

Settlement Meter Data Applications Working Group (SE-113)

Stakeholder Meeting #3
December 12, 2013



- Items From Last Meeting
- Approach and Timing
- Losses Overview
- Why Changes are Required
- Allocation of No Load Losses
- Loss Precedence
- Dynamic Load Allocation Ratio
- Compliance Aggregation/Meter Disaggregation Models
- Next Steps
- Questions
- Appendix

A number of questions arose during and after the last working group session:

- Q. How will a day's delay in making EDI data available to distributors affect the submission of the (formerly) Form 1598 data?
- A. The IESO is looking at various options as to how this concern can be addressed. One would be to extend the due date submission by one day, thus extending the submission window to no later than 5 business days after the last trade day of the month.
- Q. In the proposed new system, would the data be provided for a full month leading up to the request, or would it be only for the calendar month in which the request was submitted?
- A. The new system data will have the same availability (timing of availability and period of data available for retrieval) as now, except for calculated delivery point (DP) data, which will be available 1 calendar day later than the existing system.

Items From Last Meeting, cont'd

- Q. Will DP data versions (current, preliminary, final) for a particular trade day be made available in a single document, like a report, in the proposed new system?
- A. The DP data versions for a particular trade date will be available in separate documents (will be confirmed upon completion of design).
- Q. With the understanding that channels 1 and 3 may be calculated or adjusted, would channels 2 and 4 also be adjusted?
- A. Adjustments are made only for the active energy. The reactive energy will not be adjusted.
- Q. Will the proposed system changes include a strategy for mitigating the impact on settlement statements of an hourly Ontario energy price of zero?
- A. The IESO is currently working to resolve this issue, but not as part of this set of system changes.

The stakeholder engagement will focus on three project phases:

1. Design (October 2013 – January 2014)

- Stage 1: Viewing/retrieving information (closed)
- Stage 2: Application of losses and estimation

2. Testing (Early 2014 – Late 2014)

- Market trial testing strategy TBD

3. Implementation (end of 2014)

- In service

- Energy transactions are settled at a point on the IESO-controlled grid called the defined meter point. This is the point of connection where energy flows into and out of the IESO-controlled grid.
- Metering installations are required to be located at the defined meter point.
- When this is not the case, the market rules require site-specific loss adjustments to be applied to the meter readings.
- The adjusted readings are representative of those that would have been obtained if the metering installation were located at the defined meter point.
- Site-specific loss adjustments (SSLA) include both power transformers and radial lines.

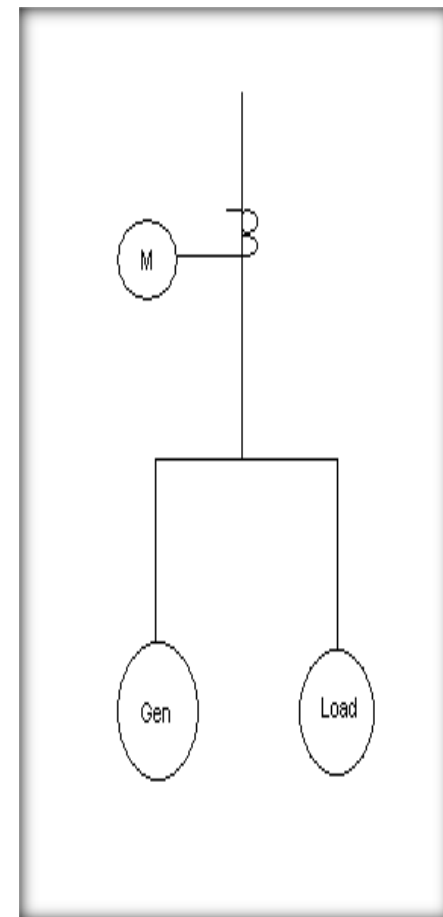
- There are two types of losses used in the IESO's Market:
 - 1. Fixed Factor Losses**
 - A single coefficient value used as a multiplier in the calculation of losses (e.g. Measurement Error Correction (MEC) and Total Loss Factor (TLF))
 - 2. Equation Losses**
 - A set of coefficient values used as variables in the calculation of loss equations (e.g. SSLA Type 1 and SSLA Type 2)
 - SSLA losses consist of Load Losses and No-Load Losses

