



PJM Draft Response To Order Directing Reports in Modernizing Electricity Market Design FERC Docket

Market Implementation Committee
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Modernizing Electricity Market Design

FERC held four Technical Conferences in this proceeding in 2021 to discuss potential resource adequacy and energy and ancillary services market reforms that may be needed as the resource fleet and load profiles change over time.

On April 21, 2022, FERC issued an **Order Directing Reports** in AD21-10 that seeks additional information to further the Commission's understanding of each RTO's changing system needs and potential solutions to address those changes over time.

PJM has a well established record on these topics:

- [Grid of the Future: PJM's Regional Planning Perspective](#)
- [Energy Transition in PJM: Frameworks for Analysis](#)
- [Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid](#)
- [Offshore Wind Transmission Study Phase 1 Results Report](#)
- FERC Technical Conference statements:
 - [A.Keech statement 09.13.2021](#)
 - [Graf statement 10.12.2021](#)

PJM developed a set of guiding principles for market design changes that will be used in this response:

- Reserve and energy prices reflect system conditions and appropriately value scarcity.
- ORDCs reflect the reliability value of reserves.
- The actual reserve capability on the system is accurately measured.
- Resources assigned reserves will provide them when deployed.
- Market power is mitigated.
- Social welfare is maximized.
- Solutions that are nimble with evolution
- Non-discriminatory market rules
- Market rule changes for efficient and robust markets
- Proper market signals to guide (the right) investments

How each RTO/ISO expects its system needs to change over the next five and 10 years

- Penetration and resource mix will drive the RTO needs.
- Increases in uncertainty need to be managed by incentivizing operational flexibility.

Information about any other reforms, including capacity market reforms and any other resource adequacy reforms, that would help each RTO/ISO meet changes in system needs

- Resource Adequacy Senior Task Force is working to reform the capacity market in various areas.
- We believe operational flexibility incentives are better suited for the Day-ahead and Real-time Markets. If there are revenue insufficiencies a capacity solution may be investigated.

Current system needs given changing resource mixes and load profiles

- The definition of ancillary services products should be informed by both system requirements and resource capabilities.

Whether and how each RTO/ISO plans to reform its energy and ancillary services (E&AS) markets to meet expected system needs over the next five and 10 years

- New reserve products can be introduced to address operational flexibility needs.
- Opportunities exist to improve market models to address operational flexibility needs.
- Flexibility needs and market solutions will vary by RTO/ISO.

PJM has reviewed the need for additional reliability-based services, with a particular focus on reliability needs in the face of the changing resource portfolio and increased penetration of intermittent resource technologies.

Five-Year Time Frame

Shorter-Term Ancillary Service Changes

- Reactive capability & supply
- Regulation
- Existing or modified A/S for flexibility
- Fuel assurance
- Energy assurance
- Load following/dispatchability
- Renewable dispatch activities

