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# Meter Data Management and Repository (MDM/R)

# Functional Specification

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**Issue 2.0**

**DESIGN**

*This document describes the functional requirements for the Meter Data Management and Repository to be implemented as part of the Ontario Smart Metering System.*

## Related Documents

Document ID	Document Title	Issue
Bill 21 2006	<i>Energy Conservation Responsibility Act 2006</i>	
Ontario Regulation 425/06	<i>Functional Specification for an Advanced Metering Infrastructure</i>	July 14, 2006
IESO_ARCH_0008	<i>MDM/R – Logical Application and Data Architecture</i>	2.0
IESO_SPEC_0239	<i>MDM/R – Service and Performance Levels</i>	2.0
IESO_SPEC_0240	<i>MDM/R – Business Process Descriptions</i>	2.0

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# Table of Changes

Reference (Section and Paragraph)	Description of Change
1.7	<ul style="list-style-type: none"> <li>Definition of CPP modified to reflect that there may be multiple CPP periods.</li> </ul>
3.3	<ul style="list-style-type: none"> <li>Description of POD updated to clarify aggregation and privacy requirements.</li> </ul>
3.4.1	<ul style="list-style-type: none"> <li>Foot note 7 deleted.</li> </ul>
3.4.1	<ul style="list-style-type: none"> <li>Intervals for C&amp;I data transfers modified to provide flexibility for 5, 15, and 60 minute interval data.</li> </ul>
3.4.2	<ul style="list-style-type: none"> <li>Updated to reflect AMI Specification that MDM/R may not need to receive all reports generated by the AMI.</li> <li>AMI Reports will not be retrieved from the MDM/R for sending to LDCs or AMI Operators.</li> </ul>
3.4.4	<ul style="list-style-type: none"> <li>Clarification provided that there may be more than one CPP period/price per month.</li> </ul>
3.5	<ul style="list-style-type: none"> <li>“TOU POD” wording removed from end of section.</li> </ul>
3.6.1	<ul style="list-style-type: none"> <li>Meter Read data will not be part of the automated data transfer of billing data sent to LDCs/Billing Agents</li> <li>Mode of Billing Quantity data transfer will be the option of the LDC/Billing Agent</li> <li>LDCs/Billing Agents will retain the option to receive Meter Read data</li> <li>Meter Read data will be aggregated by POD Classification for transmission to LDCs/Billing Agents</li> </ul>
3.6.6	<ul style="list-style-type: none"> <li>Clarification of presentment requirements for Public Information and Customer Information</li> <li>Minimum authorization for Customer presentment directly from the MDM/R will require security login IDs and passwords.</li> <li>Added footnote #28</li> </ul>
3.7.1	<ul style="list-style-type: none"> <li>Clarification of use of Service Multipliers</li> <li>Footnote added to clarify aggregation requirement by groups of PODs.</li> </ul>
3.7.2	<ul style="list-style-type: none"> <li>Description of versioning clarified including footnotes.</li> </ul>
3.8.1	<ul style="list-style-type: none"> <li>AMI-MDM/R-CIS synchronization description expanded based on proposed functionality.</li> </ul>

3.8.3	<ul style="list-style-type: none"><li>• Clarification the nature of Meter Reads received from AMIs</li><li>• Wording in parentheses removed that stated interval consumption was derived from Meter Reads.</li></ul>
3.8.4	<ul style="list-style-type: none"><li>• Clarification provided on archiving data retention periods.</li></ul>
3.8.5	<ul style="list-style-type: none"><li>• Clarification regarding minimum on-line availability of Billing Quantity data and Meter Read data</li><li>• Clarification of retention of data retained for purposes of historical trend analysis</li></ul>
3.8.6	<ul style="list-style-type: none"><li>• Description of user, user groups and roles added for consistency with proposed functionality including footnote.</li></ul>

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# 1. Introduction

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To create a conservation culture in Ontario and make the Province a North American leader in energy efficiency, the Government has taken action to facilitate a number of key initiatives, including:

- The introduction of flexible, time-of-use pricing for electricity;
- A targeted reduction in Ontario's energy consumption by five percent by 2007;
- A commitment to install a smart electricity meter in 800,000 homes and small businesses by 2007 and throughout Ontario by 2010; and
- The passage of legislation to enable implementation of its smart metering initiative and conservation targets.

