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**Operating Agreement
Definitions Revisions**

Yellow: Avoidance
Green: Mitigation Language
Blue: Avoidance and Mitigation

Resiliency Failure:

“Resiliency Failure” shall mean instability, uncontrolled separation, or cascading resulting in one or more of the following:

- 1) Loss of load greater than or equal to 1000 MW
 - Includes consequential load loss and tripped load
 - Total loss of load should be considered
- 2) Three voltage levels of facility trips
 - Includes lines, transformers, and generators
 - Tripped elements should include 69kV and above facilities
- 3) Case fails to converge after tripping of facilities
 - Confirm that convergence is not due to modeling issues or local pockets

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Substation Contingency Resilience Criteria:

“Substation Contingency Resilience Criteria” shall mean the analyses performed, as needed but at a minimum annually, by PJM to ensure broader system resilience based on a study of select substation contingencies, which are based upon TPL-001-4 Extreme Contingency Analysis. The analyses evaluate the loss of load and potential cascade events or Resiliency Failure that may result from power flow analysis. Due to the sensitive nature of the analyses, identified substations and results require confidentiality consistent with established processes and good utility practice.

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Substation Contingency Resilience Project:

“Substation Contingency Resilience Project” shall mean a transmission expansion or enhancement proposed by PJM that mitigates a violation of the Substation Contingency Resilience Criteria.

Supplemental Project:

“Supplemental Project” shall mean a transmission expansion or enhancement that is not required for compliance with the following PJM criteria: system reliability, operational performance, ~~or~~ economic criteria, or resiliency pursuant to a determination by the Office of the Interconnection and is not a state public policy project pursuant to Operating Agreement, Schedule 6, section 1.5.9(a)(ii). Any system upgrades required to maintain the reliability of the system that are

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driven by a Supplemental Project are considered part of that Supplemental Project and are the responsibility of the entity sponsoring that Supplemental Project.

Schedule 6 Revisions

1.1 Purpose and Objectives.

This Regional Transmission Expansion Planning Protocol shall govern the process by which the Members shall rely upon the Office of the Interconnection to prepare a plan for the enhancement and expansion of the Transmission Facilities in order to meet the demands for firm transmission service, and to support competition, in the PJM Region. The Regional Transmission Expansion Plan (also referred to as "RTEP") to be developed shall enable the transmission needs in the PJM Region to be met on a reliable, economic, **resilient** and environmentally acceptable basis.

1.4 Contents of the Regional Transmission Expansion Plan.

(a) The Regional Transmission Expansion Plan shall consolidate the transmission needs of the region into a single plan which is assessed on the bases of (i) maintaining the reliability of the PJM Region in an economic and environmentally acceptable manner, (ii) supporting competition in the PJM Region, (iii) striving to maintain and enhance the market efficiency and operational performance of wholesale electric service markets, ~~and~~ (iv) considering federal and state Public Policy Requirements, **and (v) fostering the resiliency of the PJM Region.**

(b) The Regional Transmission Expansion Plan shall reflect, consistent with the requirements of this Schedule 6, transmission enhancements and expansions; load forecasts; and capacity forecasts, including expected generation additions and retirements, demand response, and reductions in demand from energy efficiency and price responsive demand for at least the ensuing ten years.

(c) The Regional Transmission Expansion Plan shall, at a minimum, include a designation of the Transmission Owner(s) or other entity(ies) that will construct, own, maintain, operate, and/or finance each transmission enhancement and expansion and how all reasonably incurred costs are to be recovered.

(d) The Regional Transmission Expansion Plan shall (i) avoid unnecessary duplication of facilities; (ii) avoid the imposition of unreasonable costs on any Transmission Owner or any user of Transmission Facilities; (iii) take into account the legal and contractual rights and obligations of the Transmission Owners; (iv) provide, if appropriate, alternative means for meeting transmission needs in the PJM Region; (v) provide for coordination with existing transmission systems and with appropriate interregional and local expansion plans; ~~and~~ (vi) strive for consistency in planning data and assumptions that may relieve transmission congestion across multiple regions; **and (vii) minimize the potential for Resiliency Failures.**

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1.5.1 Commencement of the Process.

