

Participation Options and Designs for Distributed Energy Resource (DER) Aggregations in Electricity Markets

U.S. Market Design for DER Aggregations

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FERC ORDER 2222

A High Level Overview



What is a DER? What is a DER Aggregator?

DER: any resource located on the distribution system, any subsystem thereof or behind a customer meter

DERA: Entity that aggregates one or more DER for purposes of participation in RTO and ISO markets

What are the Key Implementation Challenges?



How Does 2222 Enable DER to Participate in ISO/RTO Markets?

Key Eligibility Requirements

- All DER technologies can **heterogeneously** aggregate to meet RTO/ISO requirements, if aggregation is at least **100 kW** in size
- Existing and/or new **participation models**
- Aggregation as **geographically broad as technically feasible**
- Data, bidding, metering, and telemetry for **DERAs** **balanced** with existing requirements, but reduce burden on **DERs**
- Limit compensation for the **same service** in other programs

What is the Timeline?

ISO tariff modifications due within 270 days. (7/19/21) All but two ISOs extended to Feb-Apr 2022. Implementation date part of each RTO/ISO proposal.

ORDER 2222 enables DER participation in ISO/RTO Markets

Who does this impact?

- Customers
- DER
- Aggregators
- Distribution Utilities
- RTOs/ISOs
- Regulators

How Will Market Participation Be Coordinated?

• **Main market interface:** **RTO/ISO** ↔ **AGGREGATOR**

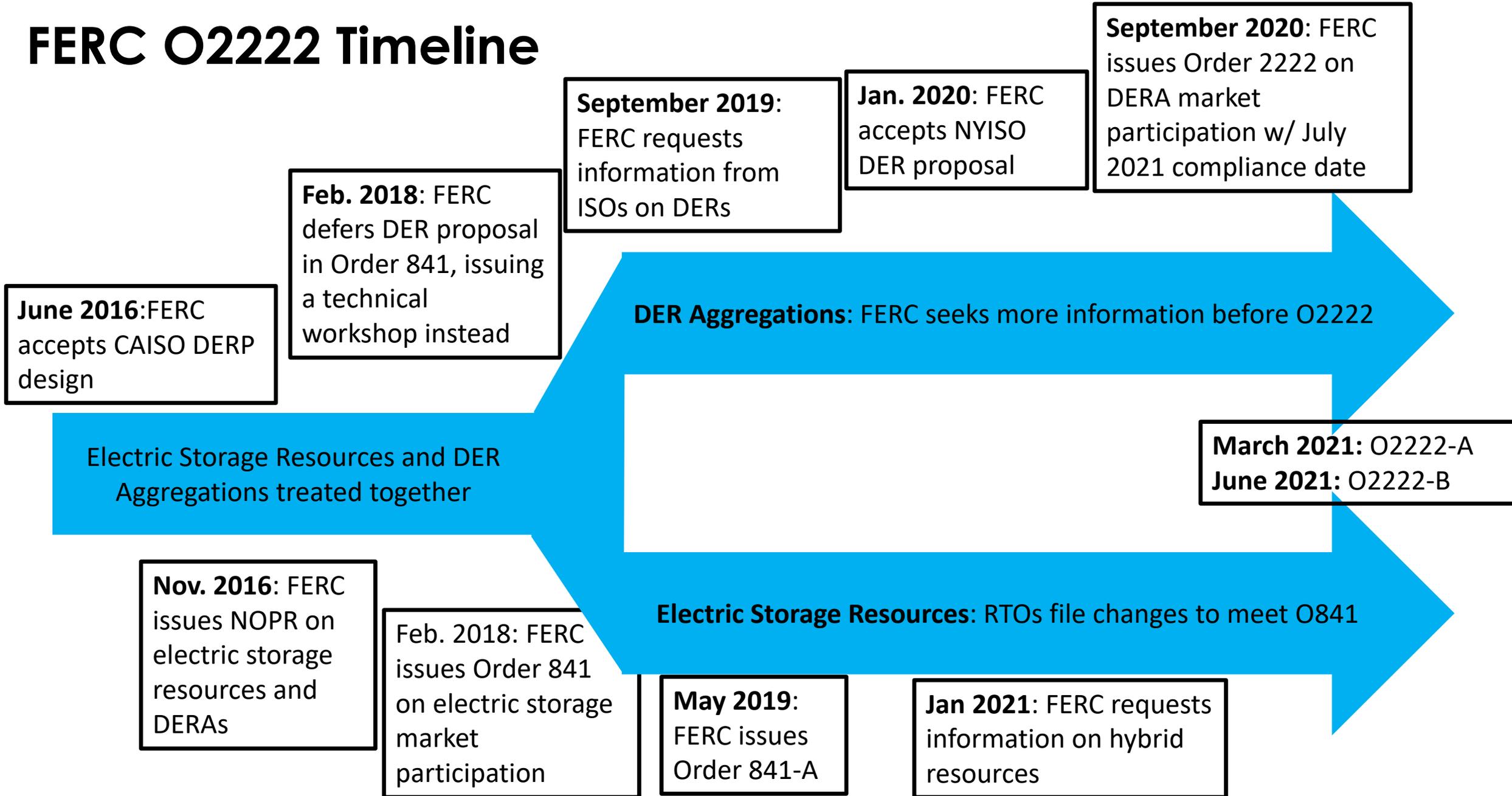
• Key Elements of Coordination

- Distribution utility **preclears** DER to join an aggregator
- Distribution utility may **override** DERA schedule to ensure distribution system safety and reliability
- **Data sharing** practices between all parties
- **Retail rate authorities** involved in coordination
- Allow regional **flexibility**, no explicit **coordination framework**

Relevant EPRI Research Areas



FERC O2222 Timeline



DERP: DER Provider, DERA: DER Aggregation, NOPR: Notice of Proposed Rulemaking.

