Market Design Project Road Map

Market Design and Economics

August 2025

For Public Use

Contents

Overview

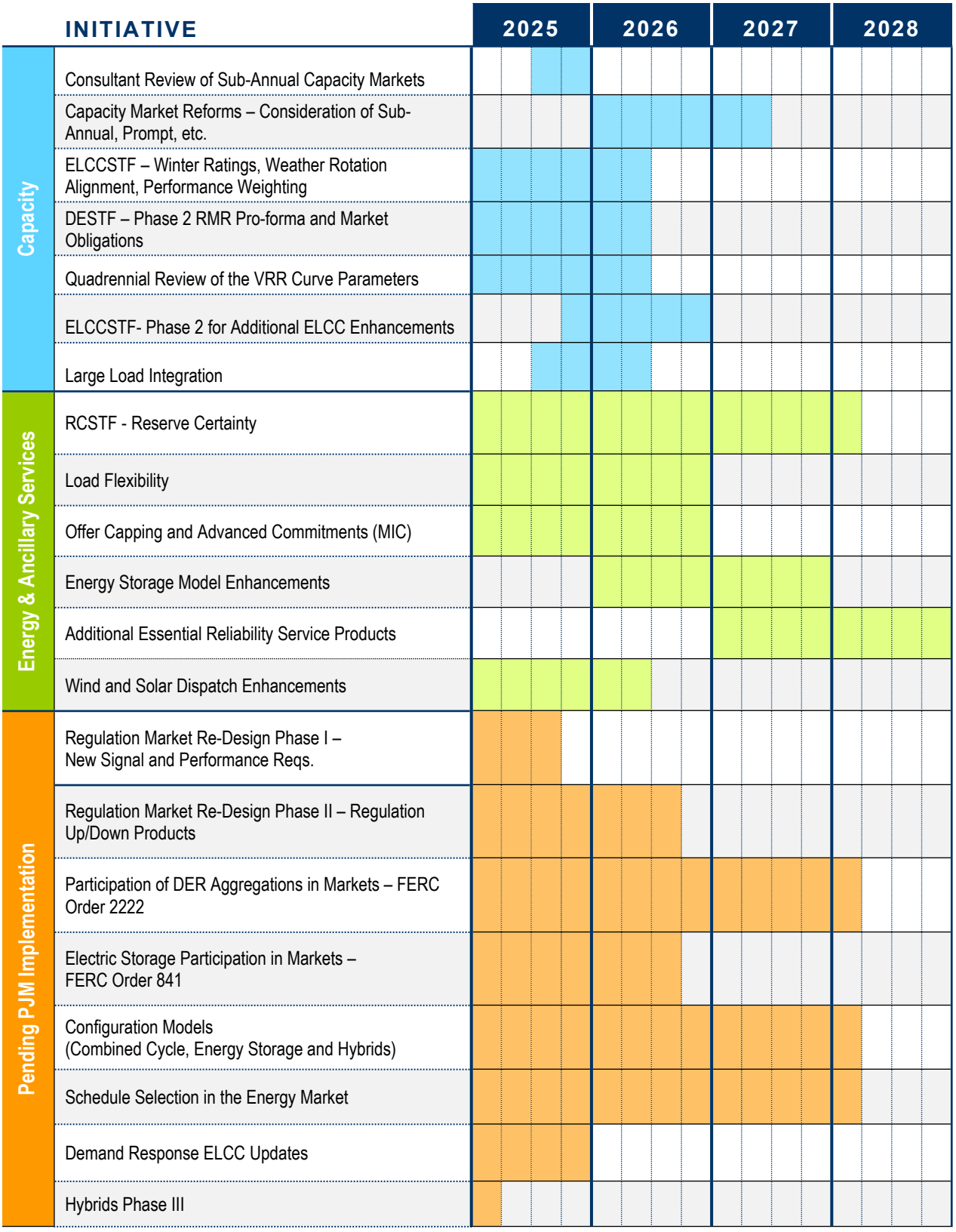
The purpose of this document is to provide transparency regarding the market design changes PJM feels are necessary and the timing associated with them. This road map reflects PJM's thinking as of the date of publication of this document and is in no way intended to foreclose on other important, necessary changes that may arise in the future. PJM fully expects that this will be a living document that will require periodic updates as issues are opened and closed and as timelines shift as PJM and the stakeholders prioritize their efforts.

As part of Ensuring a Reliable Energy Transition, PJM is taking steps to maintain reliability as we progress through the energy transition. PJM has identified three time frames for reliability concerns: immediate, near term and upcoming. The immediate concern supports the need for excellence in resource performance based on learnings from Winter Storm Elliott. The near-term concern seeks to ensure resource adequacy based on the recent Energy Transition in PJM: Resource Retirements, Replacements & Risks (PDF) report. The upcoming concern seeks to maintain and attract essential Reliability Services and the need for flexibility in generation as recommended in both the Energy Transition in PJM: Frameworks for Analysis (PDF) and Energy Transition in PJM: Flexibility for the Future (PDF) papers. PJM and stakeholders have worked on some of these concerns, but more action needs to be taken.

The Market Design Project Road Map outlines the key market initiatives and the expected timelines for the projects necessary to remain responsive to the energy transition. Projects in the Market Design Road Map include current and potential future stakeholder issues that impact market rule changes. For each initiative, the document briefly describes the issue to be solved, the anticipated project deliverables and the expected timeline for the effort. The timeline is broken out into phases, including internal PJM design, stakeholder process, software development, and implementation, to display the entire lifecycle of each initiative. The project descriptions, deliverables and corresponding timelines reflect information known at the time of this document. Projects are categorized as: (1) Capacity, (2) Energy & Ancillary Services, and (3) Pending PJM Implementation initiatives.

CATEGORY	Description
Capacity	Initiatives in the Capacity section represent future projects that address concerns raised in the near term and seek to ensure resource adequacy.
Energy & Ancillary Services	Initiatives in the Energy & Ancillary Services section represent future projects that address immediate and upcoming concerns about supporting resource performance and seeking to maintain and attract essential reliability services.
Pending PJM Implementation	Initiatives in the Pending PJM Implementation section represent projects that are in different phases of the implementation process where they could be concluding the stakeholder process, pending a FERC filing, anticipating FERC approval, or approved by FERC and in software development.

