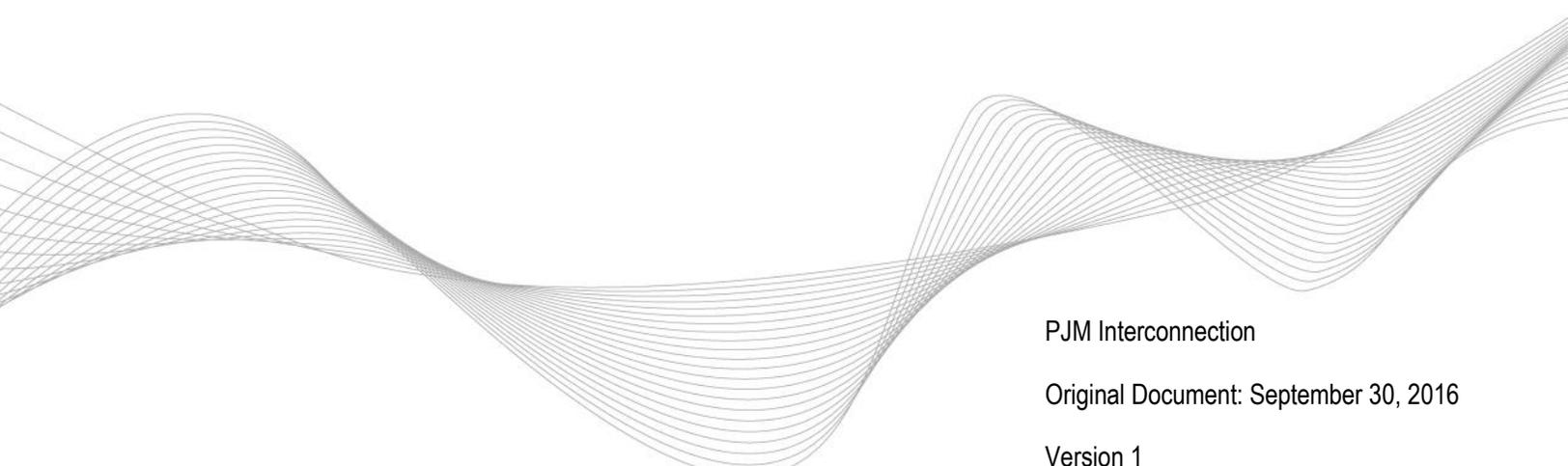




# **PJM RTEP – 2016 RTEP Proposal Window #3 Problem Statement & Requirements Document**

**Scope: 2021 Winter Reliability Analysis; 2021 Light Load  
Reliability Analysis; Short Circuit Reliability Analysis**

A decorative graphic consisting of multiple thin, overlapping grey lines that form a series of wavy, undulating shapes across the lower half of the page.

PJM Interconnection

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Version 1

**Email: [ProposalWindow-Admin@pjm.com](mailto:ProposalWindow-Admin@pjm.com) or [ProposalWindow-Tech@pjm.com](mailto:ProposalWindow-Tech@pjm.com) with any questions or clarifications and include a reference to 2016 RTEP Proposal Window #3**

**2016 RTEP Proposal Window #3**

**I. Purpose of Proposal Window**

PJM seeks technical solution alternatives (hereinafter referred to as “Proposals”) to resolve potential reliability criteria violations on facilities identified below in accordance with all applicable planning criteria (PJM, NERC, SERC, RFC, and Local Transmission Owner criteria).

**II. Criterion applied by PJM for this proposal window:**

- A) 2021 Winter - Baseline Thermal and Voltage N-1 Contingency Analysis**
- B) 2021 Winter Generator Deliverability and Common Mode Reliability Analysis**
- C) 2021 Summer Generator Deliverability and Common Mode Reliability Analysis**
- D) 2021 Winter Load Deliverability Thermal and Voltage Analysis**
- E) 2021 Winter - N-1-1 Thermal and Voltage Analysis and Voltage Collapse**
- F) 2021 Light Load - Generator Deliverability and Common Mode Reliability Analysis**
- G) 2021 Light Load - Baseline Thermal and Voltage N-1 Contingency Analysis**
- H) Short Circuit Reliability Analysis**

**III. Terminology**

For Proposal windows, PJM will distribute an Excel workbook of potential violations on facilities identified through a series of analyses. The following column headings are generally representative of the data fields that will be used to identify the specific facility and other factors of the output of this analysis. Not all column headings will appear in every sheet within the workbook. Additional information deemed necessary by PJM will be provided on a separate sheet along with the results file.