FERC Order 2222 Status

- **CAISO:** FERC-approved DERP model in 2016
 - No active participants
 - Main barriers: higher retail rates, lack of resource adequacy eligibility rules
 - Submitted compliance filing to FERC (July 2021), received FERC comments (Oct. 2021), and addressed comments (Nov. 2021)
- **NYISO:** FERC-approved “DER and Aggregation” Model in Jan. 2020
 - Submitted compliance filing to FERC (July 2021), received FERC comments (Oct. 2021), and addressed comments (Nov. 2021)
- **PJM:** Filing extended by Feb. 1, 2022
- **ISO-NE:** Filing extended by Feb. 2, 2022
- **MISO:** Filing extended by Apr. 18, 2022
- **SPP:** Filing extended by Apr. 28, 2022



Multi-state ISOs/RTOs who did not have existing designs had approved extensions on compliance filings.

Design Features

- **Participation Models:** FERC requires each RTO/ISO to allow each DER Aggregator to register its DERAs under one or more participation models. To comply with this requirement, each RTO/ISO may modify some existing participation models and/or create one or more new participation models for DERAs.
- **Wholesale Market Services:** FERC required each RTO/ISO to allow the participation of DERAs in all wholesale market services (Energy, Ancillary Services and Capacity) when they are technically capable of providing the service.
- **Locational Requirements:** FERC required each RTO/ISO to modify their tariff to establish locational requirements for DERs participating in a DERA, which should be as *geographically broad as technically feasible*.
- **Metering and Telemetry Requirements:** FERC required each RTO/ISO to establish market rules that address metering and telemetry hardware and software requirements for DERAs in its compliance filing.
- **Application of Net Benefits Test (Order 745):** FERC required each RTO/ISO to allow Demand Response (DR) resources to be part of a heterogeneous aggregation. Such DR is still subject to the requirements of FERC Order 745 including the Net Benefits Test.
- **Size Requirements:** FERC does NOT require ISOs/RTO to impose a maximum size requirement for each individual DER or a DERA. However, a few of the RTOs/ISOs prefer to impose such requirements to have more visibility and control over the operation of DERs.
- **Dual Participation:** FERC allows for dual wholesale/retail participation if DERs are not double compensated for providing the same service.
- **Operational Coordination:** ISOs are required to establish coordination schemes with DERA and distribution utilities.

NYISO Participation Models

Resource Technology Type	Generator	Energy Storage	Load Curtailment - Demand Side Resources (DSR)	Generator + Storage	Mixed Technology - DER
Participation Models	Generator – for thermal generators and large hydro	Energy Storage Resources (ESR)	Demand Response (DR) – for non-dispatchable curtailment/load reduction	Co-located Storage Resource (CSR) – for separate IPR & ESR w/ shared interconnection	Dispatchable Distributed Energy Resource (DER) – for a facility or aggregation with mixed resource technologies (to be implemented by the end of 2022).
	Intermittent Power Resources (IPR) – for wind and solar	Limited Energy Storage Resource (LESR) – for Regulation-only storage like flywheels	Dispatchable Distributed Energy Resource (DER) – for curtailment that is dispatchable (to be implemented by the end of 2022).	Hybrid Storage Resource – under development for a renewable and storage as one resource	Behind-the-Meter Net Generation (BTM:NG) – for a facility comprised of a Generator and a Host Load.
	Other models include – Run-of-River Hydro, Behind-the-meter Net Generator (BTM:NG)	Energy Limited Resources (ELR) – for pumped hydro			

NYISO Model – Eligible Resources

- Accepted in Jan. 2020 by FERC, and plan to implement by the end of 2022
- NYISO’s “**DER and Aggregation**” participation model requires **the aggregation to follow the NYISO’s dispatch instructions**. BTM resources can be part of an aggregation but would need to be separately metered).
- NYISO defines two broad categories of resource types:
 - **Generator:** including thermal generation, electric/thermal Energy Storage Resources (ESRs), Intermittent Power Resources (IPRs), Limited Energy Storage Resources (LESRs), and BTM:NG Resources
 - **BTM:NG Resources are not eligible to be part of an aggregation.** A BTM:NG is a Generator combined with a Host Load operating as a single resource offering its net capability in the NYISO’s Energy, AS, and ICAP markets.
 - “DER and Aggregation” rules requires a Load Serving Entity (LSE) to serve the Load (not wholesale).
 - Can participate only if Generation is separately metered. If Load is a DR, it may also participate.
 - **Demand Side Resource:** Capable of controlling demand by either curtailing Load or using a local generator. Could participate in the markets or in emergency programs.
 - Resources participating in NYISO’s existing **Special Case Resource (SCR)** program and **Emergency Demand Response Program (EDRP)** are not eligible to be in a DER aggregation.
 - Reasons: SCR needs more advanced notice than a DER; EDRP’s performance is voluntary

BTM:NG: Behind-the-Meter Net Generation, **AS:** Ancillary Services, **ICAP:** Installed Capacity Market, **DERA:** Distributed Energy Resource Aggregation, **DR:** Demand Response, **ESR:** Energy Storage Resource, **LESR:** Limited Energy Storage Resource, **IPR:** Intermittent Power Resource, **SCR:** Special Case Resource, **EDRP:** Emergency Demand Response Program.

