



# FERC Order 2222 Filing Framework



Iteration 2  
August 2, 2021  
IR070

# Purpose & Key Takeaways



## Purpose:

A comprehensive presentation that outlines all aspects of MISO's O2222 response. Updated items are noted on [slide 4](#).

## Key Takeaways:

- Stakeholder feedback generally supports the proposed modeling approach.
- Metering is proposed to be required for individual DER within an aggregation to ensure accurate settlements.
- Telemetry is proposed to match existing requirements with the potential for changes as future technologies are defined.
- Stakeholder comments are requested on parking lot items for post-filing consideration, small utility opt-ins, and scan rates for certain resources by **August 16**.

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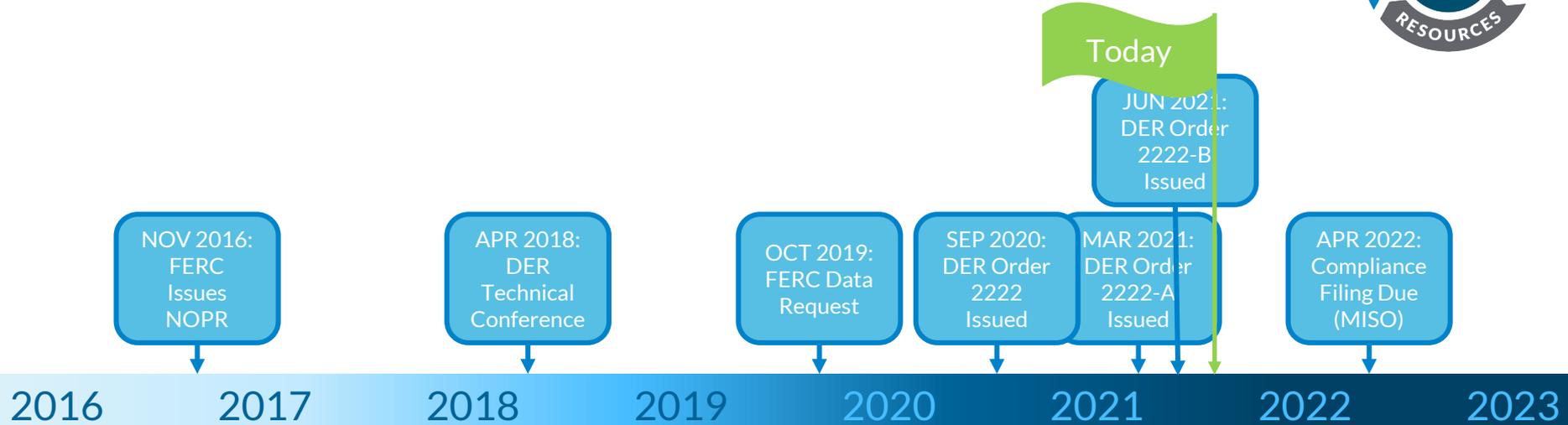
# August 2 Framing Deck: New or Modified Slides

- **Framing Information**
  - Updated FERC process outline to include Order 2222-B ([Slide 7](#))
  - Updated feedback request ([Slide 14](#))
  - Inserted summaries and response to June DER TF feedback ([Slides 21-23](#))
- **A - Commission Jurisdiction**
  - Updated utilities over 4M MWh\* to remove G&T ([Slide 23](#))
  - Added small utility opt-in feedback request ([Slide 28](#))
  - Updated IPWG discussion timeline ([Slide 33](#))
- **C, D, E - Participation Models**
  - Updated decision summary ([Slide 37](#))
  - Inserted stakeholder comments and MISO responses on modeling ([Slides 46 - 52](#))
  - Clarified market data requirements ([Slide 56](#))
- **F, G - Information, Data, Metering, and Telemetry**
  - Inserted stakeholder comments, MISO responses, recommendation and examples for meter data ([Slides 65, 68-71](#))
  - Inserted stakeholder comments, MISO responses, and background on dual participation ([Slides 73 - 77](#))
  - Inserted stakeholder comments, MISO responses, proposal, and a feedback request on telemetry ([Slides 80 - 83, 85](#))
- **H - Coordination**
  - Updated decision summary ([Slide 87](#))
- **Next Steps**
  - Included Parking Lot to capture future discussions and research opportunities with feedback request ([Slides 98-100](#))

# Framing Information



# FERC Order on DER has seen a long development



“We define a distributed energy resource as any resource located on the distribution system, any subsystem thereof, or behind a customer meter. These resources may include but are not limited to, electric storage resources, distributed generation, demand response, energy efficiency, thermal storage, and electric vehicles and their supply equipment.”

*O2222, fn. 1; see also P 114*



# FERC Process Outline

- **Order No. 2222**, issued on September 17, 2020, requires that ISOs/RTOs allow distributed energy resources (DERs) to provide all wholesale services that they are technically capable of providing through an aggregation of resources.
- **Order No. 2222-A**, issued on March 18, 2021, modified/clarified certain aspects of Order No. 2222 on rehearing, including removing RERRA opt-out rights for "heterogeneous" DER aggregations.
- **Order No. 2222-B** issued on June 17, 2021, modified/reversed a portion of Order No. 2222-A, deferring the opt-out examination to a Notice of Inquiry proceeding for Order No. 719.
- To comply, ISO/RTOs either need to:
  - Revise their tariffs consistent with specific requirements from the Order, -OR-
  - Demonstrate how current tariff provisions satisfy the intent and objectives of the Order.
- MISO will need to make substantive tariff edits to comply with this Order, and existing tariff language for market participation, registration, settlement, and more will serve as a guide for the creation of DERA rules.
- FERC did not establish a specific implementation deadline in Order No. 2222; rather, ISOs/RTOs must propose an implementation deadline in the compliance filings.

Relevant Electric Retail Rate Authority - RERRA  
Distributed Energy Resource Aggregator - DERA

# Order 2222 and 2222-A: High-Level Requirements



- ISOs are required to change tariffs to accommodate DER aggregations in energy, ancillary services, and capacity markets.
- Aggregations can be one asset, as small as 100kW, and “heterogeneous” (i.e., an aggregation comprised on both demand resources and at least one DER capable of injecting onto the grid).
- ISOs can limit maximum DER resource and/or aggregation size.
- DER aggregations, including qualifying facilities, will be subject to state interconnection requirements rather than the ISO queue process.
- Significant flexibility is allowed for single node aggregation, methods of communication, and maximum size, but ISO choices must be technically explained and not overly burden DER aggregators.
- FERC recommends that each ISO create a “coordination framework” to clarify the communication and other responsibilities of the ISO, Distribution Company, RERRA, and DERA. However, the DERA is ultimately responsible to attest it has met all the requirements for registration.
- In O2222-A, FERC allowed aggregated demand resources to participate in a heterogeneous DER aggregation and not be subject to RERRA opt-out rights.
  - RERRAs retain the right to limit DERA participation to retail markets only.

[DER TF O2222 Public File Calendar, Issues, Requirements](#)

# O2222 Takeaways



## Biggest challenges to solve:

- Coordination between and among RTO/ ISOs, RERRAs, distribution companies, and DERAs must be clear to all parties and have transparent and well-established communications to **ensure system reliability** and prevent double counting.
- Measurement and verification will take considerable thought; distribution operations and transmission **operations must be assured visibility**.
- The distribution system is designed to be more dynamic than the transmission system, and routine switching operations will make the “path” between the DERs and the Bulk Electric System difficult to ascertain – especially important if DERA can inject energy.

- Some commenters have indicated this is the first time they remember a FERC Order leading (being ahead of) technology in this way.
- Sections of the Order state “including but not limited to” language which reflects anticipated development of distributed energy resource aggregations.
- How much flexibility can/ should MISO build for assets that do not exist yet, whose attributes and capabilities are unknown and evolving?

# Relevant Demand Response FERC Orders



Order	Date	Description
Order 719	October 17, 2008	<ul style="list-style-type: none"> <li>- The Commission will require RTOs and ISOs to: (1) accept bids from demand response resources in their markets for certain ancillary services, on a basis comparable to other resources; (3) permit ARCs to bid demand response on behalf of retail customers directly into the RTO's or ISO's organized markets.</li> <li>- Established opt-out/opt-in rights for RERRAs.</li> </ul>
Order 745	March 15, 2011	<ul style="list-style-type: none"> <li>- When a demand response resource participating in an organized wholesale energy market administered by a RTO/ ISO has the capability to balance supply and demand as an alternative to a generation resource and when dispatch of that demand response resource is cost-effective as determined by the net benefits test described in this rule, that demand response resource must be compensated for the service it provides to the energy market at the market price for energy, referred to as the locational marginal price (LMP).</li> </ul>
Order 2222 and O2222-A	September 17, 2020 March 18, 2021	<ul style="list-style-type: none"> <li>- Allow distributed energy resource aggregators to register distributed energy resource aggregations under one or more participation models that accommodate the physical and operational characteristics of the distributed energy resource aggregations;</li> <li>- We require that each RTO's/ISO's rules do not prohibit any particular type of distributed energy resource technology from participating in distributed energy resource aggregations.</li> <li>- O2222: Retained RERRA opt-out/opt-in rights regarding demand resource participation in DERA.</li> <li>- O2222-A: "We clarify, however, that the participation of demand response in distributed energy resource aggregations is not subject to the opt-out requirements of Order Nos. 719 and 719-A if heterogeneous; remains subject to opt-in requirements based on utility size."</li> </ul>

Relevant Electric Retail Rate Authority – RERRA  
Distributed Energy Resource Aggregator - DERA

# Key Terminology



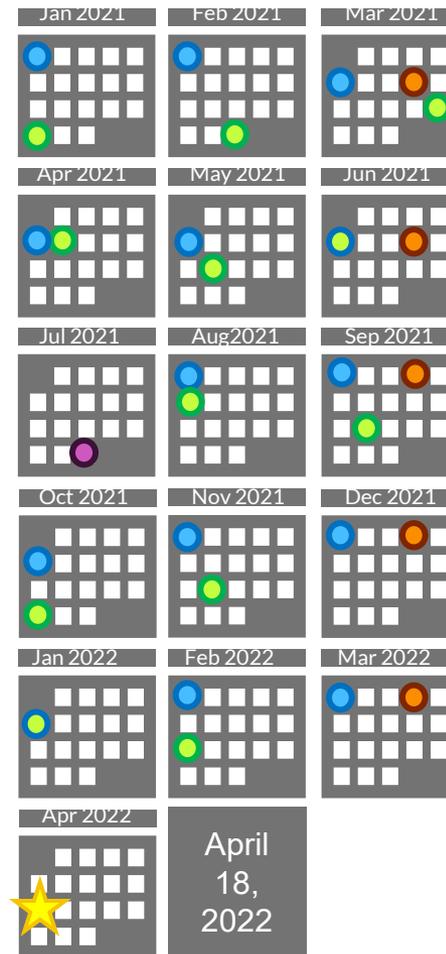
- [DER Glossary](#) will be a living document and a link has been added to the DER pages on the MISO website.
- While the acronyms are similar, MISO has made a distinction between the market participant who is the Aggregator of DER (**DERA**) and the aggregation of DER (**DERa**). This is consistent with other similar items in our tariff.
- Triple A data – what does MISO need from data provided by DERAs?
  - Automated – human intervention is not required; signals are automated.
  - Accurate – traceable and auditable.
  - Actionable – data can quickly become overwhelming; what is necessary?
- Distribution Company (**DC**) vs. Electric Distribution Company (**EDC**)
  - MISO used the former term when scheduling workshops.
  - In the MISO tariff, EDC is a defined term.
  - EDC will be the term used going forward.

