NEXTBRIDGE
INFRASTRUCTURE

May 17, 2018

VIA COURIER, RESS and EMAIL

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
2300 Yonge Street, 27th Floor
Toronto, ON
M4P 1E4

Dear Ms. Walli:

Re: Hydro One Networks Inc. ("Hydro One")
Ontario Energy Board ("OEB" or "Board") File EB-2017-0364
Lake Superior Link Project - Hearing of NextBridge Motion
Undertaking Responses of NextBridge

Attached please find the following undertaking responses by NextBridge taken during the Technical Conference on May 16, 2018 in the above noted proceeding.

Exhibit JT1.13
Exhibit JT1.14

Yours truly,

(Original Signed)

Krista Hughes
Senior Legal Counsel
Enbridge Employee Services Canada Inc.

UNDERTAKING JT1.13

UNDERTAKING

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NextBridge to provide the article where the quote from the memorandum of understanding comes from, or the memorandum comes from.

RESPONSE

Attached to this response is a copy of the full article excerpted at page 5 of the memorandum of Mr. Robert Nickerson. Relevant excerpts have been highlighted.

http://news.hydroquebec.com/en/news/116/ice-storm-1998-15-years-later/

January 7, 2013

News

Print

Ice Storm 1998: 15 years later

What if a storm like the one in 1998 occurred today?

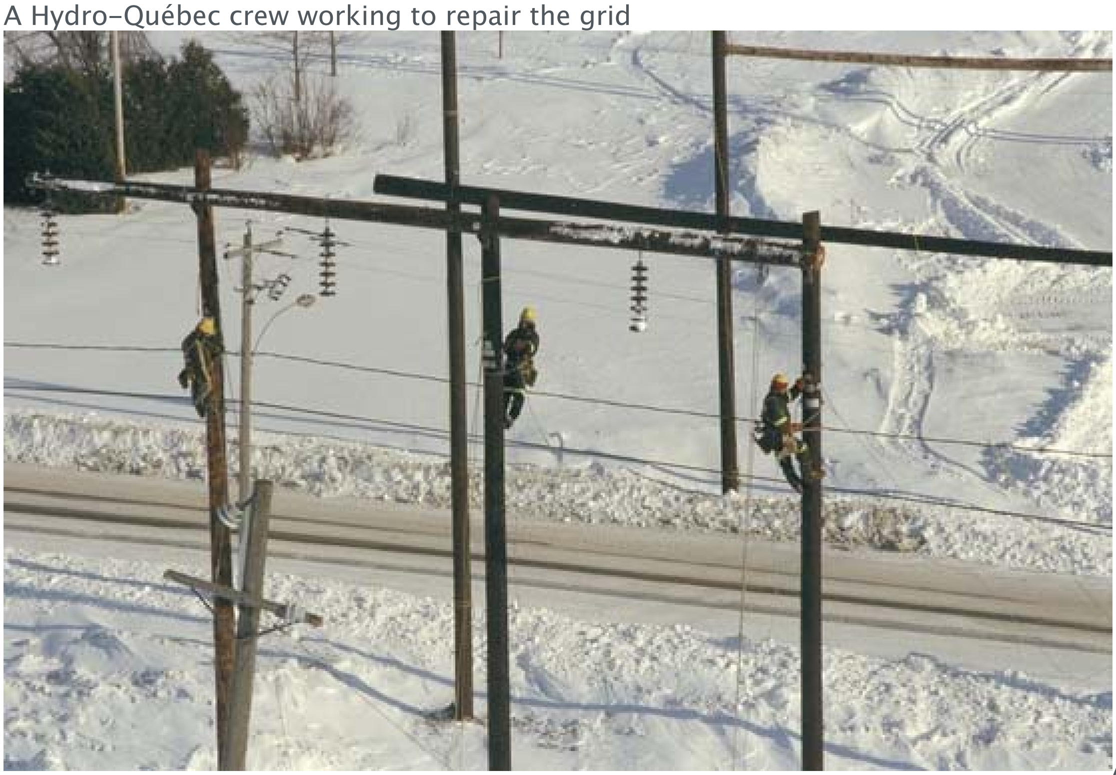
Between January 5 and 10, 1998, Québec experienced exceptionally harsh weather conditions as three successive storms left up to 110 mm of ice over the south of the province. Though robust and well-maintained, the Hydro-Québec grid suffered unprecedented damage.