Typical thermal analysis column headings:

Column Headings	Title	Description
FG #	Flowgate Number	A sequential numbering of the identified potential violations
Fr Bus	From Bus Number	PSSE model Bus number corresponding to one end of line identified as a potential violation
Fr Name	From Bus Name	PSSE model Bus name corresponding to one end of line identified as a potential violation
To Bus	To Bus Number	PSSE model Bus number corresponding to other end of line identified as a potential violation
To Name	To Bus Name	PSSE model Bus name corresponding to other end of line identified as a potential violation
Monitored Facility	Monitored Facility	The circuit on which a potential violation is occurring
Base Rate (MVA)	Base Rate (MVA)	Normal Facility Rating (Rate A)
% Overload	Percentage Overload	Percentage above base rate
CKT	Circuit	Circuit number of identified potential violation
KVs	Kilovolt level (A/B)	Kilovolt level of both sides of potential violation, if A does not equal B, potential violation is a transformer
Areas	Area Numbers (A/B)	Area numbers of both ends of potential violation (A=From Bus Area Number, B=To Bus Area Number) If A does not equal B, potential violation is a tie line
Rating	Line Rating	Applicable Thermal rating (MVA) of line
DC Ld(%)	Direct Current Loading percentage	Percentage above 'Line Rating' determined from DC testing
AC Ld(%)	Alternating Current Loading percentage	Percentage above 'Line Rating' determined from AC testing
Cont Type	Contingency Type	Contingency Categorization (potential options include: Single, Bus, Line_FB, Tower)
Cont Name	Contingency Name	Contingency Name as identified in associated contingency file or embedded in the spreadsheet
Contingency	Contingency	Contingency Description
Violation Date	Violation Date	Date on which violation is expected to occur
Analysis Case	Analysis Case	Case title to use in replicating analysis

Typical voltage analysis column headings:

Column Headings	Title	Description
FG #	Flowgate Number	A sequential numbering of the identified potential violations
Bus #	Bus Number	PSSE model Bus number corresponding to bus identified as a potential violation

Name	Bus Name	PSSE model Bus name corresponding to bus identified as a potential violation
KV	Kilovolt level	Kilovolt level of bus identified as potential violation
Area	Area Number	Area number of bus identified as potential violation
ContVolt	Contingency Voltage (P.U.)	Per Unit Voltage at identified bus after contingency is applied
BaseVolt	Basecase Voltage (P.U.)	Per Unit Voltage at identified bus before contingency is applied
Low Limit	Low Voltage Limit(P.U.)	Threshold of Per Unit Low voltage, if ContVolt is under this limit, a potential violation is identified
Upper Limit	High Voltage Limit(P.U.)	Threshold of Per Unit High voltage, if ContVolt is over this limit, a potential violation is identified
Cont Type	Contingency Type	Contingency Categorization (potential options include: Single, Bus, Line_FB, Tower)
Vdrop(%)	Voltage drop	The Percentage that the voltage has dropped as a result of the contingency
Contingency	Contingency Name	Contingency Name as identified in associated contingency file
Contingency 1	First Contingency	N-1 (First) Contingency identified
Contingency 2	Second Contingency	N-1-1 (Second) contingency identified in N-1-1 analysis
Violation Date	Violation Date	Date on which violation is expected to occur
Analysis Case	Analysis Case	Case title to use in replicating analysis

Typical short circuit analysis column headings

Column Heading	Title	Description
BUS_NO	Bus Number	Aspen bus number where breaker is located
BUS	Bus Name & Voltage	Aspen bus name and voltage where breaker is located
BREAKER	Breaker Name	Breaker name as given by Transmission Owner
RATINGTYPE	Type of Breaker	Symmetrical(S) or Total (T) rated type of breaker
DUTY_P	Duty Percentage	percentage of the asymmetrical fault current divided by breaker capacity
DUTY_A	Asymmetrical Fault Current	The combination of the symmetrical component and the direct current component of the current.
BKR_CAPA	Breaker Capacity	Breaker's derated interrupting capability, (A)
ISC	Symmetrical Fault Current	Fault currents for applied faults
X/R	X/R Ratio	ANSI X/R ratio of the applied faults
3LG_AMPS	3 Phase Fault Current	Maximum 3LG fault current at breaker bus
3LG_X/R	3 Phase X/R Ratio	ANSI X/R ratio in 3LG fault at breaker bus
1LG_AMPS	Single Phase Fault Current	Maximum 1LG fault current at breaker bus
1LG_X/R	Single Phase X/R	ANSI X/R ratio in 1LG fault at breaker bus

