Manual 14B Periodic Review
Summary of Changes

Stan Sliwa
Lead Engineer, Transmission Planning
Markets and Reliability Committee
December 20, 2023

300 MW Load Loss Criteria

300 MW Load Loss Criteria

- "Original intent" of 300 MW load loss criteria was to address load loss occurring over an area/many people and not necessarily for losing a single customer.
- The 300 MW total load loss limit is based, in part, on a Federal reporting requirement for major system incidents on electric power systems
  - Refer to Electric Power System Emergency Report - Form EIA-417R
- With the continued increase in large, individual block load additions like Data Centers which may impact only a single (or several) customers, the current 300 MW load loss criteria in M14B is being updated
  - Additional qualifying language is being added where losing more than 300 MW will impact numerous customers
  - Evaluation (whether to accept or mitigate 300MW load loss or higher) to be performed on a case-by-case basis

2.3.8 NERC P3 & P6 “N-1-1” Analysis

2.3.8 NERC P3 and P6 “N-1-1” Analysis

Purpose

N-1-1 studies are conducted as part of the annual RTEP to determine if all monitored facilities can be operated:

- Within normal thermal and voltage limits after N-1 (single) contingency assuming re-dispatch and system adjustments, and
- Within the applicable emergency thermal ratings and voltage limits after an additional single contingency (N-1-1) condition.

All violations of the applicable thermal ratings are recorded and reported and tentative solutions will be developed. These study results will be presented to and reviewed with stakeholders.

Model

Annually, the N-1-1 study is conducted on a 50/50 non-diversified summer and winter peak case. The case building details are defined in Attachment C (C7 3.0 Step 1: Develop Base Case). Non-firm Merchant Transmission withdrawals can be removed. All BES facilities in PJM and ties to PJM will be monitored. In addition, non-BES facilities included in the real-time congestion management facility list will be examined on the light load case. Areas of the system that become radial post-contingency will be excluded from monitoring, with the following exceptions

- If the radial system contains greater than 300 MW of load, or
- Specific local TO Planning Criteria require that it be monitored.

Contingencies considered:

- All BES single contingencies as defined in NERC P3 and P6 as well as lower voltage facilities that are monitored by PJM Operations will be included in the assessment. Non-BES contingencies, defined by Transmission Owners, need to be included to check for greater than 300 MW load loss impacting numerous customers. Non-BES facilities that are included in the assessment will also have corresponding contingencies defined.

2.9 Critical Substation Planning Analysis

PJM will evaluate all proposed system reinforcements, consistent with RTEP critical substation planning analysis methods incorporated in cascading trees tool software. This analysis is performed as part of the 5 year annual RTEP cycle, as described in Section 2.3.3 of this manual, to determine if any projects addressing other drivers cause concern from a critical substation planning analysis perspective.

Critical substation planning analysis is performed to identify Instability, Uncontrolled Separation, or Cascading resulting in one or more of the following outcomes due to the loss of all voltage levels 69 kV and above at a single transmission facility that has an "aggregate weighted value" exceeding 3000 according to the table below. The "aggregate weighted value" for a single station or substation is determined by summing the "weight value per line" shown in the table below for each incoming and each outgoing BES Transmission Line that is connected to another Transmission station or substation:

Voltage Value of a Line	Weight Value per Line
Less than 200 kV (not applicable)	(not applicable)
200 kV to 299 kV	700
300 kV to 499 kV	1300
500 kV and above	0

1. Loss of load approaching 1000 MW impacting numerous customers
    - Includes consequential load loss and tripped load
    - Total loss of load should be considered
2. Three levels of facility trips

Attachment D: PJM Reliability Planning Criteria

Attachment D: PJM Reliability Planning Criteria

The PJM Reliability Planning Criteria consist of multiple standards and applicable planning principles that include PJM planning procedures, NERC Planning Standards, NERC Regional Council planning criteria, and the individual Transmission Owner FERC filed planning criteria. PJM applies all applicable planning criteria when identifying reliability problems and determining the need for system upgrades on the PJM system. Details of specific criteria applicable to the various stages of reliability planning are discussed along with the corresponding discussion of each procedure found elsewhere in this manual.

