

Revenue Metering



Independent Electricity
System Operator

Revenue Metering

AN IESO TRAINING PUBLICATION

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Introduction

The IESO settlements process includes:

- Gathering and processing metering data
- Reconciling the markets
- Invoicing participants
- Transferring funds

This workbook deals with the first item: gathering and processing metering data.

We¹ use revenue metering data when we calculate your settlement statements. This workbook explains:

- How we process revenue metering data and the roles and responsibilities in this process
- How we validate, estimate and edit the data
- Totalization of metering data
- How we store the data, and how you can access it

We end with a section listing additional information.

¹ In this document, 'we', 'us', and 'our' refer to the IESO. 'You' refers to the market participant.

1. Overview

Before we consider metering data 'settlement ready' (i.e., usable for settlement calculations), it must be collected, validated and processed. Metering installations used to measure energy bought and sold must meet hardware and software standards set by Measurements Canada, the market rules and IESO standards. The market rules also define participant roles and responsibilities associated with revenue metering.

Objectives

After completing this section, you will be able to:

- Describe the steps in processing revenue metering data
- Describe your role and our role in the process
- List the types of meters authorized for use in the IESO-administered markets

1.1 Introduction

Revenue metering data is integral to the settlements process. It is the basis for deriving all settlement charges and payments that you will make or receive for your physical market transactions. Within Ontario, all energy bought or sold by market participants must be measured and recorded by registered revenue metering installations.

Objectives

After completing this section, you will be able to:

- Describe the role of revenue metering in the settlement process
- List the steps in preparing settlement-ready data, from collecting the data through to transferring the data to the settlements process

Collecting Metering Data

Our meter data collection software application, MV-90, collects metering data daily. Once it has established communication with the metering installation, MV-90 automatically collects metering data from the metering installation. MV-90 validates the data, then sends the files to the metering database (some validation is also done outside of MV-90). You can use MV-WEB to access the metering data. (See Section 4 *The Metering Database* for details.)

Preparing Settlement-Ready Data

Before the metering data we collect or receive is passed along to the settlements process, the following steps occur:

1. Validation, estimation and edit
 - Data is validated
 - Estimation is carried out, if required
 - Data is edited, if required
2. Totalization calculations are made (includes measurement error corrections and adjustments for energy losses)

Here is an overview of these steps:

The VEE (Validating, Estimating, Editing) Process

After metering data is collected, MV-90 checks it for reasonableness before the data is transferred to the settlement system. This data check is done through a process known as **VEE** (Data **V**alidation, **E**stimation and **E**dit). The VEE process flags the suspect metering data as 'validated', 'estimated', or 'edited' data.

If the data does not satisfy preset validation criteria, we issue a meter trouble report, or MTR (called a 'trouble call' in the Market Rules) to the metering service provider (MSP) to investigate any potential metering issues. (See *Section 1.2 Revenue Metering Roles & Responsibilities*). Estimated data, prepared by MV-90, may be substituted for the missing and suspect data until the meter trouble report is resolved. If resolution of the meter trouble report confirms a problem with the meter, the MSP submits real or estimated data. If the revenue metering data is later confirmed to be correct, we manually undo the estimate and substitute it with the metering data.

(See Section 2 Data Validation, Estimation and Edit for details.)

Totalization

Totalization calculations are made for each energy and transmission delivery point where settlement occurs:

- To total the metering data for a specific metered market participant (MMP)
- To factor out settlement quantities for other MMPs using the same meter point
- To apply energy losses and measurement error correction factors
- To allocate station service load

(See Section 3 *Totalization* for details.)

Settlement-Ready Data

At this point in the process, the metering data is 'settlement-ready', and is transferred to the settlements process to be used as 'allocated quantities' when we calculate settlement statements.

Skill Check Questions

Overview: Introduction

1. Select the two correct statements:

Within Ontario, revenue meters measure and record the quantities of energy bought and sold by market participants, then the data:

- a. Is passed directly from the revenue meter to the settlements process as 'settlement-ready' data
 - b. Proceeds through a series of steps before the data collected is considered 'settlement-ready'
 - c. Is stored in the metering database, and can be viewed and downloaded via the MV-WEB application
 - d. Is stored in the MV-WEB application, which is also used to view the data
2. Which step in the metering process estimates or provides substitutions for failed data?
- a. VEE
 - b. Totalization
 - c. Application of loss adjustments

Skill Check Answers

Overview: Introduction

1. Select the two correct statements:

Within Ontario, revenue meters measure and record quantities of energy bought and sold by market participants, then the data:

- a. Is passed directly from the revenue meter to the settlements process as 'settlement-ready' data
 - b. **Proceeds through a series of steps before the data collected is considered 'settlement-ready' ✓**
 - c. **Is stored in the metering database, and can be viewed and downloaded via the MV-WEB application ✓**
 - d. Is stored in the MV-WEB application, which is also used to view the data
2. Which step in the metering data process estimates or provides substitutions for failed data?
- a. **VEE ✓**
 - b. Totalization
 - c. Application of loss adjustments

1.2 Revenue Metering Roles and Responsibilities

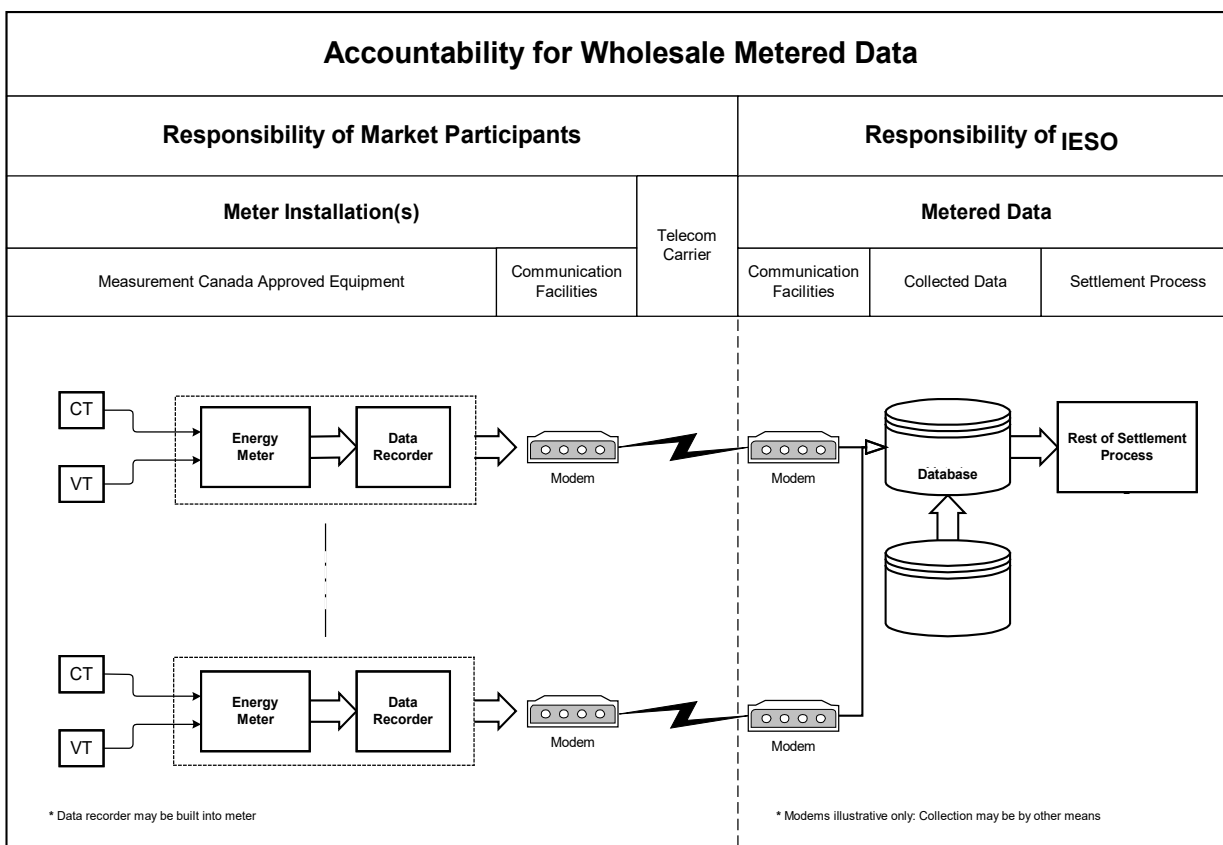
The IESO, market participants and metering service providers all play a role in the revenue metering process. This section provides a brief overview of these roles.

Objective

- List the roles and responsibilities associated with revenue metering

Revenue Metering Accountabilities

The following diagram shows an overview of general metering responsibilities for metering installation registration and for processing metering data. In this workbook, we concentrate on metering data processing, not on metering installation.



A metered market participant (MMP) is designated for each registered wholesale meter. The MMP is responsible for that metering installation. The MMP, in turn, notifies us of the metering service provider (MSP) for the metering installation. (A market participant may be an MSP or may contract with an MSP).

