

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



**Draft Version**

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#### **Applicability**

- 1** Section 501.10 applies to:
  - (a) the **ISO**; and
  - (b) a **market participant** who has requested or is receiving **system access service** under:
    - (i) Rate STS of the **ISO tariff**, *Supply Transmission Service*;
    - (ii) Rate XOS of the **ISO tariff**, *Export Opportunity Service*;
    - (iii) Rate IOS of the **ISO tariff**, *Import Opportunity Service*; or
    - (iv) Rate DOS of the **ISO tariff**, *Demand Opportunity Service*.

#### **Requirements**

##### **Establish and Maintain Loss Factors**

- 2(1)** The **ISO** must establish and maintain a final **loss factor** for each calendar year, subject to subsection 2(4) below, for each **system access service** that a **market participant** is receiving under a rate of the **ISO tariff** included in subsection 1(b) above.
- (2)** The **ISO** must determine the anticipated losses on the **transmission system** and the average **loss factor** for the **transmission system** for each calendar year, subject to subsection 2(4) below.
- (3)** The **ISO** must establish a final **loss factor** for a new **system access service** that a **market participant** has requested under a rate of the **ISO tariff** included in subsection 1(b) above, as part of a **loss factor** study completed in accordance with subsection 4(3) of section 4 of the **ISO tariff**, *System Access Service Requests*.
- (4)** The **ISO** may adjust one (1) or more final **loss factors** during a calendar year when a change has occurred to a generating, load, transmission, or other facility that is part of or is connected to the **interconnected electric system** and if as a result:
  - (a) the final **loss factor** for a **system access service** increases or decreases by zero point two five (0.25) or more percentage points, then the **ISO** may adjust the final **loss factor** for that **system access service**; or
  - (b) the average **loss factor** for the **transmission system** increases or decreases by zero point two five (0.25) or more percentage points, then the **ISO** may adjust the final **loss factors** for all **system access services** that **market participants** are receiving under rates of the **ISO tariff** included in subsection 1(b) above.

##### **Make Loss Factors Publicly Available**

- 3(1)** The **ISO** must make final **loss factors**, including the dates when each loss factor becomes effective and ceases to be effective, publicly available on the AESO website:
  - (a) using reasonable best efforts, no later than the ~~fifth~~**first** **business day** of ~~November~~**October** prior to the calendar year in which the **loss factors** will apply, ~~including the dates when each loss factor becomes effective and ceases to be effective;~~ or

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



(b) if the ISO is unable to make final loss factors available by the first business day of October, no later than the first business day of December prior to the calendar year in which the loss factors will apply.

(2) The ISO must, when publishing final **loss factors** in accordance with subsection 3(1) above, also make publicly available on the AESO website the following information used to establish the **loss factors**:

- (a) the hourly **merit order** data described in subsection 6(1) below, being the hourly **metered energy** and **operating blocks** for **source assets** and the **available transfer capability** that is not scheduled for imports over **interties**;
- (b) a sample of the hourly load data described in subsection 6(2) below, being a sample of the hourly **metered energy** for **sink assets** that includes four (4) hours randomly selected from each of the following:
  - (i) hours in which **system load** is in its highest quartile in each **month**;
  - (ii) hours in which **system load** is in its lowest quartile in each **month**; and
  - (iii) all other hours in each **month**;and
- (c) the process for requesting access to the twelve (12) system topologies described in subsection 7 below;
- (d) the *Procedure to Determine Transmission System Losses for Loss Factor Calculations* referred to in subsection 8(1) below;
- (e) the software and scripts used to calculate hourly raw **loss factors** in accordance with subsection 8 below;
- (f) a workbook showing the calculations from hourly raw **loss factors** to final **loss factors** in accordance with subsections 8(8), 9, 10, 11 and 12 below; and
- (g) the anticipated losses on the **transmission system** and the average **loss factor** for the **transmission system** determined in subsection 2(2) above.

