

FERC Order 2222: Policy & Regulatory Approaches



*PREPARED FOR THE
Microgrids and Energy Storage for
Emergency Grid Resilience Webinar Series*

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Energy storage policy is the focus of this presentation.

- We will be covering the following topics:
 - Setting the Context for Order 2222
 - Microgrids 101
 - Summary of the Order
 - RTO Responses
 - Need for Federal / State Coordination
 - Q&A Session

Context for FERC Order 2222

Federal vs. State Responsibilities

FEDERAL

FERC, Congress, potential for
federal agencies to act
(e.g., EPA)

- Rules governing wholesale markets / RTOs (FERC)
- Rules governing transmission lines (FERC)
- Tax credit for solar + storage (Congress)

STATES

PUCs,
state legislatures,
executive directives from governors

- Retail markets
- Operations of distribution networks
- Utility rates
- Other enabling policies

FERC is the agency that regulates wholesale markets.

- FERC regulates the transmission and wholesale sales of electricity across interstate lines.
- Comprised of five commissioners appointed by the president.
- Commissioners serve five year terms and have an equal vote on regulatory decisions.
- The current commissioners are:
 - Chairman Richard Glick
 - Commissioner James Danly
 - Commissioner Allison Clements
 - Commissioner Mark C. Christie
 - Commissioner Willie L. Phillips



The U.S. market is not homogenous.

Regulated Markets

“Vertically integrated” utility **owns or controls** generation, transmission, and distribution

Regulated by states (public utility commissions)
Cost recovery via rates charged to customers

ES needs to solve grid problem and be reliable, low-risk

Status of Electric Restructuring by State



Restructured Markets

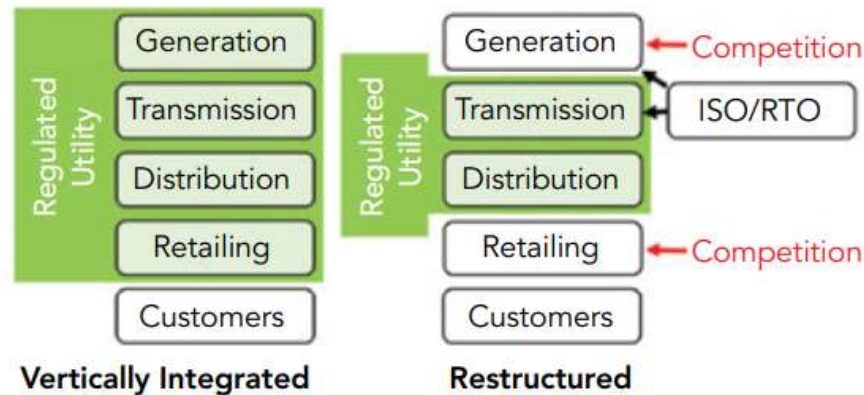
Market is **competitive**

Utilities usually prohibited from owning G&T assets.