In the days and weeks that followed, thousands of Hydro-Québec workers, with substantial support from colleagues from Québec companies and neighboring electrical utilities, worked relentlessly to restore power in the regions hardest hit.

By late January, most customers again had power. However, the efforts to ensure a secure power supply did not end there.

Major investments have made the Hydro-Québec grid of today much more robust and better able to withstand the impacts of extreme weather events like the ice storm. As a result, Hydro-Québec is now able to restore service to its customers more quickly.

A Hydro-Québec crew working to repair the grid



A Hydro-Québec crew working to repair the grid.

http://news.hydroquebec.com/en/news/116/ice-storm-1998-15-years-later/

In brief

Jean-Pierre Giroux, director of Planning at Hydro-Québec TransÉnergie, provides an overview of the improvements made to the lelectricity transmission and distribution networks.

What has been done since 1998 to minimize the effect of similar weather events in the future?
Like other regions of the world, Québec is not immune to extreme meteorologic conditions. We cannot control Nature but we can control how we act and minimize the impacts of such events. We have invested on a number of fronts to reinforce our power network and improve its performance under harsh climatic conditions.

Thousands of poles, towers and kilometers of lines fell in 1998, often through a domino effect, sometimes increasing by 80% the time it took to restore service to our customers.

Now, our new construction standards limit the potential for that effect. The mechanical strength of our grid has been increased. For instance, by making every tenth tower along a transmission line a very robust anti-cascading tower, we limit the damage that results from the collapse of a single tower.

On the distribution system, we have strengthened poles and their anchoring. We thus ensure that the poles remain intact despite high wind and ice loading. Only the conductors fall, not the poles. Such measures make it possible to restore service more quickly.

Since 1998, all new lines have been built to these tougher engineering standards.

Hydro-Québec has also changed the configuration of its transmission system to make energy sources more secure and to include redundant sources of supply in case of line failures. These "loops" permit the delivery energy over different paths.

Furthermore, if a satellite substation on the transmission grid is lost, certain distribution lines can provide backup from another substation in order to supply customers.

How does maintenance work help make the grid more robust?

A good example is our effort in the area of vegetation control near transmission and distribution lines, a job that plays a huge role in protecting our power system from the impact of weather events like the ice storm.

Many power failures are caused by contact between branches and power lines. The farther vegetation can be kept away, the better the grid will withstand storms.

If the 1998 storm happened now, how would the power system respond?

Restoration times would be much shorter.

http://news.hydroquebec.com/en/news/116/ice-storm-1998-15-years-later/

This is because efforts to reinforce the grid, such as creating loops, strengthening facilities and pruning trees, would reduce the number of customers affected and the extent of damage. Repair efforts would thus be more localized and take less time.

Additional information

-Vegetation control

Vegetation control plays a key role in preventing power failures by maintaining clearance around power lines. Efforts were intensified following the 1998 ice storm.

Vegetation growing too close to power lines causes short circuits, which can result in power outages.

During wind or ice storms, if trees are too close to distribution lines, falling branches can damage them and greatly increase the time needed to restore electrical service.

This is why Hydro-Québec carries out preventive pruning to ensure that you have reliable service.

For more information on vegetation control:
www.hydroquebec.com/vegetation/en/pop-animation (This hyperlink will open a new window)

-R&D's decisive role

Major research and development efforts to better understand events and to strengthen facilities began immediately after the ice storm and continue today.

Test lines have been built at Hydro-Québec's research institute, IREQ, in order to replicate icing conditions, and to test and validate specific designs and parameters.

Certain results have been incorporated into Hydro-Québec construction standards and methods, while various research projects have helped or will help to make the power system more robust.

Innovations include the new generation of insulators now installed to better protect facilities and interphase spacers that curb the effects of galloping, high-amplitude oscillations along overhead conductors.

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To provide copies of the NPCC standards referred to

RESPONSE

Attached to this response is a copy of an excerpt from the Northwest Power Coordinating Council, Inc. Regional Reliability Reference Directory #1 – Design and Operation of the Bulk Power System standard referred to in the memorandum of Mr. Richard Bolbrock. The relevant excerpts are at page 13 of the PDF, note xii, page 18 of the PDF, note xiii, and pages 19-20 of the PDF.

NPCC, Inc.

NORTHEAST POWER COORDINATING COUNCIL, INC.
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Regional Reliability Reference Directory # 1
Design and Operation of the Bulk Power System

Task Force on Coordination of Planning Revision Review Record:
December 01, 2009
September 30, 2015

Adopted by the Members of the Northeast Power Coordinating Council, Inc., on December 01, 2009 based on recommendation by the Reliability Coordinating Committee, in accordance with Section VIII of the NPCC Amended and Restated Bylaws dated July 24, 2007 as amended to date.