References:

1. [Compliance with FERC Order No. 2222, New York Independent System Operator, July 19, 2021.](#)
2. [NYISO Response to October 1, 2021, Letter Requesting Additional Information in Docket No. ER21-2460-000, -001, New York Independent System Operator, November 19, 2021.](#)

NYISO Model – Participation Models for DERs

- Both **homogeneous and heterogeneous** aggregations can participate as DERA
- **Homogeneous aggregations** except for Demand Side Resources will be **subject to the existing rules for the Resource type**, in addition to general Aggregation rules.
- Heterogeneous aggregations are subject to general Aggregations rules and certain DER Aggregation-specific rules.
- **What participation model should an aggregation mostly composed of a single resource type elect?**
 - **Example: homogeneous aggregations of solar resources** may elect IPR participation model: not subject to non-performance penalties. However, if “DER and Aggregation” participation model is elected, they will be subject to penalties as this participation model assumes dispatchable resources.
 - **Example: an aggregation mostly comprised of non-controllable resources (12 MW solar IPRs, 1 MW ESRs)**
 - **Alternative approaches** that would financially make more sense:
 1. 2 separate aggregations: homogeneous aggregation of ESR; homogeneous aggregation of ESR,
 2. 2 separate aggregations: 1 MW ESR and 2-3 MW of solar; Remaining solar in another aggregation.
 - NYISO indicates that it would be unfair to not require dispatchable resources to follow ISO-issued instructions
 - **Co-located Storage Resource (CSR)** participation model could be used if some or all ESRs and some or all IPRs are located behind a single point of injection. Min size for ESR/IPR portions are 100 kW and 1 MW respectively. Each resource type would be independently dispatched. (Expected implementation: Dec. 2021)
 - NYISO is also working with stakeholders to develop integrated hybrid storage model.

NYISO Model – Eligible Services

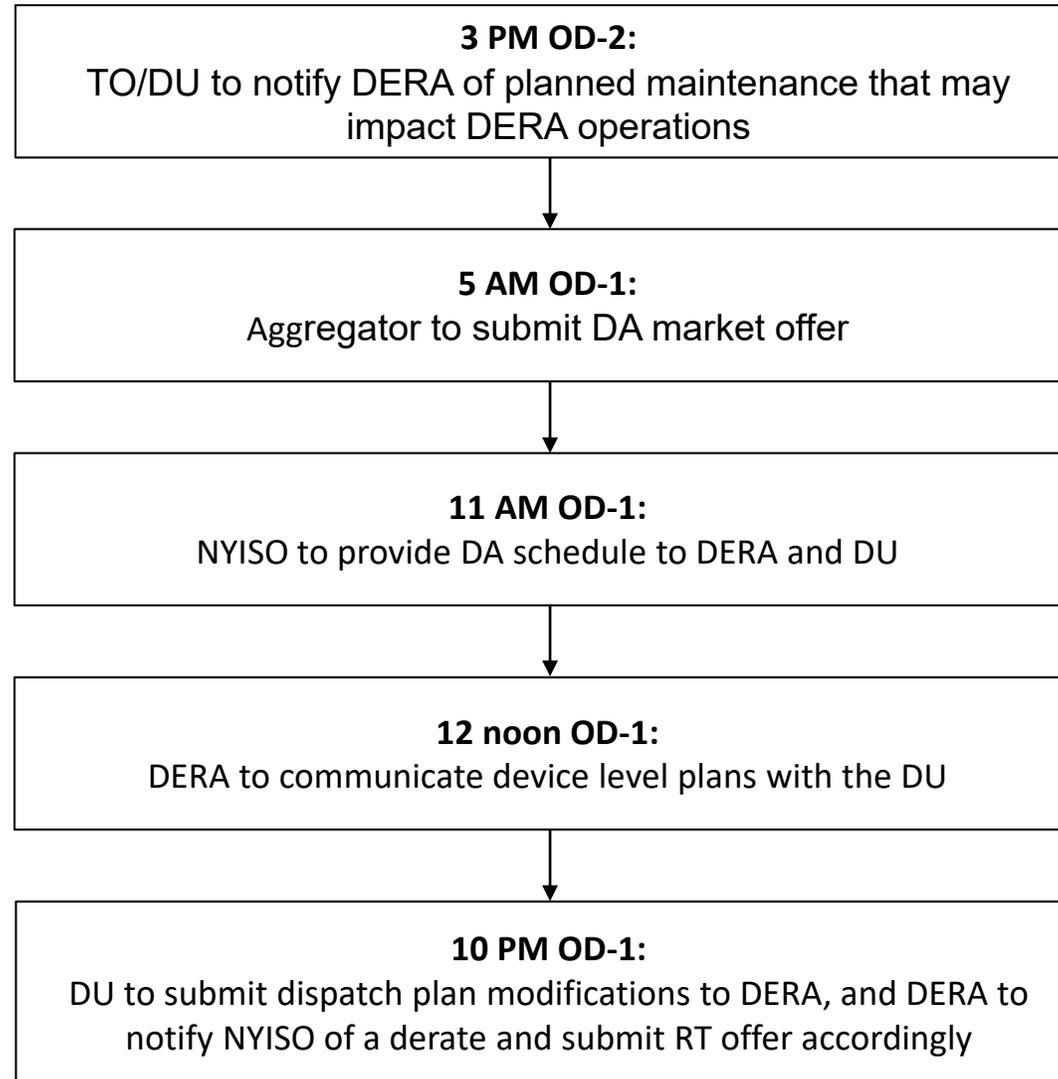
- **Energy Service:** dispatch-only model (no unit commitment), fully dispatchable continuous bid curve including withdrawal range if the aggregation has at least one “Withdrawal Eligible Generator”.
- **Ancillary Services:** Operating Reserve and Regulation only; DERs not eligible for Voltage Support Service
 - “An Aggregation may only qualify to offer the Ancillary Services that all individual facilities in the Aggregation are qualified to provide”. NYISO states that this requirement ensures compliance with NERC, NPCC, and NY state Reliability Committee rules.
 - For Regulation and Spinning Reserves (both 10-min and 30-min reserves): Generating units must use inverter-based energy storage technology; if DR is using local generator, it must use inverter-based energy storage technology.
 - IPR aggregations are not eligible for Operating reserves. They are allowed to provide Regulation, in which case, they would not be compensated for overgeneration, and non-performance penalties for under-generation would apply.
- **Dual Participation:** Dual Participation is allowed, and NYISO plans to work with distribution utilities to identify allowed retail/wholesale service pairs
- **Locational requirements:** DERs need to be located behind a single transmission node. NYISO has identified a total of 115 transmission nodes. Several factors are considered including system topology, transmission congestion, Distribution Utility footprint, etc.