The Smart Metering System (SMS) includes an Advanced Metering Infrastructure (AMI), the Meter Data Management and Repository (MDM/R) functions, and billing functions for time based rates. AMI is the infrastructure within which date- and time-stamped hourly Meter Reads are be remotely collected and transmitted daily to a utility's control computer and, eventually, to a centralized MDM/R.

The *Energy Conservation Responsibility Act, 2006*, sets out the broad purposes and objectives for MDM/R.

## 1.1 Purpose

This document describes the functional requirements to be supported by the MDM/R. Its purpose is to familiarize the reader with the requirements for the MDM/R as well as to provide additional descriptive text to help set some of the requirements in context. This document prescribes many requirements that the MDM/R will need to meet but does not prescribe any implementation or operational methodology.

This document together with the Logical Application and Data Architecture (LADA) identifies data elements that are required for data transfer to and from the MDM/R. A consistent specification will be used for the data transfers to and from all Interested Parties, including LDCs and AMIs. It is not a detailed design document.

## 1.2 Scope

This document describes the functional requirements for the Meter Data Management and Repository.

Various portions of this document make reference to current business processes and integration requirements, however these requirements are more fully described in other related documents listed at the front of this of specification.

## 1.2.1 Overview of the MDM/R

The MDM/R is to provide a common infrastructure for receiving Meter Reads from all AMI in Ontario, processing the reads to produce Billing Quantity data (that is, data to support billing), storing and managing data, and providing access to such data to Interested Parties.

The MDM/R is expected to use a WAN to connect to all LDCs (their AMI and customer information systems) and Interested Parties. The AMI systems can be expected to transmit their Meter Reads on a daily basis to the MDM/R using a common protocol and data transfer structure.

At a high level, the MDM/R shall:

- Receive and load Meter Reads;
- Receive and load other data from the AMCC, including but not limited to voltage sags/swells, tamper alerts, outage alarms;
- Validate, edit and estimate Meter Reads;
- Store, manage and maintain data;
- Provide scalability to support the Government's smart metering targets;
- Provide auditing of all changes to data;
- Provide end to end traceability of data use within the MDM/R;
- Provide security to manage access to functions and data;
- Provide Billing Quantity data for each Point of Delivery on different rate structures including, hourly, RPP, CPP;
- Provide data on request at scheduled or ad-hoc intervals;
- Receive and manage information to support relationships between PODs, meters, LDCs and Interested Parties within the MMD; and
- Meet the retention and archival requirements of Measurement Canada and others.

## 1.3 Who Should Use This Document

This document has been prepared for use by the members of the IESO SMSIP Team and the vendors pre-qualified for the design, delivery, and integrated operation of MDM/R Solution Space as part of the Ontario Smart Metering System.

## 1.4 Assumptions and Limitations

This document has been developed in the context of

- The MDM/R will operate on Eastern Standard Time (EST).
- Limited validation of the data may be performed by the AMI before the data is sent to the MDM/R.

- Validation, editing and estimating (VEE) functionality will be provided centrally for all AMI in the province.
- The data transfer from the MDM/R to LDCs and Billing Agents may be through either a “push” mechanism or a “pull” mechanism<sup>1</sup>.
- LDCs will retain the customer interface.
- Some LDCs may outsource billing to a third party.
- Some LDCs may choose to outsource their AMI operations<sup>2</sup>.
- The LDC or Billing Agent, not the MDM/R, will apply losses to billing quantities.
- Hourly load research profiles will be used to support VEE for meters where insufficient data are available at the outset.
- The MDM/R will be populated with all requisite data prior to the commencement of operations to ensure that VEE can be performed once connected to AMI.
- As required, LDCs will provide historical data to help populate the database.
- LDCs may share the use of one or more AMCCs, and an LDC may have more than one active AMCC.
- As part of the initial stage of implementation, the MDM/R will receive, process, and manage Meter Reads for all consumers served by LDCs with smart meters being read by AMI and where metering of demand is not required.
- The implementation of the MDM/R will include the following functionality that may not be available when the MDM/R is initially placed in-service:
  - Support of Commercial & Industrial consumers where metering of demand is required (including multiple channels and multiple data types)
  - Access to the MDM/R for Interested Parties
- Later stages of implementation may use functions including:
  - Support of sub-metering
  - Support of Distributed Generation
  - Support of Net Metering
  - Addition of gas, water and other electrical (i.e. volts, vars) meters
  - Future billing functionality including the application of loss factors and maintenance of customer information
- The MDM/R will be subjected to regular audits.