(a) The Office of the Interconnection shall initiate the enhancement and expansion study process if: (i) required as a result of a need for transfer capability identified by the Office of the Interconnection in its evaluation of requests for interconnection with the Transmission System or for firm transmission service with a term of one year or more; (ii) required to address a need identified by the Office of the Interconnection in its on-going evaluation of the Transmission System's market efficiency and operational performance; (iii) required as a result of the Office of the Interconnection's assessment of the Transmission System's compliance with NERC Reliability Standards, more stringent reliability criteria, if any, or PJM planning and operating criteria; (iv) required to address constraints or available transfer capability shortages, including, but not limited to, available transfer capability shortages that prevent the simultaneous feasibility of stage 1A Auction Revenue Rights allocated pursuant to the Operating Agreement, Schedule 1, section 7.4.2(b), constraints or shortages as a result of expected generation retirements, constraints or shortages based on an evaluation of load forecasts, or system reliability needs arising from proposals for the addition of Transmission Facilities in the PJM Region; ~~or~~ (v) expansion of the Transmission System is proposed by one or more Transmission Owners, Interconnection Customers, Network Service Users or Transmission Customers, or any party that funds Network Upgrades pursuant to the Operating Agreement, Schedule 1, section 7.8; or required to address a violation of the Substation Contingency Resilience Criteria (except those identified in Attachment M-4 to the PJM Tariffs). The Office of the Interconnection may initiate the enhancement and expansion study process to address or consider, where appropriate, requirements or needs arising from sensitivity studies, modeling assumption variations, scenario analyses, and Public Policy Objectives.

1.5.3 Scope of Studies.

In conducting the enhancement and expansion studies, the Office of the Interconnection shall not limit its analyses to bright line tests to identify and evaluate potential Transmission System limitations, violations of planning criteria, or transmission needs. In addition to the bright line tests, the Office of the Interconnection shall employ sensitivity studies, modeling assumption variations, and scenario analyses, and shall also consider Public Policy Objectives in the studies and analyses, so as to mitigate the possibility that bright line metrics may inappropriately include or exclude transmission projects from the transmission plan. Sensitivity studies, modeling assumption variations, and scenario analyses shall take account of potential changes in expected future system conditions, including, but not limited to, load levels, transfer levels, fuel costs, the level and type of generation, generation patterns (including, but not limited to, the effects of assumptions regarding generation that is at risk for retirement and new generation to satisfy Public Policy Objectives), demand response, and uncertainties arising from estimated times to construct transmission upgrades. The Office of the Interconnection shall use the sensitivity studies, modeling assumption variations and scenario analyses in evaluating and choosing among alternative solutions to reliability, market efficiency and operational performance needs. The Office of the Interconnection shall provide the results of its studies and analyses to the

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Transmission Expansion Advisory Committee to consider the impact that sensitivities, assumptions, and scenarios may have on Transmission System needs and the need for transmission enhancements or expansions. Enhancement and expansion studies shall be completed by the Office of the Interconnection in collaboration with the affected Transmission Owners, as required. In general, enhancement and expansion studies shall include:

- (a) An identification of existing and projected limitations on the Transmission System's physical, economic and/or operational capability or performance, with accompanying simulations to identify the costs of controlling those limitations. Potential enhancements and expansions will be proposed to mitigate limitations controlled by non-economic means.
- (b) Evaluation and analysis of potential enhancements and expansions, including alternatives thereto, needed to mitigate such limitations.
- (c) Identification, evaluation and analysis of potential transmission expansions and enhancements, demand response programs, and other alternative technologies as appropriate to maintain system reliability.
- (d) Identification, evaluation and analysis of potential enhancements and expansions for the purposes of supporting competition, market efficiency, operational performance, and Public Policy Requirements in the PJM Region.
- (e) Identification, evaluation and analysis of upgrades to support Incremental Auction Revenue Rights requested pursuant to the Operating Agreement, Schedule 1, section 7.8.
- (f) Identification, evaluation and analysis of upgrades to support all transmission customers, including native load and network service customers.
- (g) Engineering studies needed to determine the effectiveness and compliance of recommended enhancements and expansions, with the following PJM criteria: system reliability, operational performance, and market efficiency.
- (h) Identification, evaluation and analysis of potential enhancements and expansions designed to ensure that the Transmission System's capability can support the simultaneous feasibility of all stage 1A Auction Revenue Rights allocated pursuant to the Operating Agreement, Schedule 1, section 7.4.2(b). Enhancements and expansions related to stage 1A Auction Revenue Rights identified pursuant to this Section shall be recommended for inclusion in the Regional Transmission Expansion Plan together with a recommended in-service date based on the results of the ten (10) year stage 1A simultaneous feasibility analysis. Any such recommended enhancement or expansion under this Operating Agreement, Schedule 6, section 1.5.3(h) shall include, but shall not be limited to, the reason for the upgrade, the cost of the upgrade, the cost allocation identified pursuant to the Operating Agreement, Schedule 6, section 1.5.6(m) and an analysis of the benefits of the enhancement or expansion, provided that any such upgrades will not be subject to a market efficiency cost/benefit analysis.