Withdrawal Eligible Generator: “Generator that is eligible to withdraw energy from the grid at a price for the purposes of recharging or refilling for later injection back into the grid.” An example is an Energy Storage Resource. **NERC:** North American Electric Reliability Corporation, **NPCC:** Northeast Power Coordinating Council, **NY:** New York

NYISO Model – Metering & Telemetry

- **Aggregator** is responsible to provide **multiple streams** of **telemetry** and **revenue quality meter** data on an **aggregation** level.
- **Multiple streams** of data include: (1) net of energy injections and withdrawals, (2) demand reductions, and (3) sum of (1) and (2).
- **Telemetry** data is required 24/7 on a 6-s basis.
- **Homogeneous aggregations** are subject to the existing rules for the resource type.
 - Example: Each ESR in a homogenous aggregation must be **directly metered** and **hourly meter data** must be separately reported for injections and withdrawals.
- **Individual DER metering:** Aggregator is responsible to collect directly metered data from each individual DER. Hourly retail billing meter data is acceptable if they are revenue quality.
- **Individual DER Telemetry:** Each DER is also required to provide direct telemetry on 6-s basis.
 - Exception: Aggregators may seek authorization to utilize alternative telemetry (e.g., calculated values) for individual DERs that have a capability of 100 kW or less. Such DERs must still be able to provide directly measured telemetry at least every 5 minutes.
- **Note:** telemetry data is used as backup for issues with meter data, and shape the revenue metering data since revenue metering is on an hourly basis (overlay and used to settle 5-minute prices)

NYISO Model – Operational Coordination



OD: Operating Day, **TO:** Transmission Owner, **DU:** Distribution Utility, **DERA:** Distributed Energy Resource Aggregation, **DA:** Day-Ahead,

Key Design Feature across U.S. ISOs/RTOs

- **Participation Models:** While proposing one or two new participation models, most ISOs also plan to allow DERAs to use several existing participation models. Most new participation models are proposed to establish compliance with Order 745 for DR resources in a heterogeneous aggregation.
 - ISO-NE plans to establish a new participation model for DERAs that seek to self-schedule and get compensated at LMP.
 - MISO and SPP have not yet proposed any new participation models.
- **Eligible Wholesale Market Services:** All ISOs propose to allow the participation of DERAs in wholesale energy and Ancillary Services markets, though the rules around participation of resources in Ancillary services are slightly different.
 - NYISO, PJM, and ISO-NE propose to allow for participation of DERAs in wholesale Capacity market.
 - DERAs are not eligible for Voltage Support service in NYISO and Non-Synchronized Reserve in PJM.
 - NYISO plans to require each DER within an aggregation to be eligible for providing the same Ancillary Service the DERA is seeking to provide. For example, a DERA that contains one or more generating units is not eligible to provide Regulation Service unless each of the generating units in the Aggregation use inverter-based energy storage technology.