Why Changes are Required

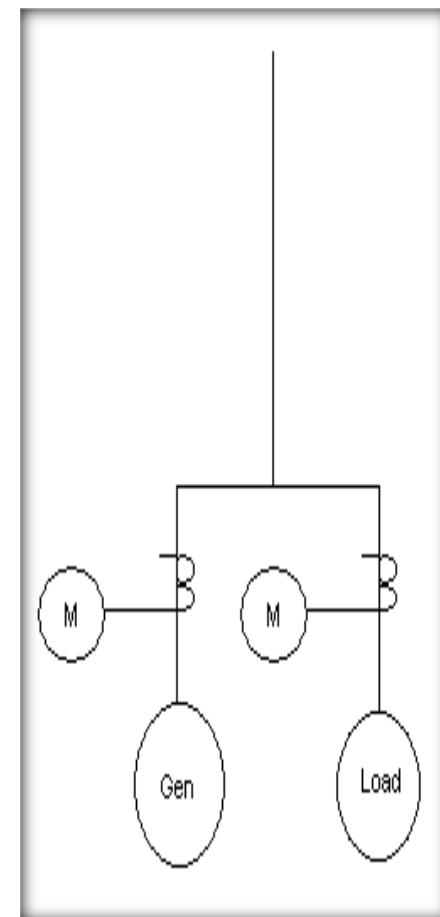
- The existing system and current loss models have limitations when it comes to applying losses to meter data.
- The current loss models do not consider the various complex metering configurations that require special consideration when applying losses, such as:
 - Allocation of no load losses
 - Sharing of losses between Market Participants
 - Embedded generation
- The IESO is introducing enhancements in the new system to address feedback received by Market Participants on the various loss applications.

Allocation of No Load Losses

- A facility could operate in such a way that it is consuming energy during certain periods of time with the capability of injecting energy into the grid during other periods (e.g. load facilities with embedded generators with one meter point).
- When the switch occurs from consumption to generation, which means there is flow on both received and delivered channels during the interval, the existing loss model will apply no load losses to both channels resulting in a double application of no load losses for that interval.



- A facility with a load and an embedded generator that are metered separately will have the losses applied at the Summary Meter (totalized meter data).
- As a result, there is flow on both received and delivered channels at the Summary Meter during each interval.
- The existing loss model will apply no load losses to both channels at the Summary Meter, resulting in a double application of no load losses for each interval.



- We are introducing the application of the ratio of channel interval data values for both received and delivered channels to the losses, thus eliminating the double application of no load losses.

kWh _{Del} (Ch1)	kWh _{Rec} (Ch3)	As-Is	To-Be
= 0	= 0	Add active loss to Ch1	Add active loss to Ch1
≠ 0	= 0	Add active loss to Ch1	Add r_{Del} * Active loss to Ch1
= 0	≠ 0	Subtract active loss from Ch3	Subtract r_{Rec} * Active loss from Ch3
≠ 0	≠ 0	Add active loss to Ch1 Subtract active loss from Ch3	

Where:

$$r_{Rec} = \frac{Ch_1}{Ch_1 + Ch_3} \quad r_{Del} = \frac{Ch_3}{Ch_1 + Ch_3}$$

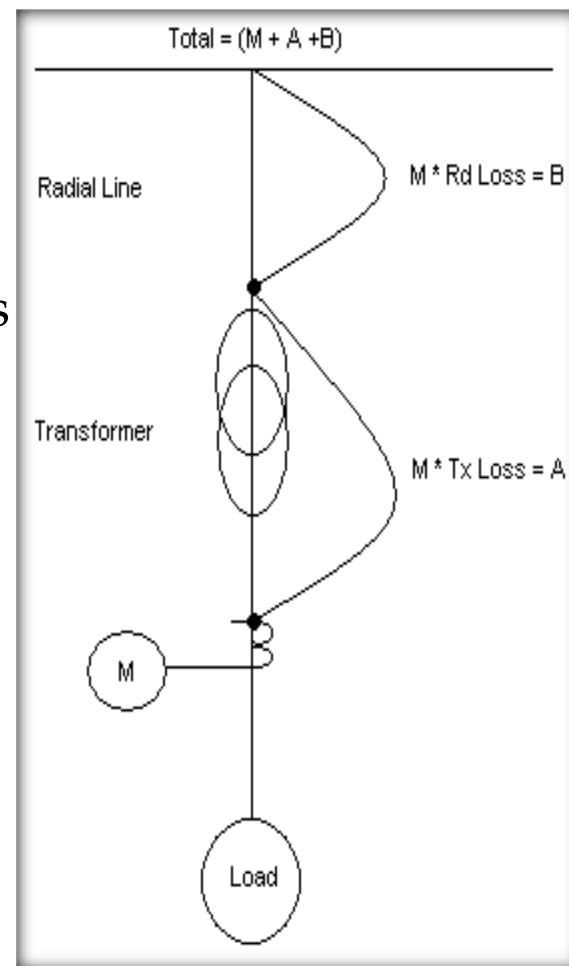
- Both the As-Is and To-Be loss allocation methods will be implemented in the new system.
- When the new system is in production, we will use the As-Is method, and then transition to the To-Be method.
- There will be a global setting that transitions the IESO loss allocation processes from As-Is to To-Be.
- Stakeholders will be notified when the new system is implemented at the end of 2014.

- Loss Codes are used to define applicable losses for all Meter Points and Summary Meters, which aggregate up to a Delivery Point.
- They are driven by criteria based on each metering configuration, and set the order in which the losses are applied
- Loss application within a Loss Code is based on Loss Precedence.

- The existing system does not respect precedence of loss application within a Loss Code at the Summary Meter level.
- The precedence of losses of the contributing meter points are not considered in the Summary Meter loss calculations.

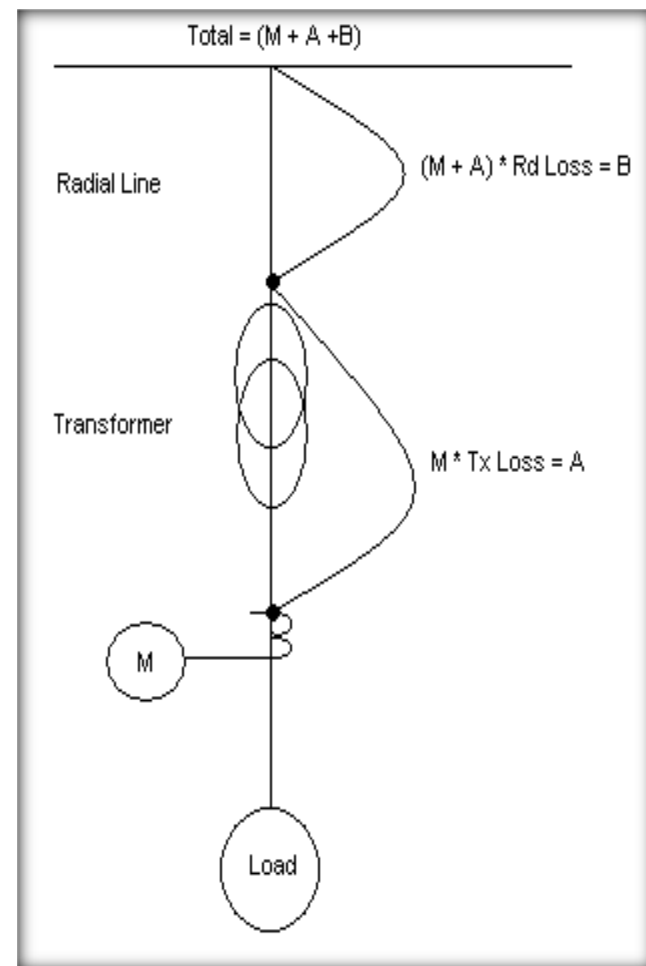
As-Is Method (Precedence "Off"):

