FERC FORM 715

ANNUAL TRANSMISSION PLANNING AND EVALUATION REPORT

Part 4: Transmission Planning Reliability Criteria

Transmitting Utility Name AMP Transmission, LLC

April 1, 2024

AMP Transmission, LLC

TRANSMISSION PLANNING CRITERIA

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1.0 Background

This document provides the local planning criteria which will determine the reinforcements and enhancements to the AMP Transmission, LLC (AMPT) transmission system.

These AMPT Transmission Planning criteria ensure compliance with the Transmission Planning standards of the North American Electric Reliability Corporation (NERC), ReliabilityFirst (RF), and PJM. AMPT is a Transmission Owner (TO) member of the PJM Interconnection Regional Transmission Organization. AMPT subscribes to and designs its Bulk Electric System (BES) and all networked non-BES transmission facilities to comply with the reliability principles and responsibilities set forth in PJM's business practice manuals.

The Federal Energy Regulatory Commission (FERC) requires all transmission providers that own, operate, or control facilities used for transmitting electric energy in interstate commerce to have on file an open access non-discriminatory transmission tariffs. PJM has these tariffs on file on behalf of its transmission-owning members to provide firm and non-firm point-to-point transmission service to other entities, as well as firm network service.

The NERC, RF, and PJM standards and requirements previously referred to above are discussed in Section 2. The AMPT Planning Adequacy Criteria are presented in Section 3. The Steady State Performance Planning Events and Parameters, such as thermal loading and voltage thresholds are presented in Section 4.

2.0 National and Regional Criteria and Guides

2.1 NERC Transmission Planning Standards

NERC was established to oversee reliability of the North American BES. NERC develops and ensures compliance with reliability standards for BES. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. NERC is the Electric Reliability Organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC consists of six Regional Entities. AMPT's transmission facilities are in the RF region.

FERC approved reliability standards can be found on the NERC website at: https://www.nerc.com/pa/Stand/Pages/AllReliabilityStandards.aspx?jurisdiction=United%20States.

2.2 ReliabilityFirst (RF) Regional Reliability Planning Standards

AMPT plans and builds its BES facilities to meet the FERC approved transmission planning requirements of NERC and RF.

2.3 PJM Planning Standards

AMPT is a Transmission Owner in the PJM footprint. PJM manages a regional planning process for generation and transmission expansion to ensure the continued reliability of the electric system. PJM annually develops a Regional Transmission Expansion Plan (RTEP) to meet system enhancement requirements for firm transmission service, load growth, interconnection requests and other system enhancement drivers. The criteria PJM uses in developing the RTEP are set forth in PJM Manual 14 series, available at: https://www.pjm.com/library/manuals.aspx.

3.0 AMPT Transmission Planning Adequacy Criteria

3.1 Planning Principles and Standards

AMPT's planning criteria may impose more stringent standards than PJM, NERC, or RF. These standards often arise to address specific system conditions. In the event that the standards of these organizations are adjusted and impose more stringent requirements than those defined in this document, those more stringent requirements will prevail.

In general, AMPT's transmission system is planned to withstand forced outages of generators and transmission facilities, individually and combined. Section 4 describes the contingencies and measurements AMPT utilizes in testing and assessing the performance of its transmission system.

For all testing conditions, stability of the network shall be maintained, and cascading outages shall not occur (see Section 3.2.2). Specific modeling considerations are adhered to as part of the testing conditions outlined in the PJM Manual 14 series.

The transmission system must perform reliably for a wide range of conditions. Because system operators can exercise only limited direct control, it is essential that studies be performed in advance to identify the facilities necessary to ensure a reliable transmission system in future years.

If the criteria described in this document cannot be met, mitigation plans and/or operating procedures will be developed. A valid mitigation plan (or "Corrective Action Plan") will bring the system into compliance through a variety of feasible options. Some examples can be found within TPL-001-5.1 Section B, R2.7.

3.2 Detailed Adequacy Criteria

3.2.1 System Load Level

3.2.1.1 Peak Period Studies

The peak load period is studied to determine future requirements for the transmission system. The basic references for system peak load to be used in studies for future years are the totals provided by the PJM Load Analysis Subcommittee.