The MSP registers and services the metering installation. A list of authorized MSPs is available on our web site, under the *Metering* section.

Metered market participants, the IESO, metering service providers, and transmitters all have distinct roles regarding the metering installation and processing of metering data:

Metered Market Participant

- Provides and is responsible for the metering installation
- Is responsible for the accuracy of metering data
- Gives us the name and contact information of the associated MSP

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- Collects metering data daily
- Processes metering data
- Issues meter trouble reports to MSPs and assesses the validity of the data provided
- Maintains the metering database
- Responds to market participant enquiries
- Provides settlement statements derived from the metering data

Metering Service Provider

- Registers the metering installation
- Maintains the metering installation
- Responds to meter trouble reports and investigates metering issues
- Provides edited metering data
- Provides correction factors where necessary

Transmitters

- Tell us who transmission customers are and how customers are billed (i.e., which assets and functions they use)
- Approve totalization tables

Skill Check Questions

Overview: Roles & Responsibilities

Match the correct answer from Column B with each activity in Column A:

Column A

1. Issues meter trouble reports to MSP
2. Registers metering installations
3. Approves totalization tables
4. Collects meter data daily
5. Identifies an associated MSP
6. Maintains metering database
7. Provides metering installation
8. Responds to meter trouble reports;
investigates metering issues
9. Processes metered data
10. Maintains metering installation

Column B

- a. IESO
- b. Metered Market Participant(MMP)
- c. Metering Service Provider (MSP)
- d. Transmitters

Skill Check Answers

Overview: Roles & Responsibilities

Match the correct answer from Column B with each activity in Column A:

Column A

1. Issues meter trouble reports to MSP **a**
2. Registers metering installations **c**
3. Approves totalization tables **d**
4. Collects meter data daily **a**
5. Identifies an associated MSP **b**
6. Maintains metering database **a**
7. Provides metering installation **b**
8. Responds to meter trouble reports;
investigates metering issues **c**
9. Processes metered data **a**
10. Maintains metering installation **c**

Column B

- a. IESO
- b. Metered Market Participant(MMP)
- c. Metering Service Provider (MSP)
- d. Transmitters

1.3 Registered Wholesale Meters (RWMs)

Energy quantities are measured by metering installations referred to as registered wholesale meters (RWMs). These meters must meet our hardware standards and must be registered with us before they are allowed into service in the IESO-administered markets.

Objectives:

- Identify the requirements for the two types of registered wholesale meters
- List the types of data registered wholesale meters collect

Registered Wholesale Meter Requirements

There are 2 types of registered wholesale meters currently in the market:

Main/Alternate	Standalone
<ul style="list-style-type: none"> • Installations consist of two revenue meters to ensure that metering data can be cross-verified • New RWMs must be main/alternate installations (except for small embedded generators <2 MW – these can be standalone as long as they are a main or alternate meter from the IESO list of conforming meters) 	<ul style="list-style-type: none"> • Standalone installations in service prior to April 17, 2000, must meet the alternative metering installation standard • New RWMs may not be standalone installations (except for small embedded generators <2 MW – these can be standalone as long as they are a main or alternate meter from the IESO list of conforming meters) • Must be replaced by main/alternate installations upon seal expiry

New metering installations – in service after April 17, 2000 – must be:

- Main/alternate installation (unless for small embedded generators <2MW)
- Tested and approved for data communications with us
- Consist of meters on the IESO *List of Conforming Meters* (available on our web site www.ieso.ca Metering section)

Metering Data Collection

Once registered and placed into service, metering installations record electrical data for the energy quantities that are injected into the grid and withdrawn from the grid. This data is measured and recorded for each 5-minute metering interval.

Exceptions to this 5-minute data recording requirement are:

1. Meters for non-dispatchable loads, self-scheduling generators and intermittent generators that are:
 - Registered under the 'Alternative Metering Installation Standard'
 - Registered using the waiver procedure in place before July 28, 2001
 - Applying for a general exemption
 - These meters can have 15-minute data recording.
2. Chapter 6 of the Market Rules does not apply to an intertie metering point. Billing is by intertie schedule, rather than by actual interchange. (For more information, please see the *Interjurisdictional Energy Trading* workbook, available on the [Training](#) web pages.)

The electrical quantities measured and recorded include:

- Active energy (kWh)
- Reactive energy (kVARh)
- Volt-squared hours (V^2h)
- Amp-squared hours (I^2h)

Recorded data is stored in the main meter for a minimum of 35 days and in the alternate meter for a minimum of 10 days.

We collect the data daily by remotely polling each RWM using data communication lines (in most cases, this is done by direct dial-up to the meter). This daily data collection occurs seven days a week. It is stored for 18 months in the metering database and is archived off-line for seven years.

Meter Channels

When a meter is polled, data is collected from 'channels' that house the information at the meter. The market rules give details regarding unit of measure and how channel numbers are to be assigned. (See the *Wholesale Revenue Metering Standard - Hardware*)

Example of Channel Assignments (for a three-phase, four-wire main meter)

Channel	Interval Data
1	kWh (kilowatt hours in the buy direction; watts delivered/withdrawn)
3	kWh (kilowatt hours in the sell direction; watts received/injected)
2	kVARh (kilovar hours in the buy direction; VARs received/injected)
4	kVARh (kilovar hours in the sell direction; VARs received/injected)
5, 6, 7 (main meter only)	V ² h per phase (voltage); Phase A, B and C
8, 9, 10 (main meter only)	I ² h per phase (current); Phase A, B and C

Some meters may be granted exemptions, or they may meet the alternative metering installation standard. These meters might not record all of the required items or list the items in the channel numbers specified.

The MSP must specify details regarding the unit of measure and channel assignment when the meter point is registered.

See Section 4 *The Metering Database* for details on using MV-WEB to view metering data.

Skill Check Questions

Overview: Registered Wholesale Meters

1. Which type of metering installation consists of two Measurement Canada-approved meters?
 - a. Main/Alternate
 - b. Standalone

2. List four types of electrical quantities measured and recorded by revenue meters.

Skill Check Answers

Overview: Registered Wholesale Meters

1. Which type of metering installation consists of two Measurement Canada-approved meters?
 - a. **Main/Alternate** ✓
 - b. Standalone

2. List four types of electrical quantities measured and recorded by revenue meters

Active Energy (kWh)

Reactive Energy (kVARh)

Volt-squared hours (V²h)

Amp-squared hours (I²h)

Section 1 Review Questions: Revenue Metering Overview

1. Estimation and replacement are:
 - a. Calculated automatically by MV-90 for missing data
 - b. Supplied by the MSP and communicated to us after resolution of the meter trouble report
 - c. Always calculated by the MSP
 - d. Both a) and b)

2. For a new meter installation, data is collected at the meter in:
 - a. 5-minute intervals
 - b. 15-minute intervals
 - c. Hourly intervals
 - d. 24-hour intervals

3. Collected meter data for the main meter is stored at the metering installation for a minimum of:
 - a. 30 days
 - b. 35 days
 - c. 60 days
 - d. 90 days

Section 1 Review Answers: Revenue Metering Overview

1. Estimation and replacement are:
 - a. Calculated automatically by MV-90 for missing data
 - b. Supplied by the MSP and communicated to us after resolution of the meter trouble report
 - c. Always calculated by the MSP
 - d. **Both a) and b)** ✓

2. For a new meter installation, data is collected at the meter in:
 - a. **5-minute intervals** ✓
 - b. 15-minute intervals
 - c. Hourly intervals
 - d. 24-hour intervals

3. Collected meter data for the main meter is stored at the metering installation for a minimum of:
 - a. 30 days
 - b. **35 days** ✓
 - c. 60 days
 - d. 90 days

2. Data Validation, Estimation and Edit

2.1 Introduction

After metering data is collected, it is checked for reasonableness by MV-90 before it is transferred to the settlements system. This metering data check is done through a process known as VEE (data validation, estimation and edit). The VEE process flags the collected metering data as actual, corrected, or estimated data.

If the data does not satisfy preset validation criteria, we review it and, if appropriate, issue a meter trouble report to the MSP to resolve any potential measurement problems. Estimated data, prepared by MV-90, may be substituted for the suspect or missing data until the meter trouble report is resolved. If resolution of the meter trouble report confirms a problem with the meter, the MSP submits real or estimated data.

Objectives:

After completing this module, you will be able to:

- Identify the metering data validation process for the two types of registered wholesale meters
- List the steps in estimating metering data in cases of failed validation
- List guidelines for editing metering data for the two types of registered wholesale meters
- Identify the initial stages for resolving discrepancies in metering data

2.2 Data Validation

Objective:

- Given the type of registered wholesale meter, describe the process for validating metering data

Validation

The first VEE step, data validation, verifies data reliability by submitting the data to a number of automated and manual system tests. These tests are performed as the data is retrieved, before the data is used for any settlement purpose.