Market Design Project Road Map



Capacity Road Map Narratives

1. Consultant Review of Sub-Annual Capacity Markets

Problem Statement

PJM Stakeholders approved an Issue Charge at the July 2025 Markets and Reliability Committee, brought forth by Governor Josh Shapiro, on behalf of the Commonwealth of Pennsylvania, to request an independent review of PJM's Capacity Markets and evaluation of transitioning to a sub-annual construct.

The current PJM capacity market is structured on an annual basis, which may not fully reflect seasonal variations in demand, resource availability, or system needs. Stakeholders and PJM are increasingly interested in exploring the feasibility, implications, and potential benefits of transitioning to a sub-annual (e.g., seasonal or quarterly) capacity market structure. This transition may improve market efficiency, resource adequacy, and alignment with the evolving resource mix, including intermittent renewable generation and flexible demand.

To support informed decision-making, a comprehensive assessment is needed to explore design options, implementation considerations, and comparative analysis with existing market structures.

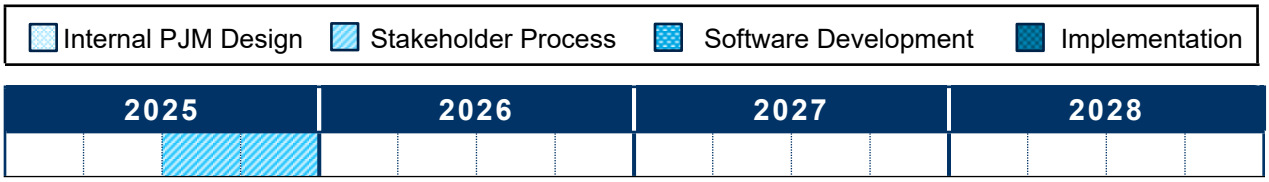
Project Description

A hired consultant will evaluate PJM's capacity market and put forward recommendations to moving to a sub-annual design. The consultant will perform a review and benchmark against other capacity markets, review key design principles to PJM's market and put forward design options. This body of work will inform PJM's next capacity market reform effort.

At a minimum, key principles that will be evaluated are:

- Sub-annual reliability requirements, targets, and demand curves.
- Sub-annual CETL values.
- Sub-annual resource capacity ratings, resource accreditation, and resource qualifications.
- A sub-annual auction structure with sub-annual clearing prices, sufficient to compensate generator annual revenue requirements.
- Sub-annual capacity obligations and charges, including potential changes to planned maintenance and outage rules.
- Sub-annual resource offer caps and minimum offer price requirements if capable of exerting buyer side market power.
- Corresponding changes to the Fixed Resource Requirement alternative to align with the sub-annual capacity market design.
- Corresponding changes to energy and reserve market must offer requirements to align with a sub-annual capacity market design.
- Transition mechanisms necessary to implement a sub-annual capacity market by the desired timeframe

Timeline: Consultant Review of Sub-Annual Capacity Markets



2. Capacity Market Reforms – Consideration of Sub-Annual, Prompt, etc.

Problem Statement

The capacity market reforms accepted by FERC in ER24-99 represented a substantial step forward in improving the status quo. They will help PJM to maintain resource adequacy in the near and long term. However, there was limited time in the Critical Issue Fast Path (CIFP) stakeholder process to work with stakeholders on certain areas of the market design to meet the filing deadline that was required to have the changes effective for the 2025/2026 Base Residual Auction (BRA), which led to certain items being removed or simplified in both PJM's and other stakeholders' proposals. In particular, in the October 2023 FERC filings, PJM committed to "continue assessing the design of the capacity construct with stakeholders, including whether and how a seasonal capacity construct could help support reliability and efficiency for the PJM Region." Considering further reforms to the capacity market would allow PJM and stakeholders to build upon the recently approved reliability enhancements to better position the capacity market for the evolving reliability challenges expected in the region.

Project Description

The primary focus areas include:

- Evaluating a sub-annual or more granular capacity market design, informed by the consultant report
- Improving the locational representation of supply and demand
- Assessing the forward period of the auction

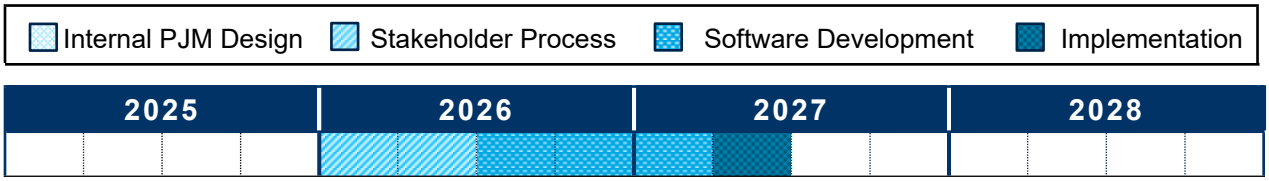
Moving to a sub-annual procurement period aligns with the shifting patterns of reliability risk observed in PJM's new models, which show significantly more risk in the winter. This transition will impact various aspects of the market construct, requiring a comprehensive assessment of the tradeoffs between annual, seasonal and more granular designs. PJM will evaluate options for auction structure, demand curves, target reliability requirements and clearing mechanics under a sub-annual design, as well as the impact on cost allocation, market power mitigation rules and Capacity Interconnection Rights.

Improving the locational representation of supply and demand is crucial to ensure that accreditation and price signals reflect locational risks. This involves reviewing how supply resources and demand curves are represented in constrained regions of the RTO and evaluating conforming changes to a sub-annual market design and potential enhancements to the calculation of Capacity Emergency Transfer Limits.

Lastly, PJM will assess the benefits and tradeoffs of moving from a three-year-forward Base Residual Auction to a prompt auction shortly before the delivery year starts. This change could improve reliability risk and accreditation modeling due to more accurate input data, but it may impact the timing of new entry or retirement decisions and the ability to evaluate

future supply commitments against the need for transmission solutions. The role of incremental auctions will also be reviewed in light of the potential reduction of the forward period of the BRA.