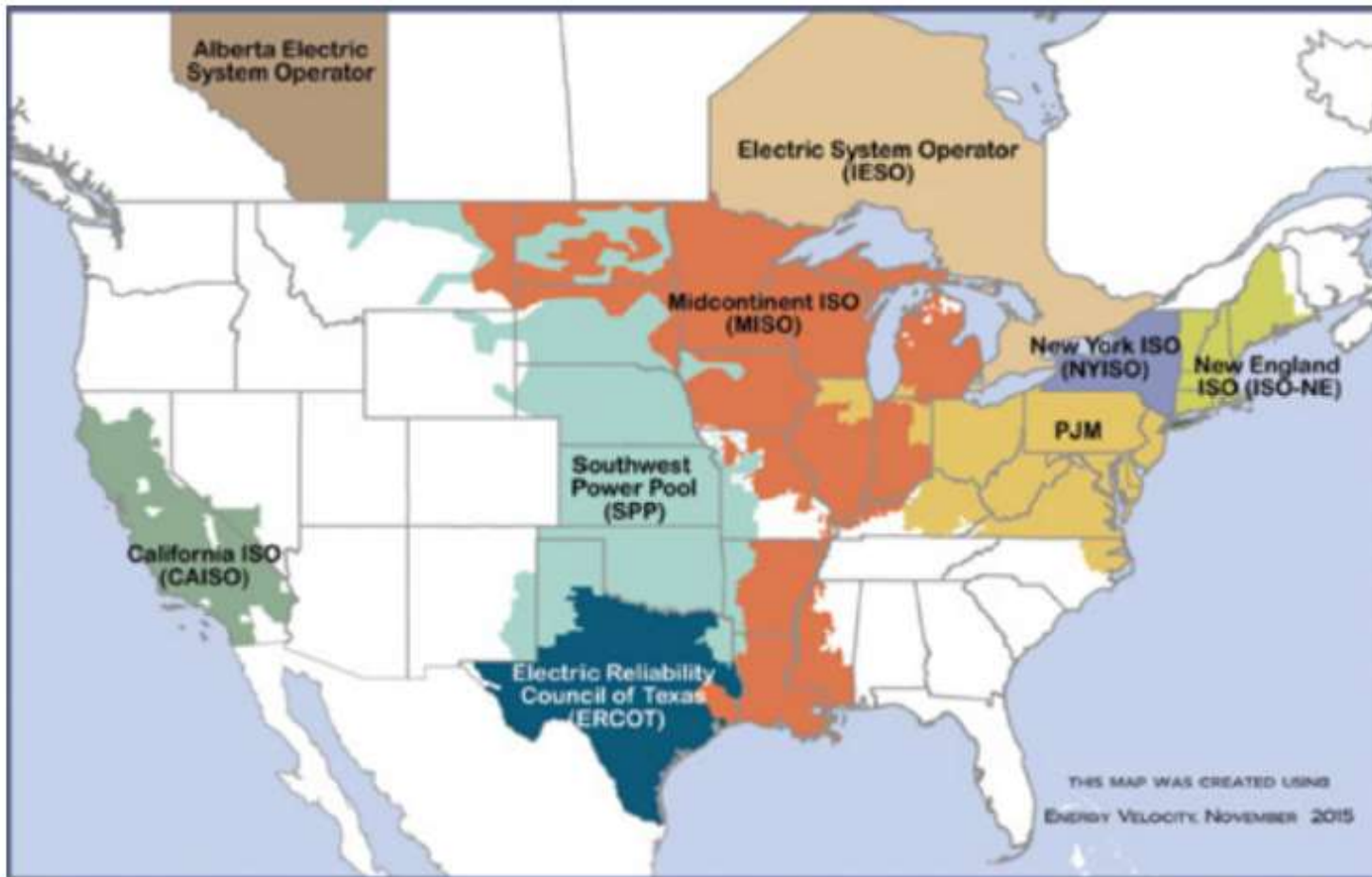
RTOS/ISOs responsible for inter-/intra-state T, D and O&M with oversight from FERC

Role of PUC varies state to state

ES needs to make money



In the late 1990s, electric restructuring included the formation of ISOs/RTOs.



Source: FERC

Some regions remain resistant to federal oversight.

- Texas is perhaps the most obvious example. Also the Southeastern U.S. and large portions of the Western U.S. are not part of an RTO.
- While some former FERC commissioners and others have called on FERC to require utilities to join RTOs, Chairman Glick questioned whether it has the authority to do so.
 - “In some cases, I think we give utilities an excuse or reason not to join RTOs if they can say, ‘Well, if I join an RTO, I have to be subject to order 2222 and 841 and all the other orders they have.’” (FERC Chairman Glick).
- Distributed energy resources (DERs) highlight the gray areas between federal and state jurisdiction when they are considered for wholesale transactions.
- In an area of policy debate that is directly germane, FERC has said for decades that sales by DERs at wholesale are FERC-jurisdictional.

DERs have struggled to find a place in wholesale markets.

- “Distributed energy resources (DERs)” is a broad term that covers small, flexible resources, often sited at end-user locations, including batteries, electric vehicles, rooftop solar, and smart thermostats.
- DERs have proliferated across the U.S. in the last decade—primarily driven by customer demand, technology improvements, and falling prices.
- DERs have been associated with Demand Response resources (i.e., dispatched infrequently in times of severe grid stress).
- However, certain DERs have characteristics that enable them to be used more strategically (e.g., immediate dispatch).
- Microgrids are considered one form of DERs.

Theoretically DERs can contribute to both wholesale and retail operations.