The data validation process detects meter data errors resulting from:

- Improper operational conditions
- Loss of current or loss of voltage
- Hardware or software malfunctions, including failures of, or errors in, metering or communication hardware

We detect metering data errors:

- When metering data exceeds predefined variances or tolerances (called 'load profile limits')
- By comparing meter data between the main and alternate meters

When a validation failure occurs, we issue a meter trouble report to the MSP, and we also send an email notification of the meter trouble report type to the MMP.

Data Validation & Types of Metering Installations

Data validation differs slightly depending on the type of metering installation.

Main/Alternate	Standalone
<ul style="list-style-type: none"> Compares data from 2 IESO-approved meters (main and alternate) Data from alternate meter is of revenue quality and can be substituted for main meter data 	<ul style="list-style-type: none"> Validation relies on historical meter data for comparison purposes MSP specifies criteria for validation tests at time of registration

Validation Tests

Immediately following the data collection and delivery processes, MV-90 automatically carries out validation tests on the metering data. These tests are:

- Defined in our market manuals, and, in the case of standalone metering installations, also by the MSP
- Applied to data originating from main/alternate and standalone meter installations

Validation tests fall into three categories:

- Tests for all metering installations
- Additional tests for main/alternate metering installations
- Additional tests for standalone metering installations

TESTS FOR ALL METERING INSTALLATIONS

Name of Test	Description
Data Not Collected or Delivered	Validation failure if the data was not collected or delivered to us and is termed missing data
Current and Voltage Check	Detects loss of current and/or voltage to the meter due to a failure of the supply from one or more instrument transformers or tampering
Meter Reading vs. Load Profile Type M	Checks for corruption introduced by the telecom system and checks the meter multiplier. If the meter can provide energy self-reads, this test is automated (See Market Rules, <i>Chapter 6, section 7.2.6</i>). If the meter does not support energy self-reads, the MSP provides readings according to <i>Chapter 6, section 7.2.5</i>
Intervals Found vs. Intervals Expected	Calculates the number of intervals expected
Time Tolerance	Checks for synchronism of meter clock to EST
Number of Power Outage Intervals	Allows periods of zero primary power to be identified
Missing Intervals	Allows periods of missing data to be identified
CRC/ROM RAM	Flag generated by the meter indicating failure of the internal electronics
Meter Clock Overflow	Flag generated by the meter indicating failure of the internal electronics
Hardware Reset	Flag generated by the meter indicating failure of the internal electronics
Time Reset	Indicates the interval in which the meter clock time has been changed by the MV-90 system, creating either a shorter or longer interval
Data Overflow on an Interval	Indicates that the meter is creating more pulses than it can record in an interval or MV-90 can accommodate in an interval
Number of Channels	The number of data channels from the meter does not match the number expected at the data collector
Changed Device ID	The internal device identifier does not match the value registered at the data collector
Watch Dog Time Out	Reported by some recorders when a watchdog register is tripped or activated
Parity Error	Determined by a parity error bit that is set by a recorder on a channel of data during status check or read/write function

Additional Tests for Main/Alternate Metering Installations

Name of Test	Description
Energy Comparison Test (carried out after the tests described on the previous page)	Hourly, the active and reactive energy in each channel of the main meter is compared to the corresponding channel of an alternate meter

Additional Tests for Standalone Metering Installation

With standalone metering, no second source of comparison data exists. Validation is based on the characteristics of the data at hand. Parameters for these validation tests are defined by the MMP via their MSP, and are submitted during registration of the metering installation. The MMP must consider the following list of checks and criteria for the validation of data collected from the main meter:

Name of Test	Description
High/Low Limit on Interval	Specifies maximum and minimum interval demand, which if exceeded results in a meter trouble report
High/Low Limit on Energy	Specifies maximum and minimum energy, which if exceeded over the time period being validated, results in a meter trouble report
Percentage Change on Interval	Flags validation failure if consecutive intervals differ by more than the specified amount
Load Factor Tolerance	Flags a validation failure when the average load divided by the maximum load over the time period being validated exceeds the prescribed level
Power Factor Limit	Flags a validation failure when the average power factor over the time period being validated is less than the specified minimum
Zero Interval Tolerance	Flags a validation failure when the total number of intervals containing zeroes over the time period being validated exceeds the tolerance limit
Power Outage Intervals	Checks for power outage intervals within the data file versus a limit of tolerance number of occurrences

Skill Check: Data Validation

1. Select the correct statement:
 - a. Validation tests are performed on settlement-ready data
 - b. When validation fails, the MMP issues a meter trouble report
 - c. Substituted data remains until the MSP responds to the meter trouble report

2. Select the correct choice for:
 - a. Main/Alternate Meter
 - b. Standalone Meter
 - i. Data validation relies on historical meter data for comparison
 - ii. Validation compares data from two IESO-approved meters

Skill Check – Answer Key: Data Validation

1. Select the correct statement:

- a. Validation tests are performed on settlement-ready data
- b. When validation fails, the MMP issues a meter trouble report
- c. **Substituted data remains until the MSP responds to the meter trouble report** ✓

Comments:

- a. is incorrect because validation tests are performed on data before it is settlement-ready
- b. is incorrect because the IESO issues the meter trouble report to the MSP, with notification to the MMP

2. Select the correct choice for:

- a. Main/Alternate Meter
- b. Standalone Meter
 - i. Data validation relies on historical meter data for comparison – **(b.)**
 - ii. Validation compares data from 2 IESO-approved meters – **(a.)**

2.3 Data Estimation

Introduction

If data is missing, MV-90 automatically prepares an estimate. At the same time, we issue a meter trouble report (or service call request). We send the meter trouble report to the MSP, and we also notify the MMP.

In the meantime, while the MSP is investigating the problem, MV-90 automatically creates replacement data by using an estimation process.

If the data from the main meter is missing, it is replaced by valid data from the alternate meter, if available.

Objectives:

After reviewing this topic, you will be able to:

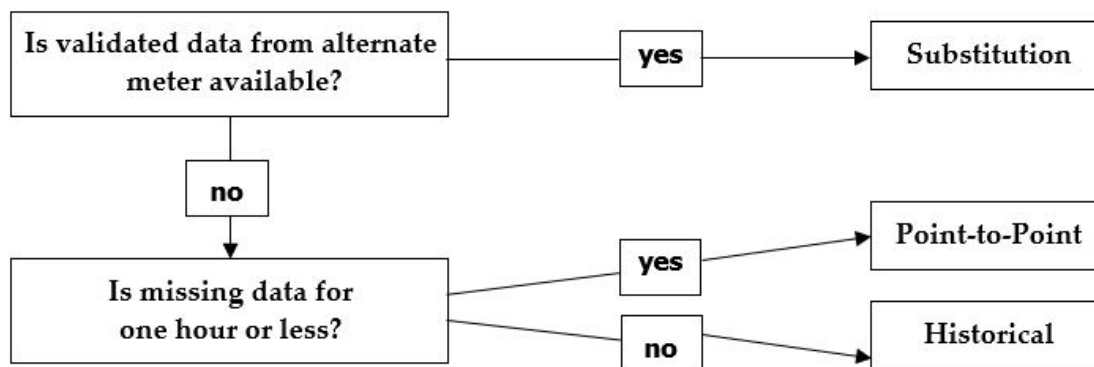
- Describe data estimation
- List the three data estimation methods and identify when they are used

Data Estimation Methods

There are 3 data estimation methods:

- Substitution
 - Used in a main/alternate metering installation: if the data from the main meter is not available, and valid data from the alternate meter is available, then the data from the alternate meter replaces the data from the main meter.
- Point-to-point
 - Used if the missing data is for one hour or less, and data from an alternate is not available or if the meter is a standalone meter.
 - Uses the actual meter values of the previous and subsequent metering intervals from the meter, and joins the two points with a straight line.
- Historical
 - Used if the missing data is for more than one hour, and data from an alternate is not available or if the meter is a standalone meter.
 - Replaces missing interval data by substituting historical data.
 - Data is used from the previous three weeks (in the case of holidays, data from up to five weeks previous is used). For example, if data is missing for hour 6, interval 5 on Tuesday, May 29th, values are checked for hour 6, interval 5 on each of the three previous Tuesdays (May 22nd, May 15th, and May 8th). For generators, the lowest of these three values is used; for loads, the highest of these three values is used.

Data Estimation Methods



During the estimation phase of the VEE process, all estimated data values are flagged as 'estimated' in the metering database, and are available for viewing through MV-WEB.

Skill Check**Questions: Data Estimation**

Select the correct estimation method from Column B for each item in Column A:

Column A	Column B
Missing data is for one hour or less, and data from alternate meter is unavailable	Substitution
Missing data id for more than one hour, and data from alternate meter is unavailable	Point-to-point
Uses data from the previous three weeks	Historical
Used if validated data from an alternate meter is available	
Uses actual meter values of the previous and subsequent metering intervals from the meter and joins the two points with a straight line	
Uses high meter reading for loads; lowest meter reading for generators	

Skill Check – Answer Key: Data Estimation

Select the correct estimation method from Column B for each item in Column A:

Column A	Column B
Missing data is for one hour or less, and data from alternate meter is unavailable	Point-to-point
Missing data id for more than one hour, and data from alternate meter is unavailable	Historical
Uses data from the previous three weeks	Historical
Used if validated data from an alternate meter is available	Substitution
Uses actual meter values of the previous and subsequent metering intervals from the meter and joins the two points with a straight line	Point-to-point
Uses high meter reading for loads; lowest meter reading for generators	Historical

2.4 Data Editing

Data editing is the final step in the VEE process. In this step, we correct the suspect data based on the outcome of the MSP's meter trouble report findings. The MSP submits the findings, which we must assess and accept before we edit the data.