(3) The ISO must, when the final **loss factors** or other information changes in conjunction with an adjustment to a final **loss factor** in accordance with subsection 2(4) above, publish updated versions of the final **loss factors** made available in accordance with subsection 3(1) above and make publicly available updated versions of the other information described in subsection 3(2) above.

#### Recovery of Cost of Transmission System Losses

4(1) The ISO must reasonably recover the cost of losses on the **transmission system** by using the final **loss factor** for each **system access service** that a **market participant** receives under a rate of the **ISO tariff** included in subsection 1(b) above, as specified in the applicable rate of the **ISO tariff**.

(2) The ISO must reasonably recover the cost of losses on the **transmission system**, excluding **interties**, by using the final **loss factors** applied under Rate STS, Rate IOS and Rate DOS of the **ISO tariff**.

(3) The ISO must reasonably recover the cost of losses on an **intertie** that is not a merchant **intertie** by using the final **loss factors** applied under Rate XOS and Rate IOS of the **ISO tariff** over that **intertie**.

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



(4) The **ISO** must adjust final **loss factors** to ensure that the actual cost of losses is reasonably recovered on an annual basis through the use of Rider E of the **ISO tariff**, *Losses Calibration Factor Rider*.

#### Location at Which Loss Factors Are Determined

5(1) The **ISO** must establish a final **loss factor** for each location that is:

- (a) a **point of supply** for **system access service** provided under Rate STS;
- (b) a point where an **intertie** connects to the remainder of the **interconnected electric system** for **system access service** provided under Rate XOS or Rate IOS over that **intertie**; or
- (c) a **point of delivery** for **system access service** provided under Rate DOS.

(2) A **market participant** must, subject to subsection 5(4) below, ensure that all **generating units** and **aggregated generating facilities** connected to the **transmission system** through a single location under subsection 5(1)(a) above:

- (a) are owned or controlled, managed, and operated by the same entity;
- (b) are part of a single economic enterprise or undertaking and not independent, standalone businesses; and
- (c) have energy submitted in the energy market as part of the price-quantity **offers** for a single **source asset**, where that **source asset** does not include any other **generating unit** or **aggregated generating facility**.

(3) A **market participant** must, when ensuring it meets the requirements of subsection 5(2) above, consider that:

- (a) all **generating units** that are part of a single industrial system that has been designated as such by the **Commission** satisfy the single owner and single enterprise requirements of subsections 5(2)(a) and 5(2)(b) above;
- (b) all **generating units** and **aggregated generating facilities** that are connected to part of an **electric distribution system** that receives **system access service** under subsection 5(1)(a) above satisfy the single owner, single enterprise, and single **source asset** requirements of subsection 5(2) above, including any of those **generating units** and **aggregated generating facilities** that have energy submitted in the energy market as a separate **source asset**;
- (c) all **generating units** and **aggregated generating facilities** that are connected to the **electric distribution system** or **transmission facilities** owned by the City of Medicine Hat satisfy the single owner, single enterprise, and single **source asset** requirements of subsection 5(2) above, including any of those **generating units** and **aggregated generating facilities** that have energy submitted in the energy market as a separate **source asset**;
- (d) all **generating units** that are subject to **power purchase arrangements** and are held by a single **power purchase arrangement** buyer satisfy the single owner and single enterprise requirements of subsection 5(2)(a) and 5(2)(b) above;
- (e) a single **generating unit** that is subject to a **power purchase arrangement** and is held by more than one **power purchase arrangement** buyer satisfies the single owner and single enterprise requirements of subsection 5(2)(a) and 5(2)(b) above; and
- (f) **generating units** that are subject to **power purchase arrangements** and are held by different **power purchase arrangement** buyers do not satisfy the single owner or single

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



enterprise requirements of subsection 5(2)(a) and 5(2)(b) above, including any of those **generating units** that are subject to common **offer** control.