Retail

- Primarily used for reliability & resilience
- Transportation/vehicle charging
- Distribution-level demand response
- Peak shaving
- Load reduction
- Non-wires solutions for distribution utility needs.

Wholesale

- Energy, capacity, and ancillary services, such as:
 - Reliability and resilience
 - Frequency regulation
 - Voltage support / reactive power used to maintain constant voltage levels.
- Arbitrage?

The challenge (for grid operators and regulators) has been to develop a “continuous” participation model that gives DERs credit for their full capacity value.

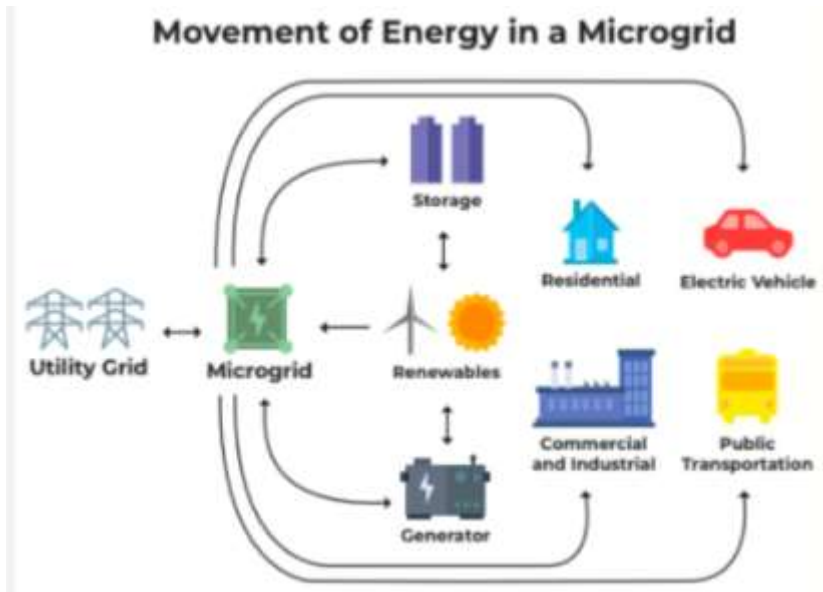
Market gaps set the stage for Order 2222.

- The “square-peg-into-round-hole” problem: DERs don’t fit legacy operational, planning, regulatory and business models.
- High volumes of “unmanaged” DERs can export variability and extreme production profiles to the bulk system (e.g., California’s “duck” profile).
- Bulk system operators have no visibility into distribution, and utilities may have very little visibility into DER activities.
- DERs reduce grid infrastructure needs, the basis of utility profits.
- It’s been difficult for DERs to monetize values because the industry has not yet agreed on methods for valuing them .
- Main driver may be revenue creation: Put simply, participation in both markets increases the financial viability of DERs.

Microgrids 101

Microgrid basics

- Microgrids are one kind of a distributed energy resource (DERs).
- Microgrids are unique in that they are localized energy grid with their own control capabilities, which means they can disconnect from the traditional grid and operate autonomously.



- A microgrid can be powered by distributed generators, batteries, and/or renewable resources like solar panels.
- Depending on how it's fueled and how its requirements are managed, a microgrid might run indefinitely.
- Most microgrids are set up to run 24/7.

What is a microgrid?

- A much smaller version of an energy utility's mega-grid: a network that connects a few buildings, a campus or a neighborhood.
- Microgrids can connect to mega-grid or through a switch can automatically or manually separate from the mega-grid and function as an island.
- Historically fossil-fuel sources, but can be powered by batteries and/or renewables; not uncommon to have a mix of power sources.
- Forecasters expect solar, wind and hydropower to drive 35% of new microgrid capacity by 2025.
- Can be utility- or third party-owned.



- A record number of microgrids (546) were installed in the United States in 2019, (Wood McKenzie). The pandemic slowed growth of microgrids in 2020 and 2021.
- However FERC Order 2222 will be a major post-pandemic accelerant for microgrids.
- Third-party ownership is also a market driver.

Microgrids are unique when compared to other DERs?

- They are typically comprised of different (heterogenous) resources-- solar, energy storage, wind, diesel, natural gas, hydro, and others.
- This creates an inherent challenge of putting one, two, or more additional energy sources on the grid at the same point.
- Microgrids are viewed differently by different entities:
 - To utilities, they are a less-valuable subset of DERs to a grid-serving entity.
 - To customers, they are a more valuable form of DER because they are flexible and have the ability to island.
- From a financial perspective, should they be valued less than other DERs?