Objectives:

After reviewing this section, you will be able to:

- Describe data editing

When is Editing Required?

Once the meter trouble report process determines the cause and resolution of the problem, editing may be required.

For example:

- Even though a metering installation is otherwise operating normally, it may provide incorrect data as a result of power system switching or the application of mobile emergency generation. We would then require edited data.
- Most errors in collected metering data are due to data communication problems between the registered wholesale meter and us. In these cases, the original recorded data is ultimately found to be correct. In most cases, the MSP collects the data locally at the meter and submits it to us. Occasionally, we automatically collect the meter data on a subsequent day. We can then use this data to revise the estimated data.
- In other cases, if the resolution of the meter trouble report confirms that a problem exists with the metering installation, we manually edit the data based on the MSP's adjustment request. (An example is a blown transformer fuse.) As above, we replace the provisional estimate if there is a better source of data.

Editing Guidelines

Under normal circumstances:

- The MSP carries out an on-site investigation within two business days of the meter trouble report
- Based on the investigation, the MSP determines the cause of the validation failure
- Based on the findings of the MSP, we manually edit the metering data (The MSP may request that the metering data be adjusted based on the on-site findings)
- The adjustment is one or more of the following:
 - A multiplier
e.g., if meter reads 50% low, multiply by 1.5 (these numbers are examples only; the specific numbers are calculated by the MSP)
 - An adder/subtractor
e.g., the meter only measured part of the load, so 200 kWh must be added on for each of the next 27 intervals (these numbers are examples only; the specific numbers are calculated by the MSP)
 - An absolute value for each interval affected
e.g., the reading should have been 40 MWh for a certain number of intervals (these numbers are examples only; the specific numbers are calculated by the MSP)

The MSP may submit a request for an adjustment, supported by documentation. On occasion, the MSP does not have improved data – they acknowledge the use of alternate meter data or high/low historical estimates.

In determining which method to adopt and the values to be used, the overall consideration is to try to achieve an accurate estimate of the actual energy injected or withdrawn. We use the best information available. If there is any doubt, we will err in favour of the marketplace in general, rather than in favour of the registered MMP for the affected metering installation.

Guidelines for Main/Alternate Metering Installations

Missing data or validation failure of data from main meter

- Data from alternate meter substituted and accepted if confirmed by MSP

Missing data or validation failure of alternate meter

- MSP notified; data from main meter used (it is left as found)

Metering data from both meters fails validation

- Point-to-point calculation used if one hour or less
- Historical data used if more than one hour
- If no historical data is available, MSP submits data for manual edit (should occur only for new installations less than 3-5 weeks old)

Guidelines for Standalone Metering Installations

Missing data

- Point-to-point calculation used if one hour or less
- Historical data used if more than one hour
- If no historical data is available, MSP submits data for manual edit

Data fails validation

- Data is flagged; MSP is notified (meter trouble report issued)
- MSP submits data, which we assess; MSP may request that we use historical estimate
- We manually edit flagged data, if required

Skill Check

Questions: Data Editing

Fill in the blanks in the following statements:

1. The MSP carries out an on-site investigation within ____ business days of the meter trouble report.
2. If there is missing data or a validation failure of the main meter, data from the _____ meter is used.
3. Point-to-point calculation is used if the missing data or failed validation period is _____ or less.

Skill Check

Answers: Data Editing

Fill in the blanks in the following statements:

1. The MSP carries out an on-site investigation within **2** business days of the meter trouble report.
2. If there is missing data or a validation failure of the main meter, data from the **alternate** meter is used.
3. Point-to-point calculation is used if the missing data or failed validation period is **one hour** or less.

2.5 Discrepancies in metering data

The MSP or the MMP may become aware of a discrepancy in the metering data. (For example, the MSP may detect a malfunction at the metering installation.)

Objective:

- List the initial options available to the MSP or MMP for dealing with discrepancies in the metering data

Contacting the IESO

The first step in investigating the discrepancy is for the MSP or MMP to contact us. If necessary, the MSP or MMP may request that a meter trouble report be issued. When a meter trouble report is issued, a log is generated, including documented follow-up.

Meter Trouble Reports

The meter trouble report is an initial way to resolve the discrepancy.

You should review the entries in the metering database (available via MV-WEB) as soon as possible so that we can address discrepancies before we issue the preliminary settlement statement.

The market rules contain strict timelines with respect to meter trouble report processing. The timelines are designed to ensure the integrity of the settlements process.

(For additional information on MV-WEB, see Section 4 *Metering Database*; for additional information on settlement statements, see the *Settlement Statements and Invoices* workbook and the *Commercial Reconciliation* recorded presentation, available on the [Training](#) web pages.)

Section 2 Review

Questions: Data Validation, Estimation and Edit

1. For a main/alternate metering installation, the automated validation compares:
 - a. Data from 2 IESO-approved meters
 - b. Historical meter data
 - c. Neither of the above
2. The point-to-point estimation method:
 - a. Uses a straight line to join the missing interval (point before and after the gap)
 - b. Uses points from the same day and interval three weeks previous
 - c. Uses data from the alternate meter
3. Data validation is carried out by:
 - a. On-site validation by MSP
 - b. Validation by MMP, submitted via MV-WEB
 - c. The MV-90 and other systems
4. If there is a discrepancy in metering data, the benefit of the doubt is given to:
 - a. The MMP for the meter in question
 - b. The marketplace in general, rather than the MMP for the meter in question
 - c. Any embedded market participants for the meter in question

Section 2 Review

Answers: Data Validation, Estimation and Edit

1. For a main/alternate metering installation, the automated validation compares:
 - a. **Data from 2 IESO-approved meters** ✓
 - b. Historical meter data
 - c. Neither of the above
2. The point-to-point estimation method:
 - a. **Uses a straight line to join the missing interval (point before and after the gap)** ✓
 - b. Uses points from the same day and interval three weeks previous
 - c. Uses data from the alternate meter
3. Data validation is carried out by:
 - a. On-site validation by MSP
 - b. Validation by MMP, submitted via MV-WEB
 - c. **The MV-90 and other systems** ✓
4. If there is a discrepancy in metering data, the benefit of the doubt is given to:
 - a. The MMP for the meter in question
 - b. **The marketplace in general, rather than the MMP for the meter in question** ✓
 - c. Any embedded market participants for the meter in question

3. Totalization

3.1 Introduction

Totalization takes place in the metering database. It is the process of summing or subtracting each registered wholesale meter for a specific MMP to an energy delivery point or a transmission delivery point, applying energy losses and measurement error correction factors.

The MSP submits totalization table instructions to us during metering installation registration. These are updated as required if changes are made to the metering installation.

Totalization tables are submitted for energy delivery points and, in the case of directly connected meter installations, for transmission tariff delivery points. In this workbook, we discuss totalization tables submitted for energy delivery points.

Objectives

- Describe the totalization concept and explain how it is used
- Explain how a summary meter is used
- List the conditions requiring the application of measurement error correction factors
- List the conditions requiring the application of site-specific and distribution loss adjustment factors
- Describe how error correction and loss adjustment factors are used to adjust metering data

How Totalization is Carried Out

Totalization is done by summing (totaling) the meters for an MMP to the delivery point, using the MMP's predefined totalization table. The metering database makes the required adjustments to the metering data, and factors out the settlement quantities of any embedded MMP's data.

Totalization calculations are made:

- To total the metering data for each channel for a delivery point
- To apply losses and measurement error correction factors
- To factor out settlement quantities of any metering installation that, due to its physical location, has captured energy data for another MMP

We must also be informed of any planned changes to the totalization table (for example, if a meter is being added or removed, or if there is a change to loss factors, etc.).

Summary Meters

In the metering database, only one meter can be attached directly to a delivery point. Therefore, a virtual meter, called the summary meter is created to accommodate the realities of the table. (The summary meter is referred to as a summary map in the metering database.)

