



PROCEDURE

Transmission Reliability Margin Implementation Document (TRMID)

Issue 1.3

**This document contains the margin to be applied
for the Available Transfer Capability (ATC)
calculation.**

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1.0	First release	February 10, 2011
1.1	Change of values in the Table in Section 3.1	March 10, 2011
1.2	Change of values and notes in the Table in Section 3.1	April 28, 2011
1.3	Change of values in the Table in Section 3.1	May 12, 2011

Related Documents

Document ID	Document Title
IESO_PRO_0728	Available Transfer Capability Implementation Document

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Table of Changes

Reference (Section and Paragraph)	Description of Change
Section 3.1 - Table	Ontario-New York Winter Base Quantity (to Ontario) changed from 690 to 970. Ontario-New York Winter Base Quantity (from Ontario) changed from 810 to 1070. Ontario-New York Increment changed from 28 to 36. Ontario-Quebec H4Z Base Quantity (from Ontario) changed from 55 to 65.

1. Introduction

Section 2 of this document provides information on Transmission Reliability Margins (TRM's) that are applied to the inertias to determine the Available Transfer Capability (ATC) and scheduling limits consistent with the requirements of MOD-008-1.

Section 3 of this document contains information on Transmission Rights including the path assumptions and criteria for determining auction quantities.

– End of Section –

2. Transmission Reliability Margin

Transmission Reliability Margins are applied to the interties to determine the Available Transfer Capability (ATC) and scheduling limits. They factor in the granularity of the phase shifter controls, AGC buffers and factors that determine the IESO's ability to control active power flows on an interface. The transmission reliability margins are determined using observations made by the IESO in its real-time operations. TRM's are computed on an interface to interface basis. The scheduling ATC limit for each path is determined by decrementing the TRM from the TTC.

Transmission Reliability Margin (TRM) as defined by NERC:

“The amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.”

The values for the TRM are listed in the table below (they do not include the loop flow adjustments which are determined in real time).

Transmission Reliability Margin			
Intertie	Export	Import	Reliability Reason
Michigan	100	100	Load distribution uncertainty and variations in generation dispatch
Manitoba	13/25	13/25	Allowance for simultaneous path interactions: Margin to account for granularity of active power control using phase angle taps (13MW for either K22W or K21W I/S, 25MW if both circuits I/S)
Minnesota	10	10	Allowance for simultaneous path interactions: Margin to account for granularity of active power control using phase angle taps.
New York	100	100	Load distribution uncertainty and variations in generation dispatch
PQBEAU	0	10	Inertial Response and Frequency Bias
PQD5A	10	10	Inertial Response and Frequency Bias
PQP33C	0	10	Inertial Response and Frequency Bias
PQH4Z	10	0	Inertial Response and Frequency Bias
PQD4Z	0	10	Inertial Response and Frequency Bias
QOUTA	10/20	10/20	Inertial Response and Frequency Bias (one/two converters I/S)

The TRM values are updated based on observed operating conditions as well as for changes to facilities and equipment. The IESO only computes a single set of TRM values which are applicable for both real time operations and long term transmission rights studies.

A portion of scheduled flows to Michigan appear on the New York ties and vice versa. The TTC is published without taking this coupling into account. The TTC for each of the paths (with flows in both directions) is the capability of the interface based on voltage, stability and thermal requirements. The coupling is factored into the scheduling limit when Dispatch Scheduling and Optimization (DSO) tool is determining the amount of coincident flows on both interfaces. Due to the dynamic nature of loop flows, their corresponding values are only considered in real time operations and do not affect the ATC or TTC limits that are published. The need to couple the Michigan and New York TTCs will expire when all Michigan ties have operating phase shifters

– End of Section –

3. Transmission Rights

Transmission Rights (TRs) provide a hedge against congestion that otherwise may discourage market activity. TRs are derived according to the criteria described in section two and will not exceed the Total Transfer Capability of the interface. The quantity of TRs will be calculated in a way to provide open access to the Ontario Market.

3.1 Total Transfer Capability (TTC)

Total Transfer Capability is a forecast of the amount of power that can be scheduled without violating operating limits or the amount of load or generation that can reasonably be isolated to a neighbouring system for radial ties. Operating limits reflect the maximum permissible power flow to respect reliability criteria, equipment ratings, or agreed operating practices. TTC will be calculated considering planned outages and transmission system limitations that affect the ties. Impracticable or emergency modes of operation have been excluded from Quebec TTC calculations. Summer/winter TRs and TTC are tabulated below.

TRs offered can be significantly less than the corresponding TTC for a number of reasons,

1. TRs are discounted on multi-circuit intertie paths by removing a circuit (e.g. K22W),
2. TRs are discounted to account for operating and control margins,
3. TRs are offered on reasonable connections based on past practice,
4. TRs are offered on paths available for bids and offers, and
5. TRs are discounted to account for outages to tie terminal breakers.