# MISO filed, and was granted, a Motion for Extension of Time to file our compliance plan with FERC



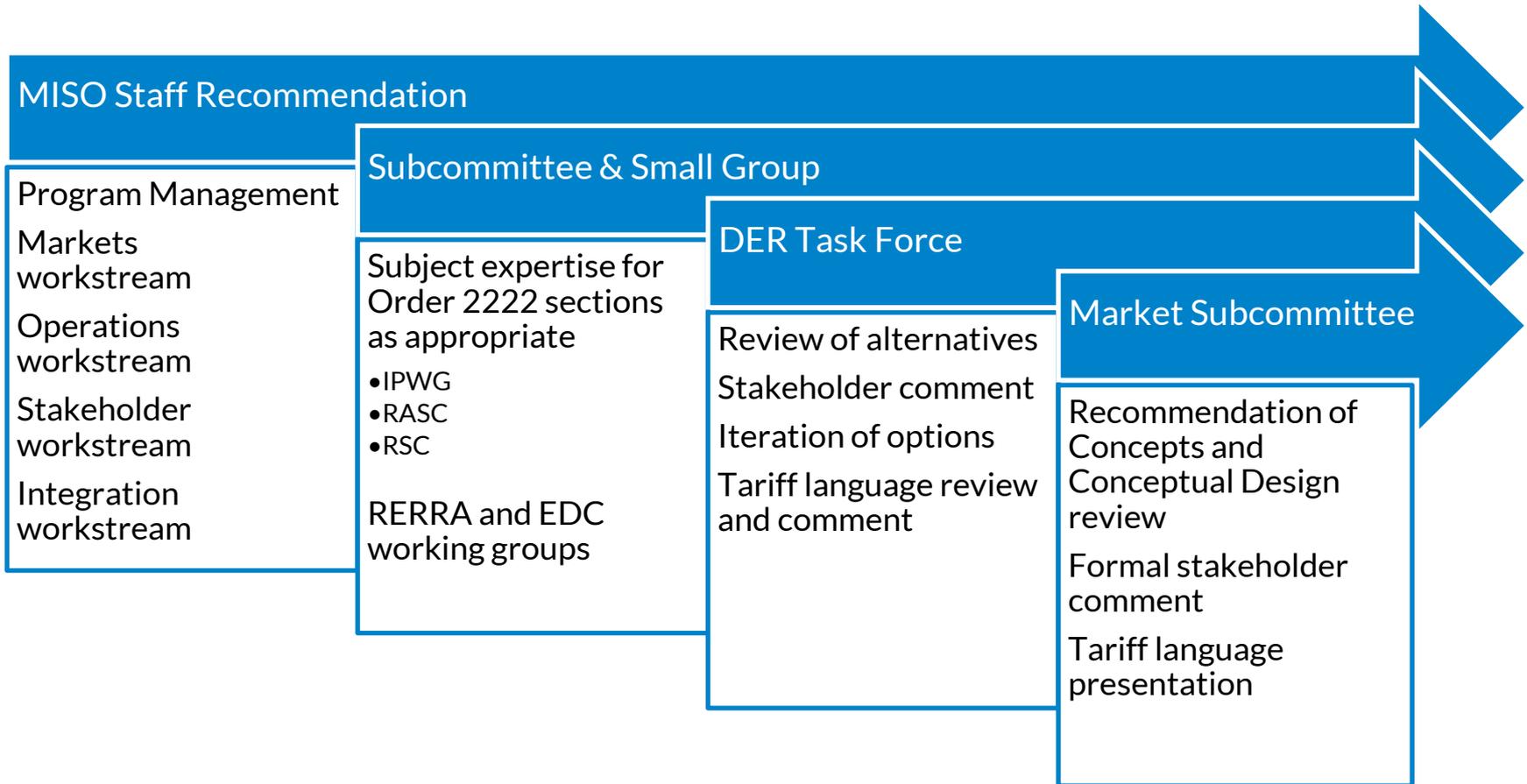
A	Commission Jurisdiction and General Requirements
B	Definition of DER and DERA
C	Eligibility to Participate in RTO/ISO Markets through a DERA
D	Locational Requirements
E	Distribution Factors and Bidding Parameters
F	Information and Data Requirements
G	Metering and Telemetry Requirements
H	Coordination between the RTO/ISO, Aggregator, and Distribution Utility
I	Modification to List of Resources in Aggregation
J	Market Participation Agreements

-  DER Task Force
-  Market Subcommittee / Present Design
-  Electric Distribution Company Workshop
-  FERC Filing



- MISO stakeholders created a Task Force to address DER compliance.
- DER Task Force and DER Distribution Company workshops will continue through extension period.
- 9-month extension calendar allows for additional collaboration.
-  **Roles of RERRA, Electric Distribution Company (EDC), DERA, and MISO need to be established.**
- Further details can be found on [MISO's DER Task Force website](#) and by joining the mailing list.
- EPRI also has a robust O2222 effort, with participation by RTO/ISO's, utilities, and DER aggregators.

# Stakeholder-Facing O2222 Response Process Flow





# Stakeholder Feedback Request

★ MISO has multiple formal feedback requests within this presentation today on an issue Parking Lot, small utility opt in, and scan rates.

- Informal feedback is welcome at any time via our email:  
[derprogrammanagement@misoenergy.org](mailto:derprogrammanagement@misoenergy.org)

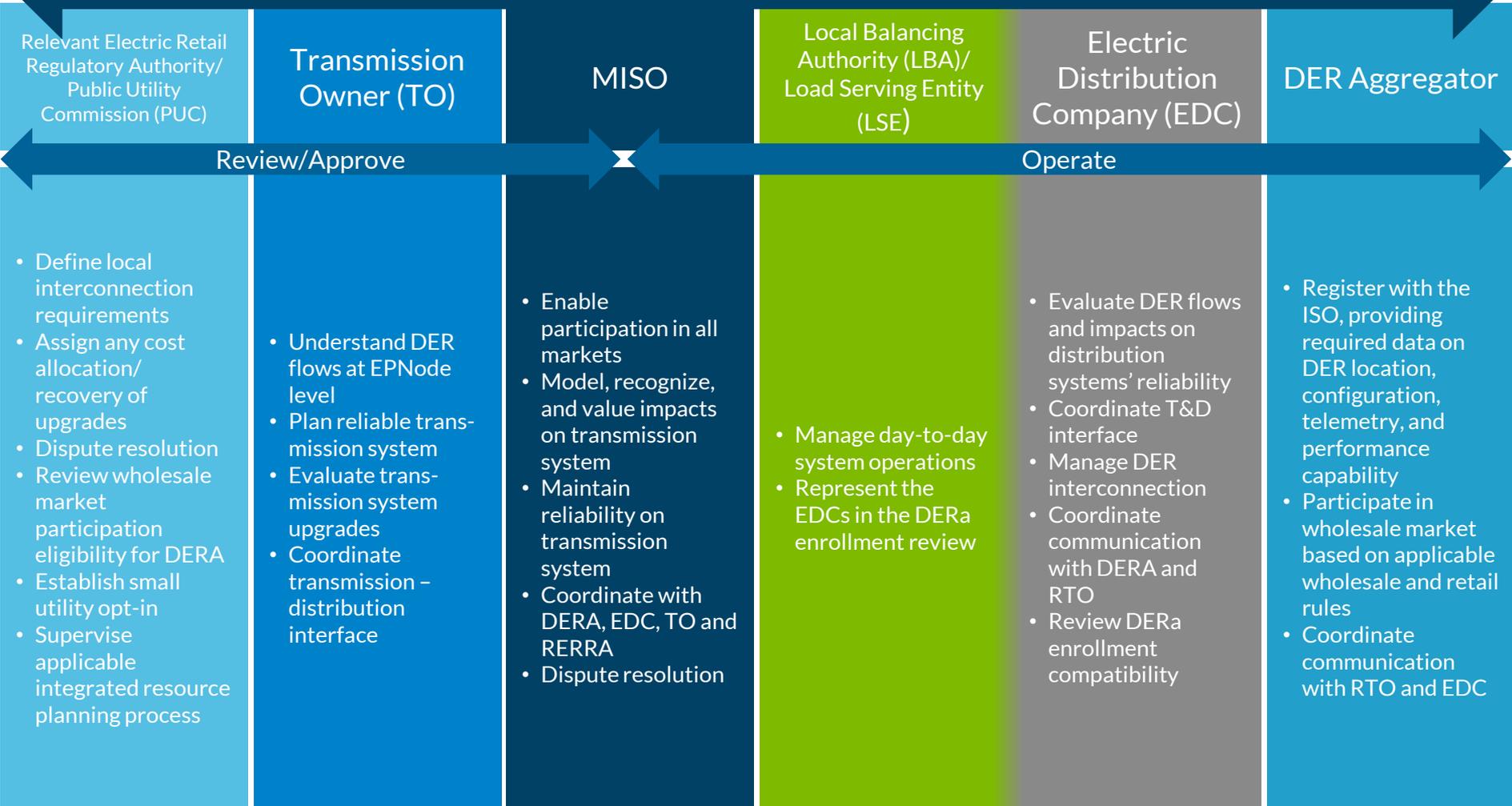
- Issue Tracking ID#: IR070 

- Feedback requests and responses are managed through the Feedback Tool on the MISO website:  
<https://www.misoenergy.org/stakeholder-engagement/stakeholder-feedback/>

# FERC has called for collaboration across jurisdictions and seams; successful implementation requires developing new frameworks

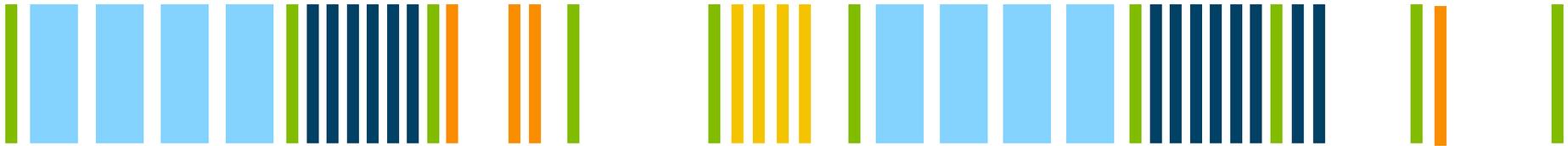


## MISO has the Facilitation Role in Order 2222





# How to Read the Filing Framework Presentation



Section Divider	Work presented today, all content present in this presentation	Work presented previously, summary in this presentation, details linked
	Work that is underway at MISO; some nods to this work may be/ have been presented, but the content is not complete	Work that is underway in another forum such as IPWG or RASC; summary here, details linked

- The presentation will follow the section order of O2222; this will mean we may “jump around” in our presentation of materials.
- The intent is that anyone picking up this Filing Framework can see a summary of where MISO is on all aspects of the compliance filing, with links to detailed presentations.

# MISO's product development process moves from problem definition to buildable solutions



*We Are Here*



**Problem Definition & Education**

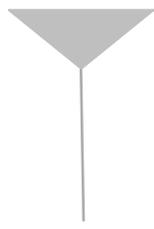
**Exploration of Options**

**Design & Business Rules**

**Software, BPM Updates & Training**

**Deploy to Production**

**Review Outcomes**



Selects an option and details specific design

Defines important design elements and derives options via higher fidelity modeling

Defines needs to address in following steps (e.g., compliance requirements)  
Can iterate as it moves through the process

# Guiding principles will be used to evaluate potential solutions



MISO and the DER TF should :

- 1) Identify DER-related issues with existing markets, tools and processes to ensure continued reliable and efficient operations.
- 2) Establish and support collaboration and coordination frameworks with stakeholders, including distribution utilities, to ensure awareness of opportunities and challenges, to ensure distribution entities can maintain reliability, maintain compliance with RERRA requirements, to ensure awareness of opportunities and challenges, and to facilitate technical coordination, policy conversation and education.
- 3) Address any DER-related issues and barriers impacting such resources' participation in MISO's wholesale markets with reasonable solutions that enhance or support reliability and market efficiency.
- 4) Support current and future resource and transmission planning initiatives and goals in concert with MISO's response to the Reliability Imperative, while complying with applicable orders, regulations and jurisdictional requirements.



