

**33 Attachment AA – Procedure to Protect for the Loss of Phase II Imports**

NOTE: In this Attachment AA, “NYPP” refers to the ISO, “NEPEX” refers to ISO New England Inc. and “PJM” refers to PJM Interconnection, LLC.

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Reference: Procedure to Protect for the Loss of Hydro-Quebec Exports

### **33.1 Introduction**

The Hydro-Quebec/NEPOOL Phase II tie has maximum transfer capability of 2,000 MW. Joint PJM/NYPP/NEPEX studies have concluded that the loss of the Phase II facilities at high levels of imports could have a worse effect on NYPP and PJM than the worst internal contingency that these individual systems normally protect against. Accordingly, it has been agreed that Phase II imports will be limited to the extent necessary to insure that NYPP and PJM operation reliability criteria are not violated by the loss of Phase II contingency. This procedure is designed to prevent the occurrence of a loss of Phase II contingency applicable when Phase II is operated in the isolated or synchronous mode. The absolute maximum loss of Phase II contingency allowable under this procedure will be 2,200 MW.

### **33.2 System Monitoring**

1. NYPP and PJM will monitor their respective systems to provide NEPEX with the data required to calculate Phase II import limits.
2. NEPEX will request forecasted data from NYPP and PJM required to establish Phase II schedules.
3. NEPEX will set schedules with Hydro-Quebec which are within acceptable limits.
4. NEPEX will monitor real time system conditions in NYPP and PJM to insure that Phase II imports are within acceptable limits.
5. The calculations required to determine Phase II limitations will normally be done using a software package in the NEPEX computer. The data required to perform the calculations is received in part via the Interpool Network and by manual entry for those values not telemetered. The program fulfills the requirements of this procedure. In the event that the NEPEX computer is unavailable for use, the necessary calculations will be performed by operator use of a personal computer with data being exchanged by telephone.

### 33.3 Definition of Terms

The following terms apply to the three (3) NYPP voltage indicators, Rochester 345 KV, Oakdale 345 KV and Oakdale 230 KV. Each indicator will have unique values for each of these terms.

**(Limit) Pre-contingency Low Voltage Limit** – the lowest precontingency voltage allowed at the station based on contingencies within NYPP.

**Actual Voltage** – Actual voltage at the station

**Voltage Margin** – Actual voltage minus Pre-contingency Low Voltage Limit

**Base NE/NB Contingency Limit** – The maximum total loss of generation within NE/NB or loss of HQ HVDC Exports to NE/NB allowable when the station voltage is at the Pre-contingency Low Voltage Limit (for the purposes of this procedure, the Base NE/NB Contingency Limit is the maximum level of Phase II Imports allowable).

**Margin Sensitivity** – The number of MW of increase in the Base NE/NB Contingency Limit allowed for each one (1) KV or Voltage Margin.

The following terms apply to the fourth indicator of NYPP Reactive Conditions, the Central/East (C/E) Interface.

**C/E Critical Transfer Level** – Postcontingency transfer limit for the C/E interface based on NYPP reactive conditions

**C/E Transfer** – Actual MW transfer on the C/E interface

\* **Phase II C/E Distribution Factor** – The number of MW by which the C/E flow would be increased for each one (1) MW of the total of Phase II imports and MW armed for runback in New Brunswick which would be lost as a result of a single contingency.

The following terms apply to the PJM Eastern, Central, and Western interfaces and are used in determining limitations based on PJM reactive conditions.

**PJM Transfer Limits** – Precontingency transfer limits for each PJM interface based on contingencies within PJM.

**PJM Transfers** – Actual MW transfers on each PJM interface.

**PJM Transfer Margins** – Transfer limit minus actual transfer for each PJM interface.

**PJM Base New England/New Brunswick (NE/NB) Contingency Limit** – The maximum total loss of generation within NE/NB or loss of HQ HVDC Export to NE/NB which is allowable when any of the three (3) PJM interfaces is loaded to its precontingency transfer limit (for the purposes of this procedure, the PJM Base NE/NB Contingency Limit is the maximum level of Phase II Imports allowable).

**PJM Transfer Margin Sensitivity** – The number of MW of increase in the PJM Base NE/NB Contingency Limit allowed for each one (1) MW of Transfer Margin. Each PJM interface has an associated Transfer Margin Sensitivity. By exception, the PJM Operations Planning Section will notify NEPEX supervision of any required change in the Transfer Margin Sensitivities.

\*THE TERMS DEFINED ABOVE ARE THE SAME TERMS USED IN THE PROCEDURE TO PROTECT FOR LOSS OF HYDRO-QUEBEC EXPORTS WITH THE EXCEPTION OF THE PHASE II C/E DISTRIBUTION FACTOR.

**Loss of Phase II Contingency** – The total of the MW of Phase II import and MW armed for runback in New Brunswick (Keswick Power Relays) which would be lost as a result of a single contingency (See Attachment I for Method of Calculating the Loss of Phase II Contingency). While the Keswick Power Relays will normally be disabled, they will be enabled during outages of the Chester Static VAR Compensator. MW armed during these periods must be included in the Loss of Phase II Contingency.

**Phase II Import Limit (Phase II Limit)** – The most restrictive Loss of Phase II Contingency allowable based on NYPP and PJM reactive conditions (See Attachment I for Method of Calculating the Phase II Import Limit).