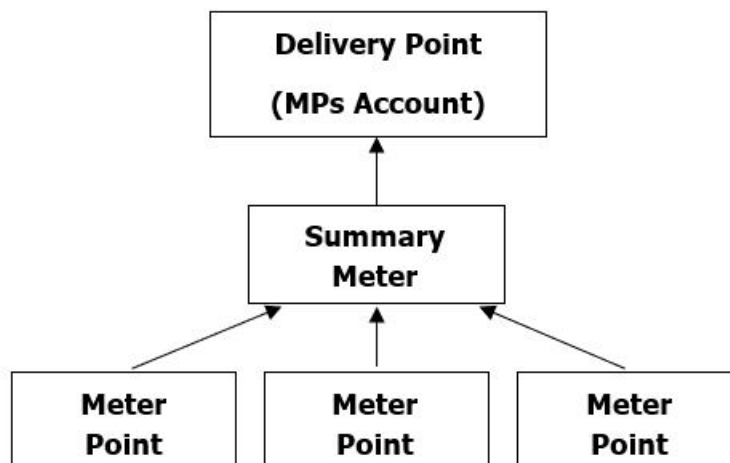
The summary meter is a mathematical tool used to sum readings for the physical and/or other summary meters supplying the delivery point, and to apply losses, error correction factors and allocation of station service. The summary meter is not a physical meter, but a marker in the database that accumulates total meter readings for the purposes of settlement.

In some instances, summary meters are also used to split physical meters/recorders into more than one summary meter so that losses can be applied.

In other words, the summary meter and totalization calculations can add and/or subtract meter readings for one or more meters.

Once the metering data has been totalized, the summary meter is attached to a delivery point. The delivery point has the same meter readings as the last summary meter. When viewing metering data via MV-WEB (see Section 4 *The Metering Database*), all losses are applied at the delivery point, but when viewing metering data at the physical meter or the summary meter level, users can request metering data with or without losses.

Totalization of a Delivery Point



Skill Check:

Questions: Totalization – Introduction

1. Which of the following are included in totalization table information?
 - a. How readings are to be totaled by the metering database
 - b. The measurement error correction factors
 - c. The losses to be applied
 - d. All of the above

2. The summary meter is:
 - a. A meter physically present at a site which transmits data about the totals for all the meters from that particular location
 - b. A virtual meter which is considered a marker in the metering database that accumulates meter readings from physical meters and/or other virtual meters
 - c. A physical meter which contains the totalization table and performs the calculations at its actual location

3. Which of the following items are part of totalization calculations?
 - a. Totaling metering data for a specific delivery point
 - b. Validating the metering data
 - c. Adding and/or subtracting metering data quantities for delivery points using the same meter point
 - d. Applying losses
 - e. Estimating amounts to replace missing data

Skill Check

Answers: Totalization – Overview

1. Which of the following are included in totalization table information?
 - a. How readings are to be totaled by the metering database
 - b. The measurement error correction factors
 - c. The losses to be applied
 - d. **All of the above** ✓

2. The summary meter is:
 - a. A meter physically present at a site which transmits data about the totals for all the meters from that particular location
 - b. **A virtual meter which is considered a marker in the metering database that accumulates meter readings from physical meters and/or other virtual meters** ✓
 - c. A physical meter which contains the totalization table and performs the calculations at the site of the meter

3. Which of the following items are part of totalization calculations?
 - a. **Totaling metering data for a specific delivery point** ✓
 - b. Validating the metering data
 - c. **Adding and/or subtracting metering data quantities for delivery points using the same meter point** ✓
 - d. **Applying losses** ✓
 - e. Estimating amounts to replace missing data

Comment: Validating and estimating are part of the VEE process, not part of totalization. (Validating and estimating are performed in MV-90; totalization is performed in the metering database.)

3.2 Measurement Error Correction (MEC)

Although there are high accuracy standards for meters, some measurement inaccuracies may occur. Measurement error correction factors are applied to the metering data during the totalization process.

Objective:

- Describe the conditions requiring the application of measurement error correction factors

Measurement Error Corrections (MEC) factors

Metering data obtained from metering installations requires corrections to address inaccuracies introduced by certain elements or conditions associated with a metering installation. For example, operational influences from such things as meter devices, instrument transformer devices and secondary cabling may occur, resulting in meter readings that exceed IESO-specified tolerances.

The MSP is responsible for providing the adjustments to us on the MMP's behalf. The MEC factors that are calculated to compensate for these measurement inaccuracies are signed and stamped by a registered professional engineer. The MSP submits the factors to us during the metering installation registration process. If changes are made to the metering installation that alter the existing MEC factors, the MSP must re-submit updated MEC factors to us.

Situations That Introduce Metering Inaccuracies

- The secondary cabling attached to the voltage transformer may create a voltage drop that causes the metering installation to read low
- When a metering installation is not compliant with Blondel's theorem, an error correction factor is required if the magnitude of the error exceeds the limits stated in the market rules
- When the current and voltage transformers connected to the metering installation are separated from each other, the market rules require a correction factor when the error exceeds stated limits

Skill Check

Questions: Measurement Error Correction (MEC)

1. Measurement error correction factors are supplied to us by:
 - a. The MMP
 - b. The MSP
 - c. The embedded MP

2. Select the two correct statements:
 - a. All installations require MEC adjustments
 - b. Most compliant metering installations do not require MEC adjustments
 - c. MEC adjustments correct measurement inaccuracies in metering installations
 - d. MEC factors cover losses due to location of the meter

Skill Check

Answers: Measurement Error Correction (MEC)

1. Measurement error correction factors are supplied to us by:
 - a. The MMP
 - b. **The MSP** ✓
 - c. The embedded MP

2. Select the two correct statements:
 - a. All installations require MEC adjustments
 - b. **Most compliant metering installations do not require MEC adjustments** ✓
 - c. **MEC adjustments correct measurement inaccuracies in metering installations** ✓
 - d. MEC factors cover losses due to location of the meter

3.3 Loss Adjustments

In addition to measurement error correction, the other type of adjustment that may have to be made is for losses. The types of losses that must be accounted for are:

- Site-specific losses
- Distribution losses

Site-specific loss adjustment (SSLA) is applied to the metering data to adjust for the location of the meter if the meter is not at the 'defined meter point'.

The total loss factor (TLF), as approved by the OEB, is applied to the metering data to adjust for the location of the embedded connection point in relation to the defined meter point.

Objectives:

After reviewing this topic, you will be able to:

- Describe what the defined meter point is, and what it is used for
- Describe the conditions requiring the application of site-specific loss adjustments
- Describe the conditions requiring the application of distribution loss adjustments

Site-Specific Loss Adjustment (SSLA)

Metering installations are located at the market participant's facilities. Settlement is based on quantities of energy injected or withdrawn at a defined point on the IESO-controlled grid, which may be different from the location of the metering installation.

Defined Meter Point (DMP)

Energy transactions are settled at a point on the IESO-controlled grid called the defined meter point (also called the defined point of sale). This is the point of connection where energy flows into and out of the IESO-controlled grid.

For embedded wholesale customers, there is an additional point – where the embedded customer is connected to the distribution system. This point is called the embedded connection point (ECP). The ECP is considered to be the same point as the embedded meter point. For embedded loads, no loss adjustments are made between the embedded meter point and the ECP.

The market rules require the metering installation to be located at the defined meter point. If the location of the metering installation (the meter point) is not at the defined meter point, the market rules require site-specific loss adjustments to be applied to the meter readings. The adjusted readings are equivalent to those that would have been obtained if the metering installation were located at the defined meter point.

Site-specific loss adjustments are calculated for both power transformers and radial lines:

- Calculations are performed automatically based on loss coefficients the MSP provided during registration
- The MSP submits these loss coefficients to us when the metering installation is registered. Transformation losses typically range anywhere from 0.3% to 1%. Radial line losses depend on conductor sizing and the distance between the metering installation and the defined meter point.

Distribution Loss Factor

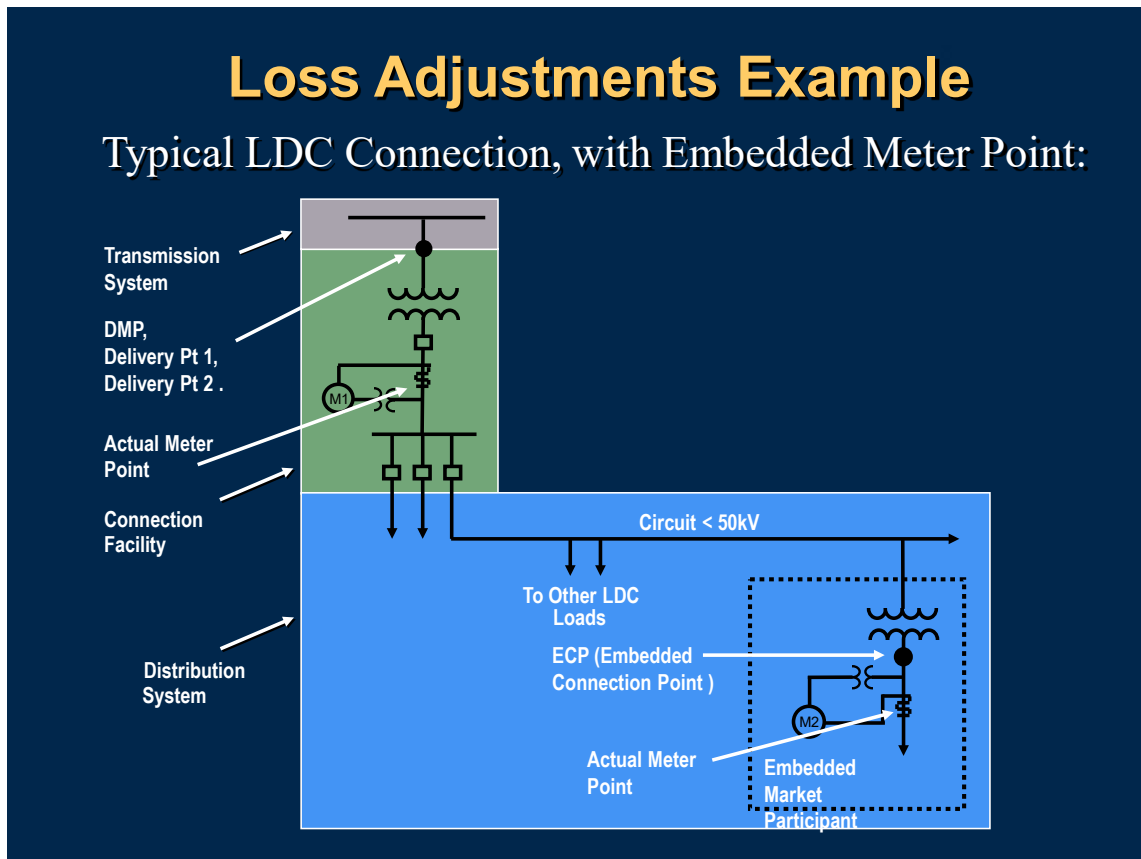
- When a market participant purchases power from the grid and transports it to a location inside a distribution system, electrical losses are incurred as the power passes through the distribution system to the embedded connection point. Therefore, the readings of the embedded meter must be adjusted to allow for these losses. This adjustment is achieved by applying a total loss factor (TLF) to the recorded metering data. The Ontario Energy Board (OEB) approves and publishes each local distribution company's (LDC's) TLF.