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Revision History

Version	Date	Action	Change Tracking (New, Errata or Revisions)
0	12/1/2009		New
1	4/20/2012	Errata Changes in Appendices B and E.	Errata
2	9/30/2015	TFCP/TFCO Review	Revised

Table of Contents

1.0 Introduction

1.1 Title: Design and Operation of the Bulk Power System

1.2 Directory Number: 1

1.3 Objective:

The objective of this Directory is to provide a “design-based approach” to design and operate the **bulk power system** to a level of reliability that will not result in the loss or unintentional separation of a major portion of the system from any of the contingencies referenced in **Requirement R7** and **Requirement R13.** The intent of this approach is to avoid instability, voltage collapse and widespread cascading outages. Loss of small portions of a system (such as radial portions) may be tolerated provided these do not jeopardize the reliability of the remaining **bulk power system**.

In NPCC the technique for achieving this level of reliability is to require that the **bulk power system** be designed and operated to meet the performance requirements for the representative **contingencies** as specified in this Directory. Simulations shall be used to assess and analyze these **contingencies.** As a minimum**, contingency** events shall be applied on **bulk power system** elements and the resulting performance requirements shall be monitored on the **bulk power system.** If an entity becomes aware[1] of a **contingency** not on a **bulk power system** element that results in a **significant adverse impact** outside the **local area,** that entity must design and/or operate the system to respect that event.

The characteristics of a reliable **bulk power system** include adequate **resources** and transmission to reliably meet projected customer electricity **demand** and energy requirements as prescribed in this document.

1.4 Effective Date: December 1, 2009

1.5 Background

This Directory was developed from the NPCC A-2 criteria document - *Basic Criteria for the Design and Operation of Interconnected Power Systems* (May 6, 2004 version). Guidelines and Procedures for consideration in the implementation of this Directory are provided in the Appendices.

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[1] NPCC Members shall strive to meet the reliability objectives in this document. However, there is no affirmative requirement for an NPCC Member to explicitly identify every potential non-BPS contingency that may impact the BPS.

1.6 Applicability

1.6.1 Functional Entities

Reliability Coordinators
Transmission Operators
Balancing Authorities
Planning Coordinators
Transmission Planners
Resource Planners
Generator Owners
Transmission Owners

1.6.2 Applicability of NPCC Criteria:

The requirements of an NPCC Directory apply only to those facilities defined as NPCC **bulk power system** elements as identified through the performance based methodology of NPCC Document A-10, "*Classification of Bulk Power System Elements*," the list of which is maintained by the NPCC Task Force on System Studies and approved by the NPCC Reliability Coordinating Committee.

Requirements to abide by an NPCC Directory may also reside in external tariff requirements, bilateral contracts and other agreements between facility owners and/or operators and their assigned Reliability Coordinator, Planning Coordinator, Transmission Operator, Balancing Authority and/or Transmission Owner as applicable and may be enforceable through those external tariff requirements, bilateral contracts and other agreements. NPCC will not enforce compliance to the NPCC Directory requirements in this document on any entity that is not an NPCC Full Member.

2.0 Defined Terms:

Unless specifically noted in this document terms in bold typeface are defined in the NPCC Glossary of Terms.

3.0 NPCC Full Member Criteria:

Information for Planning and Operational Assessments

R1 Each Functional Entity that owns equipment shall submit verified information representing the physical or control characteristics of its equipment for system modelling and reliability analysis of the **bulk power system** in accordance with **Requirement R2**.

R2 Each Planning Coordinator and Reliability Coordinator shall collect and maintain information needed for system modelling and reliability analysis of the **bulk power system.**

R2.1 System modelling information shall be submitted to an NPCC Task Force upon request.

R3 Each Reliability Coordinator shall share and coordinate forecast system information and real-time information to enable and enhance the analysis and modeling of the interconnected **bulk power system** by security application software on energy management systems.

Resource Adequacy

R4 Each Planning Coordinator or Resource Planner shall probabilistically evaluate **resource** adequacy of its Planning Coordinator **Area** portion of the **bulk power system** to demonstrate that the loss of **load** expectation (LOLE) of disconnecting **firm load** due to **resource** deficiencies is, on average, no more than 0.1 days per year.