(4) A **market participant** may, notwithstanding subsection 5(2) above, continue the connection of **generating units** to the **transmission system** in the following configurations that existed on December 31, 2016:

- (a) for the connection of multiple hydro **generating units** owned by TransAlta Corporation on the Bow River system upstream of Calgary, Alberta, at eleven (11) locations that are **points of supply** for **system access service** provided under Rate STS and have energy submitted in the energy market in aggregate as a single **source asset**;
- (b) for the connection of multiple **generating units** that are part of the Suncor Energy Inc. industrial system in the area of Fort McMurray, Alberta, at a single location that is a **point of supply** for **system access service** provided under Rate STS and have energy submitted in the energy market as three (3) **source assets**;
- (c) for the connection of multiple **generating units** that are part of the Imperial Oil Resources Limited industrial system in the area of Cold Lake, Alberta, at a single location that is a **point of supply** for **system access service** provided under Rate STS and have energy submitted in the energy market as two (2) **source assets**; and
- (d) for the connection of multiple **generating units** that are part of the Shell Canada Limited Scotford industrial system in the area of Fort Saskatchewan, Alberta, at a single location that is a **point of supply** for **system access service** provided under Rate STS and have energy submitted in the energy market as two (2) **source assets**.

(5) A **market participant** may request, no more than once each calendar year, a change to the configuration of **generating units** or **aggregated generating facilities**:

- (a) for:
  - (i) the aggregation of **generating units** and **aggregated generating facilities** that are currently connected to the **transmission system** through multiple locations; or
  - (ii) the disaggregation of **generating units** and **aggregated generating facilities** that are currently connected to the **transmission system** through a single location;
- (b) while ensuring that the single owner, single enterprise, and single **source asset** requirements of subsections 5(2)(a), 5(2)(b), and 5(2)(c) above will continue to be satisfied; and
- (c) by contacting the **ISO** no later than March 31 prior to the calendar year in which the **loss factors** will apply.

(6) The **ISO** must respond to a request under subsection 5(5) within sixty (60) calendar **days** by:

- (a) approving the request in writing and proceeding to work with the **market participant** to implement, on a best efforts basis, prior to the calendar year in which the **loss factors** will apply, any changes to **metering equipment**, **transmission facilities**, **system access service** agreements, or **source assets** required for the aggregation or disaggregation; or
- (b) denying the request in writing, with reasons, which may include constraints on resources of the **ISO** or the **legal owner** of a **transmission facility** to implement changes to **metering equipment** or **transmission facilities** required for the aggregation or disaggregation.

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



(7) The **market participant** must pay the following costs if incurred to implement an aggregation or disaggregation:

- (a) any costs incurred by a **legal owner** of a **transmission facility** related to changes to **metering equipment** or **transmission facilities**;
- (b) any costs required to comply with applicable provisions of the *AESO Measurement System Standard* or applicable **ISO rules**, for any measurement point associated with the aggregation or disaggregation;
- (c) any costs required by applicable provisions of the **ISO tariff**, including provisions of sections 9 and 10 of the **ISO tariff**, *Changes to System Access Service After Energization* and *Generating Unit Owner's Contribution*; and
- (d) any costs required to maintain compliance with any other applicable provisions of the **ISO rules**, **reliability standards**, or **ISO tariff**.

#### Data Used to Calculate Loss Factors

6(1) The **ISO** must calculate **loss factors** using hourly historical metered volume and **merit order** data for all **source assets** connected to the **transmission system** that are included in the system topologies created in subsection 7 below, for the calendar year for which **loss factors** are being determined, by:

- (a) using hourly historical data for the calendar year two (2) years prior to the calendar year for which **loss factors** are being determined;
- (b) including, in the following order, the following volumes for each **source asset**, including for the eleven (11) locations at which hydro **generating units** on the Bow River system are connected to the **transmission system**:
  - (i) all **metered energy** for **source assets** that do not submit price-quantity **offers** in the energy market;
  - (ii) all dispatched **operating blocks** for **source assets** that submit price-quantity **offers** in the energy market, in **merit order** first by price and then by size;
  - (iii) all undischarged **operating blocks** offered in the energy market for **source assets** that submit price-quantity **offers** in the energy market, in **merit order** first by price and then by size;
  - (iv) all volumes for **source assets** that the **ISO** accepts for **dispatch** for **contingency reserve**, in **merit order** first by price and then by size; and
  - (v) all **available transfer capability** which is not scheduled for imports over **interties**;

