# PJM's Order 1920 Compliance Approach for Long-Term Regional Transmission Planning
## (Order 1920 – Section III)

PJM Interconnection, L.L.C.

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**Based on PJM's Proposal at the Date of Publication**

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# Contents

# I. Introduction

This white paper aims to provide an overview of PJM's approach for long-term planning to comply with FERC Order No. 1920.[1] It specifically focuses on **Section III** of Order 1920, Long-Term Regional Transmission Planning (LTRTP) and details the draft compliance process for developing:

**1 |** The Long-Term Scenarios

**2 |** The analysis to be performed on the scenarios to identify long-term transmission needs

**3 |** How the identified needs would then be moved into a competitive window

**4 |** Ultimately, how projects addressing long-term needs would be evaluated and selected

Order 1920 establishes specific roles for PJM; PJM Area Relevant State Entities Committee (PARSEC, aka, Relevant State Entities); PJM Transmission Owners (TOs); and, in a more general sense, the greater stakeholder community (for example, but not limited to, Electric Distribution Companies, Generation Owners, Industrial Customers and the Consumer Advocates). This white paper emphasizes the PJM states' opportunities to participate throughout the implementation of this process. PJM also notes that the PJM TOs and the greater PJM stakeholder community maintain an important role in the implementation of Order 1920 through an open and transparent LTRTP process, which will provide meaningful opportunities for engagement throughout.

This white paper emphasizes the PJM **states' opportunities to participate throughout the implementation of this process.**

*Of note, this white paper does not focus on the additional aspects of complying with Order 1920 beyond the Section III requirements. However, components of PJM's compliance with other sections of Order 1920 are mentioned if relevant to PJM's compliance with Section III.*

# II. Overview of PJM's Long-Term Planning Proposal

Order 1920 requires that each FERC-regulated transmission provider implement a long-term planning process that utilizes at least three 20-year scenarios to identify "Long-Term Transmission Needs" (LT Needs),[2] which can then be addressed through selecting and constructing "Long-Term Regional Transmission Facilities." Through consultation with the PARSEC and PJM stakeholders, PJM has developed a draft compliance approach that targets satisfying Order 1920's long-term planning requirements.

PJM has crafted its compliance approach to allow PJM, at a minimum, to address those identified LT Needs necessary to maintain system reliability while also advancing additional projects that enable state policies of interest. This approach balances the diverse objectives across the PJM region while still ensuring that PJM, as the regional

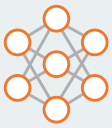
[1] Bldg. for the Future Through Elec. Reg'l Transmission Plan. & Cost Allocation, Order No. 1920, 187 FERC ¶ 61,068 (2024), order on reh'g & clarification, Order No. 1920-A, 189 FERC ¶ 61,126 (2024), order on reh'g & clarification, Order No. 1920-B, 191 FERC ¶ 61,026 (2025).

[2] PJM will propose a specific definition for LT Needs in its Order 1920 compliance filing. For the purpose of this white paper, PJM considers LT Needs to be transmission needs identified through Order 1920-compliant reliability and economic analyses that may require solutions with a lead-time of six years or more.

transmission planner, has a pathway to plan for system reliability. While Order 1920 does not require PJM to resolve any identified LT Needs,[3] PJM believes that LTRTP is a valuable component of its strategy to maintain reliability amid an evolving energy landscape. Also, because projects that address reliability needs inherently also produce economic benefits and further policy objectives, the benefits of PJM's approach are not confined to only keeping the lights on.

Consistent with Order 1920's requirements, PJM's compliance approach will employ a three-year process that begins with collaborative scenario development involving the PARSEC, PJM TOs and the greater PJM stakeholder body, and ends with projects being identified and possibly selected to then proceed toward PJM Board approval and construction. The holistic set of analysis and projects developed throughout this process will also provide guidance to the near-term, annual RTEP process on how the PJM transmission system may evolve, taking into account longer-term needs of the PJM system. Any selected Long-Term Regional Transmission Facility will be cost allocated according to an approved cost allocation methodology, to be filed by the PJM Transmission Owners, in consultation with the Relevant State Entities, per the requirements of Orders 1920, 1920-A and 1920-B.

**The proposed three-year process within each LTRTP planning cycle can be summarized as:**

| | |
|---|---|
| **Year 1**  | Determine the assumptions for developing the Long-Term Scenarios and then finalize the scenarios for analysis.<br><br>The PJM TOs assess asset conditions and develop 10-year in-kind replacement estimates, which PJM will use in the LTRTP process for right-sizing considerations. |
| **Year 2**  | Build the model and perform scenario analysis to identify LT Needs, identify opportunities for right-sizing and then solicit proposals from transmission developers addressing the LT Needs through an open, competitive transmission window. |
| **Year 3**  | Evaluate and possibly select projects to arrive at a Final Plan for the LTRTP planning cycle (developing the Final Plan is explained in more detail within Section C – "Year 3 – Project Evaluation and Project Selection" of this white paper). |

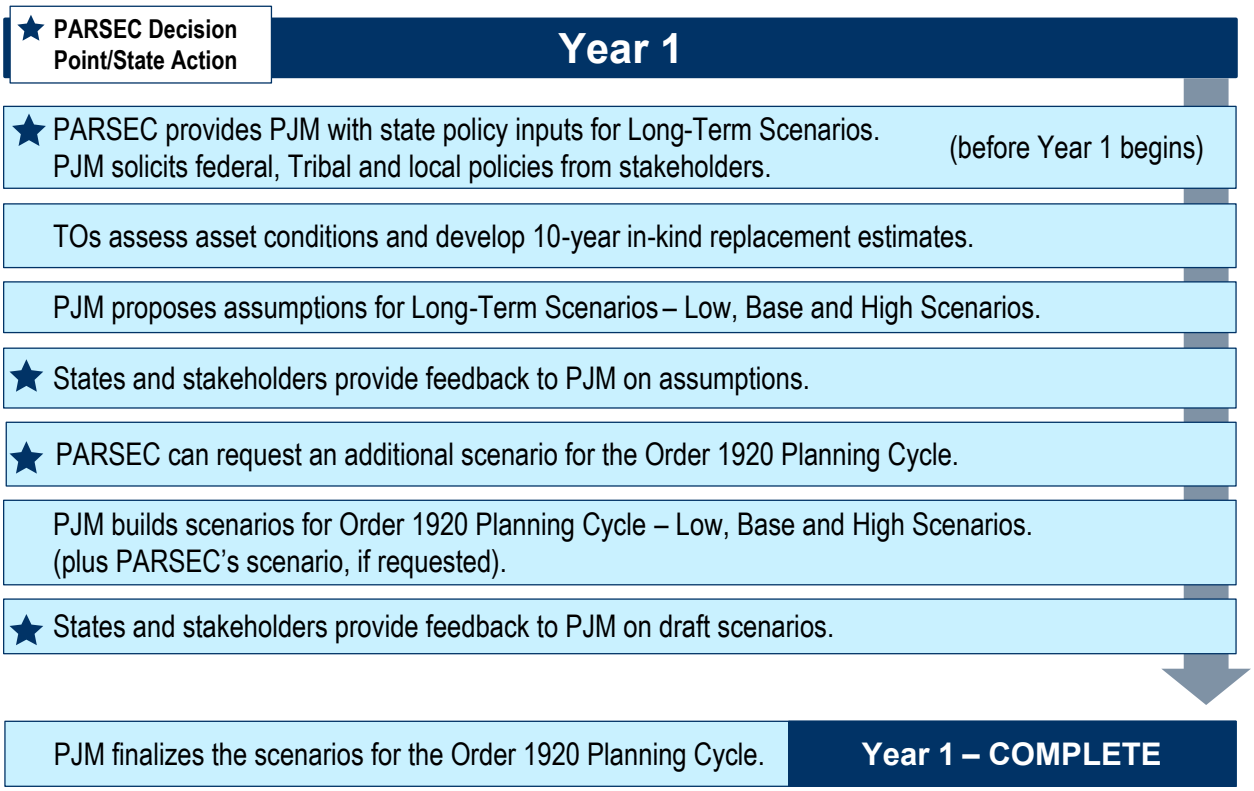
[3] See Order 1920 at PP 1026 (transmission providers are not required to select any particular Long-Term Regional Transmission Facility, even where it meets the transmission provider's selection criteria); Order 1920-A at P 468 (same).

# A. Year 1 – Scenario Development

## 1. Year 1 Overview

The first year of PJM's Order 1920 long-term planning process will be dedicated to: (1) identifying the inputs and assumptions (including load and generation) that will be used in the Long-Term Scenarios, along with the PJM TOs' asset conditions; and (2) developing the scenarios that will then be analyzed in Year 2. This first year will involve significant collaboration with the PARSEC, PJM TOs and other PJM stakeholders. See **Figure 1** for these details. For PJM's interaction with the states, PJM intends to work with the PARSEC to develop and memorialize a jointly created guidance document that details key state-related interactions within Year 1 of the LTRTP process. PJM's full engagement with the PJM states and PJM stakeholders, including the PJM TOs, for LTRTP will be described in future governing document and manual language.

**Figure 1.** Flow Chart for Year 1 – Scenario Development With Stakeholders




At several steps in Year 1, assumptions will be finalized at PARSEC decisional/state action points. Maintaining previously agreed-upon assumptions as the process progresses is key to maintaining the overall timeline. PJM will endeavor to seek PARSEC support, through that committee's decision-making processes in place at the time, regarding the assumptions used and scenarios established. PJM will work with the states and stakeholders to establish an agreed-upon timeline for each decision point to allow for an efficient and timely process.