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<sup>1</sup> This specification is written as though all data transfers from the MDM/R will use a “push” mechanism however some LDCs and Billing Agents may not have 24/7 availability to receive transfers from the MDM/R and may prefer to “pull” data. The MDM/R shall support both mechanisms.

<sup>2</sup> Pertinent to the MDM/R specifications since it affects who is authorized to send data to the MDM/R and who may need to be contacted in the event of problems.

## 1.5 Conventions

The standard conventions followed for this document are as follows:

- Title case is used to highlight process or component names; and
- Italics are used to highlight publication, titles of procedures, letters and forms

## 1.6 Roles and Responsibilities

This document does not impart any specific roles or responsibilities. This document is intended to provide the design basis for development of the systems solutions and documentation associated with the MDM/R system implementation and development of associated interfaces.

## 1.7 Definition of Terms used in this Document

Within this document the following words and phrases have the following meanings:

“**AMCC**” is an advanced metering control computer that is used to retrieve or receive and temporarily store Meter Reads before or as they are being transmitted to the MDM/R. The information stored in the AMCC is available to log maintenance and transmission faults and issue reports on the overall health of the AMI to the LDC.

“**AMI**” means the advanced metering infrastructure. It includes the meter, Advanced Metering Communication Device (AMCD), Local Area Network (LAN), Advanced Metering Regional Collector (AMRC), Advanced Metering Control Computer (AMCC), Wide Area Network (WAN), and related hardware, software, and connectivity required for a fully functioning data collection system. An AMI does not include the MDM/R.

“**API**” means Application Program Interface, which is the interface (calling conventions) application program used for accessing services provided by another module.

“**Billing Quantity**” refers to consumption data that has been through VEE and is ready for use in billing.

“**CPP**” refers to specific rate structures called Critical Peak Pricing. Under these structures, the price of electricity is variable. Such occurrences will typically occur when wholesale prices for electricity are very high due to constrained supply. One or more of the TOU rating periods will be used to track a consumer’s electricity consumption during CPP events.

“**consumer**” or “**customer**” refers to residential or small general service consumers where the metering of demand is not required.

“**Daily Read Period**” means the 24-hour period for collecting Meter Reads, subject to the two periods during which changes to and from Daylight Savings Time take place. The Daily Read Period commences at 12:00 midnight of each day.

“**Firmographic/Demographic**” is basic customer-profiling information about business organizations and individuals, respectively. Firmographic data is more relevant for business-to-business

transactions involving automated electronic data exchange between businesses or trading partners; they do not typically involve customers.

“**Specification**” means these functional specifications.

“**GUI**” means graphical user interface. The most commonly used type of computer interface, exemplified by Microsoft Windows and MacOS. Typical elements of a GUI are a mouse interface and a system of visual directories that look like file folders.

“**Interested Party(ies)**” are those entities that are authorized to access specific data from the MDM/R.

“**kWh**” means kilowatt-hour.

“**LDC**” means a local distribution company, which is a LDC, as defined in the Ontario Energy Board Act, 1998.

“**LDC CIS**” means the LDC’s customer information system, in which customer account information is held.

“**Meter Read**” is a number generated by a meter that reflects cumulative electricity consumption at a specific point in time. (The Meter Read and related data will be reported to the MDM/R at a specific Point of Delivery.<sup>3</sup>)

“**MDM/R**” means the meter data management and meter data repository functions within which Meter Reads are processed to produce Billing Quantity data and the storage of data for future use.

“**MMD**” means the MDM/R Master Directory, which is a portion of the MDM/R that contains the data relationship among the Meter Read data received from the AMCC and the Point of Delivery.

“**POD**” means the Point of Delivery at which delivery is metered or calculated. The POD is assigned by the MDM/R and is a unique identifier that identifies the point at which billing occurs based on input from one or more smart meters.

“**RPP**” means Regulated Price Plan (RPP) for consumers that sets out prices per kWh that local electricity utilities charge for electricity use.