# Evaluation Framework is based on Guiding Principles



# Documentation will follow the format below, with examples and responses to comments added as needed



## Key Compliance Requirements: Participation Models



- Section 1: Description
  - Language
- Section 2: Description
  - Language

16

### Question



1. Option 1
2. Option 2
3. Option 3
4. Option 4

23

### Alternatives Considered



### Question Recommendation

#### Benefits

- Grid Reliability and Resiliency  
*TBD*
- Market Efficiency  
*TBD*
- Minimize Implementation Costs  
*TBD*
- Minimize Complexity  
*TBD*

#### Assumptions

1. Assumption 1
2. Assumption 2

#### Considerations

- Grid Reliability and Resiliency  
*TBD*
- Market Efficiency  
*Does not have 2 decimal point resolution*
- Minimize Implementation Costs  
*TBD*
- Minimize Complexity  
*TBD*

#### Risks

1. Risk 1
2. Risk 2





# MISO Response to Stakeholder Feedback on Filing Framework Presentation and Format (1)

Stakeholder Comments	MISO Response
<p>MISO should include definitions of ESR, DERa, and DR in the document.</p>	<p>These terms appear in or will be added to the glossary, link on <a href="#">slide 11</a>.</p>
<p>MISO should include a more detailed description of the tradeoffs of using the DIR/ ESR participation model vs other existing products.</p>	<p>Noted; work into defining how DERA may participate in existing participation models is ongoing.</p>
<p>MISO should consider how it can more clearly flag issues that it believes are required to be part of its Order 2222 compliance filing as opposed to issues that will be useful during the compliance/implementation process. Also, because this is meant to be an iterative document, we suggest that MISO (1) include a slide at the beginning pointing the reader to the most recent changes, and (2) commit to communicating with the DER TF listserv when updates are made to the document.</p>	<p>As the tariff language for the compliance filing is developed, items which are specifically tariff related will become clear. New changes are highlighted at the beginning of the presentation, slide 4. Updates are made by staff routinely and posted monthly. There is no “live” version of edits to this framework document.</p>
<p>Slide 11 shows a calendar framework. It would be helpful if MISO could label the calendar with at least the months in which the meetings occur.</p>	<p>This has been updated.</p>

# MISO Response to Stakeholder Feedback on Filing Framework Presentation and Format (2)



Stakeholder Comments	MISO Response
<p>One modification that would be useful would be to clearly identify which Section of the FERC Order is being addressed in each evaluation section. For example, Sections C, D, and E are discussed in the proposal and then MISO looks at “range of DER aggregations’ characteristics.” For the issues and alternatives being considered, what is the Section is being addressed?</p>	<p>The presentation is organized by FERC section; some topics don’t align perfectly to a single section. As tariff language is developed, MISO will include the reference to the Order section for each tariff section addressed.</p>
<p>Additional transparency on how the Order 2222 compliance framework will be affected by, or will be advanced, in light of the Market System Enhancement timeline and in relation to the Order 841/ESR product timeline will be a useful addition to Compliance Iteration 2 and discussion at the RERRA workshop and August DER TF.</p>	<p>Noted-- MISO’s DER TF team has reached out to the staff working on MSE and has requested this information for future discussion (although not available for today’s DER TF).</p>
<p>An overview of MISO software (including MSE but also other potential software or system limitations) and what those limitations are in relation to Order 2222. Points to address would be whether, and who, are working on further development of those software or system limitations, what is driving the development, and if possible, understanding of the timeline for the research and outcomes.</p>	<p>This will be incorporated into the Compliance Plan filing to FERC in April 2022. MISO will describe what the system limitations are, including planned enhancements, when discussing the implementation timeline.</p>

# MISO Response to Stakeholder Feedback on Filing Framework Presentation and Format (3)



Stakeholder Comments	MISO Response
<p>The OMS DER WG sees the MISO slide defining potential stakeholder or industry sectors as needing discussion and improvement. MISO should consider stakeholder input on how to define these roles and responsibilities; this may be an area where stakeholders bring to the table their proposed definition and roles within the process for collective DER TF input. Additionally, the OMS DER WG wants to ensure that any roles or responsibilities that are defined in an Order 2222 compliance be vetted by that stakeholder sector and be as minimal as possible.</p>	<p>Understood; MISO has the facilitation role for the Order response and must be mindful of the timeline associated with the compliance plan filing as well as the jurisdictional limits of MISO’s ability to “dictate” a solution. We are committed to working with stakeholders to coordinate closely. That said, some roles and responsibilities are indicated within Order 2222, or are outside MISO’s jurisdiction and must be managed by the RERRA or EDCs, for example.</p>
<p>The OMS DER WG sees multiple areas of overlap between the DER TF and the on-going hybrid resource work. The OMS DER WG wants to ensure that any similarities, connections, or streamlining of resource and product development be mimicked wherever possible to ensure efficient and less complex solutions (and market products).</p>	<p>Noted; many of the same MISO staff are working on both hybrid development as well as the DER Program. MISO would also like to ensure there are streamlined processes where possible to minimize confusion and complexity.</p>
<p>Iterative Order 2222 Tariff Development – Post April 2022.</p>	<p>MISO has acknowledged that there is unlikely to be a perfect, comprehensive solution in the first tariff filing, in part because of the wide variety of DER potential futures. MISO expects to continue tariff adjustment with time, and MISO or stakeholders can bring future work, via “Issues”, to the Steering Committee for assignment to the stakeholder committees. MISO and stakeholders can also leverage the roadmap process to prioritize and address future tariff development.</p>

# A-Commission Jurisdiction and General Requirements



# Key Requirements of FERC 2222:

## Section A. FERC Jurisdiction

1. FERC jurisdiction
  - DERA becomes FERC jurisdictional utility
  - Distribution utilities can assess wholesale distribution charges on DERA
2. Opt-out/ in
  - MISO must accept bids from DERA:
    - If utility >4 million MWh sales in prior fiscal year
    - If utility  $\leq$  4 million MWh sales in prior fiscal year, but only with RERRA approval
  - O2222-A removed RERRA opt-out rights for demand resources participating in a heterogeneous DERA
3. Interconnection
  - FERC declined to exercise jurisdiction over DER interconnection to distribution
    - FERC may revisit need to assert DER interconnection authority if process used as a barrier to entry
  - MISO/ EDC/ TO coordination needed to share information to study impact of aggregation on the transmission system

Legal citations O2222 [P 42](#), [P 62](#), [P 65](#), [P 90](#), [P 96](#), [P 99](#), [P 101](#); O2222-A [P 22-23](#), [P 28](#)

# Utilities over 4M MWh\*



ALTM	ALLIANT ENERGY CORPORATE SERVICES, INC.
AMCP	AMEREN ILLINOIS COMPANY
AMUE	UNION ELECTRIC COMPANY - AMEREN MISSOURI
CCJN	CLECO CAJUN LLC
CETR	CONSUMERS ENERGY COMPANY
CPWR	CLECO POWER LLC
DEMO	DTE ELECTRIC COMPANY
DMT1	DYNEGY MARKETING AND TRADE, LLC
EAGL	EDF TRADING N.A. LLC
EAMP	ENTERGY ARKANSAS, LLC
ELMP	ENTERGY LOUISIANA, LLC
EMMP	ENTERGY MISSISSIPPI, LLC
ENMP	ENTERGY NEW ORLEANS, LLC
ETMP	ENTERGY TEXAS, INC.

IPLM	INDIANAPOLIS POWER AND LIGHT CO.
MECB	MIDAMERICAN ENERGY COMPANY MECB
MPM	MINNESOTA POWER
NEVI	CONSTELLATION NEWENERGY, INC
NIP	NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
NSPP	NSP ENERGY MARKETING
OTPW	OTTER TAIL POWER COMPANY
PSI	DUKE ENERGY INDIANA, LLC
SIGW	SOUTHERN INDIANA GAS AND ELECTRIC CO
TEA	THE ENERGY AUTHORITY
WEPM	WISCONSIN ELECTRIC POWER COMPANY
WPSM	WISCONSIN PUBLIC SERVICE CORPORATION

“Each RTO/ ISO must accept bids from a distributed energy resource aggregator if its aggregation includes distributed energy resources that are customers of utilities that distributed more than 4 million megawatt-hours in the previous fiscal year.” -O2222 P8

\* MISO pulled Energy Information Administration (EIA) data from 2019 to create an estimate of the number of utilities in MISO with over 4M MWh in sales; verification of this data, available only in arrears, will be a topic for discussion when assessing eligibility to participate in MISO markets.

# Utilities under 4M MWh



- “An RTO/ ISO must not accept bids from a distributed energy resource aggregator if its aggregation includes distributed energy resources that are customers of utilities that distributed 4 million megawatt-hours or less in the previous fiscal year, unless the relevant electric retail regulatory authority permits such customers to be bid into the RTO/ISO markets by a distributed energy resource aggregator.” - O2222, P 8
- The opt-in creates additional questions:
  - What about utilities that may fall above the line in one fiscal year and below the line the next year?
  - Who is responsible for verifying this data?
  - For those utilities which opt-in, over what period of time is that opt-in “authorized”? How does this align with MISO process timelines?

# Stakeholder Feedback Request



- For small utilities opt-ins, MISO seeks general feedback and input on the following questions:
  - What about utilities that may fall above the line in one fiscal year and below the line the next year?
  - Who is responsible for verifying this data?
  - For those utilities which opt-in, over what period of time is that opt-in “authorized”? How does this align with MISO process timelines?
- Feedback is due by **August 16, 2021**
- Issue Tracking ID#: **IR070** 
- Feedback requests and responses are managed through the Feedback Tool on the MISO website:  
<https://www.misoenergy.org/stakeholder-engagement/stakeholder-feedback/>

# O2222 Section A-3: Interconnection



Question	Status
How should MISO and local utilities coordinate DER aggregation interconnection?	Ongoing discussion at IPWG.
How should this coordination be triggered?	Order 2222 compliance items completed and will be presented at the October DER Task Force (DER TF).
What will be the study process?	
How will the studies be coordinated with the MISO Interconnection Queue?	

# How should MISO, DERA, and local utilities coordinate interconnections?



## Alternatives Considered

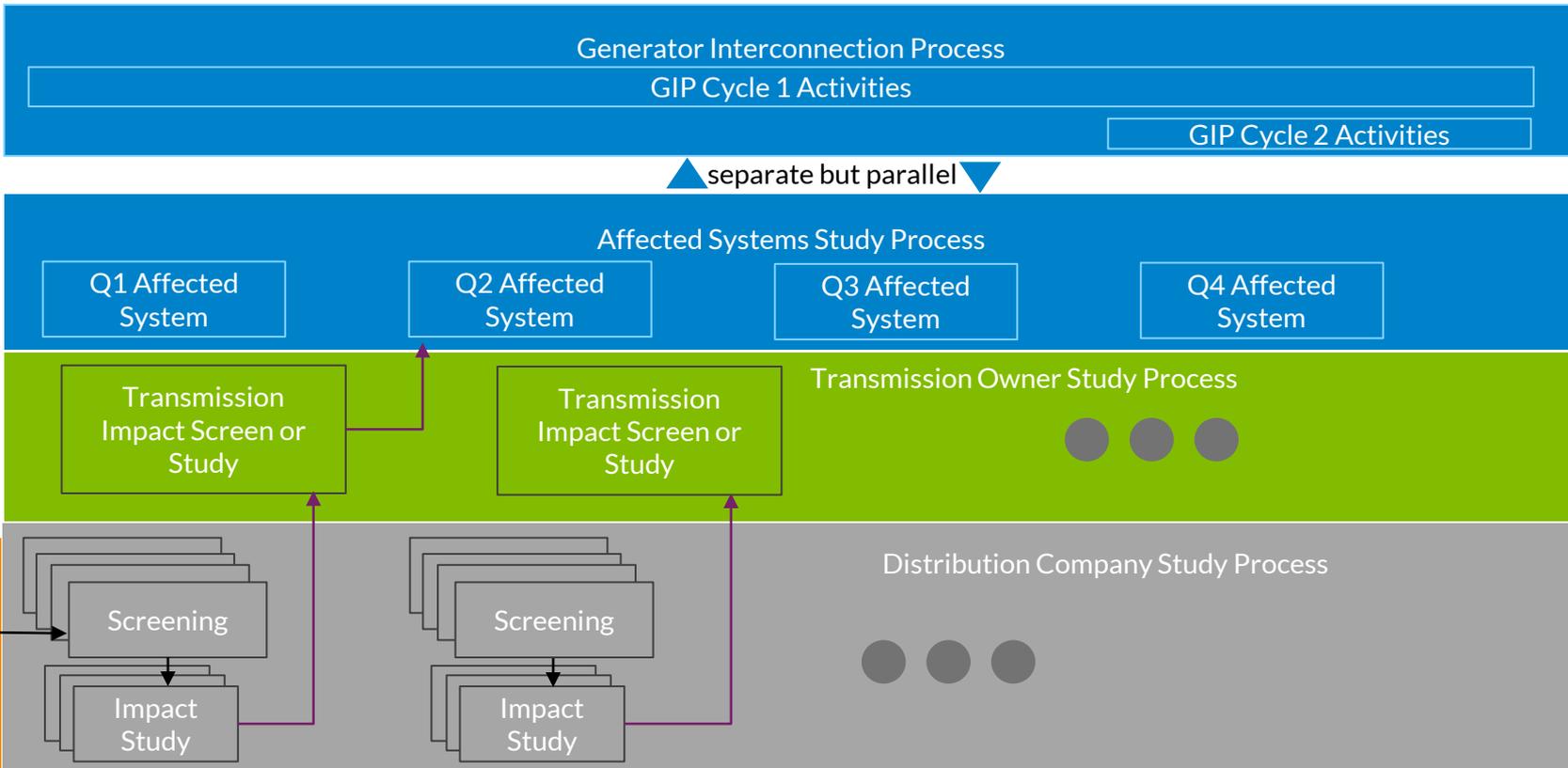
1. How should the coordination be triggered?
  1. Transmission back feed
  2. DER size limit
  3. Utility specific
2. What will be the study process?
  1. Cluster (group study)
  2. Individual requests
3. How will the studies be coordinated with the remainder of the MISO Interconnection Queue?
  1. Request-date based
  2. Study-commencement based



# Proposed Principles for DERa Interconnection

- EDC interconnection approval is a prerequisite for wholesale aggregation registration
- DER or DERa will not enter the MISO queue, but they need to be coordinated:
  - Threshold for affected systems study
  - Timing and frequency of studies
  - Coordinating study assumptions and results

# The Transmission (MISO) and Distribution (State) Processes



The RERRA defines applicable interconnection process and technical requirements



# IPWG Discussion

Recommendations from this working group will be brought back to the DER Task Force for discussion, and conceptual design will be presented to the Market Subcommittee for a final round of comments.