Key Design Feature across U.S. ISOs/RTOs

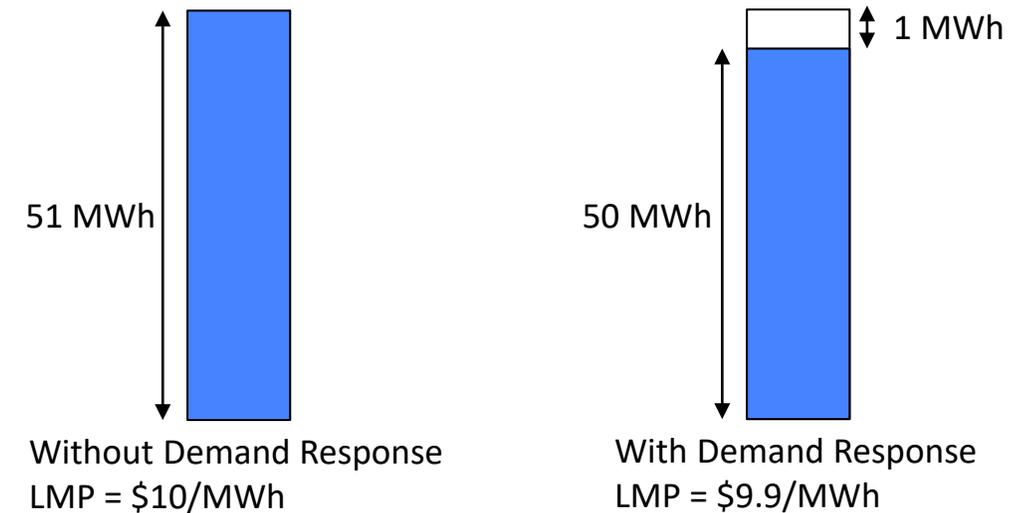
- **Locational Requirements:** Concerned with the reliability and pricing implications of DER Aggregation over multiple transmission pricing nodes, most ISOs propose to allow DERs to be located at the same transmission pricing node.
 - CAISO and ISO-NE propose multiple transmission pricing node aggregation. CAISO allows aggregations across a single Sub-Load Aggregation Point (Sub-LAP). Note that in comparison, there are 23 sub-LAPs compared with over 12,000 pricing nodes in CAISO. ISO-NE plans to allow for aggregation across the intersection of a Demand Response Resource (DRR) Aggregation Zone and a metering domain. In comparison, there are 20 DRR Aggregation Zones compared with over 1,000 pricing nodes.
 - NYISO's approach to locational requirements is a combination of single and multi-node aggregation as it identifies the locations where DERs can aggregate across based on the severity of historical transmission congestion and other system conditions (total of 115 transmission nodes).
- **Metering and Telemetry Requirements:** Most ISOs require metering and telemetry data at the aggregation level. Some ISOs require multiple streams of metering and telemetry data representing energy injections, energy withdrawals, and demand reductions.
 - PJM plans to require meter data from each individual DER. MISO has a similar requirement but allows for "DER Groups" to submit a single meter data. MISO defines a "DER Group" as a subset of DERs that are homogeneous and have the same M&V.
 - Certain DERAs are proposed to be exempt from providing telemetry data: (1) In CAISO, DERAs that are smaller than 10 MW and do not provide Ancillary Services, (2) In ISO-NE, DERAs that participate through Settlement-Only DERA (SODERA).
 - Some ISOs propose different telemetry scan rate requirements depending on the services the DERA seeks to provide.

Key Design Feature across U.S. ISOs/RTOs

- **Application of Net Benefits Test (NBT) (Order 745):** ISOs have two choices: (1) apply the NBT price threshold as an offer bid floor and reject any offer below the floor, (2) Allow resources to participate with any offer but compensate DR only if the Real Time Locational Marginal Price is higher than the NBT price threshold.
 - Although Approach (1) seems simpler to implement, it impacts non-DR resources within the aggregation as well.
 - Approach (2) does not have Approach (1) drawback above but may cause certain issues at the DR cost allocation stage.
- **Size Requirements:** Most ISOs require individual DERs larger than a threshold to participate as a stand-alone resource. ISOs that allow for multi-node aggregations are proposing to impose maximum size requirement on the DERA.
 - The maximum size limits proposed by the ISOs on individual DERs are somewhat arbitrary.
 - ISO-NE requires individual DERs larger than 5 MW to be their own DERAs and not select SODERA as participation models.
 - ISO-NE's size requirement on a DERA located on multiple nodes requires that the total DER size at each pricing node be no more than 5 MW.