Path (circuit considered o/s)	Transmission Rights (summer/winter*)			Transfer Capability (s/w*) with all elements in service	
	Base quantity		Increments**	to Ontario	from Ontario
	to Ontario	from Ontario			
Ontario-Manitoba(K22W) ^{1,2,4}	150/177	150/177	6	288/300	288/300
Ontario-Minnesota ^{2,4}	90	140	0	100	150
Ontario-Michigan(L4D) ^{1,2,4}	1250/1290	1250/1400	50	1680/1960	1870/2080
Ontario-New York (PA301) ^{1,2,4}	900/970***	980/1070***	36	1210/1500***	1500/1780***
Ontario-Quebec D4Z ³	36/75	0	0	65/85	0
Ontario-Quebec H4Z ³	0	65	0	0	85
Ontario-Quebec Q4C ^{3,4}	0	0	0	0	120/140
Ontario-Quebec P33C ⁵	190	0	8	345	0
Ontario-Quebec X2Y ^{3,4}	45	0	0	65	0
Ontario-Quebec D5A ^{3,5}	110	115	4	250	200
Ontario-Quebec H9A ³	0	0	0	120/176	60
Ont-Que B31L+B5D(B5D) ^{1,4}	390	0	16	800	470
Ont-Que HVDC ^{1,4}	620	620	25	1250	1250

*Summer Ratings apply from May 1 to October 31

**Increments are 4% of the lowest Transmission Rights Base Quantity

***NY interface does not include BP76 because it is out of service for an extended period. However, BP76 is included in the determination of Base quantities for the NY interface when PA301 (or PA302) is out of service.

3.2 Transmission Right Path Assumptions

Considerations that affect TRs offered are listed below.

Manitoba: TRs are restricted by the thermal rating of K21W minus a 13 or 25 MW margin (for one or two circuits in-service, respectively) to account for the granularity of active power control using phase angle taps. TRs are not offered on Circuit SK1 because it is available only during outages or emergencies.

Minnesota: TRs are restricted by the operating limit minus a 10 MW margin to account for the granularity of active power control using phase angle taps.

Michigan: TRs have been calculated using Circuits J5D, B3N and L51D. Long Term Emergency ratings have been used in TRs calculations to reflect present practice. The maximum quantity of TRs that can be offered in either direction is the transfer capability less 100 MW to account for AGC.

New York: TRs have been calculated using Circuits PA27, PA302, L33P and L34P. The 25 Hz circuits that were decommissioned on April 30, 2009 and the BL104 circuit are not available for bids and offers and not approved for segregated mode of operation. Long Term Emergency ratings have been used in TRs calculations. The flow at St. Lawrence has been set at 300 MW in both directions. The maximum quantity of TRs that can be offered in either direction is the transfer capability less 100 MW to account for AGC.

P33C: TRs are not offered for transfers to Quebec as there is neither generation in Ontario nor load in Quebec that can be isolated to the other system under normal modes of operation. For TRs to Ontario, in addition to discounting for DL33 terminal breaker out of service at Chat Falls, a 10 MW operating margin is applied.

Q4C: TRs are not offered for transfers to Ontario as there is neither generation in Quebec nor load in Ontario that can be isolated to the other system under normal modes of operation. TRs are not offered for transfers to Quebec as this is done with Chat Falls GS units in a segregated mode of operation.

X2Y: TRs are not offered for transfers to Quebec as there is neither generation in Ontario nor load in Quebec that can be isolated to the other system under normal modes of operation.

D5A: TRs are not offered for the emergency connection to Hydro Quebec. For TRs to Ontario, in addition to discounting for outages to D5A terminal breakers at Hawthorne, a 10 MW operating margin is applied.

H9A: TRs will not be offered on H9A unless D5A is planned to be out of service for the entire duration of a transmission right. Concurrent transfers to MacLaren over H9A and D5A are not permitted.

B31L+B5D: TRs are not offered for transfers to Quebec as this can be done only with Saunders GS units in a segregated mode of operation. For TRs to Ontario, in addition to discounting for B5D out of service, a 10 MW operating margin is applied.

H4Z: TRs are not offered for transfers to Ontario as there is neither generation in Quebec nor load in Ontario that can be isolated to the other system under normal modes of operation. TTC and TR's offered are contingent upon on reasonable connections based on past practice.

D4Z: TRs are not offered for transfers to Quebec as there is neither generation in Ontario nor load in Quebec that can be isolated to the other system under normal modes of operation.

HVDC: TRs have been calculated using two HVDC converters.