- IPWG March 16 – Introduce the issues for O2222
- IPWG April 26 – Discuss stakeholder thoughts on how MISO should change process
- IPWG May 25 – MISO proposal for interconnection changes re: O2222
- IPWG July 13 – Discuss stakeholder thoughts and version 2 of the proposal
- ★ **IPWG September – Final recommendation from IPWG**
  - DER TF will review Interconnection in October & November 2021
  - MSC will review final Conceptual Design for Interconnection in December 2021

# B-Definition of DER and DERA



# Key Requirements of FERC 2222:

## B. Definition of DER and DERA

A “DER” is defined as “‘any resources located on the distribution system, any subsystem thereof or behind a customer meter.’ These resources may include, but not limited to, resources that are in front of and behind the customer meter (e.g., customer sites capable of demand reduction), electric storage resources, intermittent generation, distributed generation, demand response, energy efficiency, thermal storage, and electric vehicles and their supply equipment.” O2222, P 114

A “DER Aggregator” (DERA) is defined as “an entity that aggregates one or more distributed energy resources for purposes of participation in the capacity, energy and/or ancillary service markets of RTO/ISOs.” O2222, P 118

An “Injecting DER” will be defined by MISO as a DER participating in wholesale markets as part of a DERA and is a source of generated or stored energy that is metered and settled as if injecting energy rather than as reducing the customers metered load. *See also “net injection” and issues of double counting.*

C-Eligibility to Participate in  
RTO/ISO Markets through a  
DERA

D-Locational Requirements

E-Distribution Factors and  
Bidding Parameters

# Participation Models, Locational Requirements, and Bidding Parameters: Decision Summary



Question	Status
How would existing resource types have to be changed to represent the range of DER aggregation's characteristics?	Complete - March MSC
What is the broadest, technically feasible scope for DER aggregation?	Complete - March MSC
How should Market Systems address small resource size in optimization engines to not lose resolution?	Complete - June MSC
Should there be a limit on DERa size?	Complete - June MSC
Should large DER assets be required to participate in markets individually?	Complete - June MSC
How should DERs be modeled in reliability, market, and planning models?	Under discussion today
How can DER be aggregated in MISO's capacity construct?	Target September RASC
How should heterogeneous aggregations of DER be accredited for capacity?	
Are there process improvements which could allow interim participation of DERa prior to full software enhancements?	DER TF Q4 2021

# Key Requirements of FERC 2222: Section C: Eligibility to Participate



- Allow DER aggregation market participation under one or more participation models
- Allow heterogeneous DER aggregation
  - Aggregator is responsible to meet performance and registration requirements
- Allow dual participation even if DER is in retail programs
  - Allows narrowly designed restrictions to prevent double payment
  - RERRAs allowed to limit DER participation to retail markets only
- 100 kW minimum size requirement for DERa
  - Allows for a maximum size or requires explanation why a maximum DERa size is not needed
- Requires a maximum size for individual DERs within an aggregation or an explanation why no such limit is needed
  - Sets no minimum size requirement for individual DER
- Single Resource aggregation is allowed under the Order

Legal citations O2222 [P 61](#), [P 129](#), [P 130](#), [P 142](#), [P 160](#), [P 162](#), [P 179](#), [P 180](#), [P 185](#), [P 186](#)

# Key Requirements of FERC 2222 : Locational Requirements, Distribution Factors, and Bidding Parameters



## Section D: Locational Requirements

- Establish locational requirements that are as geographically broad as they are technically feasible

## Section E: Distribution Factors and Bidding Parameters

- Addresses bidding requirements to represent physical and operational characteristics
- If multi-node aggregations are allowed, require distribution factors

Legal citations O2222 [P 204](#), [P 225](#)

# How would existing resource types have to be changed to represent the range of DER aggregations' characteristics?



## Alternatives Considered



1. **DIRs and ESRs at 0.1 MW for DER**
2. DIR, ESR, GEN and DRR II at 0.1 MW
3. DRR I, DRR II, ESR at 0.1 MW. DRR I are only multi-node
4. All resources changed to 0.1 MW. DRR I are only multi-node

[March DER TF Agenda Item 5](#)  
[April DER TF Agenda Item 4b](#)  
[May DER TF Agenda Item 3a](#)

ESR: Energy Storage Resource  
DIR: Dispatchable Intermittent Resources  
GEN: Generation Resource  
DRR: Demand Response Resource

# How would existing resource types have to be changed to represent the range of DER aggregations' characteristics?

## DIRs and ESRs at 0.1 MW for DER



## Benefits



### Grid Reliability and Resiliency

*Current offer parameters in the ESR and DIR participation models can cover the range of characteristics needed to represent DERs.*



### Market Efficiency

*Options allow DERs to match participation with the characteristics of their resources.*



### Minimize Implementation Costs

*Leveraging MISO's DIR and ESR models allows DERs to participate in MISO's markets, with minimal software costs.*



### Minimize Complexity

*Rather than creating a new model, leveraging other MISO models reduces complexity in resource options.*

## Assumptions

1. Resource type must accommodate DERs as small as 0.1 MW.
2. DERs can participate under existing resource types at existing size and location constraints if they qualify.

## Considerations



### Grid Reliability and Resiliency

*Uncertainties with mapping DERs to a single node within distribution system.*



### Market Efficiency

*ESR Capability -Based Resource types must self-commit. If all capabilities are not captured, the system could lose efficiencies.*



### Minimize Implementation Costs

*Introducing new resource types adds substantial cost and time considerations.*



### Minimize Complexity

*Modifying / introducing resource types adds complexity to solutions. Additional complexity for load modifying DERs on distribution.*

## Risks

1. DERs implementation is impacted with delays in MSE and ESR.
2. Relies on aggregation at a single EPNode to function within MISO market systems.
3. Limited operation experience with 0.1 MW resources. No MISO or Market Participant experience with ESR.

# What is the broadest, technically feasible scope for DER aggregation?



## Alternatives Considered

1. **Single EPNode for DER aggregation participation**
2. Single EPNode for dispatchable resources; multi-EPNode for on/ off resources
3. Clusters of EPNodes created based on historical mapping for continuously dispatchable resources
4. Single EPNode for continuously dispatchable resources; multi-node aggregation allowed for on/ off resources in same Local Balancing Authority (LBA)

[March DER TF Agenda Item 5](#)  
[April DER TF Agenda Item 4c](#)

# What is the broadest, technically feasible scope for DER aggregation?

## Single EPNode for DER aggregation participation



### Benefits



#### Grid Reliability and Resiliency

*EPNode level provides needed visibility and operation awareness at the right locations on grid.*



#### Market Efficiency

*Provides transparent locational pricing and aligns with efficient operational needs. 100kw minimum size increases potential participation.*



#### Minimize Implementation Costs

*Costs are minimized by minimizing changes to the market engines.*



#### Minimize Complexity

*No market clearing changes needed to accommodate EPNode dispatch of DERa.*

### Considerations



#### Grid Reliability and Resiliency

*Timely and accurate distribution factors may be infeasible given the dynamic distribution system and DERa locations.*



#### Market Efficiency

*Multi-node aggregations would result in inefficiencies where resources hurting a constraint are paid the same as those helping.*



#### Minimize Implementation Costs

*Substantial system changes, including modeling, clearing, dispatch, and settlement, are required for multi-node aggregations.*



#### Minimize Complexity

*Communications complexity would be increased due to needed real-time updates to distribution factors.*

### Assumptions

1. DERs could use existing DRR 1 model at 1 MW aggregation size.
2. Research studies show broad multi-node aggregations can lead to reliability concerns and power/ price oscillations that are worsened with inaccurate distribution factors.
3. Current and MSE systems will not alleviate these concerns.

### Risks

1. Limiting to a single EPNode may limit participation due to difficulty in aggregating 100 KW at a single node.
2. There may be errors in mapping aggregations to a single EPNode.

# Should large DER assets be required to participate in markets individually?



## Alternatives Considered

1. Individual assets above 5 MW and desiring to participate in Bulk market should be represented individually and not in a DERa
2. Individual assets above 20 MW and desiring to participate in Bulk market should be represented individually and not in a DERa
3. **No individual resource maximum size limitation for participation within an aggregation. Defer to Electric Distribution Companies (EDCs), states, and MISO interconnection studies (if applicable) to identify system impacts or limits due to size**



[April DER TF Agenda Item 4c](#)  
[May DER TF Agenda Item 3b](#)

# Should large DER assets be required to participate in markets individually?

No individual resource maximum size limitation for participation within an aggregation



## Benefits



### Grid Reliability and Resiliency

Dispatch of DERa at a single EPNode can provide adequate reliability even with large embedded resource.



### Market Efficiency

The 'No max size limit' could encourage more participation including Demand Response.



### Minimize Implementation Costs

Reduces barrier to participation as compared to increased cost of managing more DERAs.



### Minimize Complexity

Reduce the number of DERAs to manage.

## Considerations



### Grid Reliability and Resiliency

Imbedding large single resource in a larger aggregation may lose some visibility.



### Market Efficiency

Splitting out large DER from DERa may result in fewer small resource to participate in a 0.1 MW aggregation.



### Minimize Implementation Costs

None noted.



### Minimize Complexity

Requires coordination around EDC and State limits.

## Assumptions

1. ISO will limit DERa aggregation range to a single EPNode.
2. NERC SPIDER (System Planning Impacts from Distributed Energy) DER modeling will address visibility requirements.
3. Individual DER has obtained interconnection rights to distribution through EDC and through MISO processes to be defined.

## Risks

1. If no individual resource size limit and EDC/ MISO interconnection and participation studies are not detailed, it may mask large resource potential to impact bulk system.
2. If large resources are not individually modeled, then reliability studies may miss impacts of loss of larger resource.