6(c) incorporating any change to **maximum capability** or **contract capacity** associated with a connection project, behind the fence project or contract capacity change project for a **source asset** included in the historical data by increasing or decreasing the **source asset's** historical volumes in subsection 6(b) above in proportion to the change in maximum capability or **contract capacity**, as appropriate;

(d) incorporating any return to service for a **source asset** that was subject to a **mothball outage**, a **planned outage** or a similar extended outage for one entire **month** or longer during the historical year, by the **ISO** reasonably adjusting the historical volumes of the **source asset** for the months affected by the **mothball outage**, **planned outage** or similar extended outage in the historical year, following an opportunity for the **legal owner** of the **source asset** to review and comment on the basis for the adjusted volumes;



# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



- (e) incorporating any new **source asset** not included in the historical data but which has an expected in-service date by the end of the calendar year for which **loss factors** are being determined, by assigning such new **source asset** an hourly data profile after its expected in-service date reflecting the hourly data profile that is, for the same period:
  - (i) the average of all **source assets** of the same technology owned by the same **market participant** in the historical data;
  - (ii) if no **source asset** of the same technology is owned by the same **market participant** in the historical data, the average of all **source assets** of the same technology owned by any **market participant** in the historical data; and
  - (iii) if no **source asset** of the same technology is owned by any **market participant** in the historical data, determined by the **ISO** ~~in conjunction with~~ after the **legal owner** of the new **source asset** has been provided an opportunity to review and comment on the basis for the hourly data profile.

and

- (df) excluding any **source asset** during a **month** when, for the entirety of that **month** of the calendar year for which **loss factors** are being determined:
  - (i) the **market participant** has notified the **ISO** that the **source asset** is planned to be subject to a **mothball outage** ~~or~~, a **planned** outage or a similar extended outage; or
  - (ii) the **system access service** for the **source asset** is planned to have been terminated.

(2) The **ISO** must calculate **loss factors** using hourly historical **metered energy** data for all **sink assets** connected to the **transmission system** that are included in the system topologies created in subsection 7 below, for the calendar year for which **loss factors** are being determined, by:

- (a) using hourly historical data for the calendar year two (2) years prior to the calendar year for which **loss factors** are being determined;
- (b) including all **metered energy** for each **sink asset**;
- ~~(e)c~~ incorporating any change to **contract capacity** associated with a connection project, behind the fence project or a **contract capacity** change project for a **sink asset** included in the historical data by increasing or decreasing the **sink asset's metered energy** in subsection 6(b) above in proportion to the change in **contract capacity**;
- (d) incorporating any new **sink asset** not included in the historical data but which has an expected in-service date by the end of the calendar year for which **loss factors** are being determined, by assigning such new **sink asset** an hourly data profile reflecting the average hourly data profile of all **sink assets** included in the historical data after the expected in-service date of the new **sink asset**;
- (de) excluding any **sink asset** during a **month** when, for the entirety of that **month** of the calendar year for which **loss factors** are being determined, the **system access service** for the **sink asset** is planned to have been terminated; and
- (ef) prorating all hourly **metered energy** for **sink assets** included in subsection 6(2)(b) above such that the total of the **metered energy** from the prorated **sink assets** plus the **metered energy** from the unprorated new **sink assets** included in subsection 6(2)(c) above is equal to the forecast **system load** annual volume for the calendar year for which **loss factors** are being determined.

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



#### System Topologies Used to Calculate Loss Factors

**7(1)** The **ISO** must create twelve (12) system topologies that represent the **transmission system** in each of the twelve (12) **months** of the calendar year for which **loss factors** are being determined.