Why are we seeing more microgrids?

- They offer a core benefit of resilience, which has become increasingly important in extreme weather conditions.
- Wildfires, hurricanes and floods often threaten the grid. Microgrid enable independence to “live off the grid.”
- Can be used by one entity or serve a larger community—e.g., distributing solar power within a neighborhood.
- They can relieve pressure on the main grid during peak demand.
- They have less emissions and are less expensive than centralized power stations.
- The cost of renewables is decreasing, which supports the projection that most future microgrids will be fueled by renewables + storage.

Why are we seeing more microgrids?

*In summary,
microgrids produce multiple benefits.*

UTILITIES

Reduced cost of operations

Reduced expenses on building power plants, costs of transmission and distribution

Operations run efficiently

CUSTOMER

Energy bills are reduced due to energy-efficient equipment.

Power cuts are reduced, and the power supply is more reliable and stable.

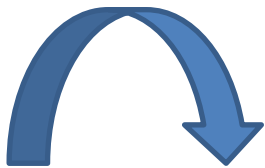
Customer satisfaction and reduced maintenance costs for energy-efficient appliances

SOCIETY

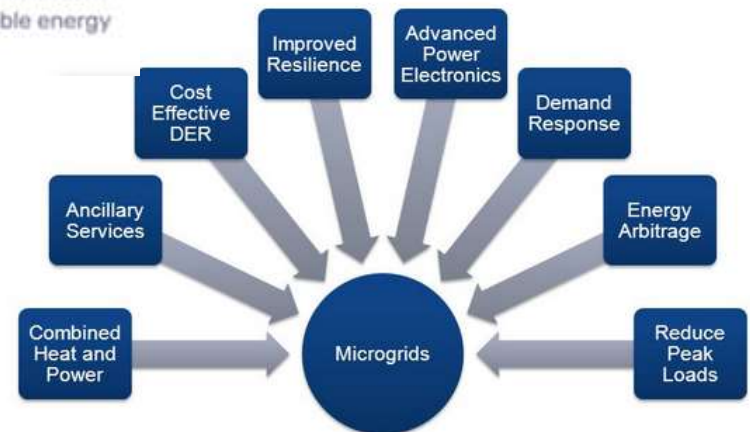
Greenhouse gasses reduction because fossil fuel power plant constructions aren't needed

Power distribution is equitable due to less disruption of power

The promotion and development of sustainable energy and efficiency in the conversion of renewable energy sources