Order 1920 requires that the Long-Term Scenarios include certain types of inputs, referred to as "factor categories." Each Long-Term Scenario will include Factor Categories 1–3 as scenario inputs, which Order 1920 does not allow transmission providers to "discount," meaning that these categories of factors must be included (in full) within each Long-Term Scenario. Order 1920 allows flexibility for how to include Factor Categories 4–7 in each scenario.

### Order 1920 Factor Categories for Long-Term Scenarios

| Factor Category | |
|---|---|
| 1 | Laws and regulations affecting the resource mix and demand (federal, federally recognized Tribal, state and local policies) |
| 2 | Laws and regulations on decarbonization and electrification (federal, federally recognized Tribal, state and local policies) |
| 3 | State-approved integrated resource plans and expected supply obligations for load-serving entities |
| 4 | Trends in fuel costs and in the cost, performance and availability of generation, electric storage resources, and building and transportation electrification technologies |
| 5 | Resource retirements |
| 6 | Generator interconnection requests and withdrawals |
| 7 | Utility and other policy goals (federal, federally recognized Tribal, state and local policies) |

*PJM will use the flexibility afforded by Order 1920 to craft scenarios that are plausible and diverse, as required by the order.*

## 2. In-Kind Replacement Estimates

Before the analysis begins, each PJM TO will provide PJM with a list of transmission facilities that each respective TO estimates may require in-kind replacement during the next 10 years, as required by Order 1920.[4] These facilities will be candidates for potential right-sizing during the LTRTP process, meaning they can address both the local need and identified LT Need(s) at the same time by increasing the facility's capability rather than being replaced in-kind (further detail on right-sizing within the LTRTP process is explained within Section B – "Year 2 – Scenario Analysis, Identification of Long-Term Needs and Competitive Window").

[4] See Order 1920 at P 1677.

## 3. Scenario Build – Policy Inputs

**State policy solicitation** will occur before the start of each LTRTP planning cycle.

Through an Order 1920 version of the existing State Policies Workbook, which has been provided by the Independent State Agencies Committee (ISAC), PJM will work with the PARSEC to identify the state policies that are to be considered and included in the Order 1920 long-term planning process.[5] This state policy solicitation will occur before the start of each LTRTP planning cycle and in conjunction with PJM working with stakeholders to identify federal, Tribal and local policies to include in the scenario build.

Specifically, as it relates to the future "Order 1920 State Policies Workbook," PJM plans to obtain relevant state policies from the PARSEC. PJM will work with the PARSEC to interpret each provided policy and classify each policy into its appropriate Order 1920 Factory Category. This stage will prove instructive for the PARSEC, stakeholders and PJM to identify and assign which policies enter into the varying factor categories. As noted above, PJM will endeavor to seek, but not require, PARSEC support through that committee's decision-making processes in place at the time, regarding the assumptions used and scenarios established, including how certain policies should be categorized for purposes of FERC's "Factor Category" definition. Per Order 1920's requirements, PJM *will not* discount any policy that falls within Factor Categories 1–3 in the scenario development and scenario analysis. The policy information provided by the PARSEC will then be made available to the PJM stakeholder community at the beginning of the Year 1 assumptions building process, along with the identified federal, Tribal and local policies, in accordance with PJM's obligation and general practice to transparently share the assumptions used for its transmission planning process.

PJM will also work with the applicable PARSEC agencies and other relevant stakeholders to best interpret policies that may vary across multiple sources of information. For example, Factor Category 3 focuses on state-approved integrated resource plans (IRP). To the extent that an approved IRP provides multiple roadmaps for implementing a state's policy, PJM will work with the respective state regulatory agency and utility to determine each IRP's targeted implementation plan.

## 3. Scenario Build – Low, Base and High Scenarios

**PJM's Base Scenario** will be considered to be the most probable scenario.

PJM is proposing to use a "Low," "Base" and "High" scenario framework for its three Long-Term Scenarios. Order 1920 requires that "if transmission providers produce a base-case Long-Term Scenario in LTRTP, that base case should be consistent with what the transmission provider determines is the most likely scenario to occur."[6] Therefore, PJM's Base Scenario will be considered to be the most probable scenario. The Low Scenario and High Scenario will be used as bookends to the Base Scenario to identify LT Needs stemming from each of the bookend scenario assumptions. The goal is to provide a more holistic view of the LT Needs under varying assumptions that could eventually be used to identify and potentially select a robust set of long-term solutions – i.e., solutions that are compatible with (either expandable or enabling) across multiple plausible scenarios and sensitivities.

For its compliance filing, PJM is developing the scenario framework, not defining the Low, Base and High Scenarios. The specific assumptions going into the three scenarios will be determined in accordance with the

[5] See e.g., "2025 RTEP – ISAC Assumptions Submission" (Jan. 31, 2025).

[6] See Order 1920 at P 559.

FERC-accepted approach and specifically identified during implementation of LTRTP. Outside of Factor Categories 1–3 at full attainment, other specific policies (i.e., factor categories) and how they will be treated will be fact- and time-specific. Such details will be identified in each LTRTP planning cycle in consultation with the PARSEC and other stakeholders. However, PJM can say at this time that the Base Scenario will be the most probable scenario and that all three scenarios will include policies identified to be within Factor Categories 1–3 without discounting.

Order 1920-A clarified that transmission providers are to include additional scenarios if requested by the Relevant State Entities.[7] To account for this requirement, PJM will provide an opportunity for the PARSEC to request an additional Long-Term Scenario within the first year of each LTRTP planning cycle. If the additional scenario requested by the PARSEC receives PARSEC's endorsement and meets FERC's definition of a "Long-Term Scenario" (i.e., is plausible and does not discount Factor Categories 1–3), then the additional scenario requested will be eligible to count as an official scenario within the LTRTP planning cycle for purposes of using it to identify LT Needs and select "Long-Term Facilities." If, however, the PARSEC's endorsed scenario does not meet FERC's definition of a "Long-Term Scenario," then PJM will be unable to use this additional scenario to identify LT Needs and select Long-Term Facilities, but the scenario may still be used for informational purposes.

Per Order 1920's requirement, an extreme weather sensitivity will also be performed on each Long-Term Scenario.[8]

PJM will conclude Year 1 of the long-term planning process by finalizing the Low, Base and High Scenarios after considering feedback from the PARSEC and other stakeholders.

## 4. Capacity Expansion Model Overview

**The importance** of a solid and multi-scenario-based capacity expansion modeling becomes more influential in regions with strong load growth.

Capacity expansion modeling is the industry benchmark tool to develop projections of the evolution of the power system's capacity over a long period. Typical capacity expansion models identify the least-cost mix of generation resources, taking into account influencing factors such as public policy mandates or laws to meet future electricity demand given other inputs (e.g., additional Order 1920 Factor Categories). The importance of solid and multi-scenario-based capacity expansion modeling becomes more influential in regions with strong load growth and/or generation fleet changes. Policy targets can enter the capacity expansion model in different ways. For example, the Inflation Reduction Act lowers the cost of specific types of generation through production or investment tax credits; a renewable portfolio standard (RPS) creates a demand for specific types of generation that can be modeled as a constraint on new generation (e.g., resources of certain types at certain locations must produce at least 20 TWh of energy in a particular year).

Capacity expansion models simulate the best timing, location (on a zonal basis) and technology types for purposes of building new power plants to meet determined objectives, such as policies and forecasted reliability requirement. This type of modeling is already being utilized by MISO, ISO-NE, NY-ISO and CAISO. This

[7] See Order 1920-A at P 366.

[8] See Order 1920 at PP 593–598.

section provides a high-level description of the typical assumptions used in capacity expansion modeling as well as an illustrative application to the PJM footprint.

## Capacity Expansion Model – Building the Model

PJM plans to follow industry best practices and utilize capacity expansion models to develop the resource mix resulting from the Low, Base and High Scenarios' assumptions. Typical capacity expansion models identify the most economic resource mix based on the specific scenario assumptions on current data, projected load growth, economic and technical trends, and policy and resource adequacy objectives. For example, the Low Scenario may have low load growth, and the High Scenario may have high load. Given the specific Long-Term Scenario assumptions, the most economic resource mix is the resource mix that minimizes system costs, i.e., the sum of investments and productions costs. This approach approximates market outcomes (the collection of individual investment and operations decisions).

**Policy inputs** are those in Factor Categories: **1, 2, 3 & 7.**

Examples of current data are the existing resource fleet, announced deactivations and interconnection requests and withdrawals. Technical and economic trends include, but are not limited to, the anticipated cost of building and operating generation and storage assets (including variable and fixed operation costs), unit heat rates and renewable efficiencies, predicted fuel prices and fuel transportation costs, and financial assumptions like the discount rate, after tax weighted average cost of capital and amortization periods. Policy inputs are those in Factor Categories 1, 2, 3 and 7 that include, for example, RPS policies (possibly with carve-outs), resource-specific targets and other policies, like laws and regulations limiting the ability of certain generation assets to operate. The capacity expansion model will also account for siting restrictions and optimal resource development zones if this information is provided to PJM.