- **Meter Point Level:** SSLA losses are applied in the Loss Code by precedence
- **Summary Meter Level:** SSLA losses in the Loss Code are applied to the raw channel values without any previous losses from the Loss Code applied
 - $M * Tx Loss = A$
 - $M * Rd Loss = B$
 - $Total\ with\ Losses = M + A + B$
 - Where:
 - » M is the Raw Meter Data
 - » A and B are calculated losses



To-Be Method (Precedence "On"):

- **Meter Point Level:** SSLA losses are applied in the Loss Code by precedence
- **Summary Meter Level:** Apply all losses in the Loss Code by precedence
 - $M * Tx Loss = A$
 - $(M + A) * Rd Loss = B$
 - *Total with Losses = $M + A + B$*
 - Where:
 - » M is the Raw Meter Data
 - » A and B are calculated losses



- The IESO performed analysis on different scenarios by comparing the results between the two methods, and concluded that the difference is negligible and in the order of 7-8 ten thousandths of a percent (when averaged over a 24 hour period).
- Both the As-Is and To-Be loss precedence methods will be implemented in the new system.
- When the new system is in production we will use the As-Is method, and then transition to the To-Be method using a global setting.

- The existing loss model is based on static load assumptions. When the load distribution is changed, the loss model does not reflect the distribution of actual losses based on actual flow.
- For example, when two generators (Gen_1 and Gen_2) share one radial line connection to the grid, the losses applied to each generator will be based on static load assumptions (i.e. size of generator).
- If Gen_1 is generating while Gen_2 is idle, the radial line losses will be applied to both generators regardless of the status of each generator based on static allocation assumptions.

- The new system will have enhancement features to allow dynamic load allocation to allocate the losses between different Meter points or Summary Meters based on measured load.
- The IESO is planning to introduce the use of a 'Ratio Meter' concept, which will be essential in allocating the losses based on actual energy flow.
- The 'Ratio Meter' will be the ratio of channel interval data values for certain channels, for one or more Meter Points/Summary Meters.
- The use of 'Ratio Meter' will be optional and will require re-registration of Totalization Tables.

Compliance Aggregation/Meter Disaggregation Models

- Compliance Aggregation is the functionality that permits measured generation from multiple facilities to be aggregated and then apportioned to the delivery points associated with the Compliance Aggregation Model.
- Meter Disaggregation is the functionality which permits measured net generation from one facility to be apportioned to the delivery points associated with the Meter Disaggregation Model.
- The apportionment is performed by applying a proportionality factor based on dispatch instructions to the aggregation/disaggregation summary meter.

Compliance Aggregation/Meter Disaggregation Models, cont'd

- In the existing system, the Compliance Aggregation/Meter Disaggregation Models cannot be modified once implemented. Any changes to the model will require re-registration of facilities, resulting in the creation of new DPs.
- The new system is expected to address this limitation by adding the capability to update these models when updating contributors without the need to re-register the facilities.

- The IESO will communicate details of a Market Trial testing plan, as well as project updates, to stakeholders through periodic webinars in early to mid 2014.
- Stakeholders will be notified of the webinars through the weekly bulletin and on the SE-113 webpage (http://www.ieso.ca/imoweb/consult/consult_se113.asp).
- Please send your comments to stakeholder.engagement@ieso.ca.



- Volt and Ampere Squared Coefficients – based on V^2h and I^2h
- Calculated separately for active energy for delivered and received channels

$$\text{Active Loss} = A*(V^2hR+V^2hY+V^2hB)+B*(I^2hR+I^2hY+I^2hB)$$

- Where:
 - A, B are predefined coefficients for the meter
 - V^2hR , V^2hY , V^2hB are the interval data for the voltage channels
 - I^2hR , I^2hY , I^2hB are the interval data for the current channels

- KVA Coefficients – based on KVA
- Calculated separately for active energy and reactive energy for delivered and received channels.

$$Active\ Loss_{Del} = k1 * \frac{i}{1000^2} * (kVAh_{Del})^2 + \frac{k2}{1000} * kVAh_{Del} + \frac{k3}{i}$$

$$Active\ Loss_{Rec} = k1 * \frac{i}{1000^2} * (kVAh_{Rec})^2 + \frac{k2}{1000} * kVAh_{Rec} + \frac{k3}{i}$$

- Where:

$$kVAh_{Del} = \sqrt{kWh_{Del}^2 + kVARh_{Del}^2}$$

$$kVAh_{Rec} = \sqrt{kWh_{Rec}^2 + kVARh_{Rec}^2}$$

- k1, k2, k3 are predefined coefficients for the meter
- 'i' is the number of intervals per hour for the meter.

