



Distributed energy resources represent a small but growing part of the electric energy resource mix. PJM is working to reliably and efficiently integrate them into its activities.

Electric systems often feature large, centralized power plants feeding transmission lines to serve communities far and wide.

In recent years, however, with technological and cost advances in power generation, shifting customer demands and choice, there has been a growing deployment of smaller resources called distributed energy resources (DER).

PJM considers DER to be any generator or electric energy storage resource connected to lower-voltage local distribution lines, and/or on the customer's side of the electric meter. DER can be powered by a wide variety of fuel sources. They also can range in capacity from a few-kilowatt residential unit, to a few-hundred-kilowatt commercial unit, to a generator as large as 20 MW.

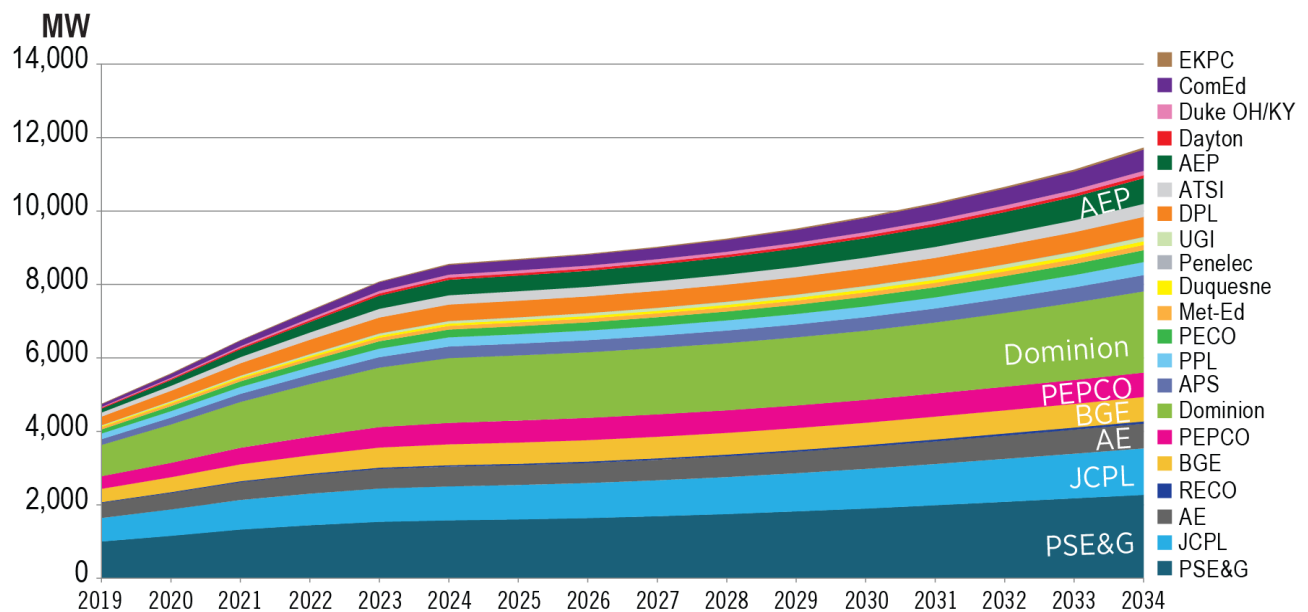
Forecasting to Ensure Efficient Dispatch and Planning

Most DER in PJM are not wholesale resources. They operate on the customer's side of the electric meter, and PJM does not have information about them. Because solar power is the fastest growing category of DER, PJM has developed two tools to help understand the impact of these solar resources: a short-term forecast and a long-term forecast.

Key Points

- DER are small electric generation or storage units connected to the local electric distribution system.
- Most DER are installed on the customer's side of the electric meter and are not visible to PJM.
- Some DER participate in wholesale electric power markets.
- The more DER in an area, the greater potential impact on the high-voltage transmission system.
- PJM is working to apply standards that allow DER to help maintain system reliability.

Long-Term Solar Growth Forecast in PJM





The short-term solar forecast predicts how much output non-wholesale solar DER will generate from five minutes to one week in advance. The long-term solar forecast looks at trends in solar power pricing and policies to forecast how many solar power systems will be installed each year, extending out 15 years. These forecasts ensure that PJM can efficiently dispatch generators to meet customers' immediate needs and help PJM plan for sufficient electric supply and transmission resources in the future.

Gaining Greater Situational Awareness

Knowing the location of non-wholesale DER can help system operators better understand system conditions if they need to respond quickly to emergencies. PJM's Dispatch Interactive Map application shows system operators if these resources are near a substation. In emergency situations, this information can help operators and transmission owners determine whether DER would be a help or a hindrance.

Providing Open Access to Wholesale Markets

PJM works to ensure that its rules allow DER to participate in its wholesale markets fairly and without undue burden. Market access offers additional benefits, because when DER provide wholesale electricity services to the PJM marketplace, PJM gains greater visibility and coordination in their operation.

Wholesale vs. Non-Wholesale DER

Wholesale DER are connected to the distribution system and offer their output and services to PJM markets. PJM knows the status of these units. They provide more than 1,000 MW. In addition, about 1,000 MW of generation on the customer's side of the meter participate in PJM markets as demand resources, which can reduce the amount of electricity drawn from the grid when regional generation capacity is tight.

Most DER are considered non-wholesale. They include as wide an array of technology types as wholesale DER, but they don't participate directly in the market. PJM estimates that there are about 7,000 MW of non-wholesale DER in the region.

When Distribution Affects Transmission

PJM oversees the regional transmission system and has a significant interest in understanding the impact that DER have on the amount of electricity that must be carried by the transmission lines. Understanding the impact of DER also helps PJM control voltage on the transmission system and protects the system from failure and damage. The more DER at the lower-voltage distribution level, the more they can affect high-voltage operations, which is why PJM is working with stakeholders on the issue.

"Riding Through" Instability

When the bulk power system experiences a brief disturbance, such as abnormal frequency or voltage conditions, large generators must stay connected and "ride through" the instability. This helps correct the issue. But under interconnection standards developed in 2003, DER must disconnect by "tripping" offline. This is largely for the safety of personnel working on the distribution system.

As the amount of DER grow, however, this tripping offline could be problematic and could make bulk electric system disturbances worse. As a result, the electric industry around the globe is working to implement new interconnection standards that would require DER to ride through disturbances to help protect system reliability. In the U.S., this standard is called IEEE Standard 1547-2018. When this new standard is implemented, so-called "smart-inverter" resources will behave much like large generators and will help the system withstand instability.