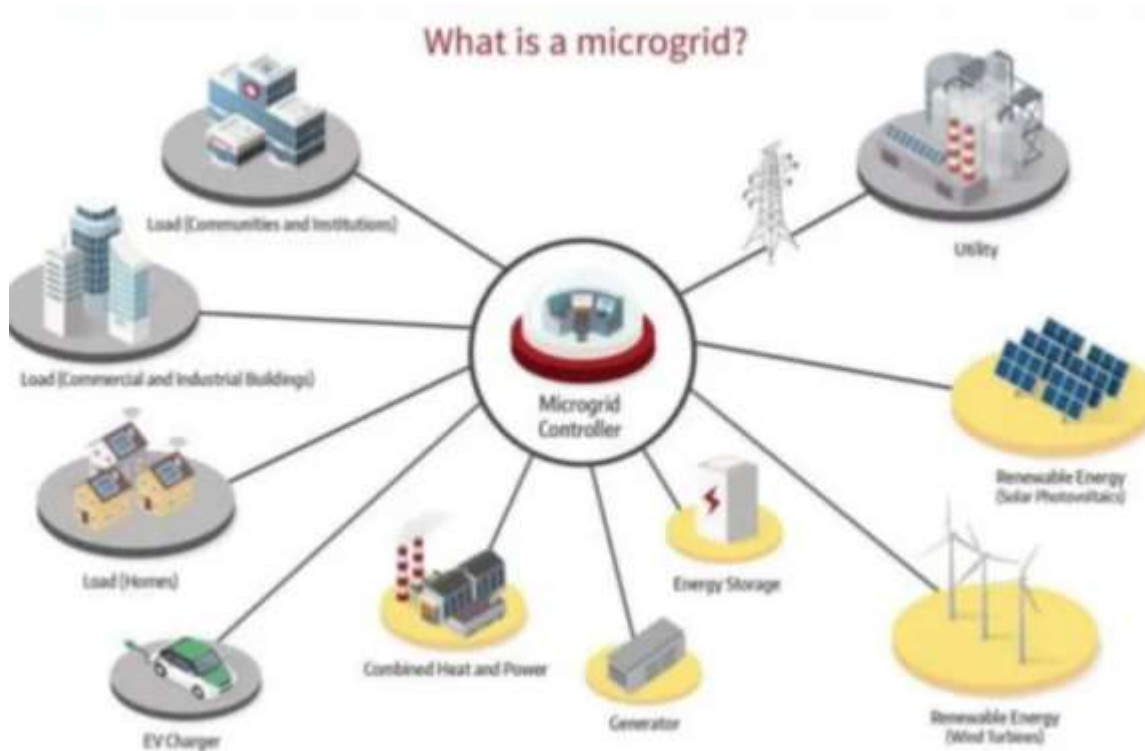


A caveat to utility benefits is that utilities have historically been resistant to DERs as they eat into profits driven by electricity sales and cost recovery for baseload power plants.



How a microgrid is structured impacts how it is regulated.

- On-site generators, energy storage, electric vehicles, energy efficiency and other energy systems are commonly integrated within a microgrid.



The likelihood that a microgrid is interconnected to other DERs such as an EV charger, energy storage (e.g., battery) becomes a defining characteristic as FERC Order 2222 unfolds.

Why are we seeing more microgrids?

Regulatory rules are being developed that open up the market for microgrids—

State level rules allowing third-party ownership.

And perhaps most significantly
FERC's Order 2222



Summary of FERC Order 2222

Prior to Order 841, FERC policies on DR laid the groundwork.

Order	Date
Order 719	October 17, 2008
Order 745	March 15, 2011



Established that Demand Response Resources need to be treated comparably to other resources.



Required each RTO/ISO to pay a Demand Response Resource the market price for energy (locational marginal price) when the DR resource can balance supply and demand as an alternative to a generation resource.

How is a Demand Response Resource defined?

Can vary slightly depending on RTO , but generally Demand Response Resources must verifiably reduce end-use demand for electricity from the power system.

FERC's Order 841 was a pre-cursor to 2222.

FERC Order 841 (2018)

- Directed RTOs to remove barriers to the participation of electric storage in wholesale markets
- RTOs must establish rules that open capacity, energy, and ancillary services markets to energy storage
- Answers the question that ES can be both generation and load
- Does not apply to vertically integrated, non-RTO markets (e.g., Texas)

841 Compliance Status:

- MISO: Has until June 6, 2022, to implement tariff provisions and comply with Order 841.
 - Received approval for SATOA filing, which enables ES assets to be valued similarly to a wires solution.
- Preliminary approval was given to PJM and SPP plans
- 10-hour duration requirement set by PJM was controversial; PJM has now has requested an extension until October 1, 2022.

Order 2222 was issued in September 2020.



Key components of Order 2222

- Based on the premise that FERC has jurisdiction over DER activities to the extent they involve injection and sale of energy for resale in the wholesale energy markets (still the subject of debate and challenges).
- Requires RTOs to ensure DERs can participate alongside traditional resources in RTOs through aggregation.
- DERs are broadly defined—“any resource located on the distribution system, any subsystem thereof or behind a customer meter above 100 kW.”
- RTOs/ISOs are required to change tariffs to accommodate DERs aggregations in energy, ancillary services, and capacity markets.
- RTOs/ISOs can limit maximum DER and/or aggregation size.

Demand response opt-out “clarification.”

- Order No. 2222-A (3/18/2021) removed opt-out rights for "heterogeneous" DER aggregations.
- Order No. 2222-B (6/17/2021) then deferred the opt-out examination to a Notice of Inquiry proceeding for Order No. 719.
- Current understanding:
 - DERs aggregations that contain DR in addition to other technology types (e.g., rooftop solar or energy storage) will be treated as mixed asset virtual power plants (VPPs) because of the use of supply and demand side resources.
 - If a DERs aggregation contains any DR resource + another kind of DERs (i.e., a VPP), a state cannot opt out of Order 2222.
 - If a DERs aggregation is composed solely of DR resources, then a state could attempt to opt out of Order 2222.