“**TOU**” or “**Time of Use**” means the sale of electricity based on rates established for certain times of day, days of week, and/or season of year. For billing purposes, Hourly Meter Reads are grouped into a number of rating periods, in accordance with the rate structure, to enable the recording of consumption at certain times of the day, week, or year.

“**VEE**” means validation, estimating and editing of Meter Reads to identify and account for missed and inaccurate reads to derive billing data. The algorithm to complete VEE identifies gaps in Meter Reads and rebuilds consumption based on historical trending and averaging.

“**WAN**” means a wide area network, the communication network that provides communication to/from the MDM/R and all the other systems interfaced to it.

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<sup>3</sup> Meter Read data will be reported by POD and other key data as more fully described in Section 9 of the LADA.

## 1.8 How This Document Is Organized

This document contains the following sections:

- **Section 1** of this document provides background for the smart metering initiative and the role of the MDM/R
- **Section 2** of this document has been left intentionally blank and has been included only to provide continuity with earlier drafts of the MDM/R functional specification.
- **Section 3** of this document provides the functional, data storage, and non-functional requirements of the MDM/R

– End of Section –

## 2. Roles and Responsibilities

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This section has been left blank intentionally and has been maintained only to provide continuity with earlier drafts of the MDM/R functional specification previously released for public consultation and updated as addenda to the IESO Request for Information for system supply and operational support for the Meter Data Management and Repository.

### 2.1 Role of the MDM/R

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### 2.2 Role of the Local Distribution Companies (LDC)

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### 2.3 Role of Interested Parties

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## 3. Specifications

This section describes the major Specifications for the MDM/R. The functionality can be broken down into four high level areas plus potential future billing functionality as depicted in the following diagram. These reflect the role of the MDM/R as described in these Specifications. Note that the arrows represent application to application dependencies.

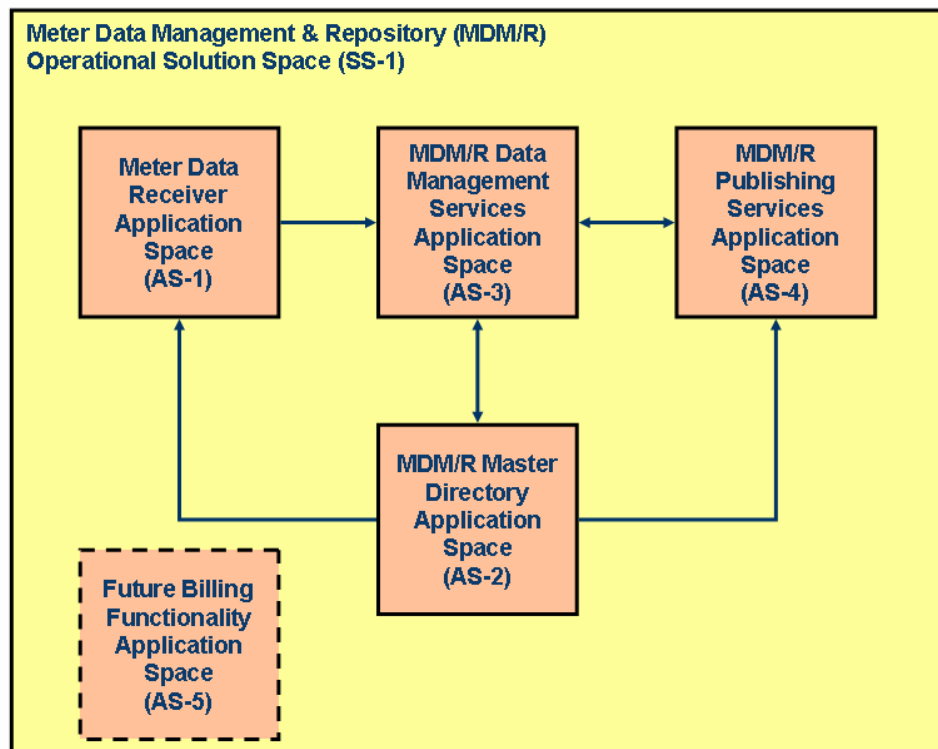


Exhibit 3–1: MDM/R High Level Functionality

### 3.1 Functional Overview

The Logical Application and Data Architecture (LADA) has superseded this section. Please refer to the LADA document for a more complete description.