R4.1 Make due allowances for **demand** uncertainty, scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring Planning Coordinator **Areas**, transmission transfer capabilities, and **capacity** and/or **load** relief from available operating procedures.

R5 Each Planning Coordinator shall report and obtain Reliability Coordinating Committee (RCC) approval for its Review of **Resource** Adequacy. Appendix D provides guidance for the Area Review of **Resource** Adequacy.

R5.1 The Review of **Resource** Adequacy will be presented to the NPCC Task Force on Coordination of Planning (TFCP). Comprehensive and Interim reviews shall be presented to the TFCP before the beginning of the first time period covered by the assessment.

R5.2 A Comprehensive Review of **Resource** Adequacy is required every three years and will cover a time period of five years. If changes in planned facilities or forecasted system conditions warrant, TFCP may require a Comprehensive Review of **Resource** Adequacy in less than 3 years.

R5.3 In subsequent years, each Planning Coordinator shall conduct an Annual Interim Review of **Resource** Adequacy that will cover, at a minimum, the remaining years studied in the Comprehensive Review of **Resource** Adequacy.

R6 Each Reliability Coordinator shall coordinate outages and deratings of **resources** to verify adequate **resources** will be available to meet the forecasted **demand** and **reserve** requirements. Appendix F provides guidance for Operational Planning Coordination.

R6.1 A Summer and Winter Reliability Assessment will be presented to the NPCC Task Force on Coordination of Operation (TFCO) every year.

Transmission Planning

R7 Each Transmission Planner and Planning Coordinator shall plan its **bulk power system** to have sufficient transmission capability to meet the respective requirements as specified in Table 1 while serving forecasted **demand**.

R7.1 Credible combinations of system conditions which stress the system shall be modelled including, **load** forecast, inter-**Area** and intra-**Area** transfers, transmission configuration, active and reactive **resources**, **generation** availability and other dispatch scenarios. All **reclosing** facilities shall be assumed in service unless it is known that such facilities will be rendered inoperative.

R8 Each Transmission Planner and Planning Coordinator shall assess the impact of the extreme **contingencies** listed in Table 2. Appendix C provides guidance for testing and analyzing extreme **contingencies**.

R9 Each Transmission Planner and Planning Coordinator shall assess the impact of extreme system conditions, one condition at a time, subject to **contingencies** as listed in the "Extreme System Conditions" category of Table 2.

R10 Each Transmission Planner and Planning Coordinator shall have procedures and implement a system design that ensures equipment capabilities are adequate for **fault** current levels with all transmission and **generation** facilities in service for all operating conditions which are not prohibited by a procedure and coordinate these procedures with materially affected Transmission Planner and Planning Coordinator Areas.

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R11 Each Planning Coordinator shall conduct and obtain Reliability Coordinating Committee (RCC) approval for its Transmission Review. Appendix B provides guidance for Transmission Reviews.

R11.1 A Comprehensive Transmission Review is required at least once every five years or if major or pervasive system changes have occurred. If changes in the planned facilities or forecasted system conditions warrant, the Task Force on System Studies (TFSS) may require a Comprehensive Transmission Review in less than five years.

R11.2 The proposal for the type of annual Transmission Review shall be presented to TFSS by March of the year during which the review is conducted. Approval for the type of Transmission Review shall be obtained from the TFSS. The annual Transmission Review shall be presented to the TFSS by April of the following year.

R11.3 If the results of the Transmission Review indicate that the planned **bulk power system** will not be in conformance with NPCC Directory #1, the Transmission Review shall incorporate a corrective action plan to achieve conformance.

Special Protection Systems

R12 Each Functional Entity that proposes a new or modified **SPS** shall consider the complexity of the scheme and the consequences of correct or incorrect operation as well as its benefits.

R12.1 Provide a rationale and justification to the TFCP including factors such as project delays, temporary construction configurations, unusual combinations of system conditions, equipment outages and infrequent **contingencies**.

Transmission Operation

R13 Each Reliability Coordinator and Transmission Operator shall establish **normal transfer capabilities** and **emergency transfer capabilities, for** its portion of the **bulk power system** to meet the respective performance requirements for the **contingencies** as specified in Table 3.

R14 Each Reliability Coordinator and **Transmission** Operator shall operate to **normal transfer capabilities** unless an **emergency,** in accordance with NPCC Directory# 2, is identified.