Timeline: Capacity Market Reforms



3. ELCCSTF – Winter Ratings, Weather Rotation Alignment, Performance Weighting

Problem Statement

The implementation of the marginal ELCC accreditation methodology approved by FERC in ER24-99 represented a substantial step forward in improving the status quo evaluation of resource's reliability value to the system. Methodology enhancements are being examined to best evaluate resource's accreditation and also ensure the model is incenting needed investments (e.g., winterization efforts for better winter performance) in new and existing resources to maintain resource adequacy.

As the PJM region faces challenges with robust load growth and faster than expected resource retirements, it is becoming increasingly important that incentives align with the pressing need to maintain resource adequacy.

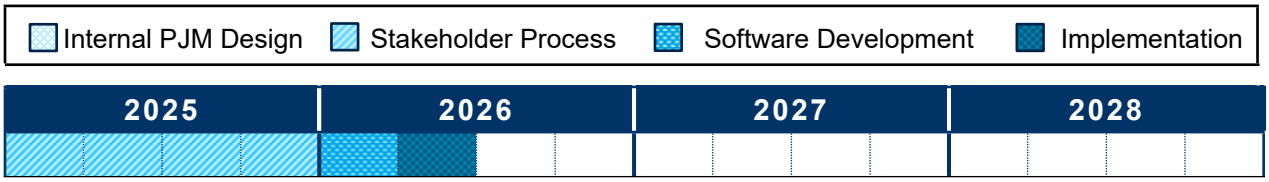
Project Description

The Effective Load Carrying Capability Senior Task Force (ELCCSTF) will examine capacity market incentives for current and new resources under the marginal ELCC accreditation methodology and will investigate enhancements in the ELCC design to align incentives with long-term system needs. The goal is to continue building upon and further improving the risk modeling framework in support of resource adequacy.

In this effort the following key elements are being reformed:

- Weather Rotation Alignment: Improves the alignment of weather, load profiles, and resource performance in the risk model and ELCC analysis
- Generator Winter Ratings: Provides the set of rules to incorporate incremental winter capability of thermal generation in the resource adequacy studies and market.
- Performance Weighting: Establishes an approach to more quickly reflect demonstrated improved resource performance and changes in system operation in the risk and accreditation model without dismissing historical performance data.

Timeline: ELCCSTF – Winter Ratings, Weather Rotation Alignment, Performance Weighting



4. DESTF – Phase 2 RMR Pro-forma and Market Obligations

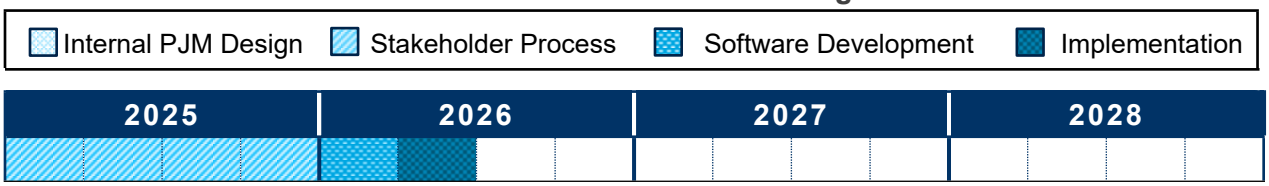
Problem Statement

The bridge proposal for RMR resources in the PJM Capacity market was accepted by FERC in Docket ER25-682 for the 2026/2027 and 2027/2028 Delivery Years. A more fulsome solution is needed considering the resource adequacy contributions of RMR resources starting with the 2028/2029 delivery year, with developing a pro-forma RMR agreement.

Project Description

Development of a pro forma RMR arrangement and accompanying updates to capacity market rules for deactivating generators that may need to be temporarily retained to maintain reliability starting with the 2028/2029 BRA.

Timeline: DESTF – Phase 2 RMR Pro-forma and Market Obligations



5. Quadrennial Review of the VRR Curve Parameters

Problem Statement

The PJM Open Access Transmission Tariff (OATT) mandates a periodic assessment of key parameters of the Variable Resource Requirement (VRR) Curve, an administratively determined representation of demand used in the capacity market auction. The Quadrennial Review of VRR Curve parameters is crucial to ensure that the Reliability Pricing Model (RPM) continues to support reliability objectives cost-effectively.

In the last Quadrennial Review, PJM updated the reference technology for the CONE from a combustion turbine to a combined cycle. However, there is a growing need to evaluate other technologies, especially in areas of the PJM footprint where fossil fuel resources are either prohibited by law or de facto, based on permitting practices, or uneconomic due to policies encouraging clean energy resources and/or retiring fossil resources by a future date certain. This necessitates the evaluation of alternative new technologies, including batteries and renewable/battery hybrids, and assessing their costs.

Project Description

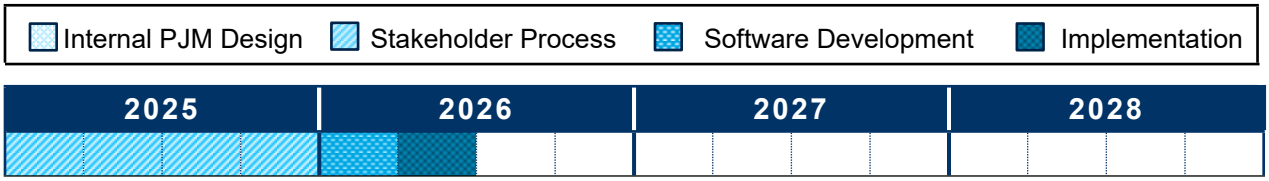
The Quadrennial Review project involves a comprehensive assessment of the CONE, the methodology used to determine Energy & Ancillary Service Revenues, and the shape of the VRR Curve. PJM typically engages a consultant to evaluate the performance of the VRR Curve, parameters, CONE and net CONE.

In addition to the standard review process, PJM will thoroughly analyze alternative technologies, focusing on batteries and renewable/battery hybrids. This analysis will include:

- Assessing the current and projected costs of these technologies
- Evaluating their potential to provide reliable capacity
- Examining the impact of state and federal policies on the economic viability of these technologies within the PJM footprint
- Developing recommendations for incorporating these technologies into the VRR Curve parameters, if appropriate

Furthermore, PJM will engage stakeholders throughout the review process to gather input and feedback on the proposed changes to the VRR Curve parameters. This engagement will ensure that market participants' final recommendations are well informed and broadly supported.