Consider the impact of aggregated DERs on a massive scale.

- Batteries at residential and commercial buildings.
- Municipal fleet vehicles being replaced with electric models.
- Enabling wholesale market participation for smart thermostats alone has the potential to contribute 40 GW of flexible and responsive load reductions from residential customers in jurisdictions
- Batteries in electric school buses (there are more than 480,000 school buses serving more than 25 million students across the U.S.)

What impact does Order 2222 have on microgrids specifically?

- By definition, any microgrid can provide asset-based demand response and therefore be considered a Demand Response Resource
- Once Order 2222 is formally adopted, it will allow microgrids to aggregate with other DERs and participating in wholesale markets.
- It's also possible that a community microgrid might be able to bid into a wholesale market on its own.
- If a microgrid is aggregated with another DERs there is no opt out option from participating in Order 2222, and its services are eligible for wholesale transactions.
- If a microgrid does not aggregate with another DERs, then it could opt not to participate in wholesale transactions and opt out from Order 2222 regulation. (unlikely because microgrids are usually paired with other DERs).

As of now, RTOs/ISOs have the action item.

- All RTOs/ISOs must amend their existing participation models or create new ones to enable participation by DER aggregations.
- Order 2222 allows grid operators to set up participation rules designed to avoid market distortions that could arise from DERs participating in both the retail programs and the wholesale markets (i.e., “dual participation” of the same service that could lead to double compensation).
- FERC recommends that each RTO/ISO create a “coordination framework” to clarify the communication and other responsibilities of the RTO/ISO, Distribution Company, Relevant Electric Retail Rate Authority (RERRA), and DERs Aggregator (DERA).
- The DERA is ultimately responsible to attest it has met all the requirements for registration.

RTO filings must define market rules.

- Define “DER Aggregator” as RTO/ISO market participant.
- Create market “participation models” for DERA ≥ 100 kW capacity.
- Establish coordination with Distribution Utilities & Aggregators & enable voluntary engagement with state regulators.
- Order is optional for utilities with < 4 million MWh annual energy delivered.
- Address metering and telemetry hardware and software requirements for DERs aggregation.
- Address coordination between the RTO/ISO, the DER aggregator, the distribution utility, and the relevant electric retail regulatory authorities .
- Create a standard market participation agreement for DER aggregations

Spring 2022 will be the next milestone.

Order No. 2222 Timeline



Compliance filings due July 2021: CAISO & NYISO filed on time; multi-state (PJM, MISO, SPP, ISO-NE) got extensions to Spring 2022.

Implementation dates to be proposed by each RTO/ISO

Need for Federal / State Coordination

Order 2222 requires active coordination of wholesale and retail operations.

Federal (FERC/ RTOs)

RTOs/ISOs will propose and FERC will either approve or reject:

- Which aggregated DERs can participate in wholesale transactions.
- Rates for wholesale sales from aggregated DERs and any other conditions of wholesale services provided by DERs.

State (Regulatory Commissions)

State regulators will retain significant authority to address:

- Reliability and safety of DERs
- Cost impacts on distribution systems
- DERs aggregations are subject to state interconnection rules
- Rates and terms of conditions of retail DERs programs
- States cannot regulate which DERs can participate in wholesale markets or how., but regulate the retail market.

Order 2222 will also create a number of new challenges (1):

