

## Action Plan *(found on page 5 of the paper)*

The current and projected expansion of DER may significantly change the technical, operational, environmental, and financial characteristics of the electricity sector. An integrated grid that optimizes the power system while providing safe, reliable, affordable, and environmentally responsible electricity will require global collaboration in the following four key areas:

### 1. Interconnection Rules and Communications Technologies and Standards

- *Interconnection rules* that preserve voltage support and grid management
- *Situational awareness* in operations and long term planning, including rules-of-the-road for installing and operating distributed generation and storage devices
- Robust *information and communication technologies*, including high-speed data processing, to allow for seamless interconnection while assuring high levels of cyber security
- A *standard language and a common information model* to enable interoperability among DER of different types, from different manufacturers, and using different energy management systems

### 2. Assessment and Deployment of Advanced Distribution and Reliability Technologies

- *Smart inverters* that enable distributed energy resources to provide voltage and frequency support and to communicate with energy management systems [1]
- *Distribution management systems and ubiquitous sensors* through which operators can reliably integrate distributed generation, storage and end-use devices while also interconnecting those systems with transmission resources in real time [2]
- *Distributed energy storage and demand response*, integrated with the energy management system [3]

### 3. Strategies for Integrating Distributed Energy Resources with Grid Planning and Operation

- *Distribution planning and operational processes* that incorporate DER
- *Frameworks for data exchange and coordination* among DER owners, distribution system operators (DSOs) and organizations responsible for transmission planning and operations
- Flexibility to *redefine roles and responsibilities* of DSOs and independent system operators (ISOs)

### 4. Enabling Policy and Regulation

- *Capacity-related costs* must become a distinct element of the cost of grid-supplied electricity to ensure long-term system reliability
- *Power market rules* that ensure long-term adequacy of both energy and capacity
- *Policy and regulatory framework* to ensure costs incurred to transform to an integrated grid are allocated and recovered responsibly, efficiently, and equitably
- *New market frameworks* using economics and engineering to equip investors and other stakeholders in assessing potential contributions of distributed resources to system capacity and energy costs