Timeline: Quadrennial Review of the VRR Curve



6. ELCCSTF- Phase 2 for Additional ELCC Enhancements

Problem Statement

The implementation of the marginal ELCC accreditation methodology approved by FERC in ER24-99 represented a substantial step forward in improving the status quo evaluation of resource's reliability value to the system. Methodology enhancements are being examined to best evaluate resource's accreditation and also ensure the model is incenting needed investments (e.g., winterization efforts for better winter performance) in new and existing resources to maintain resource adequacy.

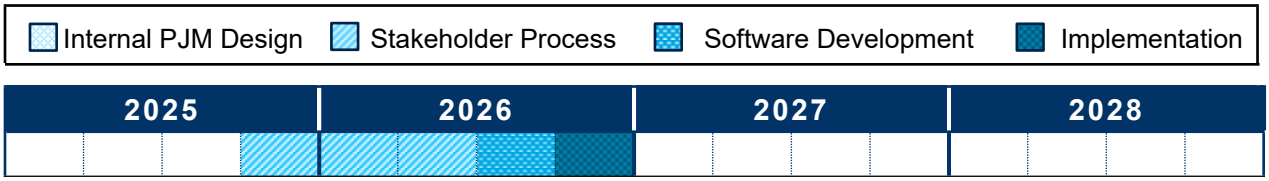
As the PJM region faces challenges with robust load growth and faster than expected resource retirements, it is becoming increasingly important that incentives align with the pressing need to maintain resource adequacy.

Project Description

The Effective Load Carrying Capability Senior Task Force (ELCCSTF) will examine capacity market incentives for current and new resources under the marginal ELCC accreditation methodology and will investigate enhancements in the ELCC design to align incentives with long-term system needs. The goal is to continue building upon and further improving the risk modeling framework in support of resource adequacy.

In this effort PJM and stakeholders will continue to explore potential improvements and further enhance the analysis beyond what was accomplished in the ELCCSTF for the 2028/2029 delivery year.

Timeline: ELCCSTF- Phase 2 for Additional ELCC Enhancements



7. Large Load Integration

Problem Statement

Recent increases in large load additions, mainly from data centers, present both opportunities and challenges for the regional grid. PJM's location, size, market opportunities and system reliability make it an attractive area for large load customers to locate, and we continue to see significant load interconnection activity at several of our utilities. Indeed, PJM's 2025 long-term load forecast shows a peak load growth of 32 GW from 2024 to 2030. Of this, approximately 30 GW is projected to be from data centers.

This onrush of demand has created significant upward pricing pressure and has raised future resource adequacy concerns. To further complicate matters, while demand expansion is clearly evident in recent system behavior, there exists a large cone of uncertainty around the trajectory and amplitude of future growth. PJM's 2022 interconnection queue reform has resulted in the processing of over 140,000 MW of queued generation projects. A total of 46,000 MW of new generation have signed interconnection agreements and are ready to construct. The remaining interconnection transition queue is expected to be completely cleared over the next six to eighteen months. Through PJM's recent Reliability Resource Initiative, PJM will process 11,000 MW of additional generation, which helps the situation, but it is likely even more will be needed over the balance of this decade and beyond. However, many of these projects are being hampered by factors outside PJM's control, such as siting and permitting challenges and supply chain backlogs. In the latest Reliability Pricing Model (RPM) auction for Delivery Year 2026/2027, PJM committed nearly 100% of the supply that was offered to meet the projected needs of customers. The updated load forecast reflects even tighter conditions, mainly because of the projected integration of large loads.

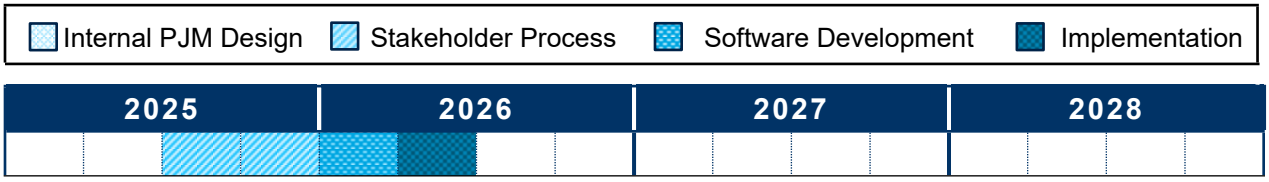
Project Description

The PJM Board of Managers issued a Critical Issue Fast Path (CIFP) process on August 8, 2025 to address this initiative. As part of this effort the following scope items will be considered:

- A reliability focused solution to ensure large loads can continue to be integrated rapidly and reliable, without causing resource inadequacy.
- Reliability Criteria for when any reliability focused solution be triggered or when no longer necessary.
- Consideration of Interconnection Rules changes targeting resource adequacy.
- Recognize coordination between applicable parties (PJM, large loads, EDCs, LSEs, etc.)

These reforms are targeting an implementation for the 2028/2029 BRA.

Timeline: Large Load Integration



Energy & Ancillary Services Projects

8. RCSTF – Reserve Certainty

Problem Statement

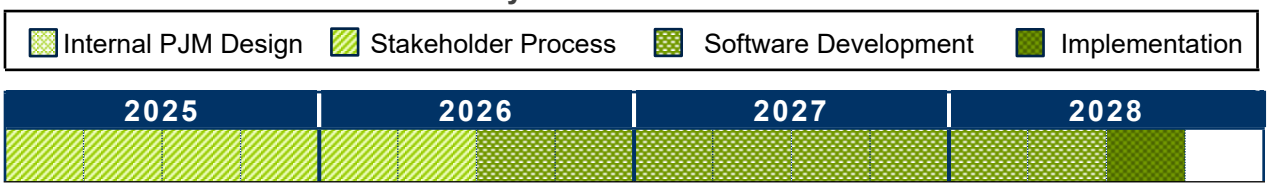
In *Modernizing Wholesale Electricity Market Design, FERC Docket No. AD21-10*, PJM, other ISO/RTOs and various commenters detail how the shifting electricity system resource mix and the growing quantity of distributed energy resources (DER) are causing uncertainty and volatility in markets and operations. New products will be required to address forecast uncertainty and future ramping needs, and markets need to accurately reflect the value of flexible capacity in maintaining system reliability.

