

Appendix J - Contingency List and Criteria/Limits

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Table 1 - NORMAL System Condition Contingencies and Criteria/Limit

		SOL / IROL Criteria			System Limits and Criteria	
Category	Contingency Event (loss of)	Respected for SOL Thermal / Voltage	Respected for SOL Stability	Respected for IROL Thermal / Voltage / Stability	Thermal Limits Applied	Voltage Limits Applied
NORMAL System Conditions	None	yes	yes	yes	Normal	NORMVL
	1) Transmission circuit (opening all ends of the line)	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	2) Transformer	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	3) Bus section	NO	yes	yes	STE to Normal ¹	STEVL to NORMVL
	4) Shunt device	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	5) Circuit breaker	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	6) Generator	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	7) Loss of a single element (contingencies 1,2,3,4 and 6) followed by a failure of a breaker to operate (i.e. stuck breaker) including a breaker switched by a RAS or ACS ²	NO	yes	yes	STE to Normal ¹	STEVL to NORMVL
	8) All poles of an HVDC facility	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	9) Two adjacent transmission circuits on a multiple circuit tower (i.e. double circuit tower or DCT)	NO	yes	yes	STE to Normal ¹	STEVL to NORMVL

Table 2 - EMERGENCY System Condition Contingencies and Criteria/Limits

		SOL / IROL Criteria			System Limits and Criteria	
Category	Contingency Event (loss of)	Respected for SOL Thermal / Voltage	Respected for SOL Stability	Respected for IROL Thermal / Voltage / Stability	Thermal Limits Applied	Voltage Limits Applied
EMERGENCY System Conditions	None	yes	yes	yes	Normal	NORMVL
	1) Transmission circuit (opening all ends of the line)	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	2) Transformer	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	3) Bus section	NO	NO	NO	STE to Normal ¹	STEVL to NORMVL
	4) Shunt device	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	5) Circuit breaker	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	6) Generator	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	7) Loss of a single element (contingencies 1,2,3,4 and 6) followed by a failure of a breaker to operate (i.e. stuck breaker) including a breaker switched by a RAS or ACS ²	NO	NO	NO	STE to Normal ¹	STEVL to NORMVL
	8) All poles of an HVDC facility	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL
	9) Two adjacent transmission circuits on a multiple circuit tower (i.e. double circuit tower or DCT)	NO	NO	NO	STE to Normal ¹	STEVL to NORMVL

Table 3 - NORMAL System Condition Contingencies, Criteria and Limits, with Guidance for System Analysis													
		SOL/IROL Criteria			System Limits and Criteria		For System Analysis Use Only Fault and/or Condition Applied to Simulate Contingency Event						
Category	Contingency Event (loss of)	Respected for SOL Thermal / Voltage	Respected for SOL Stability	Respected for IROL Thermal / Voltage / Stability	Thermal Limits Applied	Voltage Limits Applied	No fault	2) No fault and failure of a circuit breaker to operate when initiated by a RAS or ACS	3a) single phase to ground fault with normal clearing ³ & correct operation of a RAS or ACS	3) single phase to ground fault with normal clearing ³ & failure of a circuit breaker to operate when initiated by a RAS or ACS	4) single phase to ground fault with delayed clearing ³	5) three phase to ground fault with normal clearing ³ & correct operation of a RAS or ACS	Simultaneous single line to ground faults on adjacent transmission circuits with normal clearing ³
NORMAL System Conditions	None	yes	yes	yes	Normal	NORMVL							
	1) Transmission circuit (opening all ends of the line)	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	2) Transformer	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	3) Bus section	NO	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	4) Shunt device	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	5) Circuit breaker	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	N/A	N/A	N/A	N/A	N/A
	6) Generator	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	7) Loss of a single element (contingencies 1,2,3,4 and 6) followed by a failure of a breaker to operate (i.e. stuck breaker) including a breaker switched by a RAS or ACS ²	NO	yes	yes	STE to Normal ¹	STEVL to NORMVL	N/A	X	N/A	X	X	N/A	N/A
	8) All poles of an HVDC facility	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	N/A	N/A	N/A	N/A	N/A
	9) Two adjacent transmission circuits on a multiple circuit tower (i.e. double circuit tower or DCT)	NO	yes	yes	STE to Normal ¹	STEVL to NORMVL	N/A	N/A	N/A	N/A	N/A	N/A	X