- For embedded market participants that have both load consumption and generation, or generation only, the loss factor applied to the received or export channel is established between the host local distribution company and the embedded generator. The host LDC's TLF is applied to the delivered channel. For the received channel, we use what all parties agreed to. If there is no agreement, we use a default of 1.0.

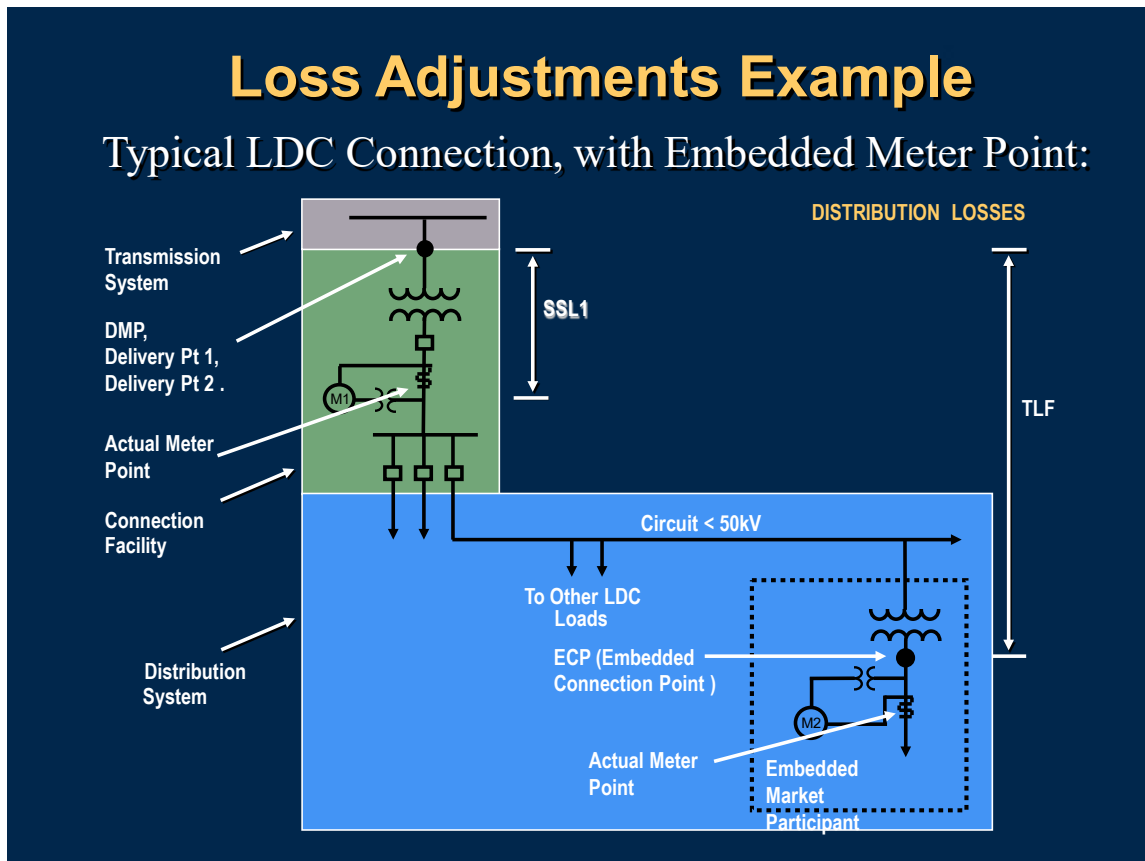
(See Market Manual 3.7 Appendix D *Settlement Principles* for details.)

Loss Adjustment Example

In this example there are two metering installations. The first meter (M1) is for the local distribution company (LDC) and the second meter (M2) is for the load that is embedded within the distribution system.



- The defined meter point (DMP) is the point of connection to the grid.
(This is the point of settlement, called the delivery point by settlements)
- The embedded connection point for the embedded load is the point at which the load is connected to the distribution system

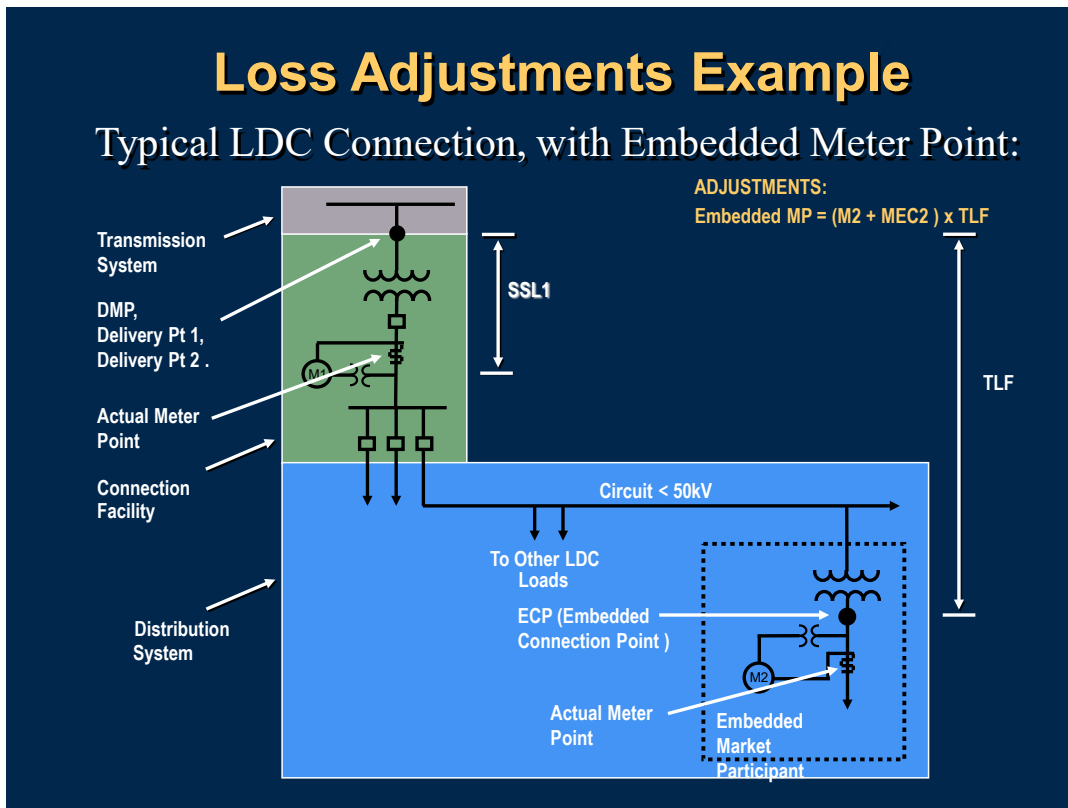


Because the meter point for M1 is not located at its defined meter point, site-specific loss adjustments are required to make allowances for location differences. These adjustments are shown as SSL on the diagram.

The meter point for the embedded load (M2) is considered to be the same as the ECP; therefore, there are no loss adjustments made between M2 and the ECP.

However, because the load is embedded within an LDC, an adjustment for the distribution loss to transport the power from the transmission system to the embedded load is required.

This adjustment is shown as TLF (total loss factor) on the slide.