# MISO Response to Stakeholder Feedback on Modeling: Percentage of 5 MW or Greater Single-Interconnection DER



Stakeholder Comments	MISO Response
<p>Most responders indicated that the amount of 5 MW or greater single-interconnection DER wanting to participate in the MISO Wholesale Market would be difficult to estimate at this time. Existing snapshots (small percentage of 5 MW+) will be outdated as MISO develops participation models which may impact future construction/participation decisions. Current conditions suggest a varied, entity-dependent response.</p>	<p>MISO recognizes that current snapshots will be outdated as we work to create the DER/DERa participation models and appreciate the insight into current and future projections that our members have provided.</p>
<p>As the order is technology leading, MISO should prepare for a greater concentration of 5 MW and greater single-interconnection DER with the proliferation of new technologies.</p>	<p>MISO recognizes that current snapshots will be outdated as we work to create the DER/DERa participation models and appreciate the insight into current and future projections that our members have provided.</p>

# MISO Response to Stakeholder Feedback on Modeling: Priority for Multiple Transmission Paths (1)



Stakeholder Comments	MISO Response
<p>High: 2 Med: 2 Low: 9 -----</p> <p>DTE believes the example showed at the May 18, 2021 Distribution Coordination Workshop shows the need for dynamic updating of connections. -----</p> <p>WPPI states that single point distribution steady state should be able to cover 98+% of the time for any given load, but that as DER penetration raises to a significant level, the desire for multiple paths to meet local load also increases. -----</p> <p>ATC has identified this as an issue that has been active in real time but is concerned that alternate outlets in Operations Modeling will drive additional costs and complexity. -----</p> <p>XCEL is concerned that studying alternative routing for abnormal conditions will significantly increase the burden on interconnection, reducing the overall level of DER capacity available.</p>	<p>MISO appreciates member feedback. Potential future improvements are captured in the framing deck (<a href="#">slide 99</a> in the August 2 iteration). -----</p> <p>This example began the discussion on this topic for MISO and resolving it has been the goal. -----</p> <p>MISO is looking to limit usage of this option to locations where the impact is of sufficient magnitude and indivisible for implementation. -----</p> <p>MISO agrees that providing flexibility should be limited to a subset of instances that rise to the level of requiring multiple transmission paths. -----</p> <p>MISO appreciates the consideration of cost burden that would accommodate this kind of change. Requiring all locations to have multiple transmission paths is not the goal-- providing the opportunity for resources that qualify is the goal.</p>

# MISO Response to Stakeholder Feedback on Modeling: Priority for Multiple Transmission Paths (2)



Stakeholder Comments	MISO Response
<p>Consumers Energy is interpreting this question to mean whether a DERa would be able to sell into the market at different locations based on changes in composition, operating state of the aggregation, or other appropriate reasons. We believe the ability for MISO to accommodate this is important and should be a high priority. This will ensure that DERAs are able to participate at the CPNode that is most appropriate on a continuing basis, notwithstanding changes in composition or physical location(s) of its component DERs. Without some mechanism for doing this, DERAs could end up participating in locations that are suboptimal based on the composition of the aggregation or have to go through the DERa registration process again (MISO and stakeholders would have to determine some comprehensible threshold for when this would be required).</p> <p>However, DERAs should not be able to change the CPNode the aggregation is selling into absent some compelling reason for doing so, such as the ones articulated above. To allow otherwise would present inappropriate arbitrage opportunities. Accordingly, there should be a review and approval process for such changes.</p> <p>We also note that any physical changes to the locations of DERs in an aggregation would have to be subject to EDC and LBA interconnection procedures, requirements, and approval processes.</p>	<p>MISO intends to allow for changes to CPNode composition on a cyclical basis, currently quarterly as aligned with the model update process.</p> <p>CPNode/ EPNode locations are fixed in place at creation; changes to the location of a resource require a new registration. The flexibility of the elements of the node is at the discretion of the DERA.</p> <p>Changes to the composition of a CPNode require notification and acceptance by MISO, with the process to be defined.</p> <p>Dynamic changes to the composition of a CP Node will not be available in real time.</p> <p>CPNode – Commercial Pricing Node EPNode – Elemental Pricing Node</p>

# MISO Response to Stakeholder Feedback on Modeling: Single Phase Installations of DER



Stakeholder Comments	MISO Response
<p>Multiple Entities – The vast majority of resources for aggregation would be installed on single phase. Most small magnitude resources are expected to be single phase, with larger ones moving into three phase interconnections.</p> <p>Environmental Sector expects most resources to be three phase, but desires MISO to maintain flexibility for single phase resources.</p> <p>ITC – Knowledge of the phase condition of resources should be made known during registration.</p> <p>DDT LLC – To stay in accordance with FERC Order 2222’s need for aggregated DER participation to be technology neutral, MISO should ensure that single phase technologies are able to participate in the market without significant barriers to participation.</p> <p>OMS – It is known that this filing is leading tech, and that we expect there to be significant changes (both in our understanding, how we utilize the market products), and therefore a proactive plan to revisit the compliance framework in the future should be a built-in feature of compliance.</p>	<p>MISO appreciates the feedback on this inquiry.</p> <p>The primary goal to this inquiry is to gather information about the new resource injection type, as MISO resources have historically been three phase.</p> <p>Inclusion of single-phase resources in aggregations is a must, and MISO is looking into what unique impacts would be brought to the wholesale market.</p>

# MISO Response to Stakeholder Feedback on Modeling: Other Stakeholder Comments (1)



Stakeholder Comments	MISO Response
<p>MISO’s presented data requirements should be reviewed to determine if they are correct for the different participation models. Data requirements need to be developed to reflect the different services and different potential configurations of DER resources provided by the DERA.</p>	<p>MISO has reviewed and clarified the original presentation to represent the DER participating in the Energy Market real-time data requirements. Data requirements for other service option will be developed as the service participation models are developed.</p>
<p>Some enhancements could be made to the commercial modeling data requirements, however. The proposal now conflates information that should be provided at the DER level versus the DERA level. For example, given that heterogeneous aggregations of different types of DERs will be permitted, the “unit type” and “fuel type” data should be set at the DER level rather than DERA. This would allow for one DERA to include multiple DERs with different fuel types. Resource size data (i.e., MW values) for modeling should also be submitted at the DER level, so that DERA formation and registration can proceed for any combination of specific DERs (aggregate data would simply sum across individual MW values).</p>	<p>MISO registration, per the FERC order, will require the individual element configuration within the DERa. However, for real-time purposes, the aggregation will be represented by one generator within the model. The values for the generator should reflect the aggregation.</p>
<p>The draft real-time data requirements also deserve further consideration. It is not clear if MISO intends to require these real-time data streams for all DERAs regardless of the service provided (e.g., capacity vs. regulation), nor is it clear how output measured in MVAR or breaker status meet MISO’s criteria of being “Automated”, “Accurate”, and “Actionable”. These two real-time metrics in particular may not be technologically feasible for all DERs, yet are listed on slide 46 among the draft real-time data requirements.</p>	<p>MVAR is not a necessary real-time parameter for DERa. A “breaker status” is required for any unit participating in the MISO market to clearly indicate to the applications whether the unit is available. A current configuration where a non-physical breaker status is reported are joint-owned unit portions.</p>

# MISO Response to Stakeholder Feedback on Modeling: Other Stakeholder Comments (2)



Stakeholder Comments	MISO Response
<p>What is meant by “retain the current representation of the Transmission/Distribution (T/D) interface” in Slide 43?</p>	<p>This refers to current modeling practices. Some transmission owners elect to represent the load on the low side of the Transmission/ Distribution interface stepdown transformer. Others elect to represent the load at the high side of the Transmission/ Distribution interface and do not model any stepdown transformer.</p> <p>MISO is recommending that the current practice be continued and the DERa generator be paired with a load EPNode.</p>
<p>One enhancement would be for MISO to develop matrices that compare the various classifications of DRR and DERa resources, including telemetry, metering, and registration parameters. Separate tables showing the market services, qualification requirements, offer parameters and performance requirements for the same types of resources would help market participants understand the distinctions between the types of resources, and the different qualification and performance requirements.</p>	<p>MISO will consider this as we prepare the compliance filing.</p>

# MISO Response to Stakeholder Feedback on Modeling: Other Stakeholder Comments (3)



Stakeholder Comments	MISO Response
<p>AEMA would like to request clarity on the statement, “new DERA market resource model that will be created...” as described in slide 43.</p> <p>Will this “new model” be accessible at the 0.1 MW level?</p> <p>Is MISO proposing that a DERA can register a DERA as any of the existing participation models including this new representative aggregate generator model from slide 43?</p> <p>Will this new representative aggregate generator model be eligible to supply the full suite of ancillary services and capacity?</p>	<p>Yes, the new resource model will be accessible at the 0.1 MW level.</p> <p>Yes, to the extent aggregations meet the existing participation requirements, they can register under the existing participation models.</p> <p>Yes, MISO will provide a path for full participation within our markets.</p>

# How will DERa be represented in markets, operations, & planning models?



## Alternatives Considered



1. **Representative aggregate generator which can have a positive or negative capability. Maintain current representation of the Transmission/ Distribution (T/D) interface. A new DERa market resource model will be created based on ESR and DIR constructs with a single EPNode/ CPNode designation**
2. Representative aggregate generator which can have a positive or negative capability. Utilize current market resource models and update to represent 0.1 MW minimum with a single EPNode/ CPNode designation
3. Representative aggregate generator which can have a positive or negative capability. Allows multiple EPNode to single CPNode representation
4. Create a new DER Aggregation Load Type. Create a new market Load product base on DRR Type I construct

# How will DERa be represented in markets, operations, & planning models?

Representative aggregate generator; create separate DER aggregation market resource type(s) (single EPNode/ CPNode)



## Benefits



### Grid Reliability and Resiliency

Enhanced operational awareness due to visibility of available resources. Clear designation within models.



### Market Efficiency

Allows for inclusion and dispatch of DERA's assets in the MISO marketplace.



### Minimize Implementation Costs

0.1 MW dispatch coming with ESR product.



### Minimize Complexity

Generator representation aligns with current DIR and ESR resources. Separate product tracked through systems. Clear segregation.

## Assumptions

1. DIRs and ESRs at 0.1 MW for DER and single EPNode.
2. Strive for consistency of representation across planning, operations, and market models.
3. DERA will provide aggregate resource information to MISO for planning, operations, and markets, including real-time and forecast data.

## Considerations



### Grid Reliability and Resiliency

Analysis of appropriate representative injection point(s) to the transmission system will involve coordination with EDC, TO, MISO, and DERA.



### Market Efficiency

If all locational capabilities are not accurately captured, the system could lose efficiencies.



### Minimize Implementation Costs

MISO Market current resource dispatch methodology maintained. New product development cost.



### Minimize Complexity

MISO Market does not dispatch loads to balance the system.

## Risks

1. Incorrect identification of electrical impact representation at the Transmission/ Distribution interface.
2. Coordination with vendor to implement new products may create time constraints.

# DRAFT: Excerpt commercial model requires DERa information



Information	Description
Unit EPNode	Representation in the Operations Models [U (Control Area) (Station) (Unit_ID)]
CPNode Name	Cannot exceed 14 characters
Minimum Output	Value is a number (MW). This can be negative number to account for charging potential
Maximum Output	Value is a number (MW)
Maximum Nameplate	Value is a number (MW). Represents the installed capacity of the DERa
Default Ramp Rate	Value is a number (MW)
Energy	Whether the resource can offer Energy in MISO market, (Yes/No)
Regulation	Whether the resource can offer regulation reserves in MISO market, (Yes/No). If Yes, Spinning and Supplemental are by default Yes
Spinning	Whether the resource can offer spinning reserves in MISO market, (Yes/No). If Yes, Supplemental is by default Yes
Supplemental	Whether the resource can offer on-line supplemental reserves in MISO market, (Yes/No)
Unit Type	DERa
Fuel Type	DERa

Product types above are based on current DIR and ESR product offering and are subject to change

# DRAFT Energy Market requires real-time DERa data for participating



Information	Description
Aggregate Control Mode	Current control mode of the DERa
Resource Aggregate Output (MW)	The MW output of the DERa
Resource Aggregate Output (Mvar)*	The Mvar output of the DERa*
Resource Breaker Status	DERa representative breaker status to indicate availability of the DERa
Echo Resource Setpoint Measurement	Echo the received setpoint for the DERa. Allows MISO to verify that the setpoint was received

\*Not required, but requested if available

Real-time data based on current DIR generator requirements for Energy Markets

# How should Market Systems address small resource size in optimization engines?



## Alternatives Considered



1. **Small (<1 MW) DERas must self-commit**
2. All DERas must self-commit
3. All DER aggregations are committed within existing optimization process regardless of size
4. Modify commitment algorithms to attempt to better optimize small resources commitment

[April DER TF Agenda Item 4b](#)  
[May DER TF Agenda Item 3a](#)

# How should market systems address small resource size in optimization engines?

## Small (<1 MW) DERAs must self-commit



### Benefits



#### Grid Reliability and Resiliency

Self-commit of small resources will result in more accurate availability status for small DER aggregations.



#### Market Efficiency

Optimization engines are more efficient for commitment of larger resources.



#### Minimize Implementation Costs

Self-commitment for small resources avoids optimization engine changes to accommodate.



#### Minimize Complexity

Option does not result in computational complexity and will not impact processing time to reconcile uneconomic commitments.

### Considerations



#### Grid Reliability and Resiliency

Commitment engines will struggle committing resources smaller than 1 MW; therefore, small resource availability is best determined by DERAs.



#### Market Efficiency

No start-up cost reimbursement to small resources may limit benefits and participation.



#### Minimize Implementation Costs

Change in offer rules (e.g., commitment status) for small resources required.



#### Minimize Complexity

Two mechanisms to commit results in slightly more complexity.

### Assumptions

DERa resource types aggregations as small as 0.1 MW are:

- ESR Capability based resource type: already self-committed.
- DIR Capability based resource type: can be economically committed by MISO.

### Risks

If resource self-commits and worsens a constraint, then MISO must dispatch to zero or manually de-commit.

