Annual Planning Outlook

Overview of Ontario's Transmission Interfaces

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1. Introduction

This module describes the status of Ontario's transmission interfaces and interties which are key inputs for the resource adequacy and transmission assessments in the Annual Planning Outlook (APO).

The transmission interfaces generally represent a group of transmission circuits that separate each of the ten Independent Electricity System Operator (IESO) electrical zones, or a boundary within one of these zones that creates a limit to the amount of power that can flow from one part of the province to another. The groups of transmission circuits which connect the IESO-controlled grid to neighbouring electrical systems are referred to as the transmission interties (or sometimes "interconnections").

2. Ontario's Interfaces and Interties

The IESO zones, transmission interfaces, and intertie locations are shown in Figures 1 and 2. The remainder of this section describes the current status of each of these interfaces and interties.

Figure 1 | Northern Ontario Transmission Interfaces and Interties

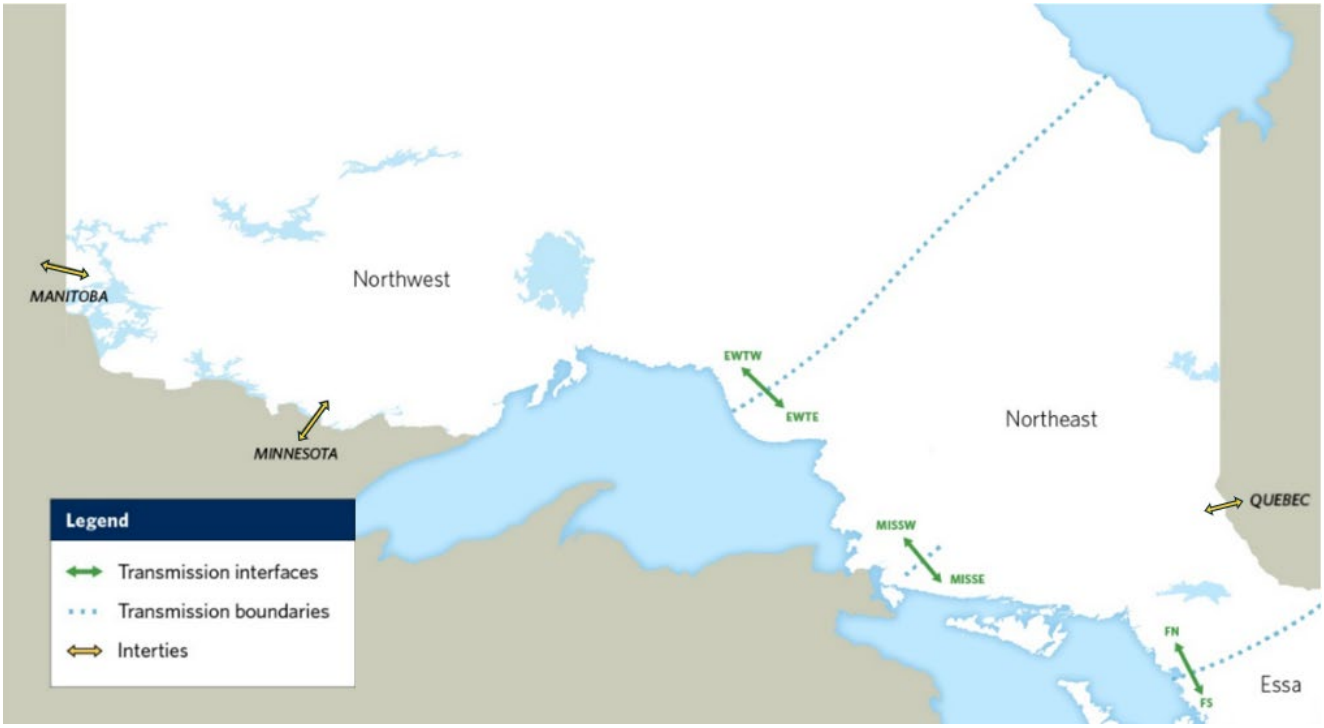
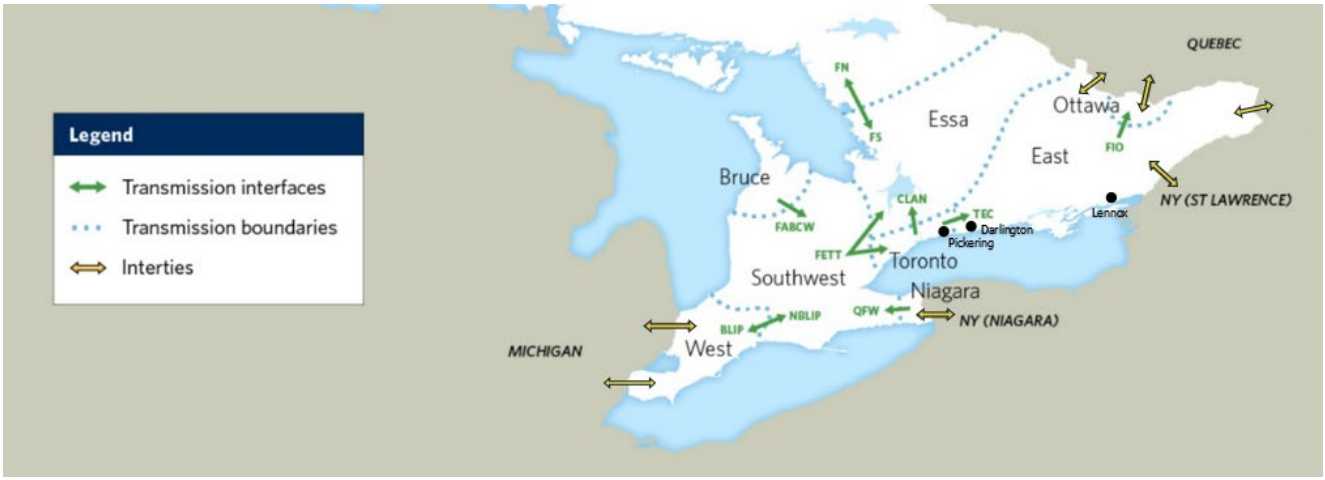