3.3 Inter-related Transmission Rights

A portion of scheduled transactions with Michigan flows over the New York ties and vice versa. This coupling between the Michigan and New York paths is accommodated by constraint equations of the following form:

$$(\text{Michigan TR offered}) < k1$$

$$(\text{New York TR offered}) < k2$$

$$f11 * (\text{Michigan TR offered}) + f12 * (\text{New York TR offered}) < k1$$

$$f21 * (\text{Michigan TR offered}) + f22 * (\text{New York TR offered}) < k2$$

The coefficients (f11, f12, f21, f22) will be initially set at (0.7,0.3,0.3,0.7). The constants on the right hand side of the equations are available from the table of Transmission Rights. The need to couple the Michigan and New York TRs will expire when all Michigan ties have operating phase shifters. No other TRs are coupled.

3.4 Criteria for Transmission Rights

The Market Rules (Chapter 8 section 4.7.1) require the *IESO Board* to establish a confidence level reflecting the degree to which the congestion rents collected by the *IESO* will be sufficient to cover the *IESO's* payment obligations.

If TR rights are oversold, the *IESO* administered physical market loads are exposed to the risk of high financial liabilities; if TRs are undersold market participants might not be able to sufficiently hedge against losses in income due to system congestion.

The following *IESO Board* approved criteria serves as the basis for determining the Transmission Rights available for auctions. The application of these criteria is deemed to be adequate to allow for uncertainties in transmission system state, loop flows and dispatch variations.

A. Long-term Auctions (offering a 12-month TR for the next year):

1. The transmission transfer capabilities used for determining the quantity of TRs to auction will be based on the lower of summer or winter thermal ratings, stability limits, or voltage limits. For radial connections, transfers may be further limited by the amount of load or generation that can be reasonably connected to one system or the other.
2. In accordance with 1 above, the quantity of TRs for multi-circuit intertie paths will be limited to the transfer capability equivalent to one circuit out of service.
3. In accordance with 1 above, the quantity of TRs for single-circuit intertie paths will be limited to the circuit's capability less any operating and control margins (e.g. allowance for

the granularity of phase shifter control and automatic generation control), or to any lower limit corresponding to a single adjacent breaker or switch outage.

The allocation of the 12-month TRs associated with each quarterly long-term TR auction will be approximately 25% of the quantity arrived at after the application of these criteria.

B. Short-term Auctions (offering a monthly TR for the next month)

The above procedures will be applied, with the exception that 2.A.1 above is replaced by:

1. The transmission transfer capabilities used for determining the quantity of TRs to auction will be based on the lower of the applicable monthly thermal ratings, stability, or voltage limits. This along with procedures 2.A.2 and 2.A.3 above establishes the base quantity of TRs to auction on a path. The quantity of monthly transmission rights auctioned on paths not already at their maximum TTC will change incrementally at quarterly intervals to stabilize the TR clearing account reserve at a level approved by the *IESO Board*.

C. Planned outage conditions

- 1 When calculating Total Transfer Capability, single outages longer than 30 days or longer will be considered for long-term auctions and single outages longer than 7 days or longer will be considered for short-term auctions. Multiple outages require special consideration.
- 2 As tabulated on page 1, planned outage conditions will not be considered when calculating the base quantity of TRs to auction on a path.
- 3 The TRs auctioned on a path will be the lower of
 - a) the base quantity plus increments, and
 - b) the TTC accounting for planned outages minus operating or control margins.

D. Stabilizing the TR Clearing Account Balance

The quantity of monthly TRs auctioned will be adjusted to stabilize the TR Clearing Account balance at the *IESO Board* approved threshold.

Quarterly, the combination of the balance in the TR Clearing Account and the Net TR revenues for the three months preceding the auction will determine whether the quantity of TRs auctioned are adjusted. For purposes of stabilizing the TR clearing account balance, the quantity of TRs auctioned will not decrease below the base quantity and the quantity of TRs auctioned will not increase above the forecast total transfer capability. The incremental change to the TR quantity will be 4% of the directional TTC quantity used for 12-month TRs. Incremental changes will not be made in path directions where TRs are not offered or along paths where no additional rights are being auctioned.

TR Clearing Account balance	Net TR revenues for preceding 3 months	Affect on monthly TRs for multi-element paths
greater than threshold	greater than zero	Increment quantity by 4%
greater than threshold	less than zero	stay the same

less than threshold	greater than zero	stay the same
less than threshold	less than zero	Decrement quantity by 4%

The timing of adjustments to stabilize the TR Clearing Account balance are tabulated below.

Time of TR Auction	Net TR revenues for months considered	Changes apply to these months
January	October, November, December	March, April, May
April	January, February, March	June, July, August
July	April, May, June	September, October, November
October	July, August, September	December, January, February

Adjustments to the quantity of TRs auctioned will also depend on the planned state of TR paths. For example, a planned long-term outage or derating could result in a decrease to the TRs auctioned on the associated TR path even though the TR Clearing Account balance exceeds the threshold and the net TR revenues for the preceding three months has been greater than zero.

References

Document Name	Document ID
Glossary of Terms Used in NERC Reliability Standards http://www.nerc.com/docs/standards/rs/Glossary_of_Terms_2010April20.pdf	

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