Given these adjustments, the data adjustment calculations are:

Purchase by Embedded MMP (load) = $(M2 + \text{MEC2}) \times \text{TLF}$

NOTE: MEC is the Measurement Error Correction (See Section 3.2)

EXAMPLE

Pineco Widgets (an embedded customer of Spruce Hydro)

Metering data = 50 MW

MEC = 0.3%, or .15 MW

TLF = 1.53%, or 1.0153

Purchase

$$= (M2 + \text{MEC2}) \times \text{TLF}$$

$$= (50 \text{ MW} + .15 \text{ MW}) \times 1.0153$$

$$= (50.15 \text{ MW}) \times 1.0153$$

$$= \mathbf{50.917 \text{ MW}}$$

Skill Check

Questions: Loss Adjustments

1. The defined meter point is:
 - a. The location of the meter
 - b. A virtual point used as the customer's account
 - c. Always located at the high side of the power transformers
 - d. The point of connection where energy flows into and out of the IESO-controlled grid

2. Select the correct statement:
 - a. The Ontario Energy Board (OEB) approves and publishes each LDC's TLF.
 - b. The distribution loss factor is submitted at the time of metering installation registration, and cannot be changed
 - c. Site-specific loss adjustments are made to adjust for the location of an embedded connection point in relation to the defined meter point

Skill Check

Answers: Loss Adjustments

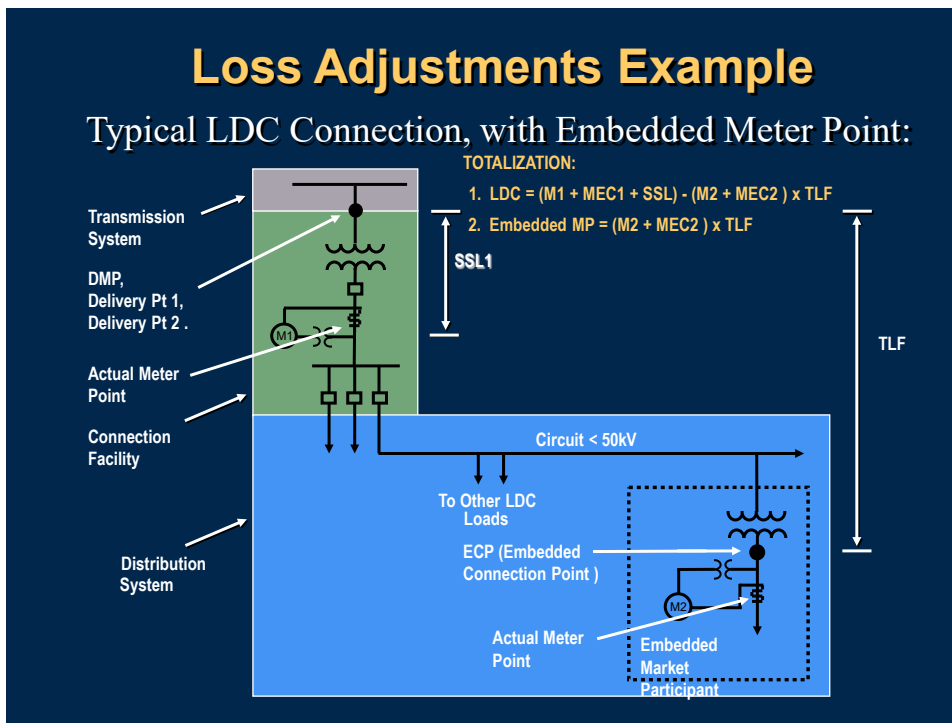
1. The defined meter point is:
 - a. The location of the meter
 - b. A virtual point used as the customer's account
 - c. Always located at the high side of the power transformers
 - d. **The point of connection where energy flows into and out of the IESO-controlled grid** ✓
2. Select the correct statement:
 - a. **The Ontario Energy Board (OEB) approves and publishes each LDC's TLF.**
 - b. The distribution loss factor is submitted at the time of metering installation registration, and cannot be changed
 - c. Site-specific loss adjustments are made to adjust for the location of an embedded connection point in relation to the defined meter point

3.4 Totalization Calculations

Objective:

- When you have completed this section, you will be able to explain a totalization calculation that includes an embedded load

Example of a Totalization Calculation



Continuing with our example from Section 3.3:

Totalization calculation number 1 on this diagram measures the LDC's purchase.

Calculation number 2 measures the consumption of the embedded MMP.

In effect, the meter reading from M1 is broken down into two components, one for the LDC and one for the embedded MMP. In this illustration there are two market participants supplied from the same defined meter point. If the reading for M1 is 100 MW (adjusted for MEC and losses) and the reading for M2 is 20 MW (adjusted for MEC and losses), the consumption for each would be calculated as follows:

<p>For LDC:</p> $= M1 - M2$ $= 100\text{ MW} - 20\text{ MW}$ $= 80\text{ MW}$	<p>For the embedded MMP:</p> $= M2$ $= 20\text{ MW}$
---	--

(NOTE: A change for an embedded MMP's totalization table always requires a change for the host's totalization table.)

If there were no embedded MMPs, the formula for a purchase by an LDC would be:
 $(M1 + MEC1 + SSL1)$

EXAMPLE:

In our example from Section 3.3, Pineco Widgets is an embedded customer of Spruce Hydro:

Pineco Widgets (an embedded customer of Spruce Hydro)

Metering data = 50 MW

MEC = 0.3%, or 0.15 MW

TLF = 1.0153

Pineco Widgets Purchase = $(M2 + MEC2) \times TLF$

$$= (50 \text{ MW} + .15 \text{ MW}) \times 1.0153$$

$$= (50.15 \text{ MW}) \times 1.0153 = \mathbf{50.917 \text{ MW}}$$

We will now add the information for Spruce Hydro:

Spruce Hydro (LDC)

Metering data = 120 MW

MEC = 0.2%, or 0.24 MW

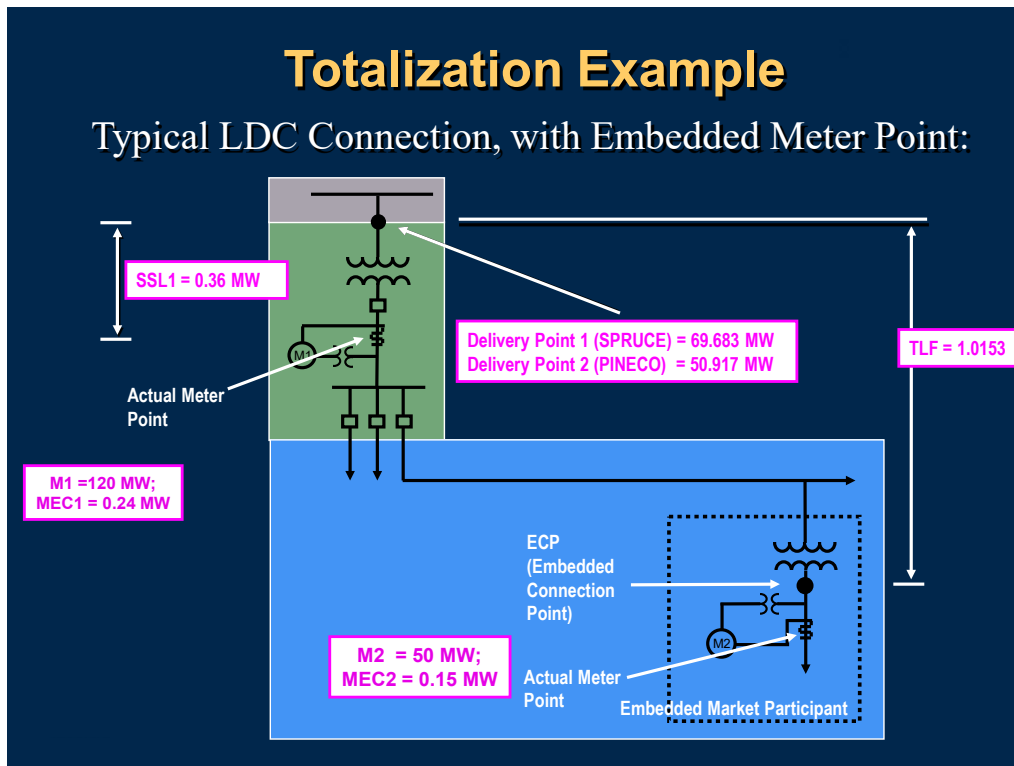
SSL = 0.36 MW (calculated amount)