**(2)** The **ISO** must, subject to subsections 7(3) and 7(4) below, include in each system topology all **transmission facilities** that the **ISO** reasonably expects to be in service before or on the last **day** of the **month** for which the system topology is created, based on the project queue most recently published by the **ISO** when the twelve (12) system topologies are created.

**(3)** The **ISO** must, subject to subsection 7(4) below, include in a system topology the **transmission facilities** that meet the in-service date criterion in subsection 7(2) above only when:

- (a) for existing **transmission facilities**, the **transmission facilities**:
    - (i) are in service under normal operation when the system topologies are created; and
    - (ii) are not included in a plan approved by the **Commission** for decommissioning before the first **day** of the **month** for which the system topology is created;
  - (b) for proposed system **transmission facilities**, being **transmission facilities** that the **ISO** determines will benefit many **market participants**, the **Commission** has issued a permit and licence for the **transmission facilities** before the system topologies are created;
  - (c) for a proposed connection project or **market participant** choice project that requires construction of a new substation or transmission line:
    - (i) the **Commission** has issued a permit and licence for the **transmission facilities** before the system topologies are created; and
    - (ii) if required by the **ISO tariff**, the **market participant** has paid a **generating unit** owner's contribution before the system topologies are created;
  - (d) for a proposed connection project that only requires construction at an existing substation:
    - (i) the **legal owner** of the **transmission facilities** has filed a facility application with the **Commission** before the system topologies are created; and
    - (ii) if required by the **ISO tariff**, the **market participant** has paid a **generating unit** owner's contribution before the system topologies are created;
  - (e) for a proposed behind-the-fence project that does not require construction of **transmission facilities**:
    - (i) the **ISO** has, after completion of the functional specification stage of the connection process, issued an acknowledgement letter before the system topologies are created;
    - (ii) if required by the **ISO tariff**, the **market participant** has paid a **generating unit** owner's contribution before the system topologies are created; and
    - (iii) if required by the *Hydro and Electric Energy Act*, the **market participant** has filed a power plant application with the **Commission** before the system topologies are created;
- and
- (f) for a proposed **contract capacity** change project that does not require construction of **transmission facilities**, the **market participant** has, after the **ISO** completes any required

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



studies and calculations, acknowledged the **ISO's construction contribution** decision before the system topologies are created.

(4) Notwithstanding subsections 7(2) and 7(3) above, the **ISO** may exclude or include a **transmission facility, source asset or sink asset** in a system topology if the **ISO** reasonably expects that the in-service date of the **transmission facility, source asset or sink asset** will differ from that provided in the project queue on which the system topologies are based.

~~(5) The **ISO** must replace this subsection 7 to be effective no later than the fifth business day of November in 2018, unless the replacement subsection 7 is then subject to a **Commission** proceeding.~~

#### Calculation of Hourly Loss Factors

**8(1)** The **ISO** must calculate hourly raw **loss factors** for each location included in subsection 5(1) above for **system access service** provided under Rate STS, Rate IOS or Rate DOS for the calendar year for which **loss factors** are being determined, using:

- (a) an incremental **loss factor** methodology with **merit order** redispatch as described in this subsection 8 and which calculates, for a **pool asset** in an hour:
  - (i) first, **transmission system** losses using the historical volume for that **pool asset**, in subsection 8(4) below;
  - (ii) second, **transmission system** losses after removing the **pool asset's** volume and replacing it by redispatching other assets, using the historical **merit order** for the hour, in subsection 8(5) below; and
  - (iii) third, the hourly raw **loss factor** as the difference between **transmission system** losses calculated in subsections 8(1)(a)(i) and 8(1)(a)(ii) above, divided by the **pool asset's** historical volume in the hour, in subsection 8(6) below;
- and
- (b) the *Procedure to Determine Transmission System Losses for Loss Factor Calculations*, as published by the **ISO** on the AESO website and as amended from time to time by the **ISO** on notice to **market participants**.