Certain policies may fall under different factor categories or affect multiple inputs of the capacity expansion model. PJM will not double-count policies. For example, if the load forecast already captures elements of a policy, PJM will not count those elements in other inputs to the capacity expansion model. As previously noted, in Year 1, PJM will endeavor to seek, but not require, PARSEC support through that committee's decision-making processes in place at the time, regarding the assumptions used and scenarios established, including how certain policies should be categorized for purposes of FERC's "Factor Category" definition. Given all these inputs, the capacity expansion model determines where and what types of future generation or storage capacity is most economic and therefore likely to be built.

PJM will model all factors in Factor Categories 1–3 in the capacity expansion model. The resulting modeled resource fleet will be fully consistent with those factors and meet the reliability criteria for resource adequacy of having no more than one loss of load event every 10 years due to insufficient capacity ("1-in-10 target" or "1-in-10 reliability criteria"). The capacity expansion model will reflect PJM accreditation process used for the capacity market.[9] However, certain resources associated with resource-specific carve-outs will count toward the energy balance constraint (dispatch generation equal to load in every hour) and production costs but will not count toward the capacity constraint.

[9] The capacity constraint approximates the capacity market and requires the sum of the resources' Effective Load Carrying Capability (ELCC) de-rated capacity to be at least equal to the peak load times the forecast pool requirement – i.e., the supply must be sufficient to at least meet the demand.

For example, suppose there are four resources: (i) a combined cycle generator, (ii) a utility scale battery, (iii) a solar farm associated with a RPS carve-out, and (iv) an offshore wind generator associated with a resource-specific target. All four resources will be dispatched in merit order to meet the load in each hour determining production costs, but only the first three resources will count toward meeting the capacity constraint – not the offshore wind generator that is associated with a resource-specific target. The reason for this is that PJM is unable to rely on certain resource-specific policy targets to contribute to the 1-in-10 reliability criteria. Examples of these resource-specific targets could be offshore wind and future small modular advanced nuclear reactors – policies that produce many megawatts and numerous, significant system violations through a small amount of resources with very few points of interconnection. If, on the other hand, PJM were to rely on very specific generators to resolve system reliability issues and then those resources do not come into service in time to meet the growing load or back off transmission overloads, then significant reliability issues or immediate need transmission could emerge. Given this reason, PJM recognizes some criteria may be beneficial in determining if resource-specific policies can address system reliability and will continue discussions with states and stakeholders in exploring this.

## Capacity Expansion Model – An Illustrative Case Study

In 2024, PJM presented to the PARSEC and other stakeholders a case study of the capacity expansion model as part of the "LTRTP Workshop Policy Study." This study illustrated the use of a capacity expansion model to develop a Long-Term Scenario, starting from PJM-specific assumptions, and how that scenario can be transposed into power flow and production cost models to perform reliability and economic analyses and identify corresponding needs.[10]

The case study used the 2024 RTEP's 2029 model year as a starting point and then used the capacity expansion tool to determine the most economic resource mix given the following assumptions: PJM's 2024 load forecast; the policies reported by the ISAC through the 2024 version of the State Policies Workbook; the list of resources anticipated to retire due to state and federal policies limiting their operation; interconnection requests (and certain withdrawals for onshore wind) as additional candidates for selection by the capacity expansion model; and cost and performance estimates of new assets sourced from PJM's Quadrennial Review, S&P and EIA's Annual Energy Outlook.

The materials presented to PARSEC and other stakeholders provided detailed assumptions – some of which are also reported in this white paper's appendix for convenience. Notably, the case study accounted for the seven factor categories similarly as required by Order 1920. Those materials also include the detailed mathematical formulations used to translate ISAC's provided policies into constraints for the capacity expansion model and to implement the capacity constraint.[11]

Given all of these assumptions, the capacity expansion model derived the most economic (least cost) resource mix at the state and zone level. **Figure 2** and **Figure 3** display the resource mix for the RTO and the additions by zone.

[10] "LTRTP Workshop Policy Study: Analysis Results" presented to the Special TEAC – Order 1920 on Dec. 12, 2024.

[11] Id., slides 32–38 for the inputs, slides 39–40 for the capacity constraint, and slides 42–45 for the mathematical formulation of the policy inputs.

**Figure 2.** LTRTP Workshop Policy Study – Capacity Expansion Results: 2032 Resource Mix (GW)

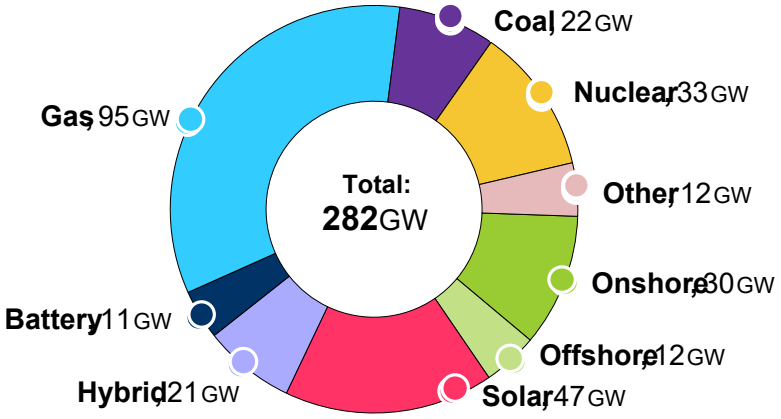



**Figure 3.** LTRTP Workshop Policy Study – Capacity Expansion Changes Relative to RTEP 2029 (Nameplate MW)

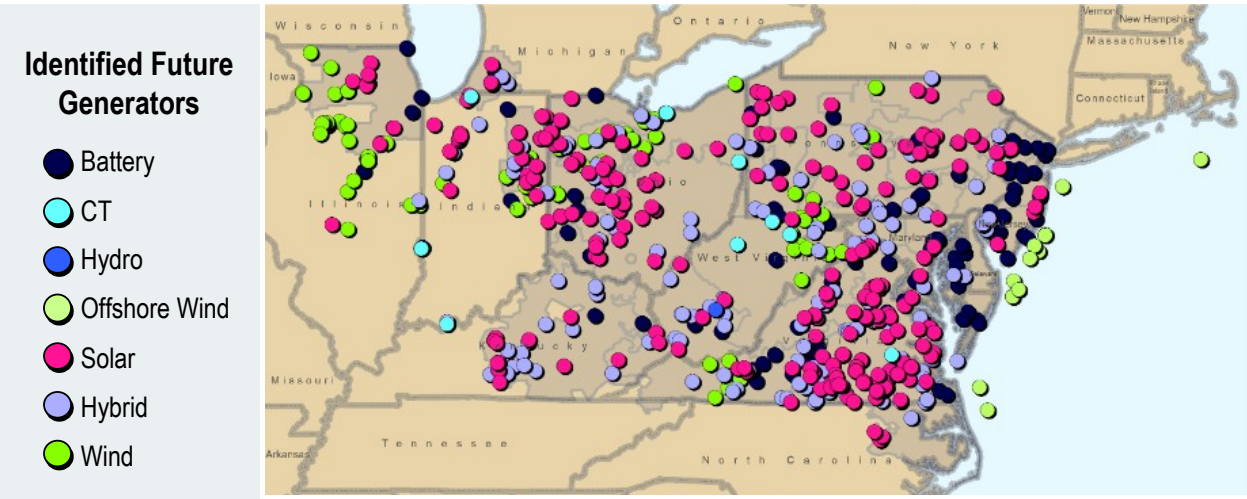
| | Solar | Onshore | Offshore | Battery | Hybrid | Renewable | Battery (Total) | Announced Retirement | Policy Retirement | New Thermal | Thermals' change | Load Change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AECO | 31 | | | 391 | 135 | 126 | 459 | 132 | ▪ | | ▪ | 47 |
| AEP | 9,828 | 10,448 | | 2,488 | 9261 | 29,537 | 7,119 | | ▪▪ | 1,971 | ▪ | 417 |
| APS | 1,072 | 3,826 | | 869 | 1,662 | 6,560 | 1,700 | 180 | | 3,299 | ✚✚ | 35 |
| ATSI | 565 | 1,596 | | 443 | 444 | 2,605 | 665 | | | 517 | ✚ | 35 |
| BGE | 125 | | | 1,250 | | 125 | 1,250 | 2114 | | | | 145 |
| COMED | 736 | 4,797 | | 260 | | 5,533 | 260 | | ▪▪▪ | | ▪▪▪ | 44 |
| DAY | 966 | 1,100 | | 352 | 554 | 2,620 | 629 | | | 10 | | 12 |
| DEOK | | | | 213 | | | 213 | | ▪ | | ▪ | 41 |
| DOM | 9,807 | | 2,640 | 2,148 | 4,490 | 16,937 | 4,393 | 29 | ▪ | 569 | ▪ | 4,512 |
| DPL | | | 1,767 | 244 | 93 | 1,860 | 291 | 577 | | | | 53 |
| DUQ | | | | 285 | 60 | 60 | 315 | | | | | 49 |
| EKPC | 737 | | | 76 | 1,639 | 2,376 | 896 | | ▪ | | ▪ | 34 |
| JCPL | 102 | | 2,400 | 484 | 60 | 2,562 | 514 | 217 | ▪ | | ▪ | 238 |
| METED | 95 | | | 75 | 109 | 204 | 130 | | | | | 215 |
| OVEC | | | | | | | | | ▪ | | ▪ | 0 |
| PECO | | | | | 3 | 3 | 2 | 760 | | | | 153 |
| PENLEC | 622 | 377 | | 45 | 13 | 1,012 | 52 | | ▪▪ | | ▪▪ | 37 |
| PEPCO | 82 | | | 795 | 635 | 717 | 1,113 | 216 | | | | 131 |
| PPL | 597 | | | 20 | 40 | 637 | 40 | | ▪ | | ▪ | 90 |
| PSEG | | | 1,342 | 773 | | 1,342 | 773 | | ▪ | | ▪ | 339 |
| RECO | | | | | | | | | | | | 4 |
| **Total** | **25,365** | **22,144** | **8,109** | **11,211** | **19,198** | **74,816** | **20,810** | **4,225** | **20,292** | **6,366** | **-13,926** | **6,631** |

Higher ▬ Lower ▪ # of Retirements ✚ Positive Net Change

*Notes: "Thermals' change" excludes RTEP 2029 announced retirements; GHG rule impacts are exclude*

PJM then applied a siting procedure to map the resource mix defined by the capacity expansion model at the zonal and state level into individual resources located as specific points of interconnection.[12] **Figure 4** below displays the location and technology class of the resources added to RTEP 2029 through this capacity expansion and siting process in the case study.