10-Year Time Frame

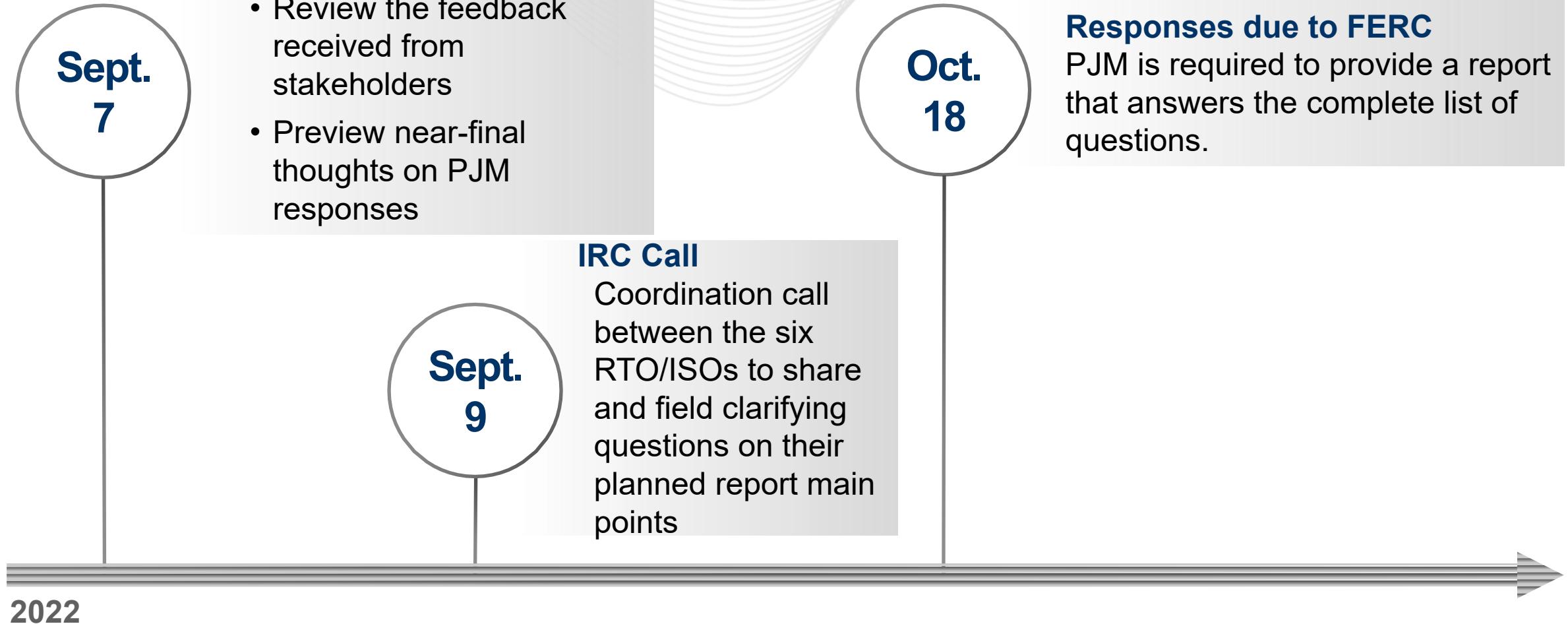
Longer-Term Ancillary Service Changes

- Fuel assurance (continued work)
- Energy assurance (continued work)
- Load following/dispatchability (continued work)
- Primary frequency response

- Combined Cycle Model
- Energy Storage Resource (ESR) Optimization (Order 841)
- Distributed Energy Resources (DER) Integration (Order 2222)
- Operating Reserve Clarification for Resources Operating as Requested by PJM
- Renewable Dispatch
- Intelligent Reserve Deployment
- Resource Adequacy Senior Task Force
- Electric Gas Coordination Senior Task Force
- Clean Attribute Procurement Senior Task Force
- Reactive Power Compensation Task Force

PJM's responses are generally aligned with the feedback received from Stakeholders

- No new products, existing AS is sufficient
- Better gas/electric coordination
- Need to revisit CP triggers and specifically load management as the need to trigger this emergency procedure in the future may increase
- Pursue multi-interval dispatch but need to settle all intervals; shouldn't be advisory
- Reform capacity to procure resource adequacy and flexibility
- Relieve dispatch from taking manual actions
- Overhaul capacity market
- PJM is in the best position to determine what needs there are but they should report out on trends to justify any future market changes
- Need to adequately incentive operating reserves





Appendix

Order Directing Reports

Questions and Response Main Points



Order Directing Reports Questions

What system needs (type and magnitude) has the RTO/ISO experienced that are attributable to changes in the resource mix and customer load profiles? How do these system needs vary over different time horizons in the E&AS markets? What specific resource capabilities could address these needs (e.g., dispatchable generation)?

- PJM undertook an effort to define the reliability product attributes specifically needed by PJM as the grid, resource mix and customer load profiles change, in an effort to define PJM system needs in the future.
- PJM's reliability product attribute study included a holistic look at all system needs for the evolving grid.
 - [Reliability Products and Service Assessment](#)
- The energy transition will drive additional needs specific to PJM's footprint, dependent on the integration of resources and the changing resource mix.
- The key findings and recommendations from PJM's series of studies on the Energy Transition in PJM will continue to inform the reforms PJM pursues in this space.



Order Directing Reports Questions

Referring to the system needs identified in answering the previous question, how does the RTO/ISO expect those system needs to change over the next five years? Over the next 10 years? What does the RTO/ISO expect the magnitude of those system needs to be in five years? In 10 years?

- Penetration levels of renewable resources, integration of distributed energy resources and scheduled retirements, among other things – not a defined timeline – will change the system needs.
- There are many external developments that will drive the changes on the grid and system needs: state policies, generator financials, industry trends.
- PJM, in the renewable integration study framework, is looking at many hypothetical system resource scenarios to identify the system needs.

Referring to the changing system needs discussed in the prior questions, to what extent are current RTO/ISO E&AS market products and compensation schemes not designed to procure the resource capabilities needed to meet these expected changing system needs? To what extent are such prices and products unable to adequately compensate the resources possessing the capabilities necessary to meet these expected changing system needs? To what extent does the risk of disorderly retirements of resources with capabilities that are needed to address such needs (e.g., fast-ramping dispatchable resources) increase if E&AS markets are not reformed? Why?

- PJM's believes the general framework of its co-optimized, cascading reserve products and energy should be maintained but that the products and requirements would benefit review and analysis. The current ancillary service requirements understate the need for flexibility today.
- Today's fleet naturally exhibits sufficient ramp capability to meet today's net load ramp needs.
- PJM anticipates roughly a doubling of the net load ramp needs in the long-term future, while also facing an online resource mix that may at times be significantly more limited in its ability to ramp up.
- Many forms of demand are inherently able to provide flexibility and are expected to increase in the coming years, potentially providing a significant source of flexibility.
- With insufficient procurement and compensation of the flexibility needed to address future system needs, PJM risks a shortfall of such capabilities, whether through inefficient failure to retain existing resources with such capabilities or failure to attract new resources.



Order Directing Reports Questions

What planned E&AS market reforms is the RTO/ISO contemplating or other stakeholder processes, if any, is the RTO/ISO conducting related to meeting those expected changing system needs?