FERC Order 745 – Compensation of DR Resources

- DR to be compensated for its demand reduction in the energy market at the locational marginal price (LMP) when:
 - DR participating in energy market can balance supply and demand as an alternative to generation
 - DR dispatch is cost-effective as determined by a net benefits test
 - The benefits of DR compensation outweigh the costs to consumers
- $$(LMP_{old} - LMP_{new}) \times MWh\ Consumed > LMP_{new} \times DR$$
- Depends on elasticity (typically cost effective in peak hours when the supply curve is steepest)
 - Net Benefits Threshold Price (NBTP)
 - The point along the supply stack beyond which the overall benefit from the reduced LMP resulting from dispatching DR exceeds its costs.
 - If $LMP > NBTP \rightarrow$ Pay DR at LMP
 - Static or Dynamic? Monthly calculation



$Payment\ to\ DR = 9.9 \times 1 = \9.9
 $Benefits\ to\ Customers = 0.1 \times 50 = \5
Not Cost Effective

Summary of RTO/ISO Distributed Energy Resource Aggregation Market Design Proposals

FERC Order 2222 Aspect	NYISO	PJM	SPP	ISO-NE	MISO	CAISO
Participation Model	❖ Most ISOs are proposing a new participation model to allow for heterogeneous aggregations consisting of both DR and non-DR resources.					
	New: “DER and Aggregation” Existing: Homogeneous aggregations may elect existing models.	New: DERA Existing: GEN, ESR, DR, EE	Existing: DDR, BDR, GEN, MSR, MCR, DVER for homogeneous; GEN, MSR for heterogeneous	New: SODERA, DRDERA Existing: GEN, CSF, BSF, DRR, ATRR	Existing: DIR, ESR	New: DERP, “Heterogeneous DERA” Existing: GEN, NGR
Eligible Wholesale Market Services	❖ All ISOs are proposing to allow DERAs provide wholesale energy service.					
	Energy, Ancillary Services (AS), Installed Capacity Market. Not eligible for Voltage Support. To be eligible for AS, each DER must be eligible.	Energy, AS (Regulation, Synchronized Reserve, Black Start), Capacity. Not eligible for Non-Synchronized Reserve.	Energy, AS (Reserves and Regulation).	Energy, AS (Reserves and Regulation), Forward Capacity Market (FCM).	Energy, AS (Reserves and Regulation).	Energy, AS (Reserves and Regulation). Not eligible for Resource Adequacy (RA) as qualifying capacity counting rules do not exist for DERAs in California.

ATRR: Alternative Technology Regulation Resource, **AS:** Ancillary Services, **BDR:** Block Demand Response, **BSF:** Binary Storage Facility, **CSF:** Continuous Storage Facility, **DDR:** Dispatchable Demand Response, **DERA:** Distributed Energy Resource Aggregation, **DERP:** Distributed Energy Resource Provider, **DIR:** Dispatchable Intermittent Resource, **DR:** Demand Response, **DRDERA:** Demand Response DERA, **DRR:** Demand Response Resource, **DVER:** Dispatchable Variable Energy Resource, **EE:** Energy Efficiency, **ESR:** Electric Storage Resource, **GEN:** Generator, **MCR:** Multi Cycle Resource, **MSR:** Market Storage Resource, **NGR:** Non-Generator Resource, **SODERA:** Settlement-Only DERA.

Summary of RTO/ISO Distributed Energy Resource Aggregation Market Design Proposals

FERC Order 2222 Aspect	NYISO	PJM	SPP	ISO-NE	MISO	CAISO
Locational Requirements	❖ Most ISOs are proposing single transmission pricing node aggregations.					
	Single Transmission Pricing Node More similar to a combination of single and multi-node aggregation. NYISO identifies the DER aggregation locations considering historical congestion and other system conditions.	Single Transmission Pricing Node Must be primarily mapped to the same node	Single Transmission Pricing Node	Multiple Transmission Pricing Nodes Intersection of DRR Aggregation Zone and Metering Domain	Single Transmission Pricing Node	Multiple Transmission Pricing Nodes Single Sub-Load Aggregation Point (Sub-LAP)
Metering Requirements	❖ All ISOs except for PJM and MISO require aggregate-level meter data.					
	Aggregated Revenue Quality Meter data Multiple streams (energy injections, energy withdrawals, and demand reductions). Individual DER data could be directly measured or calculated values.	Individual DER Settlement Quality Meter data Hourly or 5-min granularity.	Aggregated Revenue Quality Meter data	Aggregated Revenue Quality Meter data Hourly or 5-min (optional) granularity.	Individual DER and “DER Group” Settlement Quality Meter data A “DER Group” is a subset of DERs that are homogeneous and have the same M&V.	Aggregated Settlement Quality Meter data Multiple streams (energy injections, withdrawals, and demand reductions). Individual DERs must be directly metered.

DRR: Demand Response Resource, NYTO: New York Transmission Owner, Sub-LAP: Sub-Load Aggregation Point.

Summary of RTO/ISO Distributed Energy Resource Aggregation Market Design Proposals