Figure 2 | Southern Ontario Transmission Interfaces and Interties



2.1 The Transmission Interfaces

2.1.1 Buchanan Longwood Input (BLIP) and Negative Buchanan Longwood Input (NBLIP)

The BLIP interface comprises the circuits that connect the West zone and the Southwest zone, near the City of London, including three 500 kilovolts (kV) circuits into the Longwood transmission station (TS) and five 230 kV circuits into Buchanan TS. The NBLIP interface is identical to BLIP, but the power transfer is measured in the opposite direction. The BLIP transfer capability is important for reliably supplying the demand in the West zone and facilitating exports from Ontario to Michigan, while the NBLIP transfer capability is important for delivering supply to the Southwest zone as well as delivering power imported from Michigan to the rest of the province.

Both BLIP and NBLIP transfers are generally thermally limited by the transmission circuits between Scott and Buchanan, Lambton and Longwood, or Chatham and Buchanan/Longwood, located west of where BLIP and NBLIP are measured. The area west of the BLIP and NBLIP interface is commonly referred to as the "West of London" system.

2.1.2 Flow Away from Bruce Complex and Wind (FABCW)

The FABCW interface comprises all of the power flows from the Bruce Nuclear Generating Station (NGS), including the Bruce 230 kV and 500 kV stations (six circuits each), plus wind generation in the area. This transfer capability is important for delivering supply from the Bruce zone to the rest of the province.

FABCW transfers are not normally limited when all transmission facilities are in-service and are effectively managed through the Bruce Remedial Action Scheme under outage conditions.

2.1.3 Queenston Flow West (QFW)

The QFW interface comprises the circuits that connect the Niagara zone and the Southwest zone. This includes the four 230 kV circuits out of Beck 2 TS and three 230 kV circuits into Middleport TS. The QFW transfer capability is important for delivering supply from the Niagara zone and imports from New York at Niagara to the rest of the province.

QFW transfers can be thermally limited at times, but they are not expected to be restrictive under typical conditions, such as normal weather, expected imports, and all transmission facilities in-service.

2.1.4 Flow East Towards Toronto (FETT)

The FETT interface comprises the circuits that connect the Southwest zone and the Toronto and Essa zones. This includes the four 500 kV circuits into Claireville TS, two 230 kV circuits out of Orangeville TS to Essa TS, and four 230 kV circuits out of Trafalgar TS to Richview TS and Hurontario SS. FETT transfer capability is important for reliably supplying demand in Toronto, Essa, East, Ottawa, Northeast and Northwest zones as it delivers supply from West, Southwest, Bruce and Niagara zones.