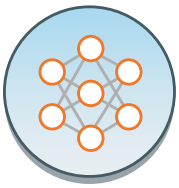
**Figure 4.** LTRTP Workshop Policy Study – Geographic Distribution of New Resources




[12] Id., slide 41 provides a description of the siting procedure.

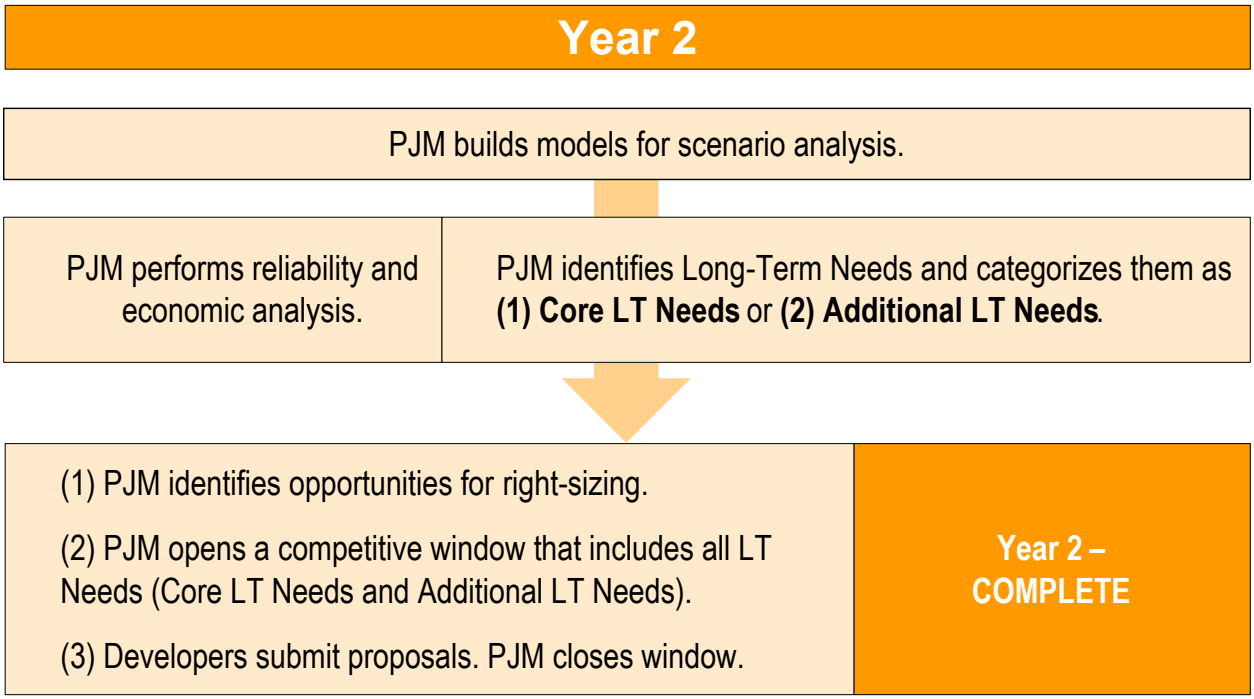
## B. Year 2 – Scenario Analysis, Identification of Long-Term Needs and Competitive Window

### 1. Year 2 Overview



The second year of PJM's Order 1920 long-term planning process will begin with building power flow and production cost models for the LT Scenarios developed in Year 1. See **Figure 5**. Through reliability and economic analysis of these models, PJM will identify a list of LT Needs. PJM will then categorize these LT Needs as either (1) Core LT Needs or (2) Additional LT Needs. The two sets of LT Needs will be addressed holistically for each scenario as part of the same competitive transmission window, taking into account opportunities for right-sizing of existing facilities and rights-of-way.

**Figure 5.** Flow Chart for Year 2 – Scenario Analysis, Identification of Long-Term Needs and Competitive Window




### 2. Long-Term Needs Identification

In Order 1920-A, FERC clarified that the identification of LT Needs should rely on reliability and economic drivers.[13] Accordingly, PJM will perform reliability and economic analyses, such as the generator deliverability test, to identify needs anticipated to materialize in the long-term or require longer time frames to develop. LT Needs are defined as the subset of these needs that may require Long-lead Projects, which per PJM's Operating Agreement, are transmission enhancements requiring six years or more from the posting of the need.[14]

[13] See Order 1920-A at P 223.

[14] Amended and Restated Operating Agreement of PJM Interconnection, L.L.C., Definitions I-L (Long-lead Project).

The lead time of the long-term solutions (LT Solutions) will be known after the competitive window closes and during the project evaluation and selection stages.[15] Thus, PJM will have to rely on engineering judgment and input from project developers (both incumbent and non-incumbents) to identify which needs from the reliability and economic analyses may require Long-lead Projects. To guide this determination, PJM will look at the magnitude of the issues, the voltage level of the facilities associated with those issues and the magnitude and concentration of those issues. For example, the presence of severe thermal violations on several high-voltage facilities located in the same area may indicate the need for substantial transmission reinforcements and possibly new greenfield backbone projects that require longer lead-times to develop.

PJM will identify LT Needs resulting from all three Long-Term Scenarios – Low, Base and High – plus any additional Long-Term Scenario endorsed by the PARSEC that meets FERC's definition of a "Long-Term Scenario" and is included in the LTRTP analysis.

## 3. Core Long-Term Needs

From the list of LT Needs, PJM will classify a subset as **Core LT Needs**. The Core LT Needs are the minimal set of LT Needs that PJM must address to maintain the reliability of the system.

*This minimum set of needs will consist of issues identified through reliability tests and are associated with the following model inputs:*

| (1) Load growth | (2) Deactivations *(including both officially announced and anticipated due to factors such as public policy)* | (3) Sufficient generation needed to meet PJM's reliability criteria *(1 in 10)*[16] |
|---|---|---|

Consistent with its current planning protocol, PJM will automatically count *every* planned generator that has an interconnection agreement or is associated with a signed State Agreement Approach (SAA) as contributing to meeting this 1-in-10 target, even if it is part of a resource-specific policy target. PJM will also incorporate the most economic resources contributing to the capacity constraint until meeting the reliability criteria – including, for example, resources associated with RPS and their carve-outs.

**Every resource needed to meet the 1-in-10 criteria will be treated as a "reliability resource"** contributing to the identification of Core LT Needs, except certain resource-specific targets that are without a signed interconnection agreement nor are associated with a signed SAA agreement.

It bears noting that although the designation of Core LT Needs focuses on what is necessary to address reliability, this approach to identify Core LT Needs is not exclusive of policy and does not "discount" policy. The Long-Term Scenarios used to identify LT Needs will not discount Factor Categories 1–3. LT Needs will be identified for all Factors in Factor Categories 1–3. As it relates to the Core LT Needs, PJM will include submitted policy requirements in developing its long-term load forecast, identifying generator deactivations and determining resources on which to rely to meet the 1-in-10 reliability criteria. This approach directly and

[15] The LT Needs definition does not preclude developers from presenting solutions with lead times shorter than six years.

[16] The 1-in-10 reliability criteria is a NERC probability standard of one day loss of load in 10 years.

explicitly uses policies to inform the identification of LT Needs that PJM must address to maintain system reliability (i.e., Core LT Needs).

The identification of Core LT Needs provides an opportunity to benchmark necessary future needs in comparison to how other drivers may influence the evolution of LT Needs in a holistic manner. Although the Core LT Need definition focuses on PJM's primary responsibility to maintain system reliability, addressing the Core LT Needs will necessarily also produce and contribute to policy and economic benefits, in addition to the reliability benefits. Indeed, PJM expects reliability, policy and economic benefits to largely overlap, which is consistent with other RTOs' long-term planning experiences and PJM's own findings from the LTRTP Workshop Policy Study. Policies affect the conditions that PJM needs to plan for to maintain the reliability of the system – they affect the load forecast, anticipated deactivations and the new generation needed to continue to reliably serve the load. Accordingly, the needs associated with these policies overlap with the Core LT Needs.