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R15 Each Reliability Coordinator and Transmission Operator shall make system adjustments once an **emergency** has been identified, including the pre-**contingency** disconnection of **firm load,** to avoid exceeding **emergency transfer capabilities.**

R16 Each Reliability Coordinator and Transmission Operator shall assess the status of the **bulk power system** immediately after the occurrence of any **contingency** and prepare for the next **contingency** as specified in Table 3.

R16.1 Voltage reduction and shedding of **firm load** shall be deployed to return the system to a secure state, if other system adjustments are not adequate. Voltage reduction need not be initiated and **firm load** need not be shed to observe a post contingency loading requirement until the **contingency** occurs, provided that adequate response time for this action is available.

R16.2 System adjustments shall be completed as quickly as possible following any **contingency,** but within 30 minutes after the occurrence of any **contingency** specified in Table 3.

R17 Each Reliability Coordinator shall notify the applicable Reliability Coordinators of forced outages of any facility as per the NPCC Transmission Facilities Notification List and of any other condition which may impact inter-**Area** reliability.

R18 Each Reliability Coordinator shall coordinate scheduled outages of facilities that are on the NPCC Transmission Facilities Notification List sufficiently in advance of the outage to permit the affected Reliability Coordinators to maintain reliability. Appendix F provides guidance for Operational Planning Coordination.

R18.1 Review and update its Facilities Notification List and submit the list to the NPCC Task Force on Coordination of Operation (TFCO) annually.

R19 Each Reliability Coordinator shall coordinate voltage control between Transmission Operator Areas. Appendix G provides guidance for Inter- Reliability Coordinator **Area** Voltage Control.

R19.1 Metering for **reactive power resources** and voltage controller status shall be consistent between adjacent Transmission Operators.

R19.2 Upon request from the TFCO, perform an Inter-**Area** Voltage Control Assessment.

4.0 Compliance:

Compliance with the requirements set forth in this Directory will be in accordance with the NPCC Criteria Compliance and Enforcement Program (CCEP).

NPCC will not enforce a duplicate sanction for the violation of any Directory#1 requirement that is also required for compliance with a NERC Reliability Standard.

Prepared by:	Task Force on Coordination of Planning
Review and Approval:	Revision to any portion of this Directory will be posted by the lead Task Force in the NPCC Open Process for a 45 day review and comment period. Upon addressing all the comments in this forum, the Directory document will be sent to the remaining Task Forces for their recommendation to seek RCC approval. Upon approval of the RCC, this Directory will be sent to the Full Member Representatives for their final approval if sections pertaining to the Requirements and Criteria portion have been revised. All voting and approvals will be conducted according to the most current "NPCC. Bylaws" in effect at the time the ballots are cast. Revisions pertaining to the Appendices or other portions of the document such as links, etc., only require RCC approval. Errata may be corrected by the Lead Task Force at any time. This Directory will be updated at least once every three years and as often as necessary to keep it current and consistent with NERC, Regional Reliability Standards and other NPCC documents.
References:	*NPCC Glossary of Terms* *Emergency Operations* (NPCC Directory #2) *Bulk Power System Protection Criteria* (NPCC Directory #4) *Reserve* (NPCC Directory #5) *Special Protection Systems* (NPCC Directory #7)) *Classification of Bulk Power System Elements* (A-10)

Table 1

Planning Design Criteria: Contingency events, Fault type and Performance requirements to be applied to bulk power system elements

Category	**Contingency** events Simulate the removal of all **elements** that **protection systems**, including **Special Protection Systems**, are expected to automatically disconnect for each event that involves an AC **fault.**	**Fault** type (permanent) On the listed **elements** where applicable	Performance requirements
I **Single Event**	1. **Fault** on any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Three-phase **fault** with **normal fault clearing**	i. to viii
	2. Opening of any circuit breaker or the loss of any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	No **fault**	
	3. Loss of single pole of a direct current facility	No **fault**	
	4. **Fault** on any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Phase to ground **fault** with failure of a circuit breaker to operate and correct operation of a breaker failure **protection system** and its associated breakers	
	5. **Fault** on a circuit breaker	Phase to ground **fault,** with **normal fault clearing**	
	6. Simultaneous **fault** on two adjacent transmission circuits on a multiple circuit tower.	Phase to ground **faults** on different phases of each circuit, with **normal fault clearing**	
	7. Simultaneous permanent loss of both poles of a direct current bipolar facility	Without an ac **fault**	