(2) The **ISO** must, when calculating a raw **loss factor** for an hour under this subsection 8, use:

- (a) the historical metered volume and **merit order** data for all **source assets** for that hour as described in subsection 6(1) above;
- (b) the historical **metered energy** data for all **sink assets** for that hour as described in subsection 6(2) above; and
- (c) the system topology for the **month** in which that hour occurs as described in subsection 7 above.

(3) The **ISO** must, when calculating **transmission system** losses under this subsection 8, exclude any losses that occur on:

- (a) a **transmission facility** that is owned and operated by a **market participant** as part of its connection to the **transmission system** for **system access service**, including a **transmission facility** that is within an industrial system that has been designated as such by the **Commission**; or
- (b) an **intertie**.



# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



(4) The ISO must, unless it is not possible, calculate **transmission system** losses for an initial state for each hour of the calendar year for which **loss factors** are being determined, based on:

- (a) the volumes for **metered energy** and dispatched **operating blocks** included in subsections 6(1)(b)(i), 6(1)(b)(ii), and 6(2)(b) above, as applicable, for that hour; and
- (b) balancing total supply to total load plus **transmission system** losses in that hour by ~~either~~:
  - (i) increasing the volume for undischarged **operating blocks**, **contingency reserve** and **available transfer capability** which is not scheduled from one (1) or more **source assets**, in the order described in subsection 6(1)(b) above; ~~or~~
  - ~~(ii)~~ where net demand from the **transmission system** exists at a location where volume from a **source asset** would be increased in subsection 8(4)(b)(i) above and that **source asset** submits offers in the energy market on a net supply basis:
    - (A) first decreasing the **metered energy** to load at that location as necessary to balance the system, but by no more than required to reduce net demand to zero (0); and
    - (B) then increasing the volume from the **source asset** as necessary to balance the system;
  - or
  - (iii) decreasing the volume for **metered energy** and dispatched **operating blocks** in the order described in subsection 6(1)(b) above.

(5) The ISO must, unless it is not possible, calculate **transmission system** losses for a redispatched state for each hour of the calendar year for which **loss factors** are being determined:

- (a) for each location for **system access service** provided under Rate STS or Rate IOS, based on:
  - (i) reducing the volume for **metered energy** or dispatched **operating blocks** for the location such that net supply to the **transmission system** is zero (0) while the facilities of the **market participant** remain connected for the applicable **system access service**; ~~and~~
  - (ii) increasing the volume for undischarged **operating blocks**, **contingency reserve** and **available transfer capability** which is not scheduled from one (1) or more **source assets**, in the order described in subsection 6(1)(b) above, such that total supply balances the total load plus **transmission system** losses with the net supply to the **transmission system** set to zero (0) for the applicable **system access service**; ~~and~~
  - (iii) where net demand from the **transmission system** exists at a location where volume from a **source asset** would be increased in subsection 8(5)(a)(ii) above and that **source asset** submits offers in the energy market on a net supply basis:
    - (A) first decreasing the **metered energy** to load at that location as necessary to balance the system, but by no more than required to reduce net demand to zero (0); and
    - (B) then increasing the volume from the **source asset** as necessary to balance the system;

and

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



- (b) for each location for **system access service** provided under Rate DOS, based on:
- (i) reducing the volume for **metered energy** for the location such that net demand from the **transmission system** reflects the Rate DTS **contract capacity** for the applicable **system access service**; ~~and~~
  - (ii) decreasing the volume for **metered energy** and dispatched **operating blocks** from one or more **source assets**, in the order described in subsection 6(1)(b) above, such that total supply balances the total load plus **transmission system** losses with the net demand from the **transmission system** reflecting the Rate DTS **contract capacity** for the applicable **system access service**; ~~and~~
  - (iii) where **metered energy** to load was decreased in subsection 8(4)(b)(ii) above at a location where volume from a **source asset** would be decreased in subsection 8(5)(b)(ii) above:
    - (A) first decreasing the volume from the **source asset** as necessary to balance the system, but by no more than required to reduce net supply to zero (0); and
    - (B) then increasing the **metered energy** to load at that location as necessary to balance the system, but by no more than required to increase net demand to its original value.