- SSLA Type 1 – Volt & Ampere Squared Coefficients

kWh_{Del}	kWh_{Rec}	As-Is	To-Be
= 0	= 0	Active loss add to kWh_{Del}	Active Loss add to kWh_{Del}
$\neq 0$	= 0	Active Loss add to kWh_{Del}	r_{Del} * Active Loss add to kWh_{Del}
= 0	$\neq 0$	Active Loss subtract from kWh_{Rec}	r_{Rec} * Active Loss subtract from kWh_{Rec}
$\neq 0$	$\neq 0$	Active Loss add to kWh_{Del} Active Loss subtract from kWh_{Rec}	

– Where:

$$r_{Del} = \frac{Ch_{kWh_{Del}}}{Ch_{kWh_{Del}} + Ch_{kWh_{Rec}}}$$

$$r_{Rec} = \frac{Ch_{kWh_{Rec}}}{Ch_{kWh_{Del}} + Ch_{kWh_{Rec}}}$$

- SSLA Type 2 – KVA Coefficients

kWh _{Del}	kWh _{Rec}	As-Is	To-Be
= 0	= 0	Active Loss _{Del} add to kWh _{Del}	Active Loss _{Del} add to kWh _{Del}
≠ 0	= 0	Active Loss _{Del} add to kWh _{Del}	Active Loss _{Del} add to kWh _{Del}
= 0	≠ 0	Active Loss _{Rec} subtract from kWh _{Rec}	Active Loss _{Rec} subtract from kWh _{Rec}
≠ 0	≠ 0	Active Loss _{Del} add to kWh _{Del} Active Loss _{Rec} subtract from kWh _{Rec}	Active Loss_{Del}(*) add to kWh_{Del} Active Loss_{Rec}(*) subtract from kWh_{Rec}

– Where:

$$Active\ Loss_{Del} = k1 * \frac{i}{1000^2} * (kVAh_{Del})^2 + \frac{k2}{1000} * kVAh_{Del} + \frac{k3}{i}$$

$$Active\ Loss_{Rec} = k1 * \frac{i}{1000^2} * (kVAh_{Rec})^2 + \frac{k2}{1000} * kVAh_{Rec} + \frac{k3}{i}$$

$$Active\ Loss_{Del} (*) = k1 * \frac{i}{1000^2} * (kVAh_{Del})^2 + \frac{k2}{1000} * kVAh_{Del} + r_{del} * \frac{k3}{i}$$

$$Active\ Loss_{Rec} (*) = k1 * \frac{i}{1000^2} * (kVAh_{Rec})^2 + \frac{k2}{1000} * kVAh_{Rec} + r_{Rec} * \frac{k3}{i}$$

- All channels used for the ratio calculation must have the same units of measure.
- The formula for each ratio R_i will be:

$$R_1 = \frac{Ch_{1m1}}{(Ch_{1m1} + Ch_{1m2} + \dots + Ch_{1mn})} \quad R_2 = \frac{Ch_{1m2}}{(Ch_{1m1} + Ch_{1m2} + \dots + Ch_{1mn})} \quad R_n = \frac{Ch_{1mn}}{(Ch_{1m1} + Ch_{1m2} + \dots + Ch_{1mn})}$$

– Where

– $m1, m2, \dots, mn$ are different Meter Points/Summary Meters

If $\sum AllChannels = 0$, Then $R_i = \frac{1}{(\text{count of channels})}$

Otherwise $R_i = \frac{\text{channel value}}{\sum AllChannels}$