Additionally and more broadly, PJM's manuals, Tariff and the Operating Agreement are currently written such that PJM is unable to reflect actions taken by system operators to maintain reliability and compliance with NERC standards in the Reserve Market. This separation between the operating plan and actions taken by system operators and what the market is permitted to clear and price can lead to operators taking out-of-market actions for reliability reasons that are done manually and dampen market price signals. Aligning system operator needs with the reserve requirements in the market will increase transparency and produce market results consistent with operational needs.

Project Description

Within the RCSTF, PJM is analyzing system flexibility needs now and into the future. Building upon this analysis and upon best practices from other regions, PJM will begin discussions on energy and ancillary service market reforms to address these system needs, with a focus on maintaining reliability in the face of the changing resource portfolio. As a part of this project, PJM will consider a broad range of reforms, including new market products, product participation requirements, advanced approaches to unit commitment and dispatch, how reserve services are valued in the markets, and how costs should be allocated. As PJM considers new and existing products, locational aspects will be considered to ensure that services are procured and deployed in a way that ensures deliverability, appropriately manages constraints and maintains system reliability. PJM will then develop a proposed set of market reforms to be brought before stakeholders.

Timeline: RCSTF – Reserve Certainty



9. Load Flexibility

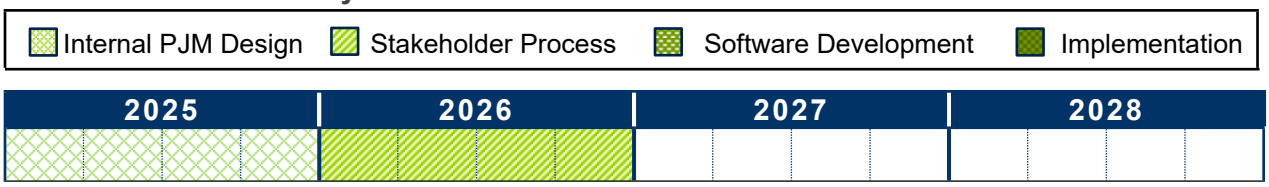
Problem Statement

PJM believes additional opportunities should be explored with load flexibility in the electric grid. There is value not only in utilizing demand to help reduce grid stress in emergencies, as the existing DR programs achieve, but also in looking at load to help balance intermittency, delay otherwise costly improvements for system reliability and establish robust markets with load participation. There is an opportunity to explore the current gaps in demand participation in PJM's markets today and identify opportunities for enhancements or reforms in the future.

Project Description

PJM's internal staff will further its 2024 initiative to on research for load flexibility and the role, opportunities and challenges for load flexibility in PJM's market. PJM will review the list of recommendations on furthering load flexibility in PJM's markets and the potential new or refined pathways/products for load participation and their ability to operate as flexible demand in the PJM footprint.

Timeline: Load Flexibility



10. Resource Scheduling Prior to the Day-ahead Energy Market (MIC)

Problem Statement

PJM System Operators, at times, will schedule resources in advance of the Day-ahead Energy Market based on projected system conditions that may warrant conservative resource scheduling. Resources scheduled in advance of the Day-ahead Energy Market have the opportunity to submit updated bids prior to the next available Day-ahead Energy Market closing. Such resources are offer capped in certain circumstances prior to the initiation of the Day-ahead case to mitigate against the potential exercise of market power. There is an opportunity to explore enhancements to the rules related to the commitment of resources prior to the Day-ahead Energy Market

Project Description

This effort will be worked in two phases. Phase 1 will address the appropriate schedule and practices used to commit resources scheduled prior to the Day-ahead Energy Market. Phase 2 will further investigate enhancements to reflecting the fuel costs in cost-based offers of resources that are scheduled prior to the Day-ahead Energy Market and to mitigate potential market power; further address the process of scheduling resources in advance of the Day-ahead Energy Market; and look at addressing compensation of resources committed in advance of the Day-ahead Energy Market, including uplift payments and settlements resulting from commitment cancellations and stranded fuel.

Timeline: Resource Scheduling Prior to the Day-ahead Energy Market (MIC)

11. Energy Storage Model Enhancements

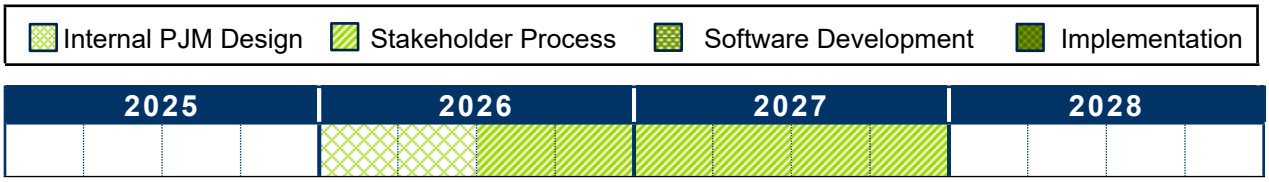
Problem Statement

FERC Order 841 addresses the participation of electric storage resources in the capacity, energy and ancillary services markets operated by ISO/RTOs. To remove barriers to their participation in wholesale markets, Order 841 requires each ISO/RTO to establish a participation model consisting of market rules that – recognizing the physical and operational characteristics of electric storage resources – facilitate their participation in the ISO/RTO markets. PJM implemented the Energy Storage Model in 2019; with storage integration expected to increase in the PJM's footprint there is an opportunity to review the existing model and business rules for potential enhancements.

Project Description

PJM's internal staff will undergo an initiative to complete research on energy storage model enhancements. PJM will review the existing Energy Storage Resource (ESR) model and potential gaps or opportunities for enhancements. This review will encompass review of other ISOs with larger penetration of energy storage resources and existing market pathways. PJM will explore analysis and recommendations on furthering the ability to operate energy storage effectively in PJM's markets and operations.