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(i) Identification, evaluation and analysis of potential enhancements and expansions that mitigate the violation of the Substation Contingency Resilience Criteria or avoid Resiliency Failure.

1.5.4 Supply of Data.

(a) The Transmission Owners shall provide to the Office of the Interconnection on an annual or periodic basis as specified by the Office of the Interconnection, any information and data reasonably required by the Office of the Interconnection to perform the Regional Transmission Expansion Plan, including but not limited to the following: (i) a description of the total load to be served from each substation; (ii) the amount of any interruptible loads included in the total load (including conditions under which an interruption can be implemented and any limitations on the duration and frequency of interruptions); (iii) a description of all generation resources to be located in the geographic region encompassed by the Transmission Owner's transmission facilities, including unit sizes, VAR capability, operating restrictions, and any must-run unit designations required for system reliability or contract reasons; the (iv) current local planning information, including all criteria, assumptions and models used by the Transmission Owners, such as those used to develop Supplemental Projects. The data required under this Section shall be provided in the form and manner specified by the Office of the Interconnection.

1.5.8 Development of Long-lead Projects, Short-term Projects, Immediate-need Reliability Projects, ~~and Economic-based Enhancements or Expansions~~ and Substation Contingency Resilience Projects.

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(e) **Criteria for Considering Inclusion of a Project in the Recommended Plan.** In determining whether a Short-term Project or Long-lead Project proposed pursuant to the Operating Agreement, Schedule 6, section 1.5.8(c), individually or in combination with other Short-term Projects or Long-lead Projects, is the more efficient or cost-effective solution and therefore should be included in the recommended plan, the Office of the Interconnection, taking into account sensitivity studies and scenario analyses considered pursuant to the Operating Agreement, Schedule 6, section 1.5.3, shall consider the following criteria, to the extent applicable: (i) the extent to which a Short-term Project or Long-lead Project would address and solve the posted violation, system condition, or economic constraint and avoid Resiliency Failure; (ii) the extent to which the relative benefits of the project meets a Benefit/Cost Ratio Threshold of at least 1.25:1 as calculated pursuant to the Operating Agreement, Schedule 6, section 1.5.7(d); (iii) the extent to which the Short-term Project or Long-lead Project would have secondary benefits, such as addressing additional or other system reliability, operational performance, economic efficiency issues or federal Public Policy Requirements or state Public Policy Requirements identified by the states in the PJM Region; ~~and~~ (iv) the ability to timely complete the project, and project development feasibility; (v) the results of the PJM's resiliency analysis; and (vi) other factors such as cost-effectiveness, including the quality and effectiveness of any voluntary-submitted binding cost commitment proposal related to Transmission Facilities which caps project construction costs (either in whole or in part), project total return on equity

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(including incentive adders), or capital structure. In scrutinizing the cost of project proposals, the Office of Interconnection shall determine for each project finalist's proposal, including any Transmission Owner Upgrades, the comparative risks to be borne by ratepayers as a result of the proposal's binding cost commitment or the use of non-binding cost estimates. Such comparative analysis shall detail, in a clear and transparent manner, the method by which the Office of Interconnection scrutinized the cost and overall cost-effectiveness of each finalist's proposal, including any binding cost commitments. Such comparative analysis shall be presented to the TEAC for review and comment. In evaluating any cost, ROE and/or capital structure proposal, PJM is not making a determination that the cost, ROE or capital structure results in just and reasonable rates, which shall be addressed in the required rate filing with the FERC.