Category	**Contingency** events Simulate the removal of all **elements** that **protection systems**, including **Special Protection Systems**, are expected to automatically disconnect for each event that involves an AC **fault.**	**Fault** type (permanent) On the listed **elements** where applicable	Performance requirements
	8. The failure of a circuit breaker to operate when initiated by a **SPS** after a **fault** on the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Phase to ground **fault**, with **normal fault clearing**	i. to viii
	9. The failure of a circuit breaker to operate when initiated by a **SPS** after opening of any circuit breaker or the loss of any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	No **fault**	

Category	**Contingency** events Simulate the removal of all **elements** that **protection systems**, including **Special Protection Systems**, are expected to automatically disconnect for each event that involves an AC **fault.**	**Fault** type (permanent) On the listed **elements** where applicable	Performance requirements
II Event(s) after a first loss and after System Adjustment	1. Following the loss of any critical: a. transmission circuit, b. transformer, c. series or shunt compensating device or d. generator e. Single pole of a direct current facility and after System Adjustment, Category I **Contingencies** shall also apply.	Any Category I event as described above.	Performance requirements i to viii apply **Area generation** and **power** flows are adjusted between outages by the use of **resources** available within ten minutes following notification and other system adjustments such as HVDC and phase angle regulator adjustments that can be made within 30 minutes.

Performance Requirements for the contingencies defined in Table 1:

i. Loss of a major portion of the system or unintentional separation of a major portion of the system shall not occur.

ii. Loss of small or radial portions of the system is acceptable provided the performance requirements are not violated for the remaining **bulk power system**.

iii. Voltages and loadings shall be within applicable limits for pre-**contingency** conditions.

iv. Voltages and loadings shall be within **applicable limits** for post-**contingency** conditions except for small or radial portions of the system as described in ii.

v. The **stability** of the **bulk power system** shall be maintained during and following the most severe **contingencies**, with due regard to successful and unsuccessful **reclosing** except for small or radial portions of the system as described in ii.

vi. For each of the **contingencies** that involve **fault** clearing, **stability** shall be maintained when the simulation is based on **fault** clearing initiated by the **"system A" protection group** and also shall be maintained when the simulation is based on **fault** clearing initiated by the **"system B" protection group**. When applying this requirement to **contingency** event *#6*, the failure of a **protection group** shall apply only to one circuit at a time. When evaluating **contingency** event#4 breaker failure protection is assumed to operate correctly even if only a single breaker failure **protection system** exists.

vii. Regarding **contingency** event*#6* if multiple circuit towers are used only for station entrance and exit purposes and if they do not exceed five towers at each station, then this condition is an acceptable risk and therefore can be excluded. Other similar situations can be excluded on the basis of acceptable risk, provided that the Reliability Coordinating Committee specifically accepts each request for exclusion. (See Appendix E.)

viii. Transient voltage response shall be within acceptable limits established by the Planning Coordinator and the Transmission Planner except for small or radial portions of the system as described in ii.

Table 2

Planning Criteria: Extreme Contingency and System Conditions, Fault type and Performance Assessments to be applied to bulk power system elements

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Category	**Contingency** events Simulate the removal of all elements that **protection systems**, including **Special Protection Systems,** are expected to automatically disconnect for each event that involves an AC **fault.**	**Fault** type (permanent) and/or condition applied On the listed **elements** where applicable	Performance to be assessed
Extreme Contingency	1. Loss of the entire capability of a generating station.	No **Fault**	i, ii, iii
	2. Loss of all transmission circuits emanating from a generating station, switching station, substation or dc terminal.	No **Fault**	
	3. Loss of all transmission circuits on a common right-of-way.	No **Fault**	
	4. **Fault** on of any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Three- phase **fault** with failure of a circuit breaker to operate and correct operation of a breaker failure **protection system** and its associated breakers. **(**with due regard to successful and unsuccessful reclosing.)	
	5. **Fault** on a circuit breaker	Three-phase **fault**, with **normal fault clearing**	
	6. Sudden loss of a large **load** or major **load** center.	No **Fault**	
	7. The effect of severe power swings arising from disturbances outside the NPCC's interconnected systems.	**Fault** applied as necessary.	
	8. Failure of a **Special Protection System**, to operate when required following the normal contingencies listed in Table 1, Category I, Single Event.	As listed in Table 1, Category I, Single Event.	
	9. The operation or partial operation of a **Special Protection System** for an event or condition for which it was not intended to operate.	No **Fault**	
	10. Sudden loss of fuel delivery system to multiple plants, (e.g. gas pipeline contingencies).	No **Fault.**	
	Any additional extreme **contingencies** identified by each Planning Coordinator Area.	**Fault** applied as necessary.	