Timeline: Energy Storage Model Enhancements



12. Additional Essential Reliability Services

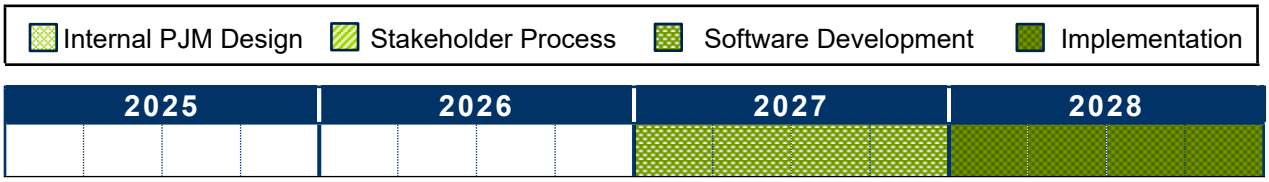
Problem Statement

Markets play a critical role in maintaining and attracting the Essential Reliability Services required for a stable and reliable electrical grid. Today, PJM's markets procure ancillary services to maintain our Area Control Error by provisioning contingency reserves and secondary frequency response. Work is on-going through the RCSTF to modernize PJM's reserve markets to further address system uncertainties and to better align PJM's ancillary service markets with existing and emerging operational needs. In the future, additional reforms may be required to address the need for other Essential Reliability Services, such as voltage control and primary frequency response. As the energy transition progresses, these services' requisite quality, quantity and nature will continue to evolve. PJM must continuously monitor and forecast this evolution to ensure that its markets appropriately procure and incentivize these essential services.

Project Description

PJM continues to lay the groundwork for the energy transition by evaluating how the changing resource mix will drive the need for additional Essential Reliability Services in the future. In 2023, PJM collected data and conducted analyses to identify metrics that create more transparency around PJM's operational flexibility needs. In 2024, PJM worked with a consultant to codesign and complete a scenario-based study to prioritize key reliability risks associated with the grid of the future. These efforts provide a foundation for future analysis, including the metrics, tools and analytical approaches required to evaluate evolving system needs. This project represents a continuation of this work and will help prioritize ongoing market design initiatives.

Timeline: Additional Essential Reliability Services



13. Wind and Solar Dispatch Enhancements

Problem Statement

Wind and Solar resources have become an increasing portion of the PJM generation mix with many more projects expected in the next five to ten years. As the number of wind and solar resources grows, it becomes increasingly difficult to manage the dispatch of these resources in PJM's real-time Market Clearing Engines (MCEs) due to the increased variable output of capability of these resource types, extremely fast response rates, and often outdated input parameters to the MCEs. These characteristics of the evolving resource mix raise questions and opportunities to address concerns related to PJM's ability to accurately forecast near term changes in resource output and reliably dispatch in real-time. Known concerns include but are not limited to:

1 | Extremely fast responding resources leading to volatile Area Control Error (ACE) fluctuations

2 | Extremely fast responding resource for Energy and transmission constraint control

3 | Stale resource input parameters (economic limits, ramp rates, etc.) not in alignment with real-time capabilities leading to a dispatch based on outdated information;

4 | Limited usage of intermittent forecasts in the PJM real-time MCEs

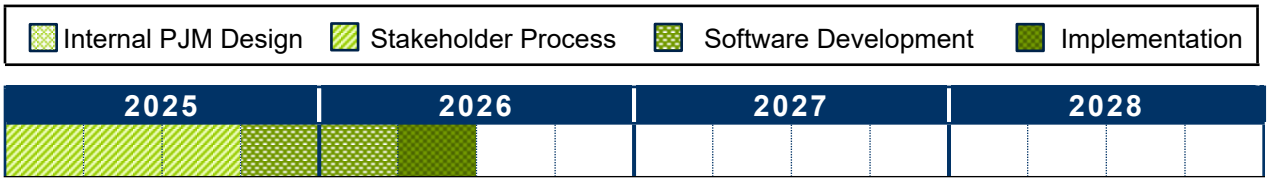
5 | Limited capability to participate in following PJM's SCED basepoint

6 | Limited awareness and education on expectations of all wind or solar resources that are PJM market participants.

Project Description

The recent, related Renewable Dispatch initiative, explicitly excludes markets calculations from its scope. The intention of this problem statement is to modify existing or propose new real-time MCE design features required to efficiently manage the dispatch of wind and solar resources. PJM sees an opportunity to improve several key aspects of its applications and increase reliability by managing these resources during real-time operations, especially within the constraint control and energy balancing calculations.

Timeline: Wind and Solar Dispatch Enhancements



Pending PJM Implementation Projects

1. Regulation Market Design

Problem Statement

PJM's current Regulation Market utilizes two regulation signals (RegD and RegA) to dispatch the regulation product. Using two signals but clearing them in a single market with a single requirement requires an accurate marginal rate of substitution, the benefits factor, to be utilized in the optimization. There are existing issues with how the benefits factor is currently applied in the optimization and how it is utilized in pricing and settlements. There is also the opportunity to reevaluate other operational and market components of the current Regulation Market design to ensure they align with the changing resource mix and operational needs.

Project Description

The Regulation Market Design Project will address Regulation Market design flaws and potential enhancements, including regulation signal design, regulation performance scoring, regulation requirement, Regulation Market clearing and Regulation Market settlement.

Stakeholder Materials

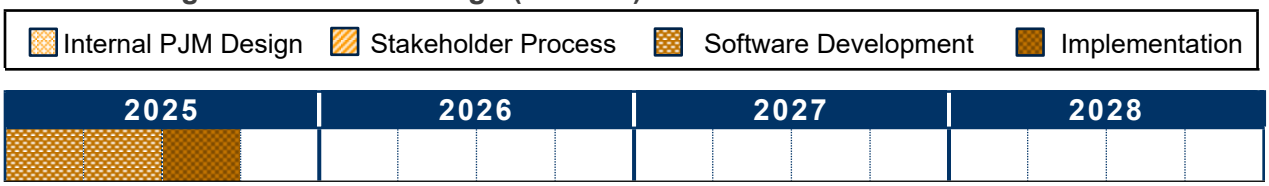
Regulation Market Design Senior Task Force

FERC Filing

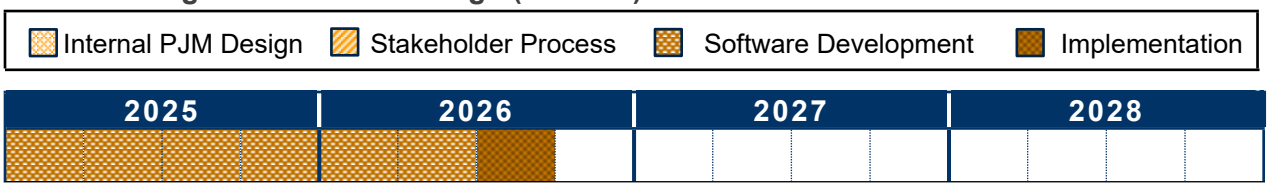
PJM Filing ER24-1772-000 (PDF)

FERC Order (PDF)

Timeline: Regulation Market Design (Phase 1)



Timeline: Regulation Market Design (Phase 2)



PJM filed Regulation Market reforms with FERC on April 16, 2024. PJM proposed a phased implementation approach to allow for more development and implementation time for both PJM and Members to move to the up/down products. The Phase I implementation would occur in Q4 2025 and include the changes for the new signal and performance requirements. Phase II implementation would occur one year later in Q4 2026, when the splitting of the market clearing and operational signals would be included to effectuate the up/down products.