### 33.4 Procedures

1. Setting Phase II Schedules – All required limitations on Phase II imports are to be recognized in the establishment of Phase II schedules for the next hour. In order to set next hour schedules for the Phase II tie, NEPEX will;
  - A. Determine the total of the desired level of Phase II import plus anticipated arming in New Brunswick (if Keswick Power Relays are enabled) for the next hour.
  - B. Determine the Phase II Limit with no margin for the next hour.
  - C. If the Phase II Limit (no margin) is less than the desired Phase II import plus arming in New Brunswick, request that NYPP and/or PJM forecast and authorize use of any available margin for the next hour.
  - D. Determine the Phase II Limit using authorized margin.
  - E. Thirty minutes in advance of the hour, establish a next hour Phase II schedule with Hydro-Quebec for which the L/O Phase II Contingency (import plus arming) will be equal to or less than the Phase II Limit (which includes any authorized margin).
2. Monitoring System Conditions – At least once each hour, NEPEX will make a complete check of actual system conditions in NYPP and PJM. Whenever a condition exists such that the L/O Phase II Limit based on those conditions, NEPEX will;
  - A. Contact NYPP and/or PJM to determine if the L/O Phase II Contingency must be reduced.
  - B. If the L/O Phase II Contingency must be reduced, reduce imports from New Brunswick to a level at which arming (KPR) is not required and/or reduce Phase II imports so that the L/O Phase II contingency is less than the Phase II Limit.

**ACTION(S) TAKEN TO REDUCE THE L/O PHASE II CONTINGENCY MUST BE ACCOMPLISHED WITHIN TEN (10) MINUTES FROM THE TIME THE PROBLEM IS IDENTIFIED.**

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## **ATTACHMENT I – Methods for Calculating the Loss of Phase II Contingency and the Phase II Import Limit**

### **I. The Loss of Phase II Contingency**

The loss of Phase II Contingency is made up of two components; 1) the transfer on the Phase II tie line between Hydro-Quebec and NEPOOL and 2) any MW armed for runback in New Brunswick (Keswick Power Relays). While normally disabled, the Keswick Power Relays will be enabled when the Chester Static VAR Compensator is OOS. ALL MW armed for the Keswick Power Relays must be included as part of the Loss of Phase II Contingency. The maximum Loss of Phase II Contingency allowable is 2,200 MW.

#### **Loss of Phase II Contingency**

=

Phase II transfers

+

MW armed for Keswick Power Relays

### **II. The Phase II Import Limit**

The calculation of the Phase II Limit requires the examination of seven (7) different sets of reactive conditions, four (4) in NYPP and three (3) in PJM. Three (3) of the NYPP calculations are based on station voltages; Rochester 345, Oakdale 345, Oakdale 230. The remaining NYPP calculation is based on MW flow across the Central East Interface. The PJM calculations are based on MW flows across the Eastern, Central, and Western Interfaces.

The Phase II Limit is the most restrictive of the values calculated.

The methods for calculating the Phase II Limits are listed below.

**A. Calculation of Limits for Next Hour Scheduling**

1. Phase II Limit based on NYPP station voltages

- a. Limit without Voltage Margin- The Phase II Limit without Voltage Margin for each of the three stations is the Base New England/New Brunswick (NE/NB) Contingency Limit for that station.
  
- b. Limit with Voltage Margin – The Phase II Limit with Voltage Margin for each of the three stations is the Base NE/NB Contingency Limit for that station plus the amount of Voltage Margin authorized for that station multiplied by the Margin Sensitivity for that station.

$$\begin{aligned} &\text{Phase II Limit} \\ &= \\ &\text{Station Base NW/NB Contingency Limit} \\ &+ \\ &\text{Station Margin Sensitivity} \times \text{Authorized Voltage Margin} \end{aligned}$$

2. Phase II Limit based on NYPP Central East flow

The Phase II Limit is  
(the C/E Critical Transfer Level minus the forecasted C/E transfer for the next hour)  
divided by  
the Phase II C/E Distribution Factor

$$\begin{aligned} &\text{Phase II Limit} \\ &= \\ &\frac{\text{C/E Crit. Transfer Level- forecasted C/E Transfer}}{\text{Phase II C/E Distribution Factor}} \end{aligned}$$

## Phase II C/E Distribution Factor

### 3. Phase II Limit based on PJM interface flows

a. Limit without Transfer Margin – The Phase II Limit without Transfer Margin for each of the three (3) PJM interfaces is the PJM Base NE/NB Contingency Limit (same for all three interfaces)

b. Limit with Transfer Margin – The Phase II Limit with Transfer Margin for each of the three (3) PJM interfaces is the PJM Base NE/NB Contingency Limit

plus

the amount of Transfer Margin authorized for that interface multiplied by the Margin Sensitivity for that interface.

Phase II Limit

=

PJM Base NE/NB Contingency Limit

+

Margin Sensitivity x Authorized Transfer Margin

### **B. Calculation of Real Time Limits**

#### 1. Phase II Limit based on NYPP station voltages

The Phase II Limit for real time conditions for each of the three (3) stations is the Base NE/NB Contingency Limit for the station

plus

the amount of actual Voltage Margin at the station multiplied by the Margin Sensitivity for the station

Phase II Limit

=

Station Base NE/NB Contingency Limit

+

Margin Sensitivity x actual Voltage Margin

2. Phase II Limit based on NYPP Central East Flow

The Phase II Limit for real time conditions is

(the C/E Critical Transfer Level minus  
the C/E Transfer)

divided by

the Phase II C/E Distribution Factor

Phase II Limit

=

(C/E Crit. Transfer Level- actual C/E Transfer)

Phase II C/E Distribution Factor

3. Phase II Limit based on PJM interface flows

The Phase II Limit for real time conditions for each of the three (3) PJM  
interfaces is the PJM Base NE/NB Contingency Limit

plus

the amount of actual Transfer Margin on the interface multiplied by the Margin  
Sensitivity for the interface

Phase II Limit

=

PJM Base NE/NB Contingency Limit

+

Transfer Margin x Margin Sensitivity