F-Information and Data  
Requirements

G-Metering and Telemetry  
Requirements

# Key Requirements of FERC 2222: Information and Data



## Section F: Information and Data Requirements

- (1) establish the information and data that a distributed energy resource aggregator must provide about the **physical and operational characteristics** of its aggregation;
- (2) require distributed energy resource aggregators to provide a **list of the individual resources** in its aggregation; and
- (3) establish any necessary information that must be submitted for the individual distributed energy resources.
- . . . .require distributed energy resource aggregators to provide **aggregate settlement data** for the distributed energy resource aggregation and to retain performance data for individual distributed energy resources in a distributed energy resource aggregation for **auditing** purposes.

Legal citation O2222 [P 236](#)

# Key Requirements of FERC 2222: Metering



## Section G: Metering and Telemetry System Requirements

“... establish market rules that address metering and telemetry hardware and software requirements necessary for distributed energy resource aggregations to participate in RTO/ISO markets.”

Legal citations O2222 [P 145](#), [P 159](#), [P 160](#), [P 161](#), [P 162](#), [P 163](#), [P 164](#), [P 165](#), [P 236](#), [P 240](#), [P 310](#), [P 312](#)

# Key Requirements of FERC 2222: Potential EDC Roles



## Section G: Metering and Telemetry System Requirements

“Each RTOs’/ISOs’ proposed metering/telemetry requirements should rely on meter/telemetry data obtained through compliance with distribution utility or local regulatory authority metering system requirements whenever possible for settlement and auditing purposes.”

Legal citation O2222 [P 269](#)

“To the extent that RTO/ISO proposes that such information (i.e., metering/telemetry data) come from distribution utilities, RTOs/ISOs is required to coordinate with distribution utilities and RERRAs to establish protocols for sharing metering and telemetry data. Such protocols must minimize costs and other burdens and address concerns raised with respect to privacy and cybersecurity.”

Legal citation O2222 [P 270](#)

“To the extent that metering and telemetry data comes from distribution utilities, RTOs/ISOs are required to coordinate with distribution utilities and the RERRAs to establish protocols for sharing metering and telemetry data that minimize costs and other burdens and address concerns raised with respect to customer privacy and cybersecurity.”

Legal citation O2222 [P 324](#)

# Key Requirements of FERC 2222: Telemetry



## Section G: Metering and Telemetry System Requirements

“... establish market rules that address metering and telemetry hardware and software requirements necessary for distributed energy resource aggregations to participate in RTO/ ISO markets.”

Legal citation O2222 [P 262](#)

“Each RTO/ ISO should explain, .... whether the proposed requirements are similar to requirements already in existence for other resources and steps contemplated to avoid imposing unnecessarily burdensome costs on the DER aggregators and individual resources in DER aggregations that may create an undue barrier to their participation in RTO/ ISO markets. “

Legal citation O2222 [P 264](#)

# Information, Metering, and Telemetry: Decision Summary



Question	Status
What is necessary to track performance of DERs and DER aggregations?	Under discussion today
How should Demand Response in aggregations be represented to accommodate the 719/745 settlement?	Under discussion today
What needs to be tracked for dual participation in retail and wholesale markets?	Under discussion today
How often is data required via telemetry to support DERa in operations and settlements?	Under discussion today
What technologies for DERa telemetry can MISO accept for market operations?	Under discussion today
What physical and operational aggregate data is needed for registering a new aggregation?	Target August 9 DER EDC workshop

[Information and Data – EDC/MISO Coordination, 2021-05-18](#)

[Current Metering & Future Considerations – EDC/MISO Coordination, 2021-05-18](#)

[Telemetry Considerations - EDC/MISO Coordination, 2021-05-18](#)

[Metering and Telemetry Themes O2222 Section G – DER Task Force, 2021-04-12](#)

[Review Metering and Telemetry – EDC/MISO Coordination, 2021-03-19](#)

[Michigan PSC State Perspective on Metering and Data Access – EDC/MISO Coordination, 2021-03-19](#)

# MISO Response to Stakeholder Feedback on: Should a DERA submit aggregated meter data or individual DER meter data for performance tracking? Why?



Stakeholder Comments	MISO Response
Individual meter data must be submitted for performance tracking (12 of 14 respondents)	Agree. Individual DER meter data will be needed to distinguish Demand Response and settle under FERC Order 745
DERA should submit individual DER meter data for EDC and MISO to validate no double counting occurred	Agree. EDC/ LSE will have access to the data in order to perform verification. Process to be defined
Meter at level performance is measured	Measurement and verification will be performed at individual DER and rolled up to the aggregate level to measure performance
Require each resource to be metered and reported separately at POI. Injection and DR must be separately metered	Agree. Individual DER meter data will be needed to distinguish Demand Response and settle under FERC Order 745
Meter data should be provided by DER where measurement and verification includes within-day adjustments to baselines. Aggregate data for Contingency Reserve Deployment performance check.	Agree. Baseline methodologies will need to be reviewed to determine adaptability during conceptual design
DERA should submit aggregated meter data. If more granular data is required, MISO should clarify why.	In order to settle Demand Response in an aggregation under FERC Order 745, we need meter data at the DER/ LSE level. Injecting DERs will also require reconstitution to address revenue inadequacy



# What data needs to be provided to support operations and settlements?

## Areas to Include:

MISO plans to align data needed in these 5 categories:

- Registration/ enrollment – location, resource type, static data
- Modeling – based on other requirements
- Resource Offer/ Bidding Parameters – based on products provided
- Telemetry – based on products provided
- Metering – see more detailed questions

[Information and Data - EDC/MISO Coordination, 2021-05-18](#)

[Information and Data Requirements - DER Task Force, 2021-05-10](#)



# Meter data is the basis for tracking performance: Current Practice

Telemetered generation resources submit meter data via MISO Portal

- Meter and telemetry data used to verify performance

Non-telemetered resources such as Aggregators of Retail Customers (ARC) and Demand Response Resource Type I (DRR-I) submit meter data via the Demand Response Tool

ARC process in Demand Response Tool

- Non-telemetered resources in homogeneous aggregations
- Individual resource measurements rolled up to aggregate value
- Measurement and Verification (M&V) performed at aggregate level to determine performance
- Load Serving Entity (LSE) reviews ARC-submitted data
- MISO auditable

# What is necessary to track performance of DERs and DER aggregations in settlements?



## Alternatives Considered

1. Create new ARC-like process for DERA to submit aggregated meter data broken out by injection, withdrawal, and demand response
2.  Create new ARC-like process for DERA to submit individual DER meter data and MISO will perform aggregation and break out
3. Enhance ARC process to include heterogeneous DER aggregations

[Current Metering & Future Considerations – EDC/MISO Coordination, 2021-05-18](#)

# What is necessary to track performance of DERs and DER aggregations in settlements?

DERA to submit individual DER meter data and MISO will perform aggregation and break out



## Benefits



### Grid Reliability and Resiliency

*Not applicable*



### Market Efficiency

*Accommodates heterogeneous aggregations allowing for multiple LSEs with demand response in an aggregation to be properly settled under Order 745*



### Minimize Implementation Costs

*Leverages existing software design for reconstituting demand response to LSEs under Order 745*



### Minimize Complexity

*Provides granular detail for Measurement & Verification to enable performance validation*

## Assumptions

1. A DER is limited to one LSE (for Order 745 treatment)
2. An individual DER will be homogeneous and will be designated as demand response, injecting or storage
3. DERA performance based on summed individual DER meter data

## Considerations



### Grid Reliability and Resiliency

*Not applicable*



### Market Efficiency

*Number of DERs registered within a DERA to accommodate one LSE per DER*



### Minimize Implementation Costs

*Non-demand response will require reconstitution to LSEs to avoid 'missing money'. Increase volume of data to be managed*



### Minimize Complexity

*Measurement & Verification methodologies need reviewed for applicability*

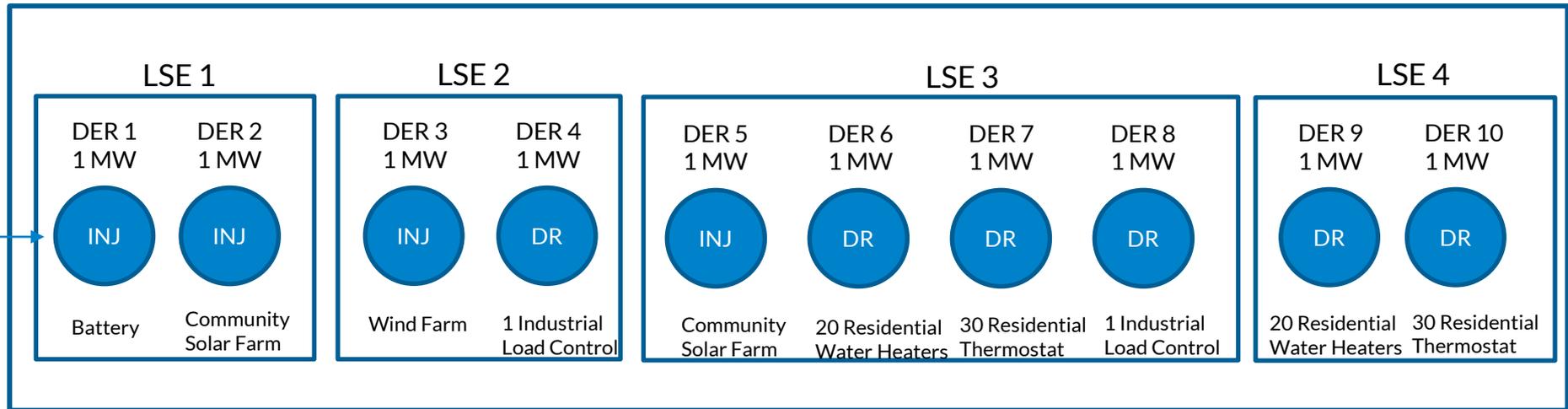
## Risks

1. Increased volume of meter data to be reviewed by LSE/ EDC for auditing purposes



# Example Aggregation with 10 DERs across 4 LSEs

## DERa (CPNode)



- Meter data at individual DER level
- M&V at individual DER level
- Performance measured at aggregate level
- 1 LSE per DER (needed for reconstitution under Order 745)

INJ - Injecting DER  
DR - Demand Response DER  
DERa - Distributed Energy Resource Aggregator  
LSE - Load Serving Entity  
M & V - Measurement and Verification

# Example of Order 745 Treatment of Demand Response



DERa dispatched for 10 MWs of energy; M&V shows 8 MWs

- Order 745 reconstitutes DR MWs to LSE when LMP < NBPT, reconstitutes cost to Reserve Zone when LMP > NBPT
- Injecting DER MWs reconstituted to LSE to resolve revenue inadequacy ('missing money').  
No NBPT test applied

LMP < NBPT					LMP > NBPT				
LSE	DER	M&V (8)	Reconstitution		LSE	DER	M&V (8)	Reconstitution	
			INJ (4)	DR (4)				INJ (4)	DR (4)
LSE 1	INJ DER 1	1	1		LSE 1	INJ DER 1	1	1	
LSE 1	INJ DER 2	1	1		LSE 1	INJ DER 2	1	1	
LSE 2	INJ DER 3	1	1		LSE 2	INJ DER 3	1	1	
LSE 2	DR DER 4	1		1	LSE 2	DR DER 4	1		1
LSE 3	INJ DER 5	1	1		LSE 3	INJ DER 5	1	1	
LSE 3	DR DER 6	1		1	LSE 3	DR DER 6	1		1
LSE 3	DR DER 7	0			LSE 3	DR DER 7	0		
LSE 3	DR DER 8	1		1	LSE 3	DR DER 8	1		1
LSE 4	DR DER 9	0			LSE 4	DR DER 9	0		
LSE 4	DR DER 10	1		1	LSE 4	DR DER 10	1		1
		8	4	4			8	4	4
Pay DERA 8 MWs		Charge	LSE 1 = 2	RZ(s) = 0	Pay DERA 8 MWs		Charge	LSE 1 = 2	RZ(s) = 4
			LSE 2 = 2					LSE 2 = 1	
			LSE 3 = 3					LSE 3 = 1	
			LSE 4 = 1					LSE 4 = 0	

# How should demand response in aggregations be represented to accommodate 719/745 settlement?



## Alternatives Considered



- Demand Response portion of the meter data reported by the DERA will be settled under existing settlement rules developed for FERC Order 745 compliance**
  - Aligns with existing tools and processes
  - Addresses double counting by reconstituting load

**Alternative 1 meets all needs; no other alternatives were considered**

[20210308 DER TF Item 07 MISO Demand Response and DER Aggregation Current Metering & Future Considerations - EDC/MISO Coordination, 2021-05-18](#)

# MISO Response to Stakeholder Feedback on: How should wholesale market transactions by DERAs be tracked and reported to prevent double counting? (Registration)



Stakeholder Comments	MISO Response
Registration process should prevent conflicting enrollments, eliminating double counting.	Agree. Nearly unanimous opinion.
Must prevent resources from being registered in more than one aggregation through registration. Data accuracy is critical.	Agree. Process to be defined by Registration workstream subject to RERRA and EDC jurisdiction.
MISO should not establish criteria for dual participation. EDC, LSE, and RERRA should determine what is allowable.	MISO would only establish processes for coordination to screen double counting. Processes are to be defined and subject to RERRA and EDC jurisdiction.
EDC will check for dual participation during registration. DERA will need to share customer data with EDC.	Process to be defined by Registration workstream.
Require attestation from DERA during registration process that aggregation is not part of another program.	Process to be defined by Registration workstream.