The LTRTP Workshop Policy Study showed that **90% of the congestion overlaps with facilities with reliability violations.**

Regarding economic benefits, the generator deliverability test is one of the tests that PJM will perform to identify Core LT Needs. The generator deliverability test begins with an economic-based dispatch and then ramps resources *beyond* that economic-based dispatch level to test for the deliverability of that energy to the rest of the PJM system and under contingency conditions. As a result, PJM expects that the reliability issues identified through the generator deliverability test will also largely overlap with economic needs (e.g., congestion). The aforementioned LTRTP Workshop Policy Study showed that 90% of the congestion overlaps with facilities with reliability violations, and notably, that model accounted for the seven factor categories similarly as required by Order 1920 – see **Figure 12** and **Figure 13** in the Appendix.[17]

## 4. Additional Long-Term Needs

**The Additional LT Needs** are those LT Needs that PJM identifies in the Long-Term Scenario analysis above and beyond what is identified as Core LT Needs.

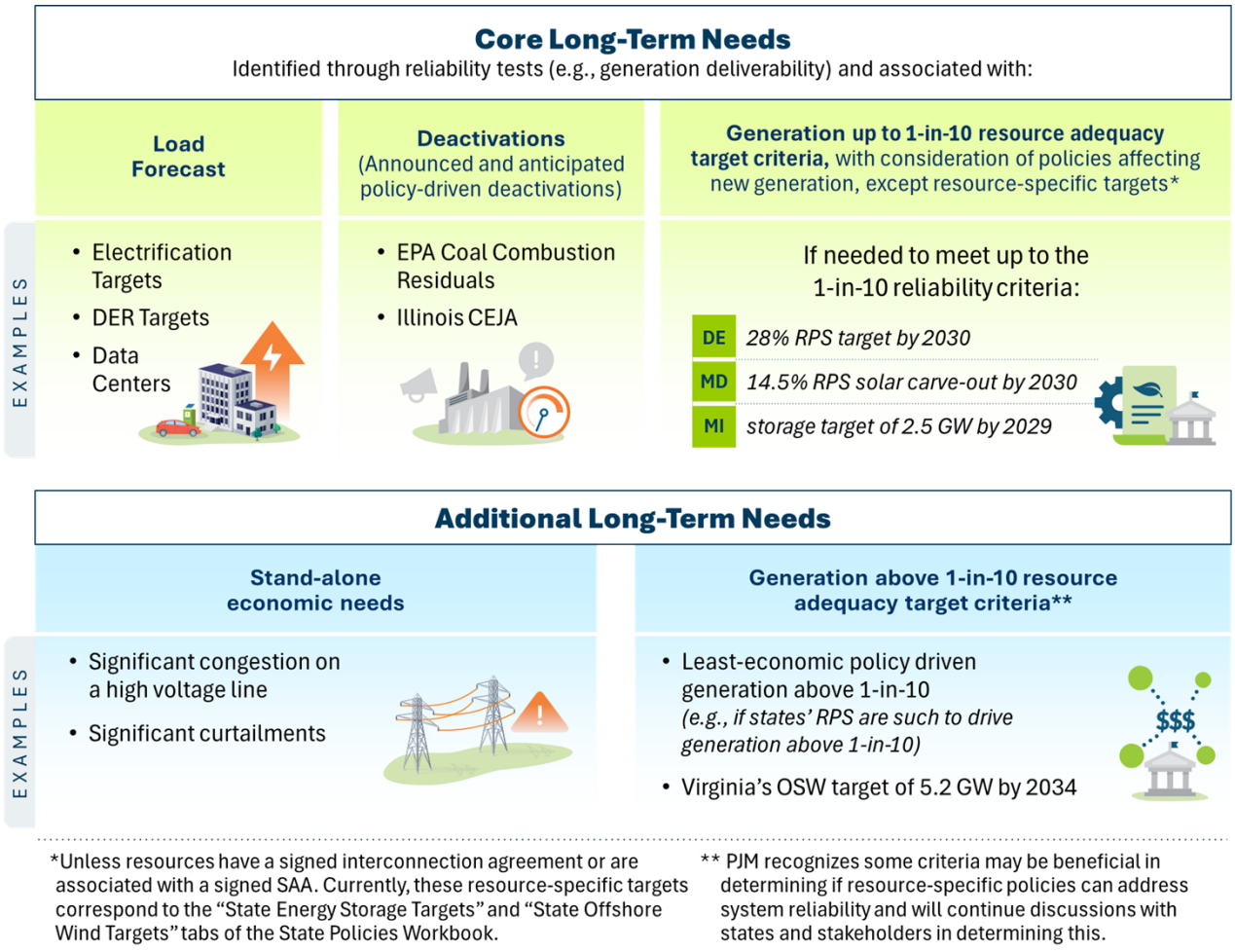
Additional LT Needs can be standalone economic LT Needs, needs associated with generation or storage resulting from resource-specific targets (which were not identified as the most economic resources to address Core LT Needs),[18] or a result of other policies that push the generation resource mix above what is needed to meet the 1-in-10 reliability criteria.

PJM's draft compliance approach will advance *all* identified Core and Additional LT Needs into one competitive window for the holistic development of transmission solutions that address both types of needs efficiently. See **Figure 6**. Nothing in PJM's compliance framework prevents Additional LT Needs from being addressed through Order 1920 planning holistically with LT Solutions addressing Core LT Needs at the same time.

[17] See footnote #10 for a link to the LTRTP Workshop Policy Study.

[18] Only those resources contributing to resource-specific targets that do not have a signed interconnection agreement or are associated with a signed SAA agreement.

**Figure 6.** Examples of Core LT Needs and Additional LT Needs




## 5. Right-Sizing

Order 1920 requires the evaluation of whether transmission facilities (1) operating above a specified kV threshold and (2) that an individual transmission provider that owns the transmission facility anticipates replacing in-kind with a new transmission facility during the next 10 years can be "right-sized" to more efficiently or cost-effectively address an LT Transmission Need.[19] In the context of LTRTP, the purpose of right-sizing transmission facilities is to modify in-kind replacements, where appropriate, to increase transfer capacity more efficiently or cost effectively to meet LT Needs.

[19] See Order 1920 at P 1677.

Before opening the LTRTP competitive window, PJM will review with the PJM TOs their in-kind replacement lists and determine which LT Needs can reasonably be addressed through right-sizing.[20] The incumbent PJM TOs will be engaged as early as Year 1 of the LTRTP process in submitting their in-kind replacement estimates. Subsequently, PJM and the PJM TOs will determine which of the facilities on the in-kind replacement estimate lists could be considered for right-sizing given the nature of LT Needs and drivers being discussed early in the process. Those LT Needs that are identified by PJM to be prudently addressed through right-sizing will advance to the competitive solicitation window as informational only for project developers. PJM will consider all solutions received through the competitive window and review the entire plan holistically.

**The incumbent PJM TOs will be engaged as early as Year 1** of the LTRTP process in submitting their in-kind replacement estimates.

## 6. Competitive Transmission Solicitation

As mentioned, this step of PJM's compliance approach involves advancing the identified Core LT Needs and Additional LT Needs, including for informational purposes the LT Needs prudently addressed through right-sizing, into a single competitive window. Developers will then submit proposals addressing the posted LT Needs. This competitive window is expected to be significantly longer (e.g., six months) than the competitive windows currently used in the existing Order 1000 processes due to the inherent complexity of long-term planning. PJM will conclude Year 2 of its long-term planning process by closing the competitive window and compiling the list of proposed projects.

## 7. Alternative Transmission Technologies

PJM will require that transmission developers consider as part of their proposed solutions the incorporation of alternative transmission technologies (ATTs), consistent with the best practices that PJM will identify in manuals and technical references through consultation with the PJM states, TOs, transmission developers and greater stakeholder community. Order 1920 specifically includes dynamic line ratings, advanced power flow control devices, advanced conductors and transmission switching as ATTs required for consideration.[21]

PJM will require that transmission developers provide justification, with sufficient detail, on why ATTs were or were not included in their proposed solutions. PJM will evaluate the inclusion or exclusion of ATTs based on the information provided using the proposing entities' justification. In accordance with Order 1920, PJM will implement ATT review in its near-term and long-term planning processes.

[20] This review will be informed by the TOs submitting to PJM their in-kind replacement estimates to PJM, which must occur before the scenario analysis begins in Year 2. In-kind replacement estimates shall be those facilities that are anticipated to need replacement over the next 10 years from the start of the LTRTP cycle and meet the right-sizing eligibility criteria. Additional details on PJM's proposed compliance approach to right-sizing can be found at:

"PJM's Compliance Approach to Order 1920 Requirements on Local Transmission Planning Inputs" presented to the Special TEAC – Order 1920 on May 9, 2025.

"Order 1920, High Level Filing Content" presented to the Special TEAC – Order 1920 on June 27, 2025.

[21] See Order 1920 at P 1198.

## C. Year 3 – Project Evaluation and Project Selection

### 1. Year 3 Overview

PJM will apply its evaluation and selection criteria to **develop both a Backstop Plan addressing the Core LT Needs and an All-in-One Plan.**

The third year of PJM's Order 1920 LTRTP process will focus on evaluating and selecting projects submitted through the competitive window. PJM will apply its evaluation and selection criteria to develop both a Backstop Plan addressing the Core LT Needs and an All-in-One Plan that jointly and holistically addresses Core and Additional LT Needs. PJM will then produce a Final Plan that optimizes the projects selected in the Backstop and All-in-One Plans, plus any projects advanced through voluntary funding by states and/or interconnection customers. See **Figure 7**.

**In developing the Backstop Plan,** PJM will utilize the following six selection criteria (discussed below): the required vis-à-vis projected in-service date, robustness, constructability, expandability, operational performance, and benefits and costs. PJM will also apply a minimum 1:1 benefit-to-cost ratio threshold calculated on a portfolio basis, as requested by PARSEC, and will also maintain options to address near-term reliability needs as part of the established Order 1000 competitive transmission planning process where efficient and reasonable.