2. Participation of DER Aggregations in Markets – FERC Order 2222

Problem Statement

On Sept. 17, 2020, FERC issued Order 2222. The main goal of Order 2222 is to better enable DER to participate in the wholesale electricity markets. The term "DER" covers a wide variety of resources, including electric battery storage systems, rooftop solar panels, products like smart thermostats that enable one to reduce power usage, energy efficiency measures, thermal energy storage systems such as ice storage, or electric vehicles and their charging equipment.

Since DER can be small compared to traditional resources like power plants and may be widely dispersed, the output of several or many DER would often need to be combined together so that there is a "bundle" of sufficient size for market participation. This bundle is called an *aggregation*, with the *aggregator* directly participating in the ISO/RTO. An aggregator, for example, may be able to bring together dozens of small DER and use their output to participate in the market, then share compensation back to the individual DER. This is easier to administer than having thousands of individual DER participating directly in the market.

In short, FERC's goal with Order 2222 is to remove barriers to DER aggregations' participation in the capacity, energy and ancillary services markets operated by RTOs/ISOs.

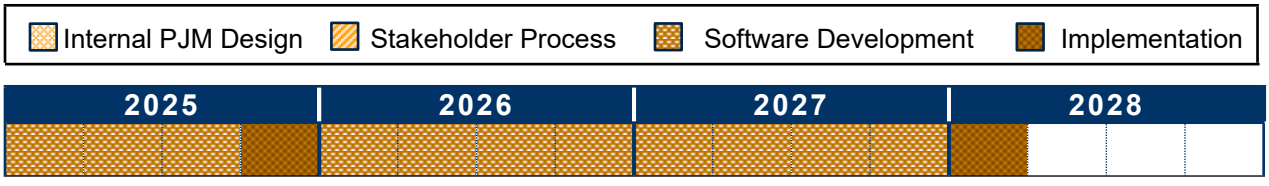
Project Description

PJM's Order 2222 filed proposal allows DER aggregation resources to be eligible to participate where they are technically and procedurally capable in all PJM's markets – this includes the Day-Ahead Energy Market, Real-Time Energy Market, ancillary services markets (Regulation and Reserves) and capacity market.

Stakeholder Materials
Order 2222 was discussed at a variety of meetings of the Distributed Resources Subcommittee.

FERC Filings
- PJM Compliance Filing ER22-962-000 (PDF)
- PJM Compliance Filing ER22-962-005 (PDF)
- Order on Capacity Market Participation Effective Date (PDF)

Timeline: Participation of DER Aggregations in Markets – FERC Order 2222



3. Electric Storage Participation in Markets – FERC Order 841

Problem Statement

FERC Order 841 addresses the participation of electric storage resources in the capacity, energy and ancillary services markets operated by ISO/RTOs. To remove barriers to their participation in wholesale markets, Order 841 requires each ISO/RTO to establish a participation model consisting of market rules that – recognizing the physical and operational characteristics of electric storage resources – facilitate their participation in the ISO/RTO markets.

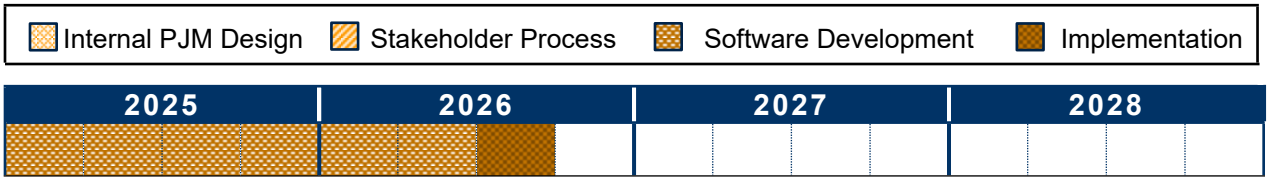
Project Description

While PJM's Electric Storage Resource (ESR) model went into production in 2019, the current model does not account for the state of charge in the dispatch. This requires market participants to manage their state of charge and can result in PJM providing an infeasible dispatch to the resource. PJM has a compliance requirement with FERC to update the model in 2026 to "account for state-of-charge." This enhancement will allow the engine to use the state of charge of the resource as a constraint to the dispatch and eliminate providing the ESR with an infeasible schedule due to available state of charge.

Stakeholder Materials
- PJM Issue Tracking: Electric Storage Participation – FERC Order 841

FERC Filings
- PJM Compliance Filing ER19-469-003 (PDF)
- PJM Compliance Filing ER19-469-005 (PDF)
- PJM Compliance Filing ER19-469-006 (PDF)

Timeline: Electric Storage Participation in Markets – FERC Order 841



4. Configuration Models

Problem Statement

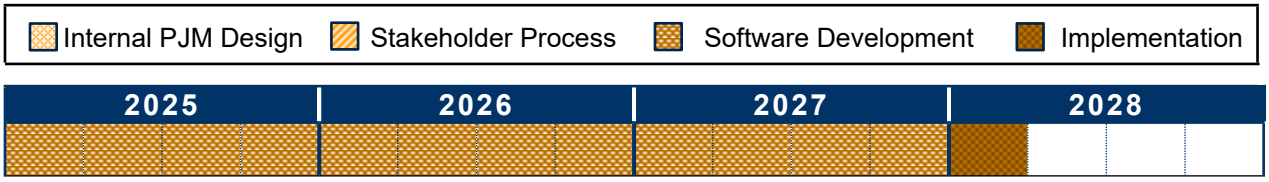
PJM's market software does not currently model various operating modes of configuration-based resources like combined cycles. While workarounds exist, parameters such as start-up cost, minimum run time, and minimum downtime of each combustion turbine and each steam turbine cannot be explicitly considered in the current model. The current model does not allow units to represent duct burners or other power augmentation methods.

