



CRA Insights: Energy

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April 2021

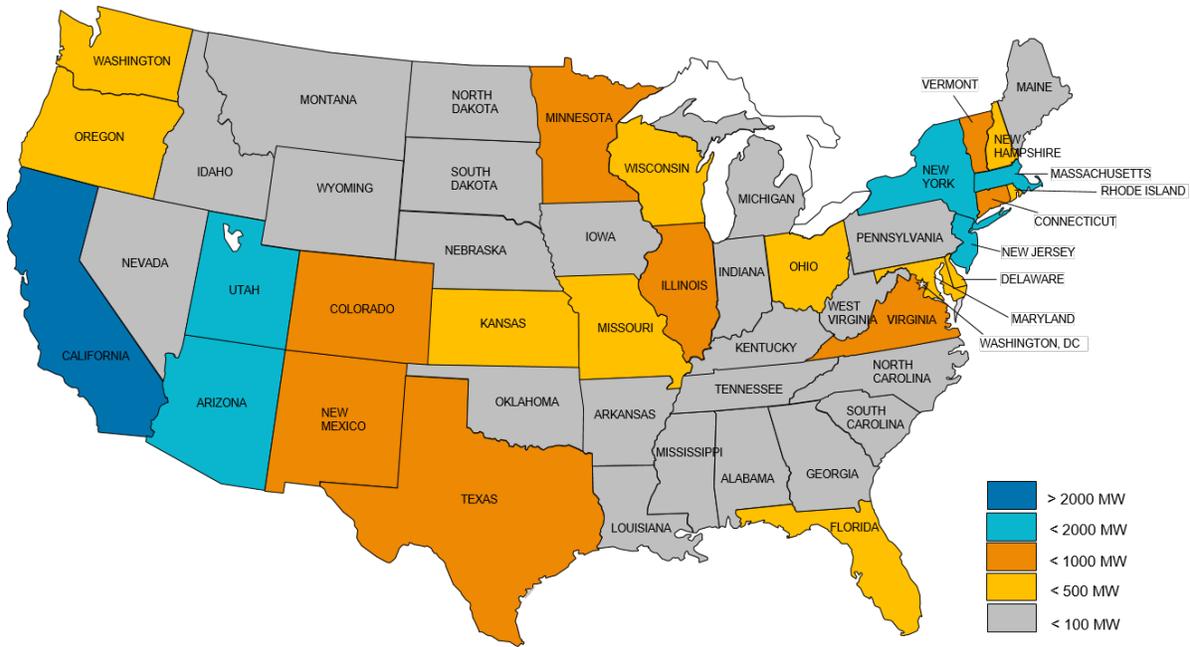
FERC Order 2222(A) – Path to Future Setting the discussion framework

The power distribution grid has changed rapidly the last few years. Drivers such as decreasing technology costs and more environmental awareness among consumers have increased the demand for Distributed Energy Resources (DER) such as solar photovoltaic panels and battery storage that are connected to the distribution network. Smart appliances are more widely deployed, increasing energy efficiency. On the utility side, a plethora of new operational and informational technologies are available for efficient monitoring, communication, and control of existing and emerging resources. In an effort to enable additional revenue streams and further accelerate the integration of DERs, the Federal Energy Regulatory Commission (FERC) issued Order No. 2222 (amended as 2222-A on March 18, 2021). In this *Insights* we review key points of the Order and our initial thoughts on impacted areas. Subsequent *Insights* will provide more details on these areas.

Background

DER adoption is accelerating in the US due to price reductions in variable renewable energy such as wind and solar, along with broader adoption of advanced metering infrastructure (AMI), and the ease of use of smart technologies at the consumer level. States like California and New York have seen increased levels of DER penetration as shown in Figure 1, a map of distributed solar generation. Other technologies such as battery storage, smart appliances, building automation, and demand response are also increasing.

Figure 1: Contiguous US – Grid Connected Solar DG in MW_{DC}



Source: SNL Financial (2020)

Cumulative DER investments in the US are expected to eclipse \$110 billion between 2020 and 2025. Residential solar installations are anticipated to increase between 6-8% annually through 2050, customer battery systems are anticipated to reach almost 1.9 GW by 2024, and current forecasts estimate that approximately 20 to 25 million electric vehicles will be added by 2030.¹

As intermittent generation and DERs proliferate, grid operators in organized wholesale markets are revising market rules to provide the flexibility needed to integrate variable resources. FERC orders 745 and 841 have helped support these market inclusion efforts. The adoption of market rules that more broadly accommodate a full range of DER technologies must accelerate to realize the benefits of DER efficiently, reliably, and consistently.