Table 4 - EMERGENCY System Condition Contingencies, Criteria and Limits, with Guidance for System Analysis													
		SOL/IROL Criteria			System Limits and Criteria		For System Analysis Use Only Fault and/or Condition Applied to Simulate Contingency Event						
Category	Contingency Event (loss of)	Respected for SOL Thermal / Voltage	Respected for SOL Stability	Respected for IROL Thermal / Voltage / Stability	Thermal Limits Applied	Voltage Limits Applied	No fault	2) No fault and failure of a circuit breaker to operate when initiated by a RAS or ACS	3a) single phase to ground fault with normal clearing ³ & correct operation of a RAS or ACS	3) single phase to ground fault with normal clearing ³ & failure of a circuit breaker to operate when initiated by a RAS or ACS	4) single phase to ground fault with delayed clearing ³	5) three phase to ground fault with normal clearing ³ & correct operation of a RAS or ACS	Simultaneous single line to ground faults on adjacent transmission circuits with normal clearing ³
EMERGENCY System Conditions	None	yes	yes	yes	Normal	NORMVL							
	1) Transmission circuit (opening all ends of the line)	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	2) Transformer	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	3) Bus section	NO	NO	NO	STE to Normal ¹	STEVL to NORMVL	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	4) Shunt device	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	5) Circuit breaker	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	N/A	N/A	N/A	N/A	N/A
	6) Generator	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	X	N/A	N/A	X	N/A
	7) Loss of a single element (contingencies 1,2,3,4 and 6) followed by a failure of a breaker to operate (i.e. stuck breaker) including a breaker switched by a RAS or ACS ²	NO	NO	NO	STE to Normal ¹	STEVL to NORMVL	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	8) All poles of an HVDC facility	yes	yes	yes	STE to Normal ¹	STEVL to NORMVL	X	N/A	N/A	N/A	N/A	N/A	N/A
	9) Two adjacent transmission circuits on a multiple circuit tower (i.e. double circuit tower or DCT)	NO	NO	NO	STE to Normal ¹	STEVL to NORMVL	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note ¹: Flow above LTE limit but below STE limit can be used if flow can be returned below LTE limit within 15 minutes; otherwise, a lower rating will be used.

Note ²: This test is concerned with the failure of a RAS / ACS to trip a breaker. RAS / ACS are tested due to potential protection of an IROL; Limited Impact RAS / ACS are designed to protect SOLs only and are not tested.

Note ³: Normal and delayed fault clearing as defined by NPCC.

OP-19 Appendix J Revision History

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
Rev 0	09/02/12	Initial version of this document
Rev 0.1	05/07/14	Periodic review performed requiring no changes; Made administrative changes required to publish a Minor Revision per SOP-RTMKTS.0201.0010 Section 5,6 and sub-Section 5.6.1;
Rev 0.2	03/04/15	Periodic review performed by procedure owner, requiring no changes; Completed the administrative changes required to publish this Minor Revision per SOP-RTMKTS.0210.0010 Section 5.6 and sub-Section 5.6.1;
Rev 1	06/15/15	Globally updated tables for creation of voltage SOL limits
Rev 2	06/03/16	Annual review by procedure owner performed requiring no changes Normal Feedback Provider and Approval processes completed, no changes required;
Rev 3	04/14/17	Annual review by procedure owner, requested completion of normal Feedback Provider comment/feedback and Approval processes; Completed the administrative changes (including adding required corporate identity to all footers) required to publish the next Revision; Globally made editorial changes required to replace "DC" with "HVDC";
Rev 3.1	02/26/18	Annual review by procedure owner performed requiring no change; Made administrative changes required to publish a Minor Revision per SOP-RTMKTS.0201.0010 Section 5,10 and sub-Section 5.10.1;
Rev 3.2	01/31/19	Periodic review performed requiring no changes; Made administrative change required to publish a Minor Revision per SOP-RTMKTS.0201.0010 Section 5,10 and sub-Sections 5.10.1.A and B;
Rev 3.3	09/09/19	Periodic review performed requiring no changes; Made administrative change required to publish a Minor Revision per SOP-RTMKTS.0201.0010 Section 5,10 and sub-Sections 5.10.1.A and B;
Rev 4	08/07/20	Annual review performed by procedure owner; Globally modified HVDC contingency and criteria to agree with NPCC Directory 1, edited line 8, deleted line 9 and renumbered remaining rows;
Rev 5	06/03/21	Annual review performed by procedure owner; modified SPS terminology and Notes to reflect NERC RAS definition and application.
Rev 5.1	05/04/22	Annual review performed by procedure owner
Rev 5.2	05/02/23	Annual review performed by procedure owner requiring no intent changes; Removed SPS language and replaced with ACS; Made administrative changes required to publish a Minor Revision.
Rev 5.3	04/24/24	Annual review performed by procedure owner requiring no intent changes; Minor formatting changes; Made administrative changes required to publish a Minor Revision.
Rev 6	04/23/25	Annual review performed by procedure owner; Updates to reflect newly published NPCC Directory #1 criteria revisions, and associated clarifications.