	Ratio	
RATING	Breaker Rating	Applicable breaker capacity rating (MVA/kA) of breaker
ITRPT	Interrupting Time	The maximum permissible interval between the energization of the trip circuit at rated control voltage and rated mechanism pressure and the interruption of the current in the main circuit in all poles
PT1	Contact Parting Time One	Contact parting time setting for protective equipment group 1
PT2	Contact Parting Time Two	Contact parting time setting for protective equipment group 2
OPKV	Operating Voltage	The normal voltage for a device
MXKV	Maximum Voltage	The upper operating voltage limit for a device
K	Voltage Range Factor K	The range of voltage to which the breaker can be applied, equaling the maximum rated operating voltage divided by the minimum rated operating voltage
NACD	Non-ac-decay ratio of the breaker	The ratio of the breaker current from remote sources to the total breaker current.
RCLS	Reclosing Time	The time interval between energizing the trip circuit and making the primary arcing contacts

#### IV. Analysis Procedure

PJM Planning follows a documented procedure for all RTEP analysis as set forth in PJM Manual 14B. This problem statement requires participants to perform analysis and identify solutions to potential violations identified using RTEP procedures detailed in Manual 14B:

<http://pjm.com/~media/documents/manuals/m14b.ashx>

Additionally, all proposed solutions must meet the performance requirements outlined in PJM Transmission Owner Criteria:

<http://www.pjm.com/planning/planning-criteria/to-planning-criteria.aspx>

PJM performs a preliminary quality assessment of the analysis in coordination with PJM Transmission Owners, Generation Owners, Neighboring Transmission Owners, and any other affected parties. In this quality assessment PJM reviews potential violations as determined by the analytical tools used throughout RTEP analysis. Through this coordination PJM seeks to identify only the violations for inclusion in the proposal window process. As PJM works through this quality assessment and continues to develop the RTEP analysis, it is possible that identified potential violations will be removed from the potential violation list as determined by PJM Planning. It is also possible that as the analysis continues, other potential violations that were

not on the potential violation list originally are added to that list as deemed necessary by PJM Planning.

This process is intended to develop upgrades to address system reliability criteria violations and market efficiency projects. PJM will regularly retool analysis based on updated system information to ensure that solutions address the identified violations, do not cause any new violations, and are still needed to address reliability criteria and/or market efficiency projects.

PJM maintains the right to select the most appropriate project to address the violation/constraint/issue.

## V. Scope of Work

Through this Proposal window PJM is seeking solutions to identified Reliability Criteria violations.

As noted at previous TEAC meetings and in the results of the analysis for this window, PJM identified several potential issues on facilities where the loading on the facility includes a contribution from a generator that has notified PJM of their expectation to retire, but either has not yet retired or has not been retired for greater than 1 year. PJM rules require retired generators to be included in the models and simulations for 1 year after their retirement to preserve their capacity rights. Assuming generation retires as anticipated, the loading on these facilities may remain within applicable rating, and these are not likely to be criteria overloads at that time. Additionally, PJM identified several potential issues on facilities where the loading on the facility includes a contribution from a FSA generator which is currently process in PJM's Generation Interconnection queue. FSA generation does not always proceed to the ISA phase and eventual commercial operation. Due to these factors, **PJM does not intend to recommend upgrades to solve these issues at this time.**

### Objectives

1. Develop solutions to identified potential violations;
2. If solutions cause any additional violations (Such as: Thermal, Voltage, Short Circuit or Stability), they should also be addressed within proposal package; and
3. Adhere to all applicable criteria, including all PJM, NERC, SERC, RFC and Local Transmission Owner Criteria.