FERC Order 2222 Aspect	NYISO	PJM	SPP	ISO-NE	MISO	CAISO
Telemetry Requirements	❖ Most ISOs require aggregate-level real-time telemetry from all DERAs.					
	Aggregated Real-Time Telemetry Multiple streams (energy injections, energy withdrawals, and demand reductions). Individual DER data could be directly measured or calculated values.	Aggregated Real-Time Telemetry Scan rate of 2s for Reg-D, 10s for Reg-A, 1-min for other AS and Capacity, 1-min for Energy if larger than 10 MW. Calculated values are acceptable for individual DERs.	Aggregated Real-Time Telemetry	Aggregated Real-Time Telemetry SODERA: no requirements. GEN, BSF, CSF: 10s or 2s (if providing regulation) DR, DRDERA: individual DER telemetry at 1- or 5-min rate	Aggregated Real-Time Telemetry Scan rate either 2s for all DERAs; or relax to 10-30 s only for non-regulation DERs smaller than 5 MW	Aggregated Real-Time Telemetry Only if DERA size is larger than 10 MW or provides Ancillary Services.
Application of Net Benefits Test (Order 745)	❖ Most ISOs apply the Net Benefits Test to heterogeneous DERAs in after the fact settlement stage.					
	Settlement Adjustment Only applies to DR DERs within a DERA.	Settlement Adjustment Only applies to DR DERs within a DERA.	Settlement Adjustment Only applies to DR DERs within a DERA.	Bid-Floor Approach Applies to both injecting DERs and DR DERs within a DRDERA. Injecting DERs can self-schedule and get paid at LMP if do not clear the market.	Settlement Adjustment Only applies to DRs within a DERA. DRs must be within the same LSE territory.	Bid-Floor Approach Applies to both injecting DERs and DR DERs within a DRDERA. Cannot provide services if not cleared.

BSF: Binary Storage Facility, **CSF:** Continuous Storage Facility, **DERA:** Distributed Energy Resource Aggregation, **DR:** Demand Response, **DRDERA:** Demand Response DERA, **GEN:** Generator, **Reg-A:** Slower regulation product in PJM typically used for non-storage resources, **Reg-D:** Faster regulation product in PJM typically used for electric storage resources, **SODERA:** Settlement-Only DERA.

Summary of RTO/ISO Distributed Energy Resource Aggregation Market Design Proposals

FERC Order 841 Aspect	NYISO	PJM	SPP	ISO-NE	MISO	CAISO
Maximum Size (Individual DERs)	❖ Most ISOs require larger DERs to participate as stand-alone resources or be the only resource in the DERA.					
	20 MW	5 MW	None	SODERA: 5 MW Other models: If larger than 5 MW, must be its own DERA	None	1 MW
Maximum Size (DERA)	❖ Only ISOs allowing multiple pricing node aggregations impose size requirements on aggregations.					
	None	None	None	5 MW on total DER size at each pricing node if aggregated across multiple pricing node	None	20 MW if aggregated across multiple pricing nodes

SODERA: Settlement-Only DERA.

Key Issues FERC Raised to CAISO Filing and CAISO's Response

- **Order 745 Compliance:** CAISO proposes that the bid for an aggregation that includes both DR and non-DR resources must be above the net benefits test price threshold (Order 745). CAISO states that it cannot apply the net benefits test to only the DR portion.
 - **FERC Comment:** FERC asked whether CAISO could use different bidding parameters for DR and non-DR portions so that only the DR portion is affected by the net benefits test.
 - **CAISO Response:** CAISO states that it currently does not have this capability. It also points out that developing such bidding parameters would require substantial time and cost with no clear benefits.
 - **FERC Comment:** FERC sought clarification as to whether CAISO's proposal could prevent non-DR resources in a heterogeneous aggregation (which includes DR resources as well) from economically clearing the market when the threshold established by the net benefits test is above \$0/MWh.
 - **CAISO Response:** **CAISO states that although this scenario is possible, it is rare.** (1) CAISO asserts that the net benefits test price threshold is typically very low and non-DR resources will be able to inject energy if the aggregation offer is above the threshold. (2) CAISO states that the scenario in FERC's comment would occur only if the DR portion is not providing demand response services in the same interval as the non-DR portion. It argues that since its DR programs are attractive, e.g., eligible for resource adequacy capacity, DR resources would select the heterogeneous aggregation participation model only if they seek to provide services in the same interval as non-DR resources. Therefore, the scenario in FERC's comment is unlikely to happen.

Key Issues FERC Raised to CAISO Filing and CAISO's Response

- **Size Requirements:** CAISO states that minimum size requirement for an aggregation is lowered to 100 kW. It also proposes not to allow individual DERs 1 MW or greater to be part of an aggregation.
 - **FERC Comment:** FERC refers to CAISO Tariff Appendix K (Ancillary Service Requirements Protocol) which imposes a 500-kW minimum size requirement for a non-storage resource providing Regulation, Spinning Reserve, or Non-Spinning Reserve, and asks whether that requirement complies with Order 2222.
 - **CAISO Response:** CAISO argues that Order No. 2222 did not establish any requirement on whether existing Ancillary Services rules are reasonable. Therefore, it does not propose to change the above-mentioned requirement in Tariff Appendix K.
 - **FERC Comment:** FERC sought clarification on how CAISO came up with 1 MW as the maximum size requirement on individual DERs.
 - **CAISO Response:** CAISO states that under its tariff, generating units 1 MW or greater must become participating generators and are not allowed to aggregate with other resources. Generating units 1 MW or greater must participate as a stand-alone resource. CAISO states that the 1 MW maximum capacity on individual DERs is not a challenge for DER participation (based on discussion with developers).

Key Issues FERC Raised to CAISO Filing and CAISO's Response

- **Metering and Telemetry Requirements:** CAISO requires DER Aggregators to provide metering and telemetry on an aggregated basis. CAISO asserts that each DER must be directly metered.
 - **FERC Comment:** FERC sought explanation on whether CAISO allows aggregators to depend on meter data provided by a Distribution Utility (DU) or a Relevant Electric Retail Regulatory Authority.
 - **CAISO Response:** CAISO states that it allows meter data from a DU or RERRA if it complies with the applicable standards.