**The 1.25:1 benefit-to-cost ratio threshold** applies only to projects that purely solve Additional LT Needs.

**PJM will then develop the All-in-One Plan** by applying the six aforementioned selection criteria and a PARSEC-developed 1.25:1 benefit-to-cost ratio threshold to select projects that holistically address the Additional LT Needs or projects that incrementally solve Additional LT Needs beyond an already identified Core LT Needs project. Said differently, this 1.25:1 benefit-to-cost ratio threshold applies only to projects that purely solve Additional LT Needs or incremental additions that solve Additional LT Needs beyond an already identified Core LT Needs project. The All-in-One Plan will holistically address both Core LT Needs and Additional LT Needs in a manner consistent with delivering greater benefits than costs. Additionally, as discussed further below, this process will include a state "opt out" mechanism, developed by the PARSEC and implemented by PJM to allow a state or states to opt out from the cost allocation of a project included in the All-in-One Plan at the time of project selection.

After the initial development of the All-in-One Plan in accordance with application of the PARSEC-developed selection criteria, interested PJM states will then have the opportunity to commit to projects that do not otherwise meet the selection criteria for inclusion in the Backstop Plan or All-in-One Plan. Such commitment occurs through the "Voluntary Funding Opportunity" required by Order 1920 to voluntarily fund the cost of, or a portion of the cost, a Long-Term Regional Transmission Facility otherwise not selected by PJM.[22] If such commitments are made, PJM will reassess the All-in-One Plan (or Backstop Plan if applicable) to include those projects committed to by states and/or interconnection customers to develop a Final Plan for the LTRTP planning cycle, optimized to include such voluntary commitments.

[22] See Order 1920 at P 1012.

***In general, the Final Plan within a given LTRTP cycle can be reflective of either:***

**1 |** The All-in-One Plan, which includes projects that holistically address the Core LT Needs and Additional LT Needs that meet the PARSEC-developed criteria, plus projects not selected by PJM as part of the All-in-One Plan but are advanced by states and/or interconnection customers through the voluntary funding mechanism

**2 |** The Backstop Plan, should no incremental project meet the PARSEC-developed minimum 1.25:1 benefit to cost ratio threshold, plus any projects advanced by states and/or interconnection customers through the voluntary funding mechanism

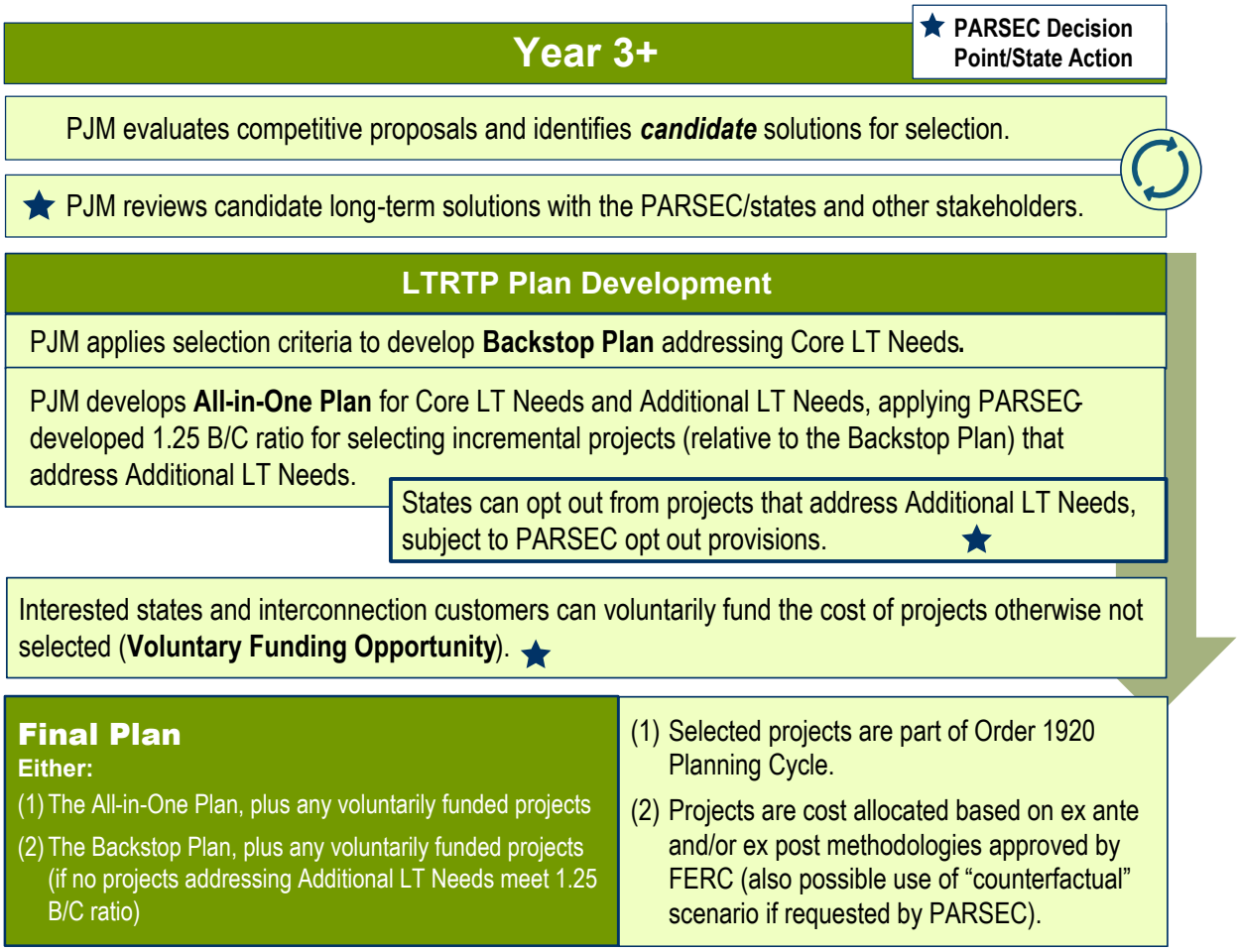
PJM will holistically optimize all projects within the Final Plan to ensure overall efficiency and cost effectiveness of the Final Plan addressing Core, Additional LT Needs and voluntarily funded developments.

Order 1920 also requires PJM to consult with and seek the support of the PARSEC on its approaches for:

| 1 | 2 | 3 |
|---|---|---|
| Evaluation process | Selection criteria | Voluntary Funding Opportunities |

*This section details PJM's proposed compliance approach for these three components.*

**Figure 7.** Flow Chart for Year 3 – Project Evaluation and Project Selection[23]




## 2. Project Evaluation Process and Selection Criteria

### Evaluation Process

In reviewing the proposals submitted through the competitive window, PJM will sequentially evaluate projects to gradually screen and identify more efficient or cost-effective projects addressing LT Needs (Core and Additional). PJM will base each project's evaluation on:

- Determining if the project addresses the LT Needs
- Do no harm (project does not cause new, un-addressed violations)
- Feasibility (cost and constructability analyses)
- Using benefit metrics to further screen among alternative solutions (This stage will involve **maximizing** the sum of Order 1920's seven enumerated benefits.)[24]

[23] The selection of the Backstop Plan will occur in Year 3. The finalization of the Final Plan and cost allocation calculations will occur in Year 4.

[24] See Order 1920 at P 720.

## Order 1920 Required Benefits

1. Avoided or deferred reliability transmission facilities and aging transmission infrastructure replacement
2. (a) Reduced loss of load probability *or* (b) Reduced planning reserve margin
3. Production cost savings
4. Reduced transmission energy losses
5. Reduced congestion due to transmission outages
6. Mitigation of extreme weather events and unexpected system conditions
7. Capacity cost benefits from reduced peak energy losses

## Selection Criteria

After evaluating the submitted projects, PJM will then proceed to select LT Solutions based on a set of selection criteria.

PJM will use its engineering judgment guided by multiple principles in selecting projects. These principles include:

1 The required in-service date vis-à-vis lead time of the proposed project (For example, a project that requires eight years to build will be selected if the specific LT Need it is addressing is expected in Year 8, whereas if the LT Need is expected in Year 16, then PJM may wait for the next LTRTP planning cycle to address the LT Need.)

2 "Robustness," meaning how well the proposed solution performs across all scenarios (e.g., Base, Low and High) and any sensitivities, including the extreme weather sensitivity

3 "Expandability," meaning it is a solution that can be expanded over time to meet additional future LT Needs, capitalizing on the initial investment and limiting the risk of stranded investment (e.g., installing double circuit towers and only stringing up one line)

4 "Constructability," meaning how likely is the project to be constructed, considering for example, whether the project takes advantage of existing rights-of-way, reducing construction risks, and social and environmental impacts

5 Operational performance and flexibility

6 Benefits and costs (including the possibility of accelerating the project)

7 A 1:1 benefit-to-cost minimum ratio threshold, calculated on a portfolio basis, for projects that address Core LT Needs and 1.25:1 benefit-to-cost minimum ratio threshold for projects that solve Additional LT Needs

## 3. Backstop Plan (for Core LT Needs)

Projects that are preliminarily selected to address the Core LT Needs will establish the **Backstop Plan**. This Backstop Plan provides a pathway to address reliability through Order 1920 and represents the *minimum* build that would result from an LTRTP planning cycle. This set of holistic reliability solutions addressing Core LT Needs may also address and overlap with Additional LT Needs as a by-product. PJM endeavors to develop a **Backstop Plan** in which the entire portfolio satisfies a minimum 1:1 benefit-to-cost ratio on a portfolio basis. PJM may keep options to address Core LT Needs through the current Order 1000 competitive transmission process or similar.