- PJM has several in-progress stakeholder discussions related to expected changing system needs, including:
 - Regulation Market Design Senior Task Force
 - Resource Adequacy Senior Task Force
 - Clean Attribute Procurement Senior Task Force
 - Electric Gas Coordination Senior Task Force
 - Reactive Power Compensation Task Force
 - Working items in the Operating Committee on Renewable Dispatch and Reliability Product Attributes
 - Working item in the Market Implementation Committee on Operating Reserve Clarification for Resources Operating as Requested by PJM
- PJM also plans to begin discussions with stakeholders on the Combined Cycle model, flexibility needs modeled in markets and incentivizing greater demand flexibility.



Order Directing Reports Questions

Over the next five years, and over the next 10 years, how well will existing RTO/ISO market designs, together with planned reforms, adequately incentivize resource behaviors that will enable the RTO/ISO to meet its changing system needs?

- PJM's reliability product attribute study included a holistic look at all system needs for the evolving grid.
 - [Reliability Products and Service Assessment](#)
- Reinforce prior responses with regard to the types of upcoming system needs that are not yet well addressed by our current mix of market products where there are opportunities to provide more sufficient incentives for flexibility.
- Highlight that our current framework of co-optimized, cascading reserve products and energy should be maintained.
- Resources that are providing energy, even if not flexible, are providing the highest-value product, and it is proper to compensate them for providing that product.



Order Directing Reports Questions

What other reforms to current RTO/ISO E&AS market rules may be required in the future given the RTO's/ISO's expected changing system needs and shortcomings of current E&AS market designs? Why? For example, are changes to resource eligibility rules for ancillary services or uplift policies expected to be necessary?

- PJM is currently discussing uplift rule changes in the Market Implementation Committee intended to remove incentives to deviate from dispatch.
- PJM is currently discussing operational issues that arise due to inconsistent controllability of renewable resources due to technological limitations, forecast accuracy and fuel availability.



Order Directing Reports Questions

For RTOs/ISOs that administer a capacity market, what capacity market reforms, if any, are the RTO/ISO considering to meet expected system needs in the future?

- In the Resource Adequacy Senior Task Force, PJM is currently working with stakeholders to review PJM's capacity market construct and explore potential reforms needed to support future system needs.
- There are 10 Key Work Activities being discussed, including:
 - Performance Assessments
 - Capacity Resource Qualification and Accreditation
 - Procurement Levels
 - Capacity Resource Obligations
 - Supply-Side Market Power Mitigation Rules
 - Fixed Resource Requirement Rules
 - Procurement of Clean Resource Attributes



Order Directing Reports Questions

What reforms beyond those to the RTO's/ISO's tariff(s) does the RTO/ISO believe might be needed to address expected changing system needs?

- Electric Gas Coordination Senior Task Force
- Order 2222 – Interaction between transmission and distribution
- Joint and Common Market/Seams Coordination
- Renewable Integration Studies/Grid of Future – retail rate design
- FERC/NERC winter reliability study
- Clean Attribute Procurement Senior Task Force
- Environmental coordination efforts



Order Directing Reports Questions

How can the Commission best assist RTOs/ISOs and their stakeholders in reforming their markets in the future?

- ISOs/RTOs have done a significant amount of thinking, research and coordination on this topic.
- While continued interregional coordination remains important, given regional operational differences, each entity should be responsible for crafting their own solution to meet their needs.

Are the RTO/ISO markets compensating dispatchable resources appropriately in all markets? Are pricing policies causing premature retirements of dispatchable resources that may threaten reliability (as the MISO Midwest results may indicate)?

- PJM views environmental policy as a stronger driver of the retirement of dispatchable resources than economics.

Are intermittent and hybrid resources compensated appropriately to ensure reliability?

- Yes. PJM has non-discriminatory models for ESRs (Order 841), DER (Order 2222) and hybrid resources.

Is it appropriate to continue to use LMP in energy and capacity markets? Does the continued use of LMP threaten reliability as the generation mix changes? Does the use of LMP ensure that consumers get the benefit of low clearing prices? Is there a better pricing model than LMP in RTO/ISO markets to achieve reliability and fairness to consumers?

- LMP is still the correct pricing incentive in the energy markets.
- The interaction between the energy and capacity markets is important to ensure the appropriate revenues are provided in real time to incent the correct real-time behaviors and so that all the revenue isn't just shifted into the capacity market.

Are capacity markets appropriate to use for resource adequacy? If not, is there a better alternative to capacity markets? Should capacity markets be purely residual or mandatory?

- Capacity markets are appropriate for resource adequacy.
- While the foundation of PJM's capacity market is solid, reforms are being discussed at the Resource Adequacy Senior Task Force and Clean Attribute Procurement Senior Task Force.

How will compliance with Order 2222 mandating the participation and compensation of aggregated distributed energy resources (DERs) in RTO/ISO markets affect the answers to the previous questions?

- PJM's compliance with Order 2222 will not affect the previous answers.
- PJM's proposed DER Aggregator Participation model was designed in the proactive lens of measurable participation by DER and assuring market principles would be upheld for DER aggregation participation.