The PJM Transmission Owners are required to follow NERC and Regional Planning Standards and criteria as well as the Transmission Owner FERC filed criteria. References to the various planning standards and criteria can be found at http://www.pjm.com/planning/planning-criteria.aspx.

- ReliabilityFirst Approved Standards will be applied for all ReliabilityFirst Bulk Electric System facilities.
- SERC Reliability Criteria will be applied to all SERC networked transmission systems rated 100 kV and higher.
- Transmission Owner standards filed in their FERC 715 filings will be applied to all facilities included in the PJM Open Access Transmission Tariff facility list. Also, interconnections to Transmission Owner facilities are subject to owner standards found at: http://www.pjm.com/planning/design-engineering.aspx (these are technical interconnection requirements and do not factor into near-term and long-term planning analyses.

PJM maintains a list (http://www.pjm.com/markets-and-operations/ops-analysis/transmission-facilities.aspx) of all PJM Open Access Transmission Tariff facilities along with which facilities are included in the PJM real-time congestion management control facility list. Both facility lists are referenced in the PJM Reliability Planning Criteria.

The PJM Generator Deliverability Procedure and Load Deliverability Procedure will be applied to all facilities in the PJM real-time congestion management control facility list. These procedures are described in Attachment C.

For all tests, PJM will not accept a loss of load of more than 300 MW, impacting numerous customers. Attachment D-1 contains a description of the various load loss types.

Facilities included in the PJM real-time congestion management control facility list but not included in the applicable regional council planning criteria as defined in section I above will be evaluated against the following criteria. For all tests, PJM will not accept a planned loss of load of more than 300 MW impacting numerous customers. Attachment D-1 contains a description of the various load loss types referred to in this document. This criterion is in addition to, not in place of, each Transmission Owners Planning Criteria as reported in the FERC 715 filing.

- The loss of any single transmission line, cable, generator, or transformer may not result in any monitored facility exceeding the applicable emergency rating or applicable voltage limit. (The applicable emergency rating and voltage limits will be as defined in PJM Operations.) The single contingency test will be applied as per the RTEP Generator Deliverability Procedure. (See Attachment C of this PJM Manual 14B.)
- The RTEP base case which includes a 5-year horizon system representation and non-diversified forecasted 50/50 summer peak load will be used for this analysis.
- System load will be represented at an area or zone wide minimum power factor of 0.97 lagging as measured at the transmission / distribution interface point.
- The 300 MW load limit referenced above does not include load that is immediately restored via automatic switching to adjacent substations. The 300 MW load limit is meant to represent contingencies impacting numerous customers that aggregate to 300 MW or higher.
- Automatic or supervisory switching as proposed by the Transmission Owner to sectionalize the system for single contingency events must receive acceptance by PJM Operations.
- During normal conditions with all facilities initially in-service, no uncontrolled load loss or load loss due to automatic schemes is allowed for a single contingency event. Consequential load loss is allowed.

After the occurrence of the transmission line, cable, generator or transformer outage, the system must be capable of re-adjustment such that no facility exceeds the maximum continuous rating or voltage limits as defined in PJM Operations.

During maintenance of any single transmission line, cable, generator, transformer, bus or circuit breaker, the loss of a transmission line, cable, generator, or transformer may not result in any monitored facility exceeding the applicable emergency rating or voltage limit (The applicable emergency rating and voltage limits will be as defined in PJM Operations.) However, for practical purposes, PJM Planning will only include a specific bus or circuit breaker maintenance condition in all future analysis if PJM Operations experiences operational problems as a result of the bus or circuit breaker maintenance condition.

- Pre-contingency generation redispatch will be considered acceptable for mitigation of a potential overload or voltage limit.
- This test will be applied at 70% of the diversified forecasted 50/50 summer peak load, as modeled in the RTEP base case, unless the Transmission Owner provides information to PJM Operations demonstrating sufficient maintenance windows at a lower load level.
- No cascading or uncontrolled load loss is allowed under any circumstance.
- Consequential load loss is allowed.
- After occurrence of the maintenance outage and the subsequent facility outage as defined in the previous test #3, the system must be capable of re-adjustment such that no facility exceeds the maximum continuous rating or voltage limits as defined in PJM Operations.