Table 2

Category	**Contingency** events Simulate the removal of all elements that **protection systems**, including **Special Protection Systems,** are expected to automatically disconnect for each event that involves an AC **fault.**	**Fault** type (permanent) and/or condition applied On the listed **elements** where applicable	Performance to be assessed
Extreme System Conditions	Contingency events listed in Table 1, Category I, Single Event	Peak **load** conditions resulting from extreme weather.	i (b, c), ii, iii
		Generating unit(s) fuel shortage (e.g. gas supply adequacy or low hydro) under normal weather peak conditions	i (c), ii, iii

Performance Assessment

i. Model the following pre-**contingency** conditions:

   a. transfers within or between Transmission Planner and Planning Coordinator Areas should be studied at values not expected to be exceeded more than 25% of the time.

   b. highly probable dispatch patterns of **generation** for the transfers being studied

   c. appropriate **load** representation (e.g. active and reactive power as a function of voltage) for transient tests and post transient **load** flows.

ii. Examine post **contingency** steady state conditions, as well as stability, overload, cascading outages and voltage collapse to obtain an indication of system robustness and determine the extent of any widespread system disturbance

iii. Where assessment concludes there are serious consequences, an evaluation of implementing a change to design or operating practices to address such contingencies shall be conducted.

Table 3

Operating Criteria: Contingency events, Fault type and Performance requirements to be applied to bulk power system elements to establish transfer capabilities.

	Contingency events	**Fault** type (permanent)	Performance requirements	
	Simulate the removal of all **elements** that **protection systems**, including **Special Protection Systems**, are expected to automatically disconnect for each event that involves an AC fault.	On the listed **elements** where applicable	<u>**Normal Transfer Capability**</u>	<u>**Emergency Transfer Capability**</u> (only after an **Emergency** is identified)
	1. **Fault** on any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Three-phase **fault**, with **normal fault clearing**	i, ii, iii, iv, v, vi, vii, ix, x	i, ii, iii, iv, v, vi, vii, ix, xi
	2. Opening of any circuit breaker or the loss of any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	No **fault**		
	3. Loss of single pole of a direct current facility	No **fault**		
	4. **Fault** on any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Phase to ground **fault** with failure of a circuit breaker to operate and correct operation of a breaker failure **protection system** and its associated breakers.	i,ii,iii,iv,v,vi,vii, viii, ix,x	**Contingency** Events 4 through 8 do not apply after an emergency is identified.
	5. **Fault** on a circuit breaker	Phase to ground **fault,** with **normal fault clearing**		
	6. Simultaneous **fault** on two adjacent transmission circuits on a multiple circuit tower.	Phase to ground **faults** on different phases of each circuit with **normal fault clearing**		
	7. Simultaneous permanent loss of both poles of a direct current bipolar facility	Without an ac **fault**		

	8. The failure of a circuit breaker to operate when initiated by a **SPS** after a **fault** on the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	Phase to ground **fault**, with **normal fault clearing**	i,ii,iii,iv,v,vi,vii, viii, ix,x	**Contingency** Events 4 through 8 do not apply after an emergency is identified.
	9. The failure of a circuit breaker to operate when initiated by a **SPS** after an opening of any circuit breaker or the loss of any of the following: a. transmission circuit b. transformer c. shunt device d. generator e. bus section	No **fault.**		

Performance Requirements for the contingencies defined in Table 3:

i. Loss of a major portion of the system or unintentional separation of a major portion of the system shall not occur.

ii. Loss of small or radial portions of the system is acceptable provided the performance requirements are not violated for the remaining **bulk power system.**

iii. Individual Reliability Coordinator Areas shall be operated in a manner such that **Contingencies** and conditions applied can be withstood without causing **significant adverse impact** on other Reliability Coordinator Areas.

iv. Voltages and loadings shall be within applicable limits for the pre-**contingency** conditions.

v. Voltages and loadings shall be within **applicable limits** for post-**contingency** conditions except for small or radial portions of the system as described in ii.

vi. The **stability** of the **bulk power system** shall be maintained, with due regard to successful and unsuccessful **reclosing** except for small or radial portions of the system as described in ii.