(6) The **ISO** must, unless it is not possible, calculate the raw **loss factor**, in percent, for each location for **system access service** provided under Rate STS, Rate IOS or Rate DOS, for each hour of the calendar year for which **loss factors** are being determined, by dividing:

- (a) the difference between:
  - (i) the **transmission system** losses for the initial state calculated in subsection 8(4) above; and
  - (ii) the **transmission system** losses for the redispatched state calculated in subsection 8(5) above;
- by:
- (b) the amount by which the volume for **metered energy** or dispatched **operating blocks** for the location was reduced or increased in the redispatched state in subsection 8(5) above.

(7) The **ISO** must exclude an hour from the calculations in subsections 8(8) through 11 below to determine final **loss factors** for all locations if, for any location in that hour, it is not possible to calculate **transmission system** losses for either the initial state in subsection 8(4) above or the redispatched state in subsection 8(5) above for any reason, including:

- (a) missing or otherwise unavailable historical data for every **source asset** or every **sink asset** connected to the **transmission system** during that hour; or
- (b) insufficient **source assets** to balance the **transmission system** in either the initial state in subsection 8(4) above or the redispatched state in subsection 8(5) above.

(8) The **ISO** must exclude an hour from the remaining calculations to determine a final **loss factor** for a single location if, for that location in that hour:

- (a) for **system access service** provided under Rate STS or Rate IOS, the volume for **metered energy** or dispatched **operating blocks** for the location results in a net supply to the **transmission system** of less than 1.00 MW; or

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



(b) for **system access service** provided under Rate DOS, the volume for **metered energy** for the location results in a net demand to the **transmission system** of less than 1.00 MW; ~~or,~~

~~(c) it is not possible to calculate, with reasonable effort, **transmission system** losses for either the initial state in subsection 8(4) above or the redispatched state in subsection 8(5) above.~~

(9) The **ISO** must, for each hour of the calendar year for which **loss factors** are being determined and which has not been excluded under subsection 8(7) above, add to or subtract from the hourly raw **loss factor** for each location a single hourly shift factor, in percent, such that the hourly shifted **loss factors** recover the **transmission system** losses calculated for the initial state in that hour in subsection 8(4) above, excluding any losses that occur on an **intertie**.

#### Calculation of Annual Loss Factors

9(1) The **ISO** must, subject to subsection 9(2) below, calculate an annual average **loss factor**, in percent, for each location included in subsection 5(1) above for **system access service** provided under Rate STS, Rate IOS or Rate DOS for the calendar year for which **loss factors** are being determined as the average of the shifted hourly **loss factors** calculated in subsection 8(9) above, weighted by the amount by which the volume for **metered energy** or dispatched **operating blocks** for the location was reduced or increased in each hour in the redispatched state in subsection 8(5) above.

(2) The **ISO** must, where all hours of the calendar year for which **loss factors** are being determined for a location have been excluded under subsections 8(7) and 8(8) above, use the following as the annual average **loss factor** for that location:

- (a) the annual average **loss factor** calculated for the location for the year prior to the calendar year for which **loss factors** are being determined; or
- (b) if no annual average **loss factor** was calculated for the location for the prior year, the average annual **loss factor** for the **transmission system** determined in subsection 2(2) above for the calendar year for which **loss factors** are being determined.

(3) The **ISO** must add to or subtract from the annual average **loss factor** for each location a single annual shift factor, in percent, such that the annual shifted **loss factors** recover the total **transmission system** losses forecast for the calendar year for which **loss factors** are being determined, excluding any losses that occur on an **intertie**.

(4) The **ISO** must use the annual shifted **loss factor** calculated in subsection 9(3) above as the uncompressed annual **loss factor**, in percent, for each location for **system access service** provided under Rate STS or Rate DOS for the calendar year for which **loss factors** are being determined.

#### Loss Factors for Interties

10(1) The **ISO** must calculate an uncompressed annual **loss factor**, in percent, for each location for **system access service** provided under Rate XOS over an **intertie** that is not a merchant **intertie**, that represents the average level of losses incurred in exporting electric energy over that **intertie**.