## 4. All-in-One Plan (for both Core and Additional LT Needs)

The **All-in-One Plan** will be composed of a set of holistically developed solutions addressing both Core and Additional LT Needs, using the PARSEC-developed 1.25:1 benefit-to-cost ratio threshold for projects that holistically address the Additional LT Needs or projects that incrementally solve Additional LT Needs beyond an already identified Core LT Needs project. The All-in-One Plan will be developed by PJM in parallel with developing the Backstop Plan.

After PJM develops the All-in One Plan, PJM states and interconnection customers will have the opportunity to voluntarily commit to otherwise not selected projects within the All-in-One Plan. For example, if a project is identified but not included in the All-in-One Plan, and a state or interconnection customer believes the project is still valuable, a voluntary funding mechanism will exist to allow parties to contribute to the costs of that project so that it can move forward into the Final Plan. More detail on the Voluntary Funding Opportunity is included in the next section of the white paper, Section C.5 – "Final Plan (and Voluntary Funding Opportunities)."

Therefore, projects selected to address Core LT Needs, Additional LT Needs and any otherwise not selected projects voluntarily funded by states or interconnection customers will advance toward the Final Plan.

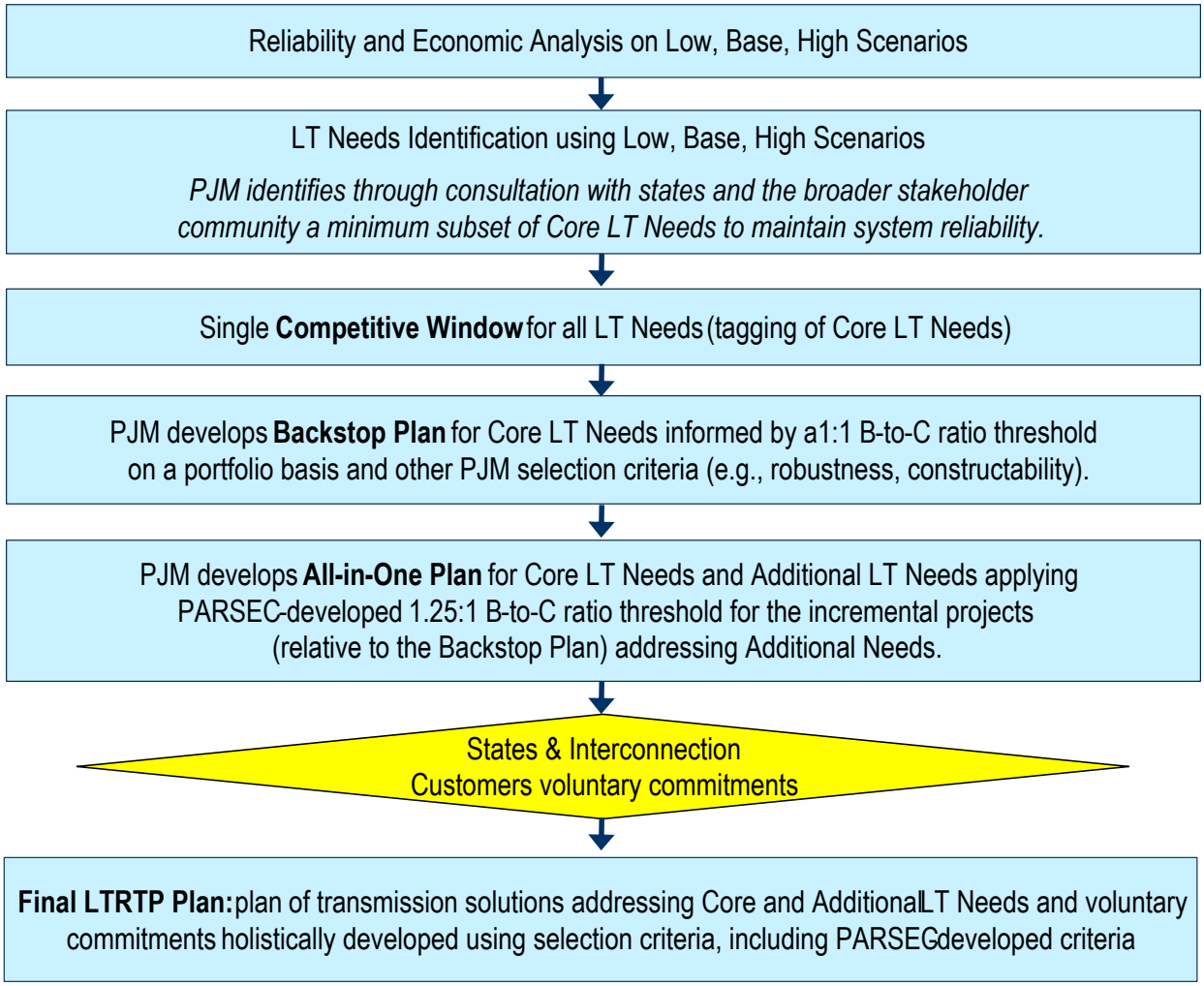
### State Opt-Out Provision

PJM will apply the aforementioned PARSEC-developed automatic selection criterion for projects in the All-in-One Plan that address Additional LT Needs. This provision will include an ability for states to "opt out" of the costs for projects addressing Additional LT Needs during a defined period. Such an opt-out mechanism will be developed by the PARSEC with collaboration by PJM and the Transmission Owners to the extent the "opt out" involves long-term planning protocol and/or long-term project cost allocation, respectively. To support informed state decision-making, and with PARSEC-guidance, PJM will provide a detailed benefit-to-cost analysis for each project proposed to address Additional LT Needs and detailed benefits distribution information to clarify the extent to which each state is expected to benefit from and contribute to the need for each project that solves Additional LT Needs.

## 5. Final Plan (and Voluntary Funding Opportunities)

The **Final Plan** will be either the (1) Backstop Plan (should no Additional LT Needs projects meet the PARSEC-developed selection criteria) or (2) the All-in-One Plan (if there are Additional LT Needs projects that meet that criteria). The Final Plan will possibly be re-optimized to account for state or interconnection customers' voluntary funding of projects not selected by PJM, consistent with the stated selection criteria. See **Figure 8**. In all cases, PJM will identify the combination of projects that jointly and holistically enable the more efficient or cost-effective solutions to address the Core and Additional LT Needs (subject to the above selection criteria, including the criteria recommended by PARSEC) and consistent with the commitments made by states and/or interconnection customers through the Voluntary Funding Opportunities mechanism. For example, in the event that projects from the Backstop and All-in-One Plans solve the same LT Need differently, PJM will optimize those solutions to reduce redundancy and improve project selection efficiency.

**Figure 8.** Summary of PJM's LTRTP Process




The Final Plan will then be cost allocated according to a FERC-approved cost allocation methodology filed by the PJM Transmission Owners (including a methodology that PARSEC may propose).

## Voluntary Funding Opportunities

Order 1920 requires a process to identify Voluntary Funding Opportunities for states and interconnection customers to voluntarily fund the cost of, or a portion of the cost of, a Long-Term Regional Transmission Facility otherwise not selected by PJM. The order requires that transmission providers propose on compliance:[25]

> **The process** by which the transmission provider will make Voluntary Funding Opportunities available to Relevant State Entities and interconnection customers, which must ensure that Relevant State Entities and interconnection customers receive timely notice of such opportunities and provide a meaningful opportunity for Relevant State Entities and interconnection customers
>
> **The period** during which Relevant State Entities and interconnection customers may exercise the option to provide voluntary funding
>
> **The method** that transmission providers will use to determine the amount of voluntary funding required to ensure that the Long-Term Regional Transmission Facility meets the transmission providers' selection criteria
>
> **The mechanism** through which transmission providers and Relevant State Entities or interconnection customers will memorialize any voluntary funding agreement, e.g., a pro forma agreement in the OATT

PJM is the relevant transmission provider for complying with Voluntary Funding Opportunity requirements 1, 2 and 4 (the process, the period and the mechanism, respectively). PJM's interpretation of Order 1920 is that the PJM TOs are the transmission provider responsible for complying with Voluntary Funding Opportunity requirement 3 (the method).

PJM's proposed compliance approach to the Voluntary Funding Opportunity requirements is:

- **Process** – After PJM selects projects for the Backstop Plan and All-in One Plan using its evaluation and selection criteria (including the benefit-to-cost ratio-based criteria requested by PARSEC for these two plans), and before the Final Plan is completed, states and interconnection customers will have the opportunity to voluntarily fund the cost of project(s) not otherwise selected. These voluntarily funded projects will then be included in the Final Plan, as discussed above.
- **Period** – The opportunity for states and interconnection customers to voluntarily fund Long-Term Regional Transmission Facilities will occur after PJM has made its initial selection.
- **Mechanism** – PJM could develop pro forma agreement language detailing the process for Voluntary Funding Opportunities – including the commitment made by states to advance projects from the All-in-One Plan to the Final Plan.

[25] See Order 1920 at P 1013.

# III. Appendix

This appendix provides an illustration of some of the inputs used for the capacity expansion model in the LTRTP Workshop Policy Study. The complete set of assumptions is available in the materials presented to the special TEAC – Order 1920 on Dec. 12, 2025, and available on PJM's website (see footnote #10).