## 3.2 Regulatory Requirements

The MDM/R shall meet all applicable federal, provincial, and municipal laws, codes, rules, directions, guidelines, regulations, and statutes (including any requirements of any applicable regulatory authority, agency, board, or department including Industry Canada, Measurement Canada, the Canadian Standards Association, the Ontario Energy Board, and the Electrical Safety Authority) collectively, “Laws”. For greater certainty, the MDM/R shall meet all applicable Laws and Regulations that are necessary for the measurement of data and/or the transmission of data to and from the consumers within the Province of Ontario, including Laws and Regulations applicable to metering, safety, privacy, and telecommunications.

## 3.3 Unique ID Number – Point of Delivery (POD)

The MDM/R shall use a Point Of Delivery (POD) to uniquely identify the point at which delivery is metered or calculated. The POD shall be assigned by the MDM/R and shall be a unique identifier that identifies the point at which Billing Quantities are determined based on input from one or more smart meters. The POD shall not be an ‘intelligent’ number and shall not include a LDC indicator. Consequently if a LDC registers multiple PODs at the same time, the POD identifiers should not be sequential so as to avoid potentially identifying the LDC from the POD identifier by itself. The MDM/R shall maintain internal links that relate each POD to premise; meter ID; and other parameters. A POD may be physical or virtual (i.e. no physical meter exists<sup>4</sup>). The POD shall be used in all communications by (and with) the MDM/R relating to Meter Reads (and derived values<sup>5</sup>) to identify the source(s) of the Meter Reads (and derived values).

The MDM/R shall have the capability to group PODs together by POD classifications. The MDM/R shall have the capability to perform aggregation of and report on meter reads and billing quantities by POD or by groups of PODs. Each POD may belong to none, one, or many POD classifications.

POD identifiers will be used to ensure uniqueness across Ontario. It will also ensure privacy and consistency over time for data access. The process for registering PODs and synchronizing POD information between the MDM/R, the AMIs and the CIS for each utility will be worked out during the detailed design process and will be dependent on the solution that is chosen to implement the MDM/R. Processes for initial POD registration and ongoing POD data maintenance and additional registrations (new development etc.) will also be worked out during the detailed design process.

Upon removal of a meter and replacement with another meter, the POD will remain the same. The POD will not be affected by the change of customers at a premise. The MDM/R shall maintain the relationships associated with a POD, continuing after the POD is retired to support access to historical data. For a retired POD no data shall be automatically reported for a POD after it is retired though it shall be possible to retrieve and view historical Meter Reads that are online.

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<sup>4</sup> Although no physical meter may exist at the Point of Delivery, the delivered quantity shall be calculated based on data from other PODs.

<sup>5</sup> Such as billing quantities, for example.

## 3.4 Data Input to the MDM/R

This document together with the LADA identifies data elements that are to be transferred to and from the MDM/R. A single consistent specification is used herein for data transfers to and from the MDM/R, LDCs, and Interested Parties.

As identified in the LADA, these data elements include:

- Meter Reads and reports from AMI systems;
- Data from LDCs' customer information systems;
- Information related to rate structures and scenarios;
- Data transmitted to LDCs for billing;
- Requests for data from the MDM/R by LDCs and Interested Parties; and
- Reports and acknowledgements.

The preferred<sup>6</sup> data transfer standard across the different interfaces will need to provide full support for the functionality of the data transfer processes to/from the MDM/R, including all information necessary to meet the Specifications contained in this document.

The MDM/R shall support the transfer of data elements defined in the LADA for meter and non-meter-related data transmissions in order to provide the level of functionality required by this Specification. In addition all transfers shall meet the security requirements identified in this Specification.

The following identifies the data elements to be transferred across these interfaces.

### 3.4.1 Meter Data Transmissions from AMI Systems

The MDM/R shall receive and process Meter Reads and related data from all AMI in the province. Meter Reads will be transmitted to the MDM/R from each AMCC as follows:

- Meter Reads for Small Volume Consumers where there is no requirement to meter demand will be transmitted as hourly data taken at the end of each hour.
- Meter Reads for Commercial & Industrial Consumers where metering of demand is required will be transmitted as either 5, 15, or 60 minute data taken at the end of each interval.