The PJM Light Load Reliability Analysis Procedure will be applied to all facilities in the PJM real-time congestion management control facility list.

Attachment D-1: Load Loss Definitions

Attachment D-1: Load Loss Definitions

Uncontrolled Load Loss – Uncontrolled load loss would require operator interaction to prevent system cascading or to return the system to applicable ratings or voltage limits. Manual load dump as defined in PJM Operations would be included in this category. The PJM Reliability Planning Criteria does not allow for the system design to permit Uncontrolled Load Loss for any contingencies that are studied.

Examples:

- Voltage collapse
- A facility overload without automatic schemes to drop load and with no available generation to re-dispatch pre-contingency.

Consequential Load Loss – Consequential load loss occurs due to the design of the system but does not include automatic schemes designed to drop load under various conditions.

Examples:

- A transformer serving radial load that taps a networked circuit.
- Load that is served from a radial circuit.

Controlled Load Loss due to Automatic Schemes – Controlled load loss occurs due to the operation of automatic schemes that are designed to drop load under specific maintenance conditions.

Planned Load Loss = Consequential load loss + Controlled load loss due to automatic schemes.

The 300 MW total load loss limit is based, in part, on a Federal reporting requirement for major system incidents on electric power systems (refer to Electric Power System Emergency Report - Form EIA-417R) impacting numerous customers.

Non-Consequential Load Loss – If situations arise that are beyond the control of PJM that prevent the implementation of a Corrective Action Plan in the required timeframe, then Non-Consequential Load Loss and curtailment of Firm Transmission Service are permitted to correct the situation that would normally not be permitted in Table 1, provided that PJM documents that they are taking actions to resolve the situation. PJM shall document the situation causing the problem, alternatives evaluated, and the use of Non-Consequential Load Loss or curtailment of Firm Transmission Service.

For Table 1 contingency categories that permit non-consequential load loss, PJM will only use this allowance for facilities that become radial after the contingency. Under such conditions, PJM will not allow any more than 300 MW of non-consequential load loss impacting numerous customers.

FAC-002-4
Qualified Change

- **Title:** Facility Interconnection Studies
- **Purpose:** To study the impact of interconnecting new or changed Facilities on the Bulk Electric System
- **Responsible Entities:** PC, TP, TO, DP, GO & Applicable GO (1)
- **Effective Date of Standard:** 1/1/2024

(1) Generator Owner with a fully executed Agreement to conduct a study on the reliability impact of interconnecting a third party Facility to the Generator Owner's existing Facility that is used to interconnect to the Transmission system.

FAC-002-4 Changes

- Under FAC-002-4, PJM as Planning Coordinator is required to maintain a publicly available definition of qualified change for the purposes of facility interconnection as per new Requirement R6
- Attachment G.12 is being added to M14B to define qualified change for existing interconnections of:
  - Generation
  - Transmission
  - Electricity end-user Facilities

Attachment G.12 NERC Standard FAC-002 – Facility Interconnection Studies

G.12 NERC Standard FAC-002 – Facility Interconnection Studies

Background

As the Transmission Planner and Planning Coordinator, PJM is responsible for the development of the Regional Transmission Expansion Plan (RTEP) for the PJM system. The planning process which ultimately culminates in the PJM RTEP base case is driven by three planning paths. The three paths include planning activities associated with:

- Baseline Projects
- Supplemental Projects
- Customer-Funded Upgrades

Each of the planning activities examine the reliability impact of: (i) interconnecting new generation, transmission, or electricity end-user Facilities and (ii) existing interconnections of generation, transmission, or electricity end-user Facilities seeking to make a qualified change as defined by PJM under Requirement R6 of FAC-002.