vii. For each of the **contingencies** that involve **fault** clearing, **stability** shall be maintained when the simulation is based on **fault** clearing initiated by the **"system A" protection group**, and also shall be maintained when the simulation is based on **fault** clearing initiated by the **"system B" protection group**. When applying this requirement to **contingency** event*#6* the failure of a **protection group** shall apply only to one circuit at a time. When evaluating **contingency** event#4 breaker failure protection is assumed to operate correctly even if only a single breaker failure **protection system** exists

viii. Regarding **contingency** event#6 if multiple circuit towers are used only for station entrance and exit purposes, and if they do not exceed five towers at each station, then this condition is an acceptable risk and therefore can be excluded. Other similar situations can be excluded on the basis of acceptable risk, provided that the Reliability Coordinating Committee specifically accepts each request for exclusion. (See Appendix E.)

ix. Appropriate adjustments shall be made to Reliability Coordinator Area operation to accommodate the impact of **protection group outages**, including the **outage** of a **protection group** which is a part of a Type I **special protection system**. For typical periods of forced outage or maintenance of a **protection group**, it can be assumed, unless there are indications to the contrary, that the remaining **protection** will function as designed. If the **protection group** will be out of service for an extended period of time, additional adjustments to operations may be appropriate considering other system conditions and the consequences of possible failure of the remaining **protection group.**

x. Normal transfer levels shall not require system adjustments before attempting manual reclosing of elements unless specific instructions describing alternate actions are in effect to maintain stability of the **bulk power system.**

xi. Emergency transfer levels may require system adjustments before attempting manual reclosing of elements to maintain stability of the **bulk power system**.

Operating to the **contingencies** listed above in Table 3 is considered to provide an acceptable level of **bulk power system** security. However, under high risk conditions, such as severe weather, the expectation of the occurrence of contingencies not listed in Table 3 and/or the associated consequences may be judged to be significantly greater. When these conditions exist, consideration should be given to operating in a more conservative manner.

Appendix E - Guidelines for Requesting Exclusions to Simultaneous Loss of Two Adjacent Transmission Circuits on a Multiple Circuit Tower.

1.0 Introduction

Directory #1 allows for requests for exclusion from the simultaneous loss of two adjacent transmission circuits on multiple circuit towers on the basis of acceptable risk. All exclusions must be reviewed by the applicable Task Forces and approved by the Reliability Coordinating Committee (RCC). An acceptance of a request for exclusion is dependent on the successful demonstration that such exclusion is an acceptable risk. These guidelines describe the procedure to be followed and the supporting documentation required when requesting exclusion, and establishes a procedure for periodic review of exclusions of record.

2.0 Documentation

The documentation supporting a request for exclusion to the Criteria includes the following:

2.1 A description of the facilities involved, including geographic location, length and type of construction, and electrical connections to the rest of the interconnected power system;

2.2 Relevant design information pertinent to the assessment of acceptable risk, which might include: details of the construction of the facilities, geographic or atmospheric conditions, or any other factors that influence the risk of sustaining the loss of adjacent transmission circuits on a multiple circuit tower;

2.3 An assessment of the consequences of the loss of adjacent transmission circuits on a multiple circuit tower, including, but not limited to, a discussion of levels of exposure and probability of occurrence of **significant adverse impact** on the **bulk power system** ;

2.4 For existing facilities, the historical outage performance, including cause, for such **contingencies** on the specific facility (facilities) involved as compared to that of other multiple circuit tower facilities;

2.5 For planned facilities, the estimated frequency of adjacent transmission circuit multiple circuit tower **contingencies** based on the historical performance of facilities of similar construction located in an area with similar geographic climate and topography.

3.0 Procedure for obtaining an Exclusion

The following procedure is used to obtain an exclusion:

3.1 The entity requesting the exclusion (the Requestor) submits the request and supporting documentation to the Task Force on System Studies (TFSS) after acceptance has been granted by the Requestor's own Planning Coordinator, if such process is applicable.

3.2 TFSS reviews the request, verifies that the documentation requirements have been met, and determines the acceptability of the request.

3.3 If TFSS deems the request acceptable, TFSS requests the Task Force on Coordination of Planning (TFCP), the Task Force on Coordination of Operation (TFCO), and the Task Force on System Protection (TFSP) to review the request. The Requestor provides copies of the request and supporting documentation to the other Task Forces as directed by TFSS. If additional information is requested by the other Task Forces as part of their assessment, the Requestor provides this information directly to the interested Task Force, with a copy to the TFSS. The other Task Forces review the request and indicate their acceptance or non-acceptance to TFSS.

3.4 If all Task Forces deem the request for exclusion acceptable, the TFSS will forward a recommendation for approval to the RCC.

3.5 Exclusion requests will be effective upon approval by the RCC.