3.2.1.2 Off-Peak Period Studies

Studies will also be conducted for the purpose of determining risks and consequences during light load or shoulder conditions and for any other period for which system adequacy cannot be evaluated from peak period study results. For these off-peak periods, it is assumed that the number of hours of occurrence is substantially higher than the number of hours at or near peak load levels.

3.2.2 Extreme Event Contingencies

In addition to events and circumstances described in NERC TPL-001 Table 1, more severe but less probable scenarios (i.e., extreme) will also be considered for analysis to evaluate the resulting consequences. As permitted in the NERC TPL Standard, judgment shall dictate

whether and to what extent a mitigation plan would be appropriate. Such events are listed in the "Steady State & Stability Performance Extreme Events" section of Table 1 of TPL-001-5.1. The transmission system will be evaluated for the risks and consequences of each of these extreme contingencies.

Extreme Event (EE) N-2 events (e.g., EE1) will utilize PJM's tool that generates N-2 Extreme Event Contingencies based on the RTEP single contingencies, and PJM evaluates EE in accordance with the NERC TPL-001-5.1 reliability standard. The rationale for selecting all applicable extreme event scenarios is based on historical operational performance knowledge of the transmission system, and concerns that these contingencies may potentially trigger a larger than expected outage on the transmission system.

AMPT will follow PJM guidance when conducting cascade analysis. This topic is addressed in PJM Manual 14B. Specifically in Manual 14B, refer to Sections 2.9 "Critical Substation Planning Analysis" and 2.3.8 NERC P3 and P6 "N-1-1" Analysis.

3.2.3 Equipment Thermal Ratings

Consistent with PJM criteria, AMPT has three sets of thermal limits for all monitored equipment: Normal limit (continuous), Emergency limit (long-term, or LTE, and short-term, or STE, are set equal unless specifically approved otherwise) and Load Dump limit (LD).

Acceptable equipment loading levels for P0 – P7 events are described in Table R1 under the "Allowable Contingency Loading" column.

Table R1 specifies the conditions analyzed for the purpose of identifying any thermal violations. Thermal capability is given with equipment ratings in Amps or MVA. The thermal equipment loadings on the transmission system shall be within acceptable limits, both during normal operation and for an appropriate range of potential system faults and equipment outages.

Contingency conditions shall not result in equipment loading beyond emergency limits. The emergency limits can vary based on equipment type and allowable time period.

Loading on facilities over their applicable ratings but below Load Dump ratings, following a contingency, must be adjusted back down to the normal or emergency rating, as indicated in Table R1, using system readjustments, some of which are listed below in Section 3.2.4.

3.2.4 Voltage Limits

The voltages on the transmission system shall be within acceptable limits, both during normal operation and for an appropriate range of potential system faults and equipment outages. The contingency conditions shall not result in voltages beyond emergency limits.

Voltage limits are in reference to the nominal design voltage and acceptable voltage deviation, both shown in per unit (pu). Adherence to the criteria given in this table ensures that the AMPT transmission system meets the applicable reliability requirements of NERC, RF and PJM.

Bus voltage magnitude limits and post-contingency voltage deviations limits are described in Table R1, with respect to the bus voltage level. Non-load serving buses that are no longer

networked because of post-contingency topology changes (e.g., N-1-1 contingency scenarios), leading them to be radially fed, are not held to these voltage magnitude and deviation limits.

System readjustment is allowed when attempting to reduce line loadings or improve a voltage profile. System readjustments considered in a planning analysis include but are not limited to:

- Load tap changer adjustment
- Circuit breaker switching
- Modification of Generator voltage schedules
- Load transfers
- Shunt capacitor bank switching
- Generation redispatch

3.2.5 Reactive Power Planning

The objective of system reactive power planning is to efficiently coordinate the reactive requirements of the transmission and distribution systems to satisfy voltage criteria. Meeting this objective ensures voltage stability, provides generator auxiliary power systems and the distribution system with adequate voltage, and minimizes transmission losses and reactive interchange. System reactive requirements can be supplied by generating units, transmission, sub-transmission, and distribution level shunt capacitors, synchronous condensers and by a variety of solid-state reactive compensation devices (i.e., SVCs, STATCOMS, etc.).