The MDM/R must be capable of receiving and processing Meter Reads for each 24-hour period in accordance with the *Service and Performance Levels* specification referenced at the front of this document. The MDM/R shall be scalable to support the requirements in the *Service and Performance Levels* specification as well as forecasted growth beyond 2010<sup>7</sup>. It shall also be able to accommodate

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<sup>6</sup> The preferred standard to be used for data transfer to the MDM/R should provide a level of self-validation. In the medium to long term (by 2010) a direct business-to-business interface capability is preferred, though some systems initially integrated with the MDM/R may require this capability from Day 1.

<sup>7</sup> Assuming all intervals are 60 minutes.

a scenario in which some of the Meter Reads may require re-reads as also described in the *Service and Performance Levels* specification.

The size of data transfers from an AMCC can be expected to be limited to a maximum number of records<sup>8</sup> (to be determined<sup>9</sup>). It is also expected that all data in such data transfers will relate to the same calendar day and the same LDC. Finally, it is expected that these parameters, as a minimum, will be identified in header information to allow the MDM/R to prioritize the loading of data for multiple concurrent data transfers.

Data received by the MDM/R from the LDC's AMI can be expected to conform to the attributes described in the LADA.

### Data Transfer Prioritization

Each LDC shall be allocated space on an MDM/R file transfer protocol server through which to upload meter data. The MDM/R shall save all versions of meter data received from an AMCC. In order to adjust MDM/R processing to accommodate urgent requirements, the MDM/R shall support a mechanism for prioritizing which AMI data transfers are processed first. Prioritization may be set on one or more of the following:

- By LDC<sup>10</sup>;
- By the date of the Meter Reads; and

The MDM/R shall be capable of receiving and storing all Meter Reads by 5 a.m. EST each day for the previous Daily Read Period. Since Meter Reads are not required to be transmitted in a single transmission, the MDM/R shall be capable of receiving transmissions on a more frequent basis. Note that it is possible that the transmitter of such reports may not be in the same time zone as either the originating meter or the MDM/R.

### Syntactic Checks

The MDM/R shall check the syntax of each data transfer that is received from an AMI. This can be expected to include checking that the data structure is consistent with the required standards and that any checksum values provided with MDM/R checksum calculations. The MDM/R shall perform a checksum calculation on the data that is received, compare the result to the original checksum, and conclude that the message was not corrupted if the sums match.

### Semantic Checks

The MDM/R shall check the semantics<sup>11</sup> of each data transfer that is received from an AMI. For efficiency (e.g. loading prioritization), the data in any one data transfer should be from the same LDC

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<sup>8</sup> A record consists of Meter Reads for a single POD for the same calendar day.

<sup>9</sup> Data transfer size will be limited to prevent lengthy reloading or retransmission problems with large data transfers that encounter an error.

<sup>10</sup> Note that for an AMI being shared by multiple LDCs, each data transfer can be expected to only contain data for a single LDC.

<sup>11</sup> The semantics refers to the approaches that the MDM/R requires to "understand" and determine that part of the data in the transfer for which relationships may be validated.

and the data should also correlate with information in the header that identifies the LDC. The MDM/R shall also check to ensure that all meters for which data is provided are currently active.

## Manual Imports

The MDM/R shall provide for the manual import of Meter Reads and related data to address situations such as those where actual data can be retrieved from a meter but can no longer be processed by the AMI. It is expected that the AMI provider or the LDC will manually transmit the required data to the MDM/R in these situations. The manual data transfer shall be in the same format as those that are automatically transmitted and the MDM/R shall perform the same checks on the data transfer and its contents as for those that are automatically received from AMIs.

The MDM/R shall process any historical updates and can be expected to make them available to the LDC as part of a subsequent billing cycle. This shall be the default.

## Acknowledgement

As each data transfer is received and the requisite checks are completed by the MDM/R, the MDM/R shall send a message to the AMI operator acknowledging the success or failure of the transfer. It is expected that a process will be developed to address failures.

## Pre-VEE Data Checks

Once a data transfer has been successfully received by the MDM/R, and has passed syntactic and semantic checks, the MDM/R shall load the data into the database. The MDM/R shall archive and not delete any data that are successfully loaded.