The FETT transfer capability is of concern during the summer peak demand periods, when the transmission circuit ratings are low and demands are high, both as result of high ambient temperatures. During summer peak, the 230 kV Trafalgar TS to Richview TS path in Mississauga reaches its capacity before the other two paths of the FETT interface, thus setting the transfer capability for the whole FETT interface. In addition, nuclear generation retirements and outages for refurbishments result in higher portion of FETT transfers on the critical Trafalgar TS to Richview TS path. This would further reduce the FETT transfer capability.

2.1.5 Transfer East of Cherrywood (TEC)

The TEC interface comprises the circuits that connect the Toronto zone and the East zone, at points east of Cherrywood TS in Pickering. The interface includes the four 500 kV circuits out of Bowmanville SS, four 230 kV circuits – with one each into Dobbin TS, Almonte TS, Belleville TS and Havelock TS – and two 230 kV circuits into Chats Falls Generating Station. TEC transfer capability is important for reliably supplying demand in the East and Ottawa zones.

TEC transfers are generally thermally limited and the extent to which they are constraining are highly dependent on local load in the Dobbin area.

2.1.6 Flow into Ottawa (FIO)

The FIO interface comprises the circuits that connect the East zone and Ottawa zone. This includes two 500 kV circuits out of Lennox, one 230 kV circuit into St. Isidore TS, one 230 kV circuit out of St. Lawrence TS, one 230 kV circuit out of Chats Falls TS and one 230 kV circuit into Merivale TS. The FIO interface is considered an open interface because the underlying lower-voltage 115 kV circuits that connect the East and Ottawa zones are not measured by the interface. This is because flows on the 115 kV circuits do not materially impact the ability to transfer bulk quantities of power into the Ottawa zone. The FIO transfer capability is important for reliably supplying demand in the Ottawa zone and facilitating exports to Québec.

FIO transfers are not generally limiting with all transmission facilities in service. With one transmission circuit out of service, FIO transfers are limited to ensure acceptable voltage performance and can also be thermally limited under certain situations.

2.1.7 Claireville North (CLAN) and Claireville South (CLAS)

The CLAN interface comprises the circuits that connect the Toronto zone and Essa zone. This includes two 500 kV circuits and two 230 kV circuits north from Claireville TS, located in the Toronto zone. The CLAS interface is defined identically to the CLAN interface, but the power transfer is measured in the reverse direction.

CLAN transfers are not generally limiting with all transmission facilities in service. With one transmission circuit out of service, CLAN transfers are limited to ensure acceptable voltage and thermal performance under certain situations.

2.1.8 Flow North (FN) and Flow South (FS)

The FN interface comprises the circuits that connect the Essa zone and Northeast zone. This includes the two 500 kV circuits north from Essa TS and one 230 kV circuit north into Otto Holden TS. The FS interface is defined identically to the FN interface, but the power transfer is measured in the reverse direction. FN transfer capability is important to reliably supply demand in the Northeast and Northwest zones, as well as facilitate exports to Manitoba, Minnesota and Québec; FS transfer capability is important to deliver imports and supply from the Northwest and Northeast zones to the rest of the province.

FN and FS transfers can be limited under certain conditions to ensure acceptable voltage and stability performance. For example, FN can be limiting under low water conditions (less hydro-electric production) and is sensitive to demand levels in Northern Ontario; and FS can be limiting under high water conditions, i.e., more hydro-electric production.

2.1.9 East-West Transfer East (EWTE) and East-West Transfer West (EWTW)

The EWTW interface comprises the circuits that connect the Northeast and Northwest zones. This currently includes the two 230 kV circuits into Wawa from Marathon, and the two additional 230 kV circuits into Wawa from Marathon that were added as part of the East-West Tie Reinforcement project. The EWTE interface is defined identically to the EWTW interface, but the power transfer is measured in the reverse direction. EWTW transfer capability is important to reliably supply Northwest zone demand, while EWTE transfer capability is important for the delivery of Northwest supply and imports from Manitoba and Minnesota to the rest of the province.

EWTE and EWTW transfers have historically been limited by voltage performance and the thermal capability of the underlying 115 kV path, which have been improved following the reinforcement.