- **FERC Comment:** FERC asked for clarification on whether calculated rather than directly measured metering and telemetry data would be acceptable for individual DERs.
 - **CAISO Response:** CAISO states that it allows aggregators to obtain metering and telemetry data using calculation-based methods.

Key Issues FERC Raised to NYISO Filing and NYISO's Response

- **Participation Models: Homogeneous DER aggregations (except for demand response) can elect the participation model associated with the resource type.** On the other hand, heterogeneous aggregations can only select the “DER and Aggregation” participation model at this stage. NYISO states that participation models associated with homogeneous aggregations can better reflect operating characteristics of the resources compared with the “DER and Aggregation” participation model.
 - **FERC Comment:** FERC sought clarification on how the “DER and Aggregation” participation model accommodates physical and operational characteristics of heterogeneous aggregations, especially for aggregations that are composed of mostly one resource type.
 - **NYISO Response:** NYISO's participation model for homogeneous renewable resources (called Intermittent Power Resources or IPR) does not apply persistent under-generation charges since these resources are not capable of following ISO dispatch signals. On the other hand, NYISO asserts that resources participating through “DER and Aggregation” participation model must be capable of following dispatch instructions. An aggregation in which a resource type not capable of following dispatch signals is the majority (for example 12 MW solar and 1 MW storage) does not fit economically well with the “DER and Aggregation” participation model. NYISO states that such an aggregation could be two separate aggregations to make them financially more interesting. It provides two options: (1) 12 MW solar participating through IPR, and 1 MW storage participating through ESR; and (2) 1 MW storage with 2-3 MW solar participating through “DER and Aggregation”, and the remaining 9-10 MW solar participating through IPR. Also, NYISO does not believe that it should apply IPR rules to resources participating through “DER and Aggregation” model stating that it would be unjust and unreasonable to not require resources to follow dispatch instructions when they are technically capable of doing so.

Key Issues FERC Raised to NYISO Filing and NYISO's Response

- **Provision of Ancillary Services:** NYISO states that all individual DERs in an aggregation must be qualified to provide the Ancillary Service the aggregator seeks to provide (to maintain compliance with NERC and other local reliability rules).
 - **FERC Comment:** FERC wants clarification on why such requirement is necessary.
 - **NYISO Response:** NYISO states that based on the above-mentioned rules it requires that all individual resources within an aggregation be capable of providing the Ancillary Service the aggregation seeks to provide. This requirement applies to other participation models as well. For a heterogeneous DERA that is comprised of several generating units and is dispatched to provide ancillary services that require the participating resource (in this case the DERA) to be online and synchronized to the grid (i.e., Regulation Service, Spinning Reserve, and 30-Minute Synchronized Reserve), the NYISO states that it does not have visibility into whether the next increment of output will be provided by a DER that is online or by a DER that is offline. Because of this concern, NYISO requires that if there is one or more generating units in an aggregation that seeks to provide Regulation Service, Spinning Reserve, or 30-Minute Synchronized Reserve, those generating units must use inverter-based energy storage technology. Otherwise, the aggregation is not eligible to provide those services.

Key Issues FERC Raised to NYISO Filing and NYISO's Response

- **Locational Requirements:** NYISO states that each individual DER within an aggregation must be electrically connected to the same transmission node. Transmission nodes are identified in collaboration with New York Transmission Owners taking into account congestion and other factors.
 - **FERC Comment:** FERC sought more information about how NYISO identifies transmission nodes for the purpose of DERA participation.
 - **NYISO Response:** NYISO states that currently, the total number of identified transmission nodes is 115. Several factors contribute to identification of transmission nodes including (1) load pockets in Tx and/or DX systems, (2) thermal limits, (3) Dx Utility and Member System footprints; (4) ratio of load to total average system load; and (5) substation topology of the distribution system. NYISO explains that in areas with adequate hosting capacity and with meshed topology, a single transmission node may include a geographically broad area. In other areas where congestion is frequent, a transmission node may include a geographically small area.

References

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11. Order 2222 Design Discussion, PJM, August 17, 2021, <https://www.pjm.com/-/media/committees-groups/subcommittees/dirs/2021/20210817/20210817-dera-proposal.ashx>
12. Order 2222 Compliance Design, SPP, September 7, 2021, <https://spp.org/Documents/65300/Order%202222%20Meeting%20Materials%2020210907.zip>
13. Demand Response Compensation in Organized Wholesale Energy Markets, FERC, Order No. 745, issued March 15, 2011. <https://www.ferc.gov/sites/default/files/2020-06/Order-745.pdf>

A blue-tinted photograph of four people, two men and two women, standing in a row. They are dressed in professional attire, including lab coats and a hard hat. The man on the far left is wearing a white lab coat with the EPRI logo. The man next to him is wearing a white lab coat and safety glasses. The woman in the center is wearing a dark polo shirt with the EPRI logo and a white hard hat. The man on the far right is wearing a light-colored button-down shirt and glasses. They are all smiling and looking towards the right. The background is a solid blue color.

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