# MISO Response to Stakeholder Feedback on: How should wholesale market transactions by DERAs be tracked and reported to prevent double counting? (Settlements)



Stakeholder Comments	MISO Response
DERA would report only wholesale transactions.	Agree. Preferred option. MISO may not know if DERa is engaged in retail activity.
MISO must provide EDC with DERA dispatch orders to track dual participation.	To be addressed by EDC Coordination workstream.
Meter and M&V results must be made available to the EDC for validation.	Agree. LSE/ EDC review similar to ARC process today.
DERA identifies DER used for wholesale and provide meter data that validates delivery of service.	Aligns with preferred option of only providing wholesale transactions. EDC review at registration and jurisdictional rules may apply.
Develop a data repository tool to track DER meter data. Secured access by EDC and LSE.	<p>Not opposed. More analysis needed. Multi-state agreement on rules. Prioritize with stakeholders.</p> <p>Potential future improvements will be captured in the framing deck (<a href="#">slide 99</a> in the August 2 iteration).</p>
DERA use existing EDC infrastructure for metering, require separate metering for DERA wholesale participation.	Subject to RERRA jurisdiction. MISO defines minimum standard. Would mitigate metering disputes.
Process should be established for meter data and performance reconciliation.	Agree. Process to be determined.



# Regulatory Background on dual participation

FERC Order 2222 states that:

- ISO must allow DER participating in retail programs to participate in wholesale markets
- ISO can include restrictions to prevent counting more than once the service provided by the DER in ISO wholesale market
  - Address potential for DER wholesale participation that reduces a utility or other Load Serving Entity's (LSE's) obligations to purchase services from ISO
- Demand Response participating in a DERa must be settled per FERC 745 rules
- RERRAs can condition retail program participation on not participating in wholesale markets



## Examples of double counting (not an exhaustive list)

- A DERA offers to provide capacity in MISO while DERs within the aggregation allow interruption by LSE as part of a Planning Resource
  - Not allowed for same capacity
- A DERA has DERs on Net Energy Metering (NEM) offers energy at wholesale
  - Not allowed for the same energy
- A DERA provides energy into the MISO wholesale market and when called on reduces LSE energy purchased from the MISO market
  - May be allowed, but:
    - MISO pays for energy, but if MISO does not collect from some load there will be “missing money”
    - This revenue inadequacy was address under FERC 745 by requiring load reconstitution to LSE or reserve zone(s) based on net benefits test

# Double Counting Energy in Operations and Settlements



## Operations:

- DERs are modeled as generators connected to transmission
- If model representation bypasses load telemetry point, telemetered load may need to be grossed up allow energy balance

## Settlements:

- DER energy dispatch will impact system load
  - If MISO pays for DER energy, and load is not grossed up accordingly there will be missing money

# How might dual participation in retail programs and MISO markets be tracked to prevent double counting?



## Alternatives Under Consideration

1. DERA reports only wholesale transactions to MISO
2. DERA reports only wholesale transactions to MISO. MISO notifies LSE and EDC and makes submitted meter data available for review
3. DERA coordinates with EDC to utilize existing infrastructure and metering to capture meter data. DERA reports only wholesale transactions to MISO
4. Use independent data repository to store standardized wholesale and retail transaction data where LSE and EDC can review. DERA reports wholesale transactions from repository to MISO



[Current Metering & Future Considerations - EDC/MISO Coordination, 2021-05-18](#)

# What steps in the registration process might help prevent double counting?



## Ideas Under Consideration

1. Establish criteria for dual participation – e.g.:
  - **Always compatible**, such as Retail VAR support and wholesale capacity
  - **Sometimes compatible**, such as time-differentiated energy
  - **Never compatible**, such as interruptible retail rate claimed by the LSE to meet resource adequacy obligation and MISO capacity market
2. Distinguish phases:
  - **Registration** – DERA applies to become MP
  - **Enrollment** – DERA provides DER/ location data
  - **Compatibility Check**– EDC review which may include interconnection engineering
  - **Eligibility Review** – RERRA verifies
  - **Meter Data** – DERA submits, EDC reviews

# MISO Response to Stakeholder Feedback on Telemetry



Stakeholder Comments	MISO Response
<p>Metering and telemetry should rely on EDC requirements and otherwise be as minimal as possible</p>	<p>Agree. MISO’s goal is to provide minimum requirements. EDC may have additional requirements to serve their system needs</p>
<p>DERs 5 MW or greater must provide full metering and telemetry data</p>	<p>Agree. Telemetry required for DERa over 5 MWs and/or providing regulation. Metering required regardless of size</p>
<p>Telemetry should be provided at 2 second update rates</p> <p>ICCP communication should be required from DERA for each DER in their aggregation</p>	<p>Agree for DERa over 5 MWs and/ or providing regulation. Considering relaxing scan rates for non-regulating DERa below 5 MWs</p> <p>Telemetry is proposed to be collected at the DERa level for MISO’s purposes</p>



# MISO Telemetry Proposal

- MISO recommends including the existing telemetry requirements of ICCP over WAN in the compliance filing
- This proven solution meets security and operational requirements
- MISO understands other technologies may emerge as viable solutions
- MISO anticipates proof of concept(s)/ pilot(s) for alternative solutions after the O2222 compliance filing

# What technologies for telemetry is MISO looking at for market operations?



- 1. Inter Control Center Protocol (ICCP) via private Wide Area Network (WAN)**
  - Benefits: Already set up to exchange real-time operational data
  - Challenges: New WAN and ICCP setup can be expensive
- 2. Extensible Markup Language/ Application Programming Interface (XML/ API) over internet**
  - Benefits: Relatively simple technology currently used for dispatch
  - Challenges: Might need development effort to push data to reliability and market systems
- 3. ICCP via internet**
  - Benefits: Relatively easier option than moving data via WAN
  - Challenges: Setting up ICCP can be expensive
- 4. Scan devices directly using DNP (Distributed Network Protocol)**
  - Benefits: Direct access to devices for data
  - Challenges: Setting is up can be challenging

# What technologies for telemetry is MISO looking at for market operations?

## Inter Control Center Protocol (ICCP) via private Wide Area Network (WAN)



### Benefits



#### Grid Reliability and Resiliency

*Known to meet security and operational requirements. Fewer service interruptions and more control than the internet*



#### Market Efficiency

*Allows efficient coordination with DERA, EDC, and MISO*



#### Minimize Implementation Costs

*Established means for exchanging operational data; no anticipated costs for existing infrastructure*



#### Minimize Complexity

*Known technology with established processes for implementation*

### Considerations



#### Grid Reliability and Resiliency

*Communication must be secure, reliable, and compliant with standards*



#### Market Efficiency



#### Minimize Implementation Costs

*Setup can be expensive for DERA*



#### Minimize Complexity

*Additional technologies may be simpler post setup*

### Assumptions

1. ICCP with WAN requires significant setup for new connections
2. Other technologies may be feasible but are not available and tested in the MISO footprint

### Risks

1. Alternative solutions may not prove out or may be cost prohibitive from a systems perspective
2. ICCP via WAN cost may be high for DERA

# How often is data required via telemetry to support DERa in operations and settlements?



## Alternatives Under Consideration

- 1. Relax scan rates for non-regulation qualified, dispatchable DERa that are < 5 MW from 2 sec to 10-30 sec. Other resources remain at 2 sec**
  - Potential reduced cost to participation
  - Initial MWs for dispatch may not reflect actual DERa output
- 2. No change – data submitted every 2 sec for all dispatchable DERa regardless of size or product**
  - Higher confidence in initial MW for dispatch
  - May limit available telemetry technology options and could increase cost of participation

[Metering and Telemetry Themes O2222 Section G – DER Task Force, 2021-04-12](#)  
[Review Metering and Telemetry – EDC/MISO Coordination, 2021-03-19](#)

# Stakeholder Feedback Request



- Should scan rates be relaxed for non-regulation qualified, dispatchable resources less than 5 MWs?
- Feedback is due by **August 16, 2021**

- Issue Tracking ID#: IR070 

- Feedback requests and responses are managed through the Feedback Tool on the MISO website:

<https://www.misoenergy.org/stakeholder-engagement/stakeholder-feedback/>

# H-Coordination between the RTO/ISO, Aggregator, and Distribution Utility

# Coordination Decision Summary



Question	Status
What communication options best meet MISO’s needs to communicate and coordinate DERA participation in markets, including managing real-time market operations?	Target 4 <sup>th</sup> Quarter DER TF
What information is needed for individual DERs in an aggregation?	Targeted August 9 EDC Meeting
How should MISO and local utilities coordinate DER aggregation for registration?	Targeted August 9 EDC Meeting
How should MISO and local utilities coordinate DER aggregation for normal operations?	Target 4 <sup>th</sup> Quarter DER TF
How should MISO and local utilities coordinate DER aggregation for abnormal or emergency operations?	Target 4 <sup>th</sup> Quarter DER TF
How should MISO and RERRAs coordinate DER aggregations eligibility to participate in ISO wholesale markets?	Target 4 <sup>th</sup> Quarter DER TF
How should MISO and RERRAs coordinate DER aggregations small utility exclusion and opt-in provisions?	Target 4 <sup>th</sup> Quarter DER TF
How should MISO and RERRAs coordinate DER aggregations dual participation?	Target July 28 RERRA
What MISO, Local Utility, RERRA, and Aggregator coordination framework will accommodate the range of all business models within MISO?	Target July 28 RERRA
How should MISO and local utilities coordinate DER Interconnection?	Addressed in Section A

# MISO's Coordination Framework



- **FERC Order 2222 recommends, but does not require, establishing a “Coordination Framework” to outline roles and responsibilities**
- **MISO will establish such a framework for O2222. This framework will include:**
  - A series of meetings and communications with RERRAs, TOs, EDCs, and potential DERAs
  - Tariff documentation of roles and operating or market participation agreements, including interoperability and communications
  - MISO resources to manage questions and inquiries related to O2222
  - Business Practices Manuals which outline O2222/ DERA participation in MISO markets and may include interoperability and communications (not usually completed as part of the compliance filing)
- **MISO’s scheduled EDC workshops, as well as RERRA meetings, are a part of the “Coordination Framework”**
- **MISO has also pointed to existing processes and tariff language which will be used to model the O2222 requirements**
  - Metering and Settlements (enhancements to these will be determined)
  - Attachment HHH (created for Order 841) as a sample document
  - Registration (upcoming workshop) for aggregators of retail customers, including EDC/ LBA/ RERRA review processes

# Key Requirements of FERC 2222: H. Coordination (1)



## 1. Market rule on coordination

- ISO/ DERA/ EDC/ TO/ RERRA
  - Registration
  - Operations
- No undue barriers

## 2. Distribution utilities

- ISO must allow distribution utilities to review DERs in aggregations at registration and at updates
- Coordinate criteria for acceptable participation
- ISO must share data with distribution utilities to help them review
- 60 days or less for reviews
- Dispute resolution process



# Key Requirements of FERC 2222:

## H. Coordination (2)

### 3. Ongoing operational

- Establish process for operational coordination
- Require DERA to report changes to offer quantity and distribution factors
- Establish coordination protocols
  - Allow distribution utility overrides of dispatch
  - Establish non-performance penalties

### 4. RERRA

- Role for RERRA in coordinating participation
- Protocols in sharing metering and telemetry data

### 5. TO

- Evaluate impact on transmission system

### 6. Coordination Framework

- Address interoperability of new information technology and communication framework