FERC Order 2222: Removing barriers for DERs

Despite the improving economic and technical capabilities associated with DER, particularly for solar and energy storage, tariff rules governing the aggregated participation of these resources had not been accommodated in the ISO/RTO tariffs prior to the passage of FERC Order 2222 on September 17, 2020. The Order is expected to reduce the barriers for DER participation in wholesale markets. Under the majority of the existing wholesale market participation models, aggregated resources

¹ Benjamin Kroposki, Andrey Bernstein, Jennifer King, et al., “Tomorrow’s Power Grid Will Be Autonomous,” IEEE Power and Energy, November 23, 2020, <https://spectrum.ieee.org/energy/the-smarter-grid/tomorrows-power-grid-will-be-autonomous>; see also Colin McKerracher, Dr. Ali Izadi-Najafabadi, Aleksandra O’Donovan, et al., “Electric Vehicle Outlook 2020,” *Bloomberg NEF*, <https://about.bnef.com/electric-vehicle-outlook/#:~:text=Passenger%20EV%20sales%20jumped%20from,sales%20spread%20to%20new%20markets>.

(including DERs) can participate in the wholesale markets *only* as demand response, limiting the eligible market services provided. FERC identified that such conditions create barriers to the participation of DERs which are becoming more technically capable of providing market services on their own or through aggregation.

The Order defines a DER as “any resource located on the distribution system, any subsystem thereof or behind a customer meter.” This technology-agnostic definition allows for the inclusion of both front and behind-the-meter resources such as energy storage, demand response, intermittent generation, electric vehicle infrastructure, and other local resources. Per the Order, different DER technologies could be allowed to participate under a single aggregator, and it falls to the ISO/RTOs to ensure reliable integration of this heterogeneous resource. The Order does not establish a minimum requirement for individual DERs but directs the ISO/RTOs to either propose a maximum capacity requirement or explain why it is not necessary. For DER aggregators, the Order establishes a minimum size of 100kW with no limit on the maximum size. Table 1 provides a high-level view of three key aspects of the Order.

Table 1: FERC Order 2222 details of eligibility, market rules, and role of distribution utilities

Issue	FERC Order 2222 Details
	<ul style="list-style-type: none"> • Allows ISO/RTOs the flexibility to determine how best to amend or establish a DER participation model. • Does not eliminate the participation in both wholesale and retail programs; calls for the adoption of appropriate restrictions. • Indicates no FERC jurisdiction over Interconnection when DER participates through aggregation.
	<ul style="list-style-type: none"> • Requires the development of rules on Locational Requirements for DER aggregation participation that are geographically broad but technically feasible. • Clarifies that the DER aggregator is the single point of contact with the RTO/ISO and is responsible for managing, dispatching, metering, and settling the individual DERs that participate in the aggregation. • Instructs RTOs/ISOs to rely on existing meter data whenever possible and not impose unnecessary barriers to individual DERs joining an aggregation. • Provides guidance on the development of coordination protocols between RTOs/ISOs, DER aggregators, distribution utilities, and relevant electric retail regulatory authorities.
	<ul style="list-style-type: none"> • Requires the development of a comprehensive and non-discriminatory process to review individual and aggregated DERs and ensure their participation does not create significant risks to the reliable and efficient operations of the distribution system. • Allows the override of the RTO/ISO dispatch by the utility when needed to maintain reliability.

How FERC 2222 will affect the industry

The ISO/RTOs have started discussions with stakeholders on how to update their market design to comply with the FERC mandate. It is important for the entire spectrum of market participants to understand the implications of the upcoming changes. We discuss three areas of important change and opportunity: integrating the planning process; market rules and design; and resource financing.

Moving from Decoupled to Integrated Planning

The centralized nature of existing resource and transmission planning must be modified to ensure the efficient and reliable integration of new DER resources. This transition to a decentralized, highly locational resource composition poses challenges but also creates opportunities.

Historically, energy system planning included two decoupled processes: (1) resource planning related to supply and (2) network topology planning that is mostly focused on transmission and limited distribution. Each planning process assumes the other is given, i.e., resource planning is implemented assuming the network topology is fixed. This decoupled planning process results in suboptimal solutions and deteriorated system reliability. These issues further accelerate as a result of increased penetration of DERs. A coordinated generation and network planning approach is necessary to leverage the full value of DERs to improve the system reliability.