Project Description

Multi-configuration models will be an important feature under the PJM Next Generation Market (nGEM) model. A multi-configuration model will be used for the Enhanced Combined Cycle, Energy Storage Resource and Hybrid Resource models. This modeling is needed in the market software to capture the resource parameters and operational characteristics best while allowing the PJM Market Clearing Engine (MCE) to commit and dispatch these resources best and maintain reliability reserve requirements.

Stakeholder Materials
Modeling Generation Senior Task Force

Timeline: Configuration Models



5. Schedule Selection in the Energy Market

Problem Statement

PJM markets currently allow generation resources to submit three types of schedules in the Day-Ahead and Real-Time energy markets: a market-based schedule (non-parameter limited) and two types of schedules used for mitigation: cost-based and market-based parameter-limited schedules. PJM's day-ahead commitment software is designed to commit resources based on the appropriate schedule offers, resulting in the lowest total system production cost. The MCE identifies the most cost-effective schedule by treating each schedule as a logical resource. This approach leads to a market resource represented by as many logical resources as eligible schedules. This method is known as the multi-schedule model in MCE optimization.

The multi-schedule model in MCE increases the optimization problem size and impacts the optimization solution time so that the commitment software requires more time to solve. The addition of enhanced combined cycle, energy storage resource, and hybrid models in PJM's Next Generation Markets (nGEM) clearing software will have a significant impact on performance that will jeopardize the clearing of the Day-Ahead and Real-Time energy markets in the approved clearing time frame with sufficient accuracy.

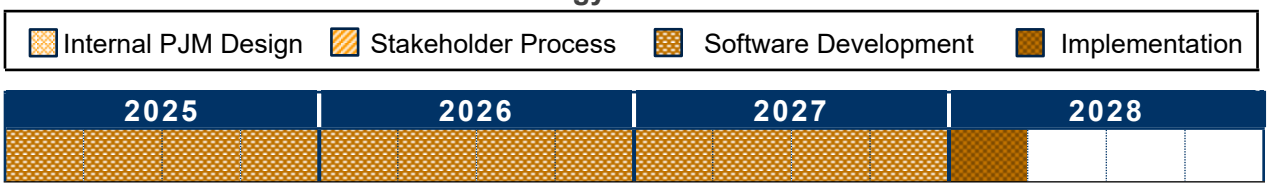
Project Description

The offer schedule selection process for clearing the Day-Ahead Energy Market needs to be reformed to address the performance impact of multi-schedule modeling on PJM's MCE resulting from the anticipated implementation of nGEM and the anticipated addition of configuration models in the nGEM clearing software. PJM has proposed to revise the approach for selecting the schedule on which resources may be committed in the Energy Market. Specifically, PJM proposes adopting the same schedule selection process currently used for clearing the Real-Time Energy Market, such that the formula to determine the lowest dispatch cost among all eligible schedules will be extended to the Day-Ahead Energy Market.

Stakeholder Materials
PJM Issue Tracking: Performance Impact of Multi-Schedule Model in MCE in nGEM ECC and ESR Models

FERC Filing
FERC Docket No. ER24-1387-000 (PDF)

Timeline: Schedule Selection in the Energy Market



6. Demand Response (DR) ELCC Updates

Problem Statement

For DR resources, the ELCC metric is based in part on the hours (Availability Hours) which define when PJM can call on DR for capacity events. The current Availability Hours were established in 2011 with the creation of an Annual DR capacity product and applied to subsequent DR Capacity Performance products.

Project Description

Updated DR ELCC modelling, effective for the 2027/2028 Delivery Year, to model:

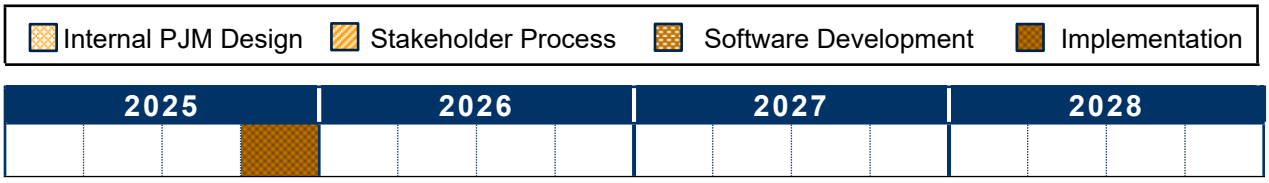
- Annual DR and Summer-Period DR to provide for a 24-hour availability window throughout the year, and
- Winter Peak Load to be based on each customer's load during a specified consistent peak hour across five coincident peak days in winter.

Stakeholder Materials
PJM Issue Tracking - DR ELCC

FERC Filing
- FERC Filing ER25-1525
- FERC Order ER25-1525

Together, these proposed enhancements will unlock opportunities to better utilize DR's capabilities during periods of reliability risk, which in turn will allow for DR to provide greater participation in PJM's capacity market.

Timeline: Demand Response ELCC Updates



7. Hybrids Phase III

Problem Statement

Over the past three years, PJM and stakeholders have worked to define business rules for hybrid resources participating in PJM's markets. The first phase of this work focused on solar-storage hybrids. The second phase expanded the hybrid participation model to all types of inverter-based hybrid resources. The third phase of this work will focus on enhancements and/or clarifications to the existing market rules for these resources as well as the definition of additional market rules for non-inverter-based hybrid configurations (e.g., gas plus storage).

Project Description

The scope of this work will focus primarily on enhancements and clarification to the existing business rules for inverter-based hybrid resources and energy storage resources, including enhancements to the existing rules and definitions for inverter-based open and closed-loop hybrid resources, hybrid resource LOC calculations and must-offer requirements. This effort will also consider what changes may be required to the hybrid market model to enable the participation of non-inverter-based hybrids such as gas plus storage.

Stakeholder Materials

PJM Issue Tracking – Hybrid Phase III Issue Details

Timeline: Hybrids Phase III