ESIG
ENERGY SYSTEMS INTEGRATION GROUP

Hybrid Resources

Opportunities for Flexibility and Increased Benefits

AT A GLANCE

Recent years have seen surging interest in hybrid resources, broadly defined as multiple resources—some combination of generation, storage, and/or flexible load—sharing a common point of interconnection and operated as a single integrated resource. Hybrid resources can offer several advantages for grid operators, resource owners, and project developers, including more efficient use of scarce transmission interconnections, grid services that solar or wind alone often cannot economically deliver, and increased flexibility in how the resource is operated and monetized over time.

The growth of hybrid resources is requiring system operators to re-evaluate market rules and interconnection requirements regarding what constitutes a generator. Throughout this re-evaluation, rules for hybrid resources should be defined in a technology-neutral manner and not be overly prescriptive. This will allow flexibility and creativity in the design and implementation of new technologies in the future high-renewables grid.

Avoiding Costly Transmission Upgrades

In most areas with high-quality renewable resources, low-cost and easy points of interconnection have already been used, and expensive upgrades to the transmission network are required to interconnect additional resources. An important benefit of hybrid resources is that they can reduce the need for such upgrades by sharing and more fully using a limited point of interconnection. Hybrids often include storage technologies, providing a destination for excess renewable energy while managing the instantaneous injection of power to comply with the interconnection limits and avoid expensive network upgrades.

Enabling Flexibility and Wider Market Participation

Hybrid resources are flexible and can be tailored to fit specific site conditions, grid needs, interconnection rules, and market conditions—and are more easily modified as these factors evolve. By combining renewable energy, storage, flexible loads, and/or other innovative technologies, a hybrid plant can be designed to emulate traditional generation, if necessary, and can provide significant flexibility and a wide spectrum of evolving grid services. By combining technologies behind a single point of interconnection and coordinating their output, hybrid systems can be offered into the market in a flexible manner.

Delivering Energy When Needed for Grid Reliability

Through the integration of storage and/or load flexibility, hybrid resources can deliver capacity and energy when it is needed most—not just when the wind is blowing or the sun is shining. This is an important consideration for resource adequacy, which measures whether the power system has enough resources to meet demand and ensure reliability. The integration of multiple resources can lead to higher capacity accreditation—or firm capacity—for the hybrid, which increases its capacity value and helps to defer the need for investment in new power plants.

Guiding Principles

Market design, interconnection requirements, and incentive mechanisms for hybrid resources should be designed to allow engineers, developers, and resource owners to creatively design systems that meet the physical and financial needs of the system in a reliable and cost-effective manner. Guiding principles include:

- Using technology-agnostic definitions
- Leveraging existing points of interconnection for additional resources
- Creating multiple, broad participation models to facilitate greater flexibility and innovation, while allowing resources to offer all grid services within their capability
- Allowing the resource owner to manage internal operation of the hybrid facility
- Reconsidering traditional requirements that close doors for future flexibility and services in a transforming grid

See also the **full report**, ***Unlocking the Flexibility of Hybrid Resources.***