(2) The **ISO** must calculate an uncompressed annual **loss factor**, in percent, for each location for **system access service** provided under Rate IOS for an **intertie** that is not a merchant **intertie** for the calendar year for which **loss factors** are being determined, that is the sum of:

- (a) the annual shifted **loss factor** calculated under subsection 9(3) above for **system access service** provided under Rate IOS over that **intertie**; and
- (b) an additional **loss factor** that represents the average level of losses incurred in importing electric energy over that **intertie**.

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



(3) The **ISO** must use the annual shifted **loss factor** calculated in subsection 9(3) above as the uncompressed annual **loss factor**, in percent, for each location for **system access service** provided under Rate IOS over a merchant **intertie** for the calendar year for which **loss factors** are being determined.

(4) The **ISO** must calculate **loss factors** under subsections 10(1) and 10(2)(b) above based on historical data for the calendar year two (2) years prior to the calendar year for which **loss factors** are being determined, for net flow over each **intertie** that is not a merchant **intertie**.

#### Compressed Loss Factors

**11(1)** The **ISO** must use the uncompressed annual **loss factors** calculated under subsections 9(4) and 10 above for all locations included in subsection 5(1) above, if no uncompressed annual **loss factor** is a charge that exceeds 12.00% or a credit that exceeds 12.00%.

(2) The **ISO** must, if any uncompressed annual **loss factor** calculated under subsections 9(3) or 10 above is a charge that exceeds 12.00% or a credit that exceeds 12.00%, compress the **loss factors** by:

- (a) estimating the single compression shift factor, in percent, that would need to be added to or subtracted from each uncompressed annual **loss factor** to address any loss recovery imbalance that would result from clipping each uncompressed annual **loss factor** that is:
  - (i) a charge that exceeds 12.00% to a charge equal to 12.00%; and
  - (ii) a credit that exceeds 12.00% to a credit equal to 12.00%;
- (b) adding to or subtracting from each uncompressed annual **loss factor** the single compression shift factor estimated in subsection 11(2)(a) above and clipping each resulting compressed annual **loss factor** that is:
  - (i) a charge that exceeds 12.00% to a charge equal to 12.00%; and
  - (ii) a credit that exceeds 12.00% to a credit equal to 12.00%;
- and
- (c) if the loss recovery imbalance in subsection 11(2)(a) is not fully addressed by the compressed and clipped **loss factors** resulting from subsection 11(2)(b) above, adjusting the single compression shift factor used in subsection 11(2)(b) above, through multiple iterations if necessary, until the compression shift factor addresses any remaining loss recovery imbalance.

#### Final Loss Factors

**12** The **ISO** must establish the **loss factor** calculated under subsection 11(1) or 11(2) above as the final **loss factor**, in percent, for each location included in subsection 5(1) above for **system access service** provided under Rate STS, Rate XOS, Rate IOS or Rate DOS for the calendar year for which **loss factors** are being determined.

#### Revision History

Effective	Description
<u>XXXX-XX-XX</u>	<u>Revised subsection 6 to clarify that source assets and sink assets are included on the same basis as subsection 7; revised subsection 6 to include increases or decreases to volumes for existing source assets and sink assets and the return to service of a source</u>

# ISO Rules

## Part 500 Facilities

### Division 501 General

#### Section 501.10 Transmission Loss Factors



	<u>asset following a mothball outage, planned outage or similar extended outage; removal of subsections 7(5) and 8(8)(c); revised subsections 8(4) and (5) to allow net demand at a self-supply site to be reduced before net supply is dispatched.</u>
2017-12-07	Revised subsection 7.
2017-01-01	Revised to reflect directions, findings and guidance in Commission Decision 790-D03-2015.
2013-10-25	Updated to reflect new ISO tariff rate schedule Rate XOM which is related to the MATL energization and other incidental amendments.
2012-10-10	Initial release.