# I-Modification to List of Resources in Aggregation

# Modifications Decision Summary



Question	Status
How often and what is the process for aggregators changing the make-up of their aggregation, e.g., adding or removing individual distributed energy resources?	Target 4 <sup>th</sup> quarter DER TF
What is the threshold for a material change? The Order states that any modification will trigger EDC review, what is the timeline associated with that modification?	Target 4 <sup>th</sup> quarter DER TF
How will this match the established interconnection process?	Target 4 <sup>th</sup> quarter DER TF



# Key Requirements of FERC 2222:

## I. Modification to list of DERs in Aggregation

- Rules to address modifying list
- Modification will not require re-registering
- Will trigger distribution utility review process
  - Will not require pause in aggregation participation
- DERA updates physical or operational characteristics of aggregation

# J-Market Participation Agreements

# Market Participant Agreements: Decision Summary



Question	Status
How should MISO and RERRAs coordinate DER aggregation Participation Agreements?	Target 4 <sup>th</sup> quarter DER TF and RERRA meetings
What about utilities that may fall above the line in one fiscal year and below the line the next year?	Target 4 <sup>th</sup> quarter DER TF
Who is responsible for verifying this data?	Target 4 <sup>th</sup> quarter DER TF
For those utilities which opt-in, over what period of time is that opt-in “authorized”? How does this align with MISO process timelines?	Target 4 <sup>th</sup> quarter DER TF



# Key Requirements of FERC 2222: J. Market Participation Agreement

Require market participation agreement

- Define DERA's role and responsibility
- Attestation of DERA that aggregation is compliant
  - ISO Tariff
  - Local utility procedures and rules
  - RERRA regulations
- Must not limit business models

# Next Steps



# Parking Lot



- As MISO and the stakeholder community proceed through the work to create the compliance filing and market design for Order 2222, a number of issues which may require future definition will be noted
- How will MISO create a tracking system to:
  - Prioritize these issues?
  - Document the needs?
  - Incorporate needs into future work plans?
- MISO has started a Parking Lot for future additional work on DER/ Demand Response, and coordination topics
- MISO is **requesting stakeholder input** to the DER Parking Lot; comments to stakeholder proposals in June included several items to be added to the Parking Lot



# Technical limitations and policy goals will be captured for post-filing prioritization

Topic	Enable	Information to Date
Price and power flow oscillation	More granular aggregation	<a href="#">Issue Definition Research Paper</a>
Small unit self-commit	MISO commitment of < 1 MW resource	<a href="#">Issue Definition</a>
Transmission – distribution interface <ul style="list-style-type: none"><li>• Multi-path modeling</li><li>• Load shifts between substations</li></ul>	Additional distribution level modeling flexibility	<a href="#">August 2 Stakeholder Input</a>
Metering data repository	Secure storage of DER metering information	<a href="#">August 2 Stakeholder Input</a>
Telemetry	Other DERA, LSE, RERRA, and/or EDC desired technology	

# Stakeholder Feedback Request



- MISO has started a Parking Lot for future additional work on DER/ Demand Response, and coordination topics, and seeks related feedback on items to be captured in this Parking Lot
- Feedback is due by **August 16, 2021**

- Issue Tracking ID#: **IR070** 

- Feedback requests and responses are managed through the Feedback Tool on the MISO website:

<https://www.misoenergy.org/stakeholder-engagement/stakeholder-feedback/>

# DER & Order 2222: Future Sessions



DER Task Force	Distribution Company workshops	Market Subcommittee
August 2	August 9 (followed by joint Registration workshop)	August 5
August 30	September 13	September 2
October 4	October 11	October 7
November 1	November 2	November 4
November 29	No meeting	December 1

- The DER Task Force and Distribution Company workshops are scheduled monthly and will continue until the FERC Order 2222 compliance plan is complete. Future DER TF meetings have been extended, so please update your meeting invites accordingly.
- Concepts and Conceptual Designs will be presented to the Market Subcommittee quarterly.
- Some DER topics will also appear in the Resource Adequacy Subcommittee and the Interconnection Process Working Group. [Visit the full calendar posted on the MISO website.](#)



# MISO is working with other ISOs and groups

- **Electric Power Research Institute** has an Order 2222 program underway
  - Developing use cases to be used by all ISO/ RTOs and stakeholders for discussion
  - All ISOs are participating, as well as many utilities
  - Six workstreams; MISO is represented in each
  - Reports are published to the program sponsors
  - Excellent participation from distribution utilities
- **PJM** holds monthly DIRS stakeholder sessions, as well as EDC workshops
  - PJM has received extension
  - Last iteration of proposal elicited significant discussion
- **SPP** holds O2222 meetings approximately 2 times a month
  - SPP has received extension
  - An advisory group makes recommendations to stakeholder committees
- **ISO-NE** has focused their meetings with the NEPOOL Markets committee
  - ISO-NE received extension (February 2, 2022)
  - Complete proposal to stakeholder community; much discussion
- **Electric System Integration Group (ESIG)** has a DER working group
  - Focused on a longer-term future; not involved intimately with O2222 compliance



# Follow progress on the MISO website



Distributed Energy Resources (DER)  
FERC Order 2222 Compliance (IR070)

- This issue tracks MISO's compliance filing for FERC Order 2222
- Details on the schedule and associated documentation can be found on the IR portion of the MISO website:

<https://www.misoenergy.org/stakeholder-engagement/issue-tracking/distributed-energy-resources/>

# Helpful Resources



# O2222 Team and Resources

Questions to: [derprogrammanagement@misoenergy.org](mailto:derprogrammanagement@misoenergy.org)

DER Task Force has a mailing list, stakeholders can/should subscribe:

<https://www.misoenergy.org/stakeholder-engagement/committees/DERTF/>

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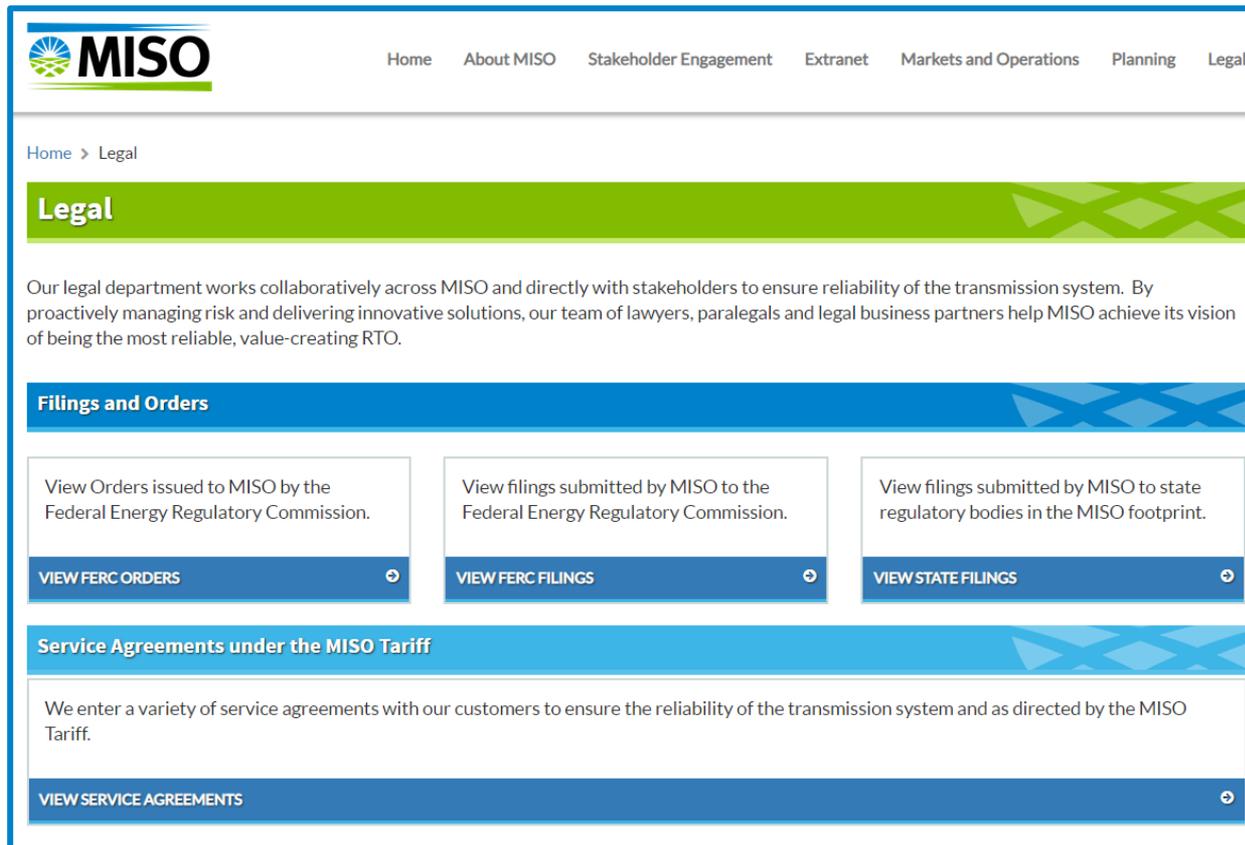
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# MISO's website provides easy access to filings

- The original text of Order 2222 is found in the September 2020 [Orders issued to MISO by the Federal Energy Regulatory Commission](#)

A screenshot of the MISO website's "Legal" page. The page features a navigation bar with links for Home, About MISO, Stakeholder Engagement, Extranet, Markets and Operations, Planning, and Legal. Below the navigation bar, there is a breadcrumb trail "Home > Legal" and a green header section titled "Legal". The main content area includes a paragraph describing the legal department's role. Below this, there is a blue header section titled "Filings and Orders" which contains three white boxes with blue buttons: "VIEW FERC ORDERS", "VIEW FERC FILINGS", and "VIEW STATE FILINGS". At the bottom, there is another blue header section titled "Service Agreements under the MISO Tariff" with a white box containing text and a "VIEW SERVICE AGREEMENTS" button.



# MISO's Tariff and BPMs

- [MISO Tariff](#) (7,000+ pages)

- [27 MISO Business Practices Manuals \(BPM\)](#)

Home > Legal > Tariff

## Tariff

We provide renditions of the MISO Tariff to allow interested parties the opportunity to review Tariff provisions electronically. MISO legal staff makes every effort to ensure the Tariff provisions posted here represent the current language on file with the Federal Energy Regulatory Commission ("FERC"); however, reference should be made to the appropriate FERC filings and orders to establish the filed rates or terms and conditions of service at any particular point in time.

As Filed - Highlighted Color Key

<b>Tariff - As Filed Version</b> Effective - 01-19-2021	<b>Tariff - As Filed Highlighted Version</b> Effective - 03-23-2020
The "As Filed" Tariff reflects language filed with FERC through the date shown.	The "As Filed-Highlighted" Tariff indicates the status of pending or not-yet-effective Tariff language.
<a href="#">DOWNLOAD TARIFF - AS FILED VERSION</a>	<a href="#">DOWNLOAD TARIFF - AS FILED HIGHLIGHTED VERSION</a>

Home > Legal > Business Practices Manuals

## Business Practices Manuals

[BPM Training Material](#)

**BPM001 - Market Registration**

[Download BPM](#)

**Effective Date: 07/01/2019**

BPM001 for Market Registration details the steps to become a Market Participant and processes to comply with the MISO Tariff.

*This BPM benefits readers who want answers to the following questions:*

- How does a company/organization become a Market Participant?
- What is the Market Participation Qualification process?
- What are the Credit Requirements to become a Market Participant?
- What is Asset Registration?





# Learning about MISO

- You can register for MISO's robust set of stakeholder education materials available through our [Learning Management System \(LMS\)](#)

## Targeted Training by Type

Level 100 - Stakeholder Process Tutorials  
Level 100 - Introduction to Stakeholder Process Participation  
Level 200 - Introduction to Stakeholder Governance  
Level 300 - Entity Leadership  
Level 300 - Entity Leadership Non-Sector Voting  
ADR Committee Member Training

## Asset Registration

Level 100 - Demand Response as a Resource  
Level 100 - Market Participant and Asset Registration  
Level 300 - Commercial Model Asset Registration

## Markets Overview

Level 100 - Energy and Operating Reserves Markets  
Level 200 - Energy and Operating Reserves Markets  
Level 200 - Energy and Operating Reserves Market Pricing

## Real Time Dispatch and Reliability Coordination

Level 100 - Real Time Operations  
Level 100 - IMM Uninstructed Deviation  
Level 100 - Real-Time Offer Enhancement  
Level 100 - Real-Time Offer Enhancement: DRR Type I  
Level 100 - Real-Time Offer Enhancement: Generation Resource  
Level 100 - Real-Time Offer Enhancement: Stored Energy Resources