Inputs to this integrated resource planning approach, such as load forecasting, must also evolve. Increased DER penetration introduces more uncertainty, as power consumption is correlated to solar PV production and the behavior of customers charging their vehicle and operating their home and smart electric appliances. It is critical for utility and ISO/RTO planners to understand this new and continuously evolving network for load forecasting to be more reliable and efficient.

Increasing Market Design Diversity

The Order requires ISOs and RTOs to develop and submit market rules for approval by early 2022.² The Commission left it to “each RTO/ISO to propose a reasonable implementation date” and develop a proposal “appropriately tailored for its region.” The ISOs/RTOs have initiated discussions with stakeholders and, in many cases, requested comments on how to comply with the Order.

Like other FERC Orders (741, 745, 841), we expect each ISO/RTO to design an appropriate framework considering the wholesale market structure in place and grid composition. Phased-in or pilot programs may be appropriate. For example, a phased approach to reducing the minimum-size threshold could enable smaller resources to participate, while helping the ISO/RTO ensure their systems and processes are able to incorporate greater volumes of resources and operating constraints. While it is difficult to determine if this threshold reduction would have a significant impact on wholesale market prices, experience has shown that when all else is equal, enhancing competition may create downward pressure on prices.

Flexibility benefits are another positive outcome of diversifying the mix of market participant resources. That said, many of these resources smaller than 1 MW that will participate in

² On April 9, the FERC granted an extension for compliance from July 2021 to 2022 for a subset of ISOs/RTOs (February 1, 2022 for PJM, April 18, 2022 for MISO and April 28, 2022 for SPP).

aggregation, are intermittent generators. While these resources could offer energy and some capacity, they may not be able to provide the full range of market products (e.g., ramping and other ancillary services) absent the addition of new equipment, such as energy storage or smart inverters.

Participation models have surfaced and are open for discussion at the ISO/RTO stakeholder level. As noted previously, participation rules for the various market products currently consider the balance between reliability and economic compensation. Figure 2 shows a new participation model from ISO-NE. The model allows different market asset types to offer services based on their characteristics. Stakeholders are currently in discussions to finalize this framework.

Figure 2: New Participation Models Summary – ISO-NE

Participation model	Market Products	Market Asset Types	Bidding Parameters
Settlement Only Demand Energy Resource Aggregation (DERA)	Energy is settled at LMP	DERA Settlement Only Generator DERA Load Asset	N/A
	May be eligible for capacity		
Dispatchable DERA	Energy is settled at LMP	DERA Generator DERA Dispatchable Asset Related Demand (DARD) DERA Alternative Technology Regulating Resource (ATRR)	Price/MW Quantity Pairs EcoMin/EcoMax Min Consumption Limit Max Consumption Limit Ramp Rates
	May be eligible for Real Time reserves		
	May be eligible for regulation		
	May be eligible for capacity		

Investment Decision and Resource Financing

While some of the larger DER resources can participate in wholesale energy markets today, their ability is limited compared to their full potential. Under Order 2222, DER aggregators will be able to compensate for energy, capacity, ancillary services, and other capabilities that they provide. The ability to participate in wholesale markets could provide new sources of revenue and expand finance opportunities for DER resources by market players such as utilities, infrastructure funds, and others.

Resources that were not economically viable in the past, may realize new opportunities when the market is in compliance with Order 2222. Although it is still early, we expect potential modifications to the following:

- Long-term contracts with credit worthy off-takers,
- Financing terms by participating in larger aggregation groups,
- Services and sources of revenue to be available as part of an aggregation group, and
- Provision of multiple services based on market needs and opportunities.

The ability to aggregate large numbers of resources also allows wholesale market participants and energy services companies to expand their offerings. Just as the rooftop solar markets expanded with long-term contracts, other resources such as storage, building energy and appliance controls,

and vehicle charging equipment will benefit from these emerging market opportunities. We expect this will attract larger players and increase innovation that drives market growth.

Conclusion

Order 2222 provides the framework to expand the DER market and allows business opportunities that come with a fair amount of challenges. Questions remain such as infrastructure related to telemetry, new market rules to complement the existing market structure, and approaches to financing in new DER technologies. With the end of an eventful winter, the challenges and opportunities afforded by DERs remain undiminished and the collaboration across the industry are as important as ever.

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