➤ **For utilities:**

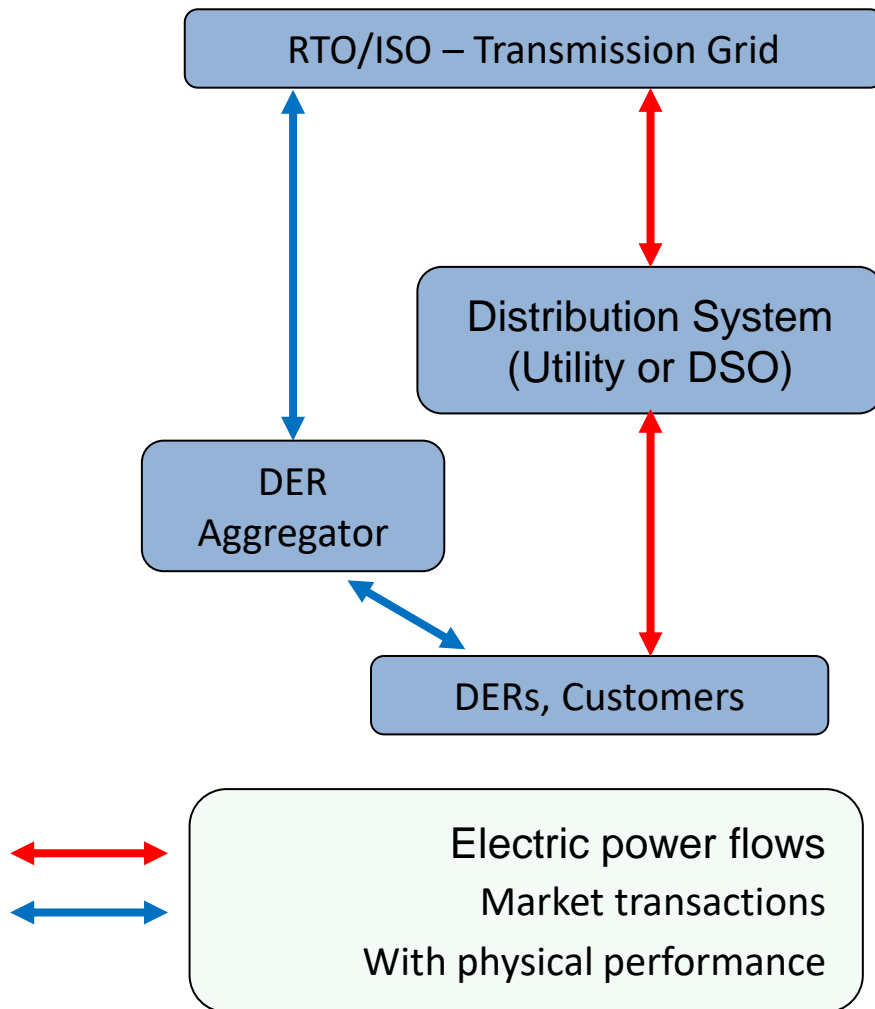
- They will be tasked with managing all the privately owned DERs connected to the grid. From rooftop solar to on-site batteries, many DER's are BTM and outside each utility operator's direct control.
- As increasing amounts of BTM DERs become connected to the grid, utilities may be increasingly overwhelmed by the sheer amount of real-time data they must manage when optimizing network-wide energy delivery.
- New operational and data analysis tools will be needed.

Order 2222 will also create a number of new challenges (2):

➤ **For grid operators and market participants:**

- Even pre-Order 2222 an additional 65GW of DERs capacity by 2025 was projected to come on to the grid. The allowance of aggregated DERs will place even greater strain on an already burdened system.
- The Order provides RTOs/ISOs with significant flexibility in designing market rules. Such flexibility may result in considerable variations in the rules that each RTO/ISO proposes for DER aggregators in its markets.
- As a result, market participants that are active in multiple RTOs/ISOs will need to be aware of the differences among the various organized markets and plan and coordinate their participation accordingly.
- RTO will not have jurisdiction of the interconnection of DER resources, but rather oversight over the DER aggregation participating in wholesale markets.

Grid operations will become more complicated.



Role clarification (illustrated by the MISO filing).



Observations on RTO filings.

- **ISO New England:** IISO-NE is arguably the farthest along in refining its compliance plan among the four RTOs that did not already have a DER participation model in place.
- **PJM:** Compliance filing due in February 2022. PJM plans to use this time to iterate on the design for DER aggregations and is gathering input from stakeholders.
- **MISO:** April deadline for compliance filing. Has expressed concerns about software capabilities. After criticism about limits on DERs aggregation is following PJM's lead and engaging stakeholders presently.
- **SPP:** April 2022 deadline. Has said publicly that it will addressing compliance on an issue-by-issue basis.
- **NYISO and CAISO** already have DER participation models that were approved by FERC prior to Order No. 2222.

The energy storage policy landscape continues to evolve.

Sandia National Labs monitors and analyzes activity at the federal and state levels and publishes information in the Global Energy Storage Database, available at this link:

<https://www.sandia.gov/ess-ssl/global-energy-storage-database/>

Q&A Session

Thank you!

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