Spruce Hydro Purchase = $(M1 + MEC1 + SSL1) - (M2 + MEC2) \times TLF$

$$= (120 \text{ MW} + .24 \text{ MW} + .36 \text{ MW}) - (50 \text{ MW} + .15 \text{ MW}) \times 1.0153$$

$$= (120.6 \text{ MW}) - (50.917 \text{ MW})$$

$$= 69.683 \text{ MW}$$



Section 3 Review

Questions: Totalization

1. Measurement error correction factors are designed to compensate for measurement inaccuracies due to:
 - a. Metering installations that are not compliant with Blondel's theorem
 - b. Current and voltage transformers connected to the metering installation that are separated from each other
 - c. Secondary cabling attached to the voltage transformer that create a voltage drop
 - d. All of the above
2. If the meter is not located at the defined meter point, the market rules require:
 - a. A measurement error correction to be applied to the meter readings
 - b. A distribution loss adjustment to be applied to the meter readings
 - c. A site-specific loss adjustment to be applied to the meter readings
 - d. All of the above
3. When an embedded MMP purchases power and transports it to a location inside the system, electrical losses are incurred and the meter readings will always require:
 - a. A measurement error correction
 - b. A distribution loss adjustment
 - c. A site-specific loss adjustment to be applied to the meter readings
 - d. All of the above
4. Distribution loss factor values for embedded loads and generators are:
 - a. Set by the IESO
 - b. Set by the IESO for embedded loads; set by the host LDC for embedded MPs with generation or with both loads and generation
 - c. Set by the OEB (Ontario Energy Board)
 - d. Set by the OEB (Ontario Energy Board) for embedded loads; set by the host LDC for embedded MPs with generation or with both loads and generation
 - e. Set by the LDC for all embedded MPs

Section 3 Review

Answers: Totalization

1. Measurement error correction factors are designed to compensate for measurement inaccuracies due to:
 - a. Metering installations that are not compliant with Blondel's theorem
 - b. Current and voltage transformers connected to the metering installation that are separated from each other
 - c. Secondary cabling attached to the voltage transformer that create a voltage drop
 - d. **All of the above** ✓
2. If the meter is not located at the defined meter point, the market rules require:
 - a. A measurement error correction to be applied to the meter readings
 - b. **A distribution loss adjustment to be applied to the meter readings** ✓
 - c. **A site-specific loss adjustment to be applied to the meter readings** ✓
 - d. All of the above
3. When an embedded MMP purchases power and transports it to a location inside the system, electrical losses are incurred and the meter readings will always require:
 - a. A measurement error correction
 - b. **A distribution loss adjustment** ✓
 - c. A site-specific loss adjustment to be applied to the meter readings
 - d. All of the above
4. Distribution loss factor values for embedded loads and generators are:
 - a. Set by the IESO
 - b. Set by the IESO for embedded loads; set by the host LDC for embedded MPs with generation or with both loads and generation
 - c. Set by the OEB (Ontario Energy Board)
 - d. **Set by the OEB (Ontario Energy Board) for embedded loads; set by the host LDC for embedded MPs with generation or with both loads and generation** ✓
 - e. Set by the LDC for all embedded MPs

4. The Metering Database

Objective:

- Explain what information is found in the metering database and who has access to it

4.1 What are the characteristics of the Metering Database?

Part of the information provided by the MSP at metering installation registration is in the metering database and is used to adjust (for errors and losses), totalize, and allocate the validated data. All of this occurs automatically in the metering database.

The metering database contains actual metering data collected, data that is produced at each stage of the VEE process, as well as data that has been adjusted for errors/losses (MEC, TLF, SSLA).

Who Has Access to the Metering Database?

Although we have a structured VEE process for detecting and resolving metering errors, it is also the responsibility of the MP and MMP to review the database entries as soon as possible after data collection to notify us of any discrepancies. This ensures that metering data inaccuracies are addressed before we issue the preliminary settlement statement and before the data is used as part of invoice calculations.

The metering data stored in the database, with respect to a delivery point (and all associated meters that make up the delivery point), is accessible to:

- The MMP for that delivery point
- The MSP for those RWMs
- Any market participant whose settlement statement is determined on the basis of the metering data recorded in those RWMs
- Any transmitter or distributor connected to a facility using those RWMs
- An MP that has been assigned as an associate by the MMP who owns those RWMs (The MMP assigns the MSP and the LDC or transmitter during delivery point registration.)

Metering data recorded in the database is confidential information. Data is not accessible by or disclosed to any person other than IESO staff and the persons described above.

Skill Check

Questions: The Metering Database Characteristics

1. The metering database contains:
 - a. Energy readings as recorded by registered wholesale meters
 - b. Data that has been adjusted for errors
 - c. Validated, estimated, edited data
 - d. All of the above

2. Select the correct statement:
 - a. Metering data recorded in the database is available to the public via our public website
 - b. Metering data recorded in the database is confidential information and is available only to the IESO
 - c. Metering data recorded in the database is confidential information and is available to the IESO, as well as to the MSP, MMP and affected MPs, transmitters, and distributors for that registered wholesale meter

Skill Check

Answers: The Metering Database Characteristics

1. The metering database contains
 - a. Energy readings as recorded by registered wholesale meters
 - b. Data that has been adjusted for errors
 - c. Validated, estimated, edited data
 - d. **All of the above** ✓

2. Select the correct statement:
 - a. Metering data recorded in the database is available to the public via our public website
 - b. Metering data recorded in the database is confidential information and is available only to the IESO
 - c. **Metering data recorded in the database is confidential information and is available to the IESO, as well as to the MSP, MMP and affected MPs, transmitters, and distributors for that registered wholesale meter** ✓

4.2 Using the Metering Database

Objectives:

After reviewing this section, you will be able to:

- Describe when and how metering data can be accessed
- Give examples of metering data reports available via MV-WEB

When and How Can the Data Be Accessed?

- You can access metering data in the database the day following the dispatch day – after that, it is available throughout each of the data processing stages.
- You can access data by submitting queries to the database via MV-WEB.
- Information is available on actual, estimated, edited, adjusted, and allocated data.
- You can process database query requests for standalone RWMs on-line. The data is available in graphical display format or you can download it as a text file.

Multiple RWM Data Requests

- For database query requests for metering data from multiple RWMs, you can submit a request file via the MV-WEB system or via FTP (file transfer protocol)
- Requests are processed overnight and are available for downloading the next day as a data file in EDI-867 format (bulk data transfer)
(EDI data requests can also be made for standalone RWMs)

Query Request

The query request specifies:

- The meter ID, summary meter ID or delivery point
- The type and quantity of metering data
- The metering data version (e.g., current validated, losses applied, etc.)
- The query time period
- The graphical display type requested for the report

Standard Reports

There are many types of standard reports available for viewing. Most reports can be viewed as table, line graph or bar graph.

EXAMPLES OF AVAILABLE REPORTS

Peak Day:	Displays profile of highest demand day within a selected time period
24 Hour Profile:	Displays interval demand values for a selected 24-hour period
Detail Profile:	Displays interval demand values for a selected time period
Daily Peaks:	Displays peak demand times & amounts for each day within a selected time period
Daily Totals:	Displays usage totals for every day within a selected time period
Comparison Graph:	Compares information about different quantities or meters on one graph (not available as a table)

4.3 MV-WEB System Simulations

Access to Metering Data

You can access metering data held in the metering database by using MV-WEB. MV-WEB allows you to:

- View metering data
- Download metering data into a spreadsheet on your own hard drive
- Generate requests for the metering database to create EDI files for downloading to your hard drive
- Upload files to the IESO (files requesting multiple EDI files for download to your hard drive)
- Download multiple EDI files and acknowledgement files

System Simulations

The following MV-WEB tool simulations are available on the Training web pages at <http://www.ieso.ca/imoweb/marketplaceTraining/systemSims.asp>:

- Display Metering Data
- Generate Request File
- Upload File
- Download File
- Using the Find Tool
- View the Status of a Meter Trouble Report

Module Review

Questions: Metering Database

1. The data in the database can be accessed:
 - a. Within one hour after it is collected
 - b. The day following the dispatch day
 - c. Two days following the dispatch day
 - d. Five business days following the dispatch day

2. Metering data with respect to a registered wholesale meter is accessible to:
 - a. The MSP and the MMP for that meter
 - b. Any MP whose settlement statement is determined on the basis of the metering data recorded in that RWM
 - c. The persons in a) and b) and any customers of these individuals
 - d. Both a) and b)

Module Review

Answers: Metering Database

1. The data in the database can be accessed:
 - a. Within one hour after it is collected
 - b. **The day following the dispatch day** ✓
 - c. Two days following the dispatch day
 - d. Five business days following the dispatch day

2. Metering data with respect to a registered wholesale meter is accessible to:
 - a. The MSP and the MMP for that meter
 - b. Any MP whose settlement statement is determined on the basis of the metering data recorded in that RWM
 - c. The persons in a) and b) and any customers of these individuals
 - d. **Both a) and b)** ✓

Additional Information

- Market Rules Chapter 6 *Wholesale Metering*, available on our [Rules and Manuals](#) web page
- Market Manual 3 *Metering*, available on our [Rules and Manuals](#) web page
- [Metering](#) section of the IESO web site
- Market Rules Chapter 9, Section 2 *Settlement Data Collection & Management* available on our [Rules and Manuals](#) web page
- Revenue Metering section of the [Technical Interfaces](#) web page
- MV-WEB User Guide, available on the [Technical Interfaces](#) web page
- Revenue Metering tool simulations, available on our [Training](#) web page
- *Settlement Statements and Invoices* workbook and *Commercial Reconciliation* recorded presentation, on our [Training](#) web page