The MDM/R shall continue to complete validation checks on data in the database while continuing to load other data transfers. The MDM/R shall perform, without limitation, the following checks on data that has been loaded into the MDM/R:

- For each data transfer, the ID of the sending AMI operator and LDC Identifier will be validated to check that the meter data is being sent from the correct authorize AMI operator and LDC;
- For each data transfer, that each POD / meter ID combination is valid and agrees with the data in the MMD;
- That each meter in the data transfer is installed in the same time zone;
- That the data transfers with Meter Reads were received by the MDM/R by 5 a.m.<sup>12</sup>;
- Compare the PODs for which data have been received against the number expected from each AMI operator or LDC;
- For each LDC, validate whether the correct level of data completeness<sup>13</sup> has been provided (currently 98% of all meters);

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<sup>12</sup>The MDM/R shall provide reports to identify data transfers and their associated PODs that are received late.

<sup>13</sup>Note that this cannot be started before 5 a.m. unless the MDM/R has determined that it has received data for all meters for the LDC.

- Confirm that all Meter Reads received from the AMCC have a measurement precision<sup>14</sup> of at least 10 Watt per hour (0.01 kWh); and
- Detect and identify the hour in which a power outage, and restoration following an outage, has occurred. As a corollary therefore the MDM/R shall detect the difference between “no reading” and “zero” based on the data sent from the AMI.
- Check Meter Reads for abnormal changes indicating either an un-notified meter change or a meter rollover.

### 3.4.2 Reports from the AMI to MDM/R

All AMI shall send various reports to the MDM/R pursuant to the *Functional Specification for an Advanced Metering Infrastructure*. The MDM/R shall store these reports such that they are indexed for quick retrieval and viewing by MDM/R operators. Reports shall be indexed by date, report type, AMI, and LDC at a minimum.

The AMI Functional Specification states that the AMI must be capable of making reports available to the MDM/R (sections 2.10.1, 2.10.2.4, 2.10.3.2). The MDM/R must be capable of receiving all reports specified in the AMI Specification but the list of required reports will be determined by business requirements determined during the detailed design phase.

The MDM/R shall not be required to extract data from these reports to support the VEE process. The data transfers from the AMI to the MDM/R containing the Meter Reads shall also contain additional data such as quality flags to support the VEE process.

Reports that are stored by the MDM/R are not required to be retrieved and sent to the LDCs or AMI Operators.

### 3.4.3 Non-AMI-Related Transfers from LDC / Billing Agent to MDM/R

The MDM/R shall be prepared to receive and process the following transfers, as a minimum:

- New POD-related data to update the MMD;
- Requests for meter data; and
- Requests for Billing Quantity data.

### LDC Update of the MMD

The MDM/R shall receive and process incremental updates to the information contained in the MMD. These data transfers represent data sent by the LDC to the MMD that identify temporal changes in various attributes associated with the Point of Delivery.

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<sup>14</sup> This requirement is to be enforced in the AMI. Pharmaceutical companies use character data fields to store numeric values because precision is important. In a numeric field 15.10000 is the same as 15.10. The reading is the same but the precision is different. Precision validation must be performed as the data transfer is prepared by the AMI and before it is stored in the MDM/R.

## Ad Hoc Requests to the MDM/R

The MDM/R shall receive and process ad hoc inquiries from LDCs, Billing Agents, and authorized Interested Parties that can be expected to be built from a menu of parameters, including, as examples:

- Points of Delivery (POD);
- Aggregation over time intervals: hourly, TOU, or CPP;
- Aggregation over a specific time period; and
- MMD Data:
- Type of demographic/firmographic <sup>15</sup>.

### 3.4.4 Critical Peak Pricing

The MDM/R shall receive and store information about critical peak pricing periods. The MDM/R shall be capable of aggregating Meter Read data into “buckets” based on pre-defined CPP periods<sup>16</sup>, which may:

- Be contained wholly within a single TOU period; or
- Straddle two or more TOU periods.

The MDM/R shall provide for receiving, storing and applying CPP information that supports all of the following cases:

- One or more CPP periods may occur each month
- One or more prices may apply to the CPP periods (only one price per CPP period)
- Usage within CPP periods may only be aggregated where the price is the same for each CPP period being aggregated.

