational pillars can be applied. The ESIG report *Ensuring Efficient Reliability: New Design Principles for Capacity Accreditation* lays out several of these pillars to help guide capacity accreditation redesign efforts currently underway. This report gives particular attention to two key considerations:

- Accreditation methods should be expanded and applied to all resource types, not just wind, solar, and battery storage. This includes considering the reliability implications of correlated outages of thermal resources, and the benefits of interregional transmission and load flexibility.
- Power system modeling is never perfect, and there are inherent risks with accrediting resources solely based on modeling and simulation. As a result, there is a need to link simulated accreditation with actual operations.

Keeping these key considerations in mind will ensure that planners and developers can efficiently select resources that best meet the needs of system reliability, ensure that load-serving entities are meeting their reliability obligations, and send a clear price signal to new market entrants.

This fact sheet was adapted from *Ensuring Efficient Reliability: New Design Principles for Capacity Acccreditation*, a report by the Energy Systems Integration Group's Redefining Resource Adequacy Task Force. Three fact sheets and the full report are available at https://www.esig.energy/new-design-principles-for-capacity-accreditation.

To learn more about the recommendations described here, please send an email to info@esig.energy.

The Energy Systems Integration Group is a nonprofit organization that marshals the expertise of the electricity industry's technical community to support grid transformation and energy systems integration and operation. Additional information is available at https://www.esig.energy.