AMPT will determine the optimal network location for reactive support. Sufficient reactive capacity shall be installed to minimize reactive power flow.

The AMPT transmission system is planned so that transmission voltages will be maintained within an acceptable range for normal and emergency conditions as described in Table R1.

3.2.6 Short Circuit Testing Criteria

A circuit breaker shall have sufficient capability to interrupt all applicable single-phase to ground or three-phase faults at a voltage of 1.05 pu. New breakers shall be designed to handle the maximum fault current plus a margin to account for future growth.

4.0 TABLE R1 – STEADY STATE PERFORMANCE PLANNING EVENTS & PARAMETERS

Category[1, 4]	Initial Condition[4]	Event[2, 3, 4]	Allowable Contingency Loading[4]	Voltage (pu)[4]	Post-Contingency Voltage Deviation Limit[4]
P0 No Contingency	Normal System	None	All facilities within Normal Ratings	0.95 min 1.05 max	N/A
P1 Single Contingency	Normal System	**Loss of one of the following:** 1. Generator 2. Transmission Circuit 3. Transformer 4. Shunt Device	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.
P2 Single Contingency	Normal System	1. Opening of a line section w/o a fault 2. Bus Section Fault 3. Internal Breaker Fault (Non-Bus-tie Breaker) 4. Internal Breaker Fault (Bus-tie Breaker)	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.
P3 Multiple Contingency	Loss of generator unit followed by system adjustments	**Loss or opening one of the following:** 1. Generator 2. Transmission Circuit 3. Transformer 4. Shunt Device	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.
P4 Multiple Contingency (Fault plus stuck breaker)	Normal System	**Loss of multiple elements caused by a stuck breaker (non-bus-tie Breaker) attempting to clear a Fault on one of the following:** 1. Generator 2. Transmission Circuit 3. Transformer 4. Shunt Device 5. Bus section 6. Loss of multiple elements caused by a stuck breaker (Bus-tie Breaker) attempting to clear a Fault on the associated bus	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.

Category[1, 4]	Initial Condition[4]	Event[2, 3, 4]	Allowable Contingency Loading[4]	Voltage (pu)[4]	Post-Contingency Voltage Deviation Limit[4]
P5 Multiple Contingency (Fault plus relay failure to operate)	Normal System	**Delayed Fault Clearing due to the failure of a non-redundant component of a Protection System protecting the Faulted element to operate as designed, for one of the following:**	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.
		1. Generator			
		2. Transmission Circuit			
		3. Transformer			
		4. Shunt Device			
		5. Bus Section			
P6 Multiple Contingency (Two overlapping singles)	**Loss or opening of one of these events followed by system adjustments:**	**Followed by the loss or opening of one of the following:**	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.
	1. Transmission Circuit	1. Transmission Circuit			
	2. Transformer				
	3. Shunt Device	2. Transformer			
		3. Shunt Device			
P7 Multiple Contingency (Common Structure / Right-of-way)	Normal System	**Loss of:**	All facilities within Emergency Ratings	0.92 min 1.05 max	0.08 p.u.
		1. Two adjacent circuits on common Structures			

1. AMPT determines and implements upgrade solutions as necessary to resolve reliability concerns identified for the P1 through P7 category events described in this table. After assessment of events, AMPT, at its own discretion, determines if there is a need to mitigate reliability exposure associated with extreme events, and what upgrades, if any, are necessary to address any concerns.
2. AMPT does not currently possess, nor does it anticipate acquiring, any "Single Pole of a DC Line" equipment as is called for in TPL-001-5.1 Table 1 Events
3. Follows the latest criteria/events specified in NERC TPL-001-5.1
4. Applies to BES and Non-BES AMPT Transmission Facilities.

5.0 Revision History

Date	Version Number	Reviewed and Approved By:	Revision Description
04/01/2023	001	Alexandros Lousos – Director of Transmission Planning	Updated AMPT 715 Form for compliance with new released TPL-001-5.1
04/01/2024	002	Alexandros Lousos – Director of Transmission Planning	Yearly update to FERC Form 715. Removed references to NERC TPL-001-4. Renamed Planning Events Table to Table R1.