### What PJM Provides:

The following data and related information is required for this analysis and is expected to be available from PJM:

**Modeling Data:**

The following data is provided (Please note these files are Critical Energy Infrastructure Information (CEII) and should be handled accordingly):

1. **Base Power Flow Case(s).**
  - a. This window addresses a variety of reliability criterion that spans several corresponding power flow cases. The data in the Excel spreadsheet notes which case(s) correspond to each identified reliability criteria violation.
2. **Contingency List(s).** All Contingency Types (Single, Bus, Tower, Line w/ stuck breaker).
3. **Subsystem File(s).** Identifying all subsystem zones to be considered in analysis.
4. **Monitor File(s)** Identifying specific ranges of facilities by area and kV level to be considered in analysis.
5. **Applicable Ratings (if different from what is in case)**
6. **Excel Workbook** containing the detailed power flow results and any additional technical comments.
7. **Short Circuit base case.** This case will reflect the 2021 RTEP base case.
8. **Breaker Change Files.** All breakers in specific TO area that have been identified as overdutied will be provided.
9. **TO Criteria Setting Files.** TO files will be provided that explain the settings used for short circuit analysis for each specific TO.

**Response back to PJM (Deliverables)**

The following must be provided no later than the close of the window. Please use the PJM provided templates to describe the high level details of your proposal. Proposing entities must provide separate templates in Microsoft Excel format for every proposal. PJM will not accept proposals with multiple options. Each proposal with a unique set of electrical characteristics and/or routing characteristics must be submitted as a separate proposal. If the proposer wishes to include more detail, additional narrative may be included in the Proposal Report (Word/PDF document) added to address specifics of your proposal including, but not limited to:

1. Description of the proposed solution and corresponding violation(s) it resolves.
  - a) Describe to PJM if the project should be considered only as a whole or if portions of the project should be considered as well.
2. Detailed analysis report on proposed solutions, including:
  - a) Breaker one-line diagrams to illustrate system topology
  - b) Spreadsheets (e.g. Output of analysis showing solution to identified issue)
  - c) High level estimate of:
    - i. Time to construct the proposed solutions and the overall expected in-service date
    - ii. Cost
      - i. Cost estimates should include an itemized list of costs for each major component (e.g. substation work, transformer cost, transmission line cost).
      - ii. with a description of assumptions (e.g. base cost, risk and contingency (R&C) costs, and total cost)

- iii. Availability of right of ways
3. Incumbent vs. Non-incumbent scope of work
  - a) If a non-incumbent proposal assumes that a portion of the work will be completed by an incumbent Transmission Owner, the high level scope and itemized cost for that work shall be provided.
4. Equipment parameters and assumptions
  - a) All parameters (ratings, impedances, mileage, etc.)
  - b) For reactive devices, settings and outputs
  - c) For synchronous machines, MW and MVAR output assumptions
5. Complete set of power flow cases containing proposed solutions (all cases should be solvable, not containing any non-convergence issues, in line with industry standards). You must provide a PSS/E version 33 IDEV file so that the modeling of the proposal may be easily applied to other models (please only use unused bus numbers for the creation of new busses). Please contact PJM with any questions. Provide any other necessary data including critical contingency files to reproduce the proposed solutions (Contingency Files must be provided in one Word document for each contingency type (Single, Bus, Tower, Line Fault Stuck Breaker) with the following sections 1) Modified Contingencies 2) New Contingencies 3) deleted Contingencies). All cases and data files must be in PSS/E ver. 33 format.
6. Any other supporting documentation required by PJM that is required to perform verification review, that isn't explicitly stated in this document.
7. Submission of Deliverables
  - a) Preferred – VIA Axway Secure File Transfer portal <https://sftp.pjm.com/>
  - b) Alternate - VIA electronic mail to [ProposalWindow-Admin@pjm.com](mailto:ProposalWindow-Admin@pjm.com)
  - c) Alternate (e.g.: DVD or flash/thumb drive) - VIA FedEx to Nancy Muhl, PJM Interconnection, 2750 Monroe Boulevard, Audubon, PA 19403

PJM requires all proposal solutions, both Transmission Owner Upgrades to existing facilities and Greenfield projects, to complete the 2016 RTEP Proposal Window Template, included within the downloadable package of files. An example of how to fill out the template can be found at:

<http://www.pjm.com/~media/planning/rtep-dev/expan-plan-process/ferc-order-1000/rtep-proposal-windows/2016-rtep-proposal-window-template.ashx>

If the proposal is a Greenfield solution then, the '2016 Greenfield Project Proposal Template' included within the downloadable package of files must also be included in the project proposal package. The Greenfield template can also be found at:

<http://www.pjm.com/~media/planning/rtep-dev/expan-plan-process/ferc-order-1000/order-1000-greenfield-project-proposal-template.ashx>

Proposing entities are required to provide a public and non-public version of the project proposal. Proposing entities should expect that PJM will post the public version of the proposals after the close of the window. The public version must include redactions for any CEII

information and information which the proposing entity deems is business proprietary and confidential (Note: PJM reserves the right to review the proposing entity's proposed redactions to ensure the appropriate level of transparency while protecting confidential and proprietary information and CEII). Redaction guidelines can be found at:

<http://pjm.com/~media/planning/rtep-dev/expand-plan-process/ferc-order-1000/rtep-proposal-windows/proposal-redaction-guidelines.ashx>

## Proposal Fees

All proposals, upgrade and greenfield, submitted to 2016 RTEP Proposal Window 1 are subject to the Proposal Fee based on the following fee structure:

- No fee (\$0) for any proposed projects (upgrade and greenfield) below \$20M
- \$5,000 fee for any proposed projects (upgrade and greenfield) greater than \$20M and less than \$100M
- \$30,000 fee for any proposed projects (upgrade and greenfield) greater than \$100M

The fee is based on the total cost estimate provided by the proposing entity in the detailed proposal (must be submitted along with final proposal submissions), by the close of the day 45 days after the window opens. Total cost estimate shall include all scope elements required in proposal, including the cost estimate of upgrade work to be completed by other entities and cost estimate of work required to alleviate any new violations caused by the proposal.

## Timeline

9/30/2016, Opening of 2016 RTEP Proposal Window 3

10/31/2016, Close of 2016 RTEP Proposal Window 3

- Items due at close of 30 day window:
  - RTEP Proposal Template (Excel Spreadsheet) with initial planning level cost estimate
    - The initial cost estimate is not binding and it is PJM's intent to use this initial estimate to support the creation of an initial analytical work plan.
  - All analytical files needed for technical analysis & simulation
    - Include all results of proposer's simulations
    - E.g. all PSS/E files, contingency files, one line diagrams, etc.
  - Detailed substation (showing all breaker and transmission topology) and route diagrams
  - Pre-qualification documentation

11/15/2016, Additional 15 days after close of window for submission of detailed Greenfield Proposal document.

- Items due 45 days after window opening:

- RTEP Proposal Template (Excel Spreadsheet) updated to include both an overall project cost and detailed cost of each component
  - This cost estimate may differ from the 30 day cost estimate.
  - This is a detailed cost estimate and should include any relevant information that PJM could need to make a project selection.
  - Any cost cap or cost containment mechanisms should include enough detail for PJM to understand the implementation and impact of the cost mechanism under theoretical scenarios.
    - Describe in detail every aspect of the proposed cost where the cost mechanism does and alternatively does not apply
    - If supplemental theoretical examples of how the cost mechanism would behave under varying scenarios would benefit PJM’s understanding of the cost mechanism, include them with the project documentation.
- Greenfield RTEP Proposal document (Detailed Word/PDF Report, Redacted and Un-redacted)

Notes:

- PJM will not make any proposal details public until all items are submitted.
- Entities cannot modify intrinsic details of the proposal or make new proposals after the initial 30 day submission.

Action	Target Date
PJM distributes Problem Statement to RTEP proposal window participants	9/30 /2016
Recipients submit questions to PJM	9/30 /2016 – 10/31/2016
PJM distributes answers to questions to all recipients*	9/30 /2016 – 10/31 /2016
Recipients submit proposal template to PJM**	On or before 10/31/2016
Recipients submit detailed greenfield proposals and final cost to PJM**	On or before 11/15/2016

\*PJM will maintain confidentiality of individual proposals for the duration of the window, including the additional 15 days.

\*\*Any proposals received after close of the proposal will not be accepted.

**Document Revision History**

9/30/2016 – V1 - Original File Posted