**Figure 9.** LTRTP Workshop Policy Study – Economics and Technology: Fixed Costs

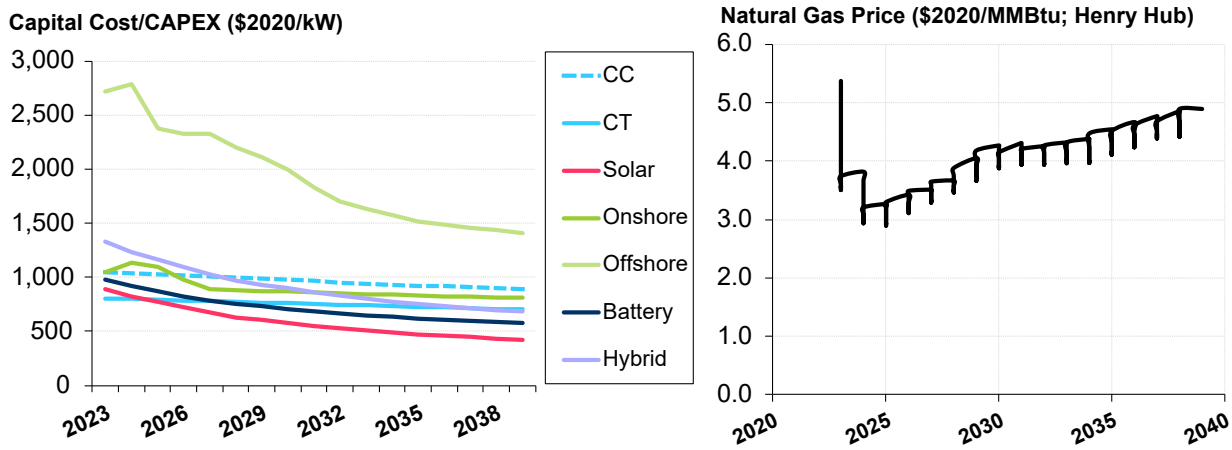



**Figure 10.** LTRTP Workshop Policy Study – Policies

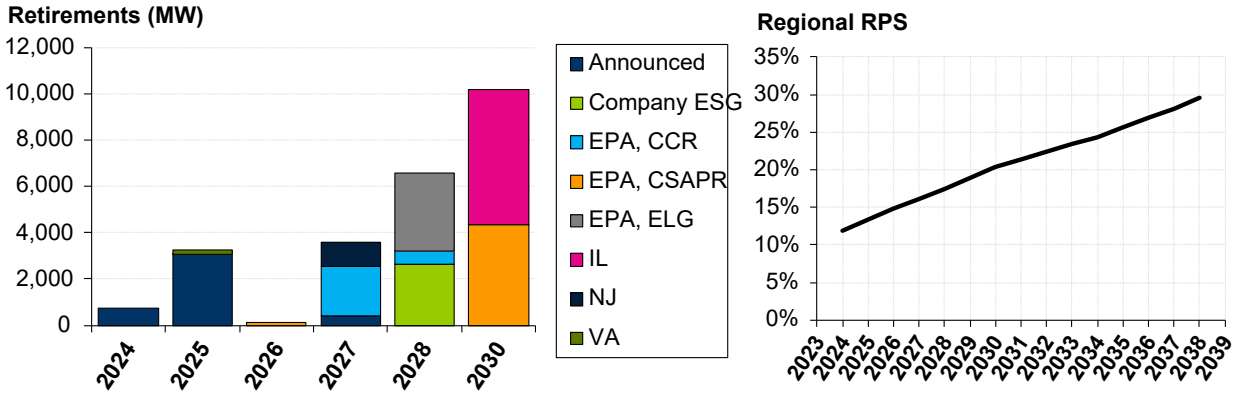
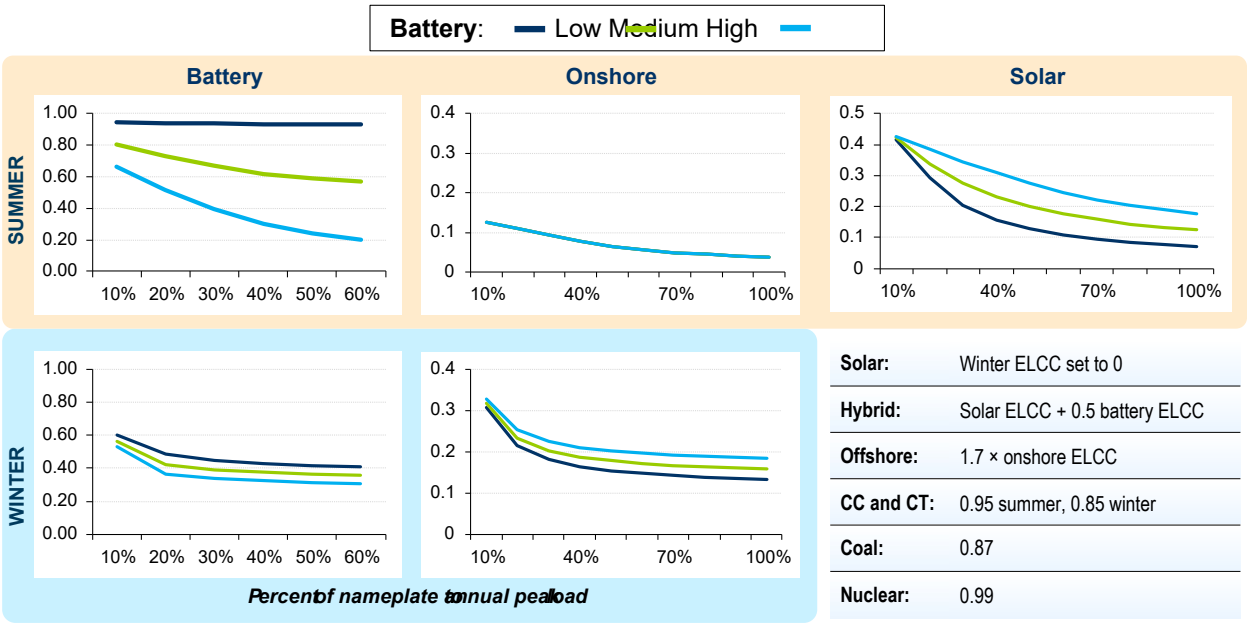


**Figure 11.** LTRTP Workshop Policy Study – ELCC Assumptions




| | |
|---|---|
| **Solar:** | Winter ELCC set to 0 |
| **Hybrid:** | Solar ELCC + 0.5 battery ELCC |
| **Offshore:** | 1.7 × onshore ELCC |
| **CC and CT:** | 0.95 summer, 0.85 winter |
| **Coal:** | 0.87 |
| **Nuclear:** | 0.99 |

**Figure 12.** LTRTP Workshop Policy Study – Annual Congestion by Zone (lines only, mil. $)[26]

| | kV Level | Congestion ($M) | Number of Facilities | Overlap with reliability | |
|---|---|---|---|---|---|
| | | | | Congestion | # of Facilities |
| **Lines** | **230** | 2,282 | 33 | 2,022 | 30 |
| | **345** | 792 | 31 | 724 | 19 |
| | **500** | 471 | 10 | 464 | 5 |
| | **Subtotal** | **3,545** | **74** | **3,210** | **54** |
| **Transformers** | **230** | 6 | 3 | 6 | 2 |
| | **345** | 89 | 6 | 0 | 1 |
| | **Subtotal** | **95** | **9** | **6** | **4** |
| **Total** | | **3,640** | **84** | **3,216** | **58** |

As previously noted, economic relief is tightly correlated to reliability needs within PJM's transmission planning process. This means that where congestion is present – and increased costs to consumers exist due to an inability to use more cost-effective generation – solutions that also address a reliability need also offer congestion relief.

[26] LTRTP Workshop Policy Study: Analysis Results, slide 27.

This dynamic especially exists in PJM's transmission planning process, specifically, because of recent changes to the block-loaded modeling of generation in power flow studies for purposes of studying generator deliverability. In PJM's case study – the LTRTP Workshop Policy Study, a prototype for Order 1920 Planning – nearly 90% of costs caused by increased congestion overlapped with reliability needs. This means that in addressing reliability needs, economic relief would be afforded in most instances as an incidental byproduct.

**Figure 13.** LTRTP Workshop Policy Study – Annual Congestion by Zone (lines only; mil. $)[27]

| kV level | Dominion | AEP | ComEd | PSEG | JCPL | DLCO | PECO | DP&L | OVEC | APS | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | **2,064** | | | 155 | 62 | | | | | | 2,282 |
| 345 | | **414** | **314** | 29 | | 32 | | | 1 | | 792 |
| 500 | **392** | | | | 59 | | 11 | 7 | | 1 | 471 |
| Subtotal | **2,456** | **414** | **314** | **185** | **121** | **32** | **11** | **7** | **1** | **1** | **3,545** |
| **Overlaps with Reliability** | | | | | | | | | | | |
| 230 | 1,960 | | | | 62 | | | | | | 2,022 |
| 345 | | 378 | 312 | | | 32 | | | 1 | | 724 |
| 500 | 392 | | | | 59 | | 6 | 6 | | | 464 |
| Subtotal | **2,352** | **378** | **312** | | **121** | **32** | **6** | **6** | **1** | | **3,210** |

[27] Id., slide 28.