2.1.10 Mississagi Flow West (MISSW) and Mississagi Flow East (MISSE)

The MISSW/MISSE interfaces consist of three 230 kV circuits connecting to Mississagi TS. This includes two circuits between Mississagi TS and Algoma TS (at Blind River), and one circuit between Mississagi TS and Hanmer TS (in Sudbury).

MISSW refers to the flows westward at Mississagi TS. This interface is important for the reliable supply of demand in Sault Ste. Marie, including steel production in the Sault, as well as delivering supply to the Northwest. MISSE refers to the flows eastward out of Mississagi TS, across the same transmission facilities as MISSW, but in the opposite direction. MISSE is important for the delivery of supply from the Northwest to the rest of the province, including renewable generation and imports from Manitoba and Minnesota.

Historically, MISSW and MISSE transfers have been limited to respect thermal capability and voltage decline criteria.

2.2 The Transmission Interties

2.2.1 Ontario-Manitoba

The Ontario-Manitoba interconnection consists of two 230 kV circuits plus one 115 kV circuit. The power transfers across the 230 kV interconnection points can be controlled with the use of phase angle regulators. Transfers across this intertie are defined as Ontario-Manitoba Transfer East (OMTE) and Ontario-Manitoba Transfer West (OMTW). Ontario and Manitoba are synchronously connected at 230 kV, while the 115 kV interconnection is operated normally open (i.e., no power flows) except under rare or emergency conditions.

2.2.2 Ontario-Minnesota

The Ontario-Minnesota interconnection consists of one 115 kV interconnection point. The transfers on this interconnection are the Minnesota Power Flow North (MPFN) and the Minnesota Power Flow South (MPFS). The Ontario and Minnesota systems are synchronously connected, and flows across this intertie can be controlled with a phase angle regulator.

2.2.3 Ontario-Michigan

The Ontario-Michigan interconnection consists of two 230/345 kV interconnection points, one 230/115 kV interconnection point, and one 230 kV interconnection point. The Ontario and Michigan systems are synchronously connected, and flows across this intertie can be controlled with phase angle regulators.

2.2.4 Ontario-New York at Niagara

The Ontario-New York Niagara interconnection consists of two 230/345 kV interconnection points and two 230 kV and one 115 kV interconnection points; the latter of which is used for emergency services only. The interconnection is free-flowing.

The QFW interface is downstream of the New York Niagara interconnection. All flows entering Ontario on the New York Niagara interconnection will impact flows on the QFW interface, including imports and unscheduled flows. Ontario and New York Niagara are synchronously connected.

2.2.5 Ontario-New York at St. Lawrence

The Ontario-New York St. Lawrence interconnection consists of two 230 kV circuits, L33P and L34P. The interconnection is under the control of phase angle regulators.

Ontario and New York are synchronously connected at St. Lawrence.

2.2.6 Ontario-Québec

The Northeast zone has two radial 115 kV interconnection points with Québec; the East zone has four 230 kV, and one 115 kV (radial) interconnection points with Québec; and the Ottawa zone has one HVDC (non-synchronous) interconnection (consisting of two 230 kV circuits), as well as one 230 kV and one 115 kV (radial) interconnection points.

2.3 Transmission Data

The total transfer capability values shown in Table 1 were derived in accordance with applicable planning standards and criteria and should not be interpreted as system operating limits. The values were determined in a comprehensive study performed to satisfy NERC Reliability Standard TPL-001-5.1; the study focused on the forecasted system in 2030 using summer ratings. These values may change as new or updated information and assumptions become available.

Table 1 | 2027 Transmission Interface and Intertie Capabilities (all Transmission Elements In-service)

Interface	Total Transfer Capability (MW)	Interface	Total Transfer Capability (MW)
BLIP	2,630	MB-ON	250
NBLIP	1,625	ON-MN	150
FABCW	>5,660	MN-ON	100
FETT	5,900	ON-MI	1,500
QFW	2,025	MI-ON	1,650
TEC	No upper capability identified	ON-NY @ Niagara	2,150
FIO	>3,010	NY-ON @ Niagara	1,835
FS	2,150	ON-NY @ St. Lawrence	435
FN	1,960	NY-ON @ St. Lawrence	475
EWTE	475	ON-QC	2,135
EWTW	490	QC-ON	2,330
ON-MB	250		

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