Stakeholders seeking to dispute a particular ROE analysis utilized in the selection process may address such disputes with the Designated Entity in the applicable rate proceeding where the Designated Entity seeks approval of such rates from the Commission. PJM may modify the technical specifications of a proposal, including to avoid a Resiliency Failure, which would result in the modified proposal being determined to be the more efficient or cost-effective proposal for recommendation to the PJM Board. The proposing entity can continue to be the Designated Entity for the project excluding any facilities or equipment added to the proposal as a result of PJM's modification. The additional facilities will be designated consistent with Section 1.5.8(i), and including, but not limited to, Section 1.5.8(l), 1.5.8(m), and Section 1.5.8(p) of this Operating Agreement. Neither PJM, the Designated Entity nor any stakeholders are waiving any of their respective FPA section 205 or 206 rights through this process. Challenges to the Designated Entity Agreements are subject to the just and reasonable standard.

(g) Procedures if No Long-lead Project or Economic-based Enhancement or Expansion Proposal is Determined to be the More Efficient or Cost-Effective Solution. If the Office of the Interconnection determines that none of the proposed Long-lead Projects received during the Long-lead Project proposal window would be the more efficient or cost-effective solution to resolve a posted violation, or system condition or would cause Resiliency Failure, the Office of the Interconnection may re-evaluate and re-post on the PJM website the unresolved violations, or system conditions pursuant to the Operating Agreement, Schedule 6, section 1.5.8(b), provided such re-evaluation and re-posting would not affect the ability of the Office of the Interconnection to timely address the identified reliability need. In the event that re-posting and conducting such re-evaluation would prevent the Office of the Interconnection from timely addressing the existing and projected limitations on the Transmission System that give rise to the need for an enhancement or expansion, the Office of the Interconnection shall propose a project to solve the posted violation, or system condition for inclusion in the recommended plan and shall present such project to the Transmission Expansion Advisory Committee for review and comment. The Transmission Owner(s) in the Zone(s) where the project is to be located shall be the Designated Entity(ies) for such project. In determining whether there is insufficient time for re-posting and re-evaluation, the Office of the Interconnection shall develop and post on the PJM website a transmission solution construction timeline for input and review by the Transmission Expansion Advisory Committee that will include factors such as, but not limited to: (i) deadlines for

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obtaining regulatory approvals, (ii) dates by which long lead equipment should be acquired, (iii) the time necessary to complete a proposed solution to meet the required in-service date, and (iv) other time-based factors impacting the feasibility of achieving the required in-service date. Based on input from the Transmission Expansion Advisory Committee and the time frames set forth in the construction timeline, the Office of the Interconnection shall determine whether there is sufficient time to conduct a re-evaluation and re-post and timely address the existing and projected limitations on the Transmission System that give rise to the need for an enhancement or expansion. To the extent that an economic constraint remains unaddressed, the economic constraint will be reevaluated and re-posted.

(h) Procedures if No Short-term Project Proposal is Determined to be the More Efficient or Cost-Effective Solution. If the Office of the Interconnection determines that none of the proposed Short-term Projects received during a Short-term Project proposal window would be the more efficient or cost-effective solution to resolve a posted violation or system condition or would cause a Resiliency Failure, the Office of the Interconnection shall propose a Short-term Project to solve the posted violation, or system condition for inclusion in the recommended plan and will present such Short-term Project to the Transmission Expansion Advisory Committee for review and comment. The Transmission Owner(s) in the Zone(s) where the Short-term Project is to be located shall be the Designated Entity(ies) for the Project.

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(i) Procedures if PJM Proposes the More Efficient or Cost-Effective Solution. Except in the case of Substation Contingency Resilience Criteria, if PJM proposes the more efficient or cost-effective solution, then PJM will use a fair and not unduly discriminatory process to grant an incumbent or non-incumbent developer the right to build and own the selected solution.

(j) Procedures for Substation Contingency Resilience Criteria projects. If PJM recommends a transmission enhancement or expansion that mitigates a Substation Contingency Resilience Criteria violation, then PJM will use a fair and not unduly discriminatory process to grant an incumbent or non-incumbent developer the right to build and own the selected solution. Only those entities pre-qualified to be a Designated Entity and who have executed necessary confidentiality agreements may participate in the competitive process. In addition, PJM will not recommend any transmission enhancement or expansion to the PJM Board that mitigates a Substation Contingency Resilience Criteria violation and includes component(s) that require public disclosure prior to completing construction, unless the PJM State has sufficient confidentiality provisions, allowing restricted access to confidential information associated with the recommended transmission enhancement and expansion.

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