Qualified Change

For the purposes of FAC-002 R6, PJM defines a **qualified change** for a facility interconnection as follows:

Table G.12.1 Qualified Change for End-User Facilities

Description	Examples
Facility change leading to change in: a) End-User Facility topology or b) Protection system changes impacting contingency definition or c) The electrical characteristics of the facility or d) Facility ratings that either of which may impact BES performance	• Increase or decrease in load • Changes to the number of feeds to an existing End-User Facility

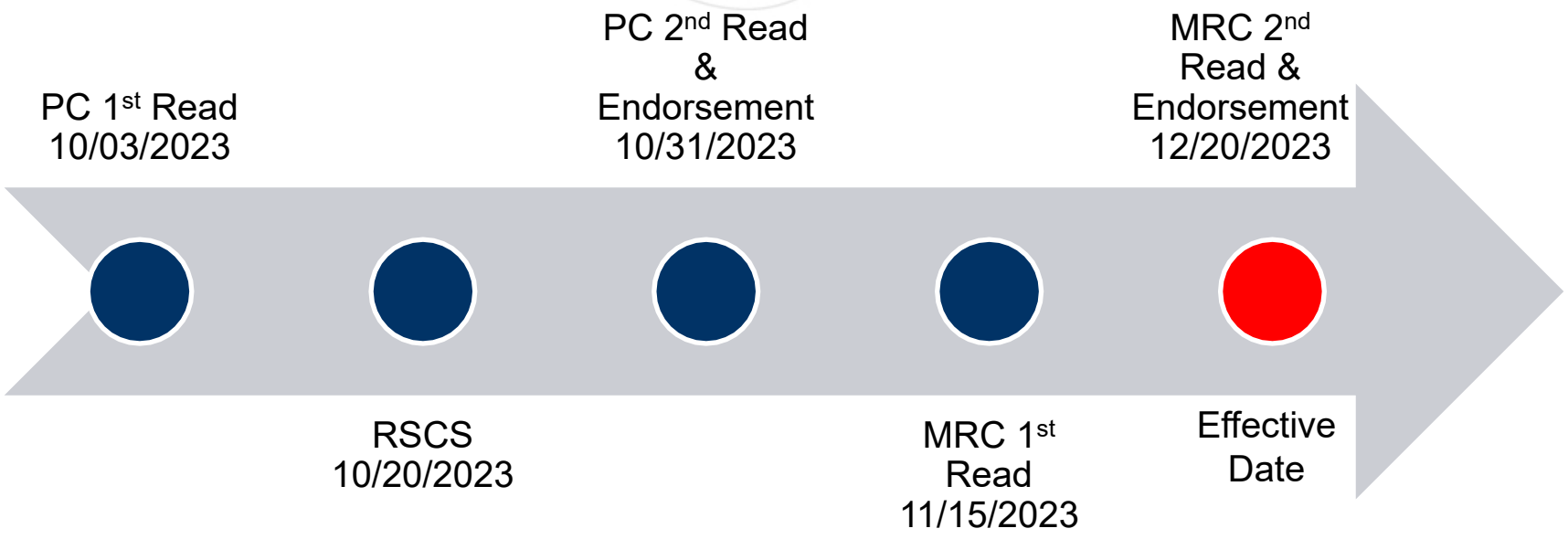
Table G.12.2 Qualified Change for Transmission

Description	Examples
Facility change leading to change in: a) Transmission system topology or b) Protection system changes impacting contingency definition or c) The electrical characteristics of the facility or d) Facility ratings that either of which may impact BES performance	• Increase or decrease in rating • Change in facility impedance • Reconfiguration

Table G.12.3 Qualified Change for Generation

Description	Examples
GO reports anticipated changes of the electrical characteristics following execution of the applicable interconnection agreement. PJM evaluation of changes requires more detailed analytical studies.	• Change in generator electrical characteristics • Change in turbine type

Review and Approval Timeline



Contact

Facilitator:
Stu Bresler, Stu.Bresler@pjm.com

Secretary:
Dave Anders,
David.Anders@pjm.com

SME/Presenter:
Stan Sliwa, Stanley.Sliwa@pjm.com

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

Manual 14B Periodic Review
Summary of Changes

Revision History

Version No.	Date	Description
1	12/13/2023	• Original slides posted

PROTECT THE POWER GRID

THINK BEFORE YOU CLICK!

Be alert to malicious phishing emails.

Report suspicious email activity to PJM.

(610) 666-2244 / it_ops_ctr_shift@pjm.com