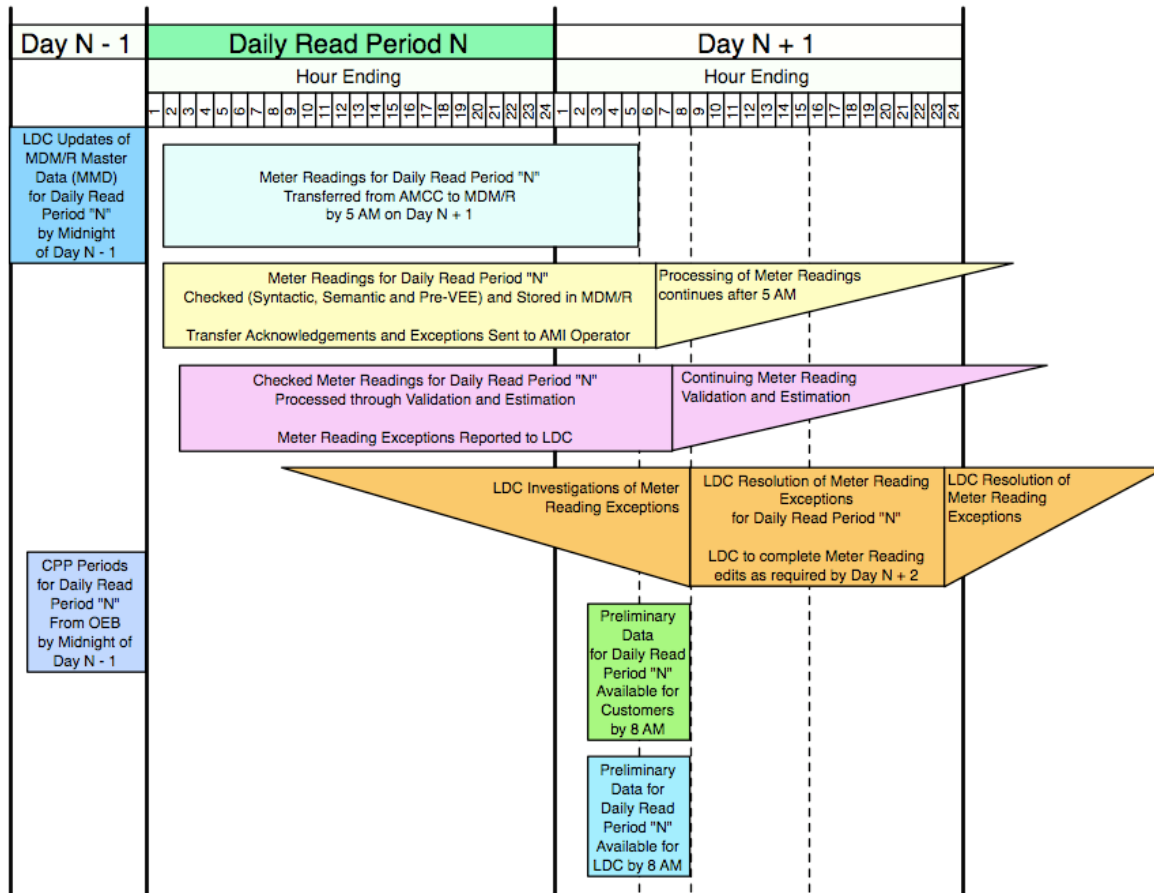
## 3.5 Data Transfer Timeline

The following diagram is provided for illustrative purposes; the times specified in this section are included to help with the illustration.

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<sup>15</sup> The format or content of the firmographic/demographic has not been determined

<sup>16</sup> The MDM/R must know how the CPP periods have been defined before it can aggregate Meter Reads for the CPP. It is expected that the OEB will announce a CPP the day before it occurs and that the information will be loaded into the MDM/R prior to the start of the daily read period.



**Exhibit 3-2: Timeline For Data Processing**

The data loaded on each day by the MDM/R will mainly be for the previous Daily Read Period. Some data transfers will be expected for other days where, for example, there was a problem with an AMI that was unable to send some data previously and is only now transmitting data from several days before. In this instance these data transfers would probably be assigned a higher loading priority. Alternatively, if estimated Billing Quantity data have already been provided to the LDC in question (for billing) it may be decided<sup>17</sup> to make these data transfers a lower priority for loading so that the Meter Read data for the previous Daily Read Period may be loaded quicker.

In addition to the data loaded each day by the MDM/R, there will be data that are undergoing validation checks, estimation, editing and aggregation into Billing Quantities. These processes are outlined at a high level in Exhibit 3-2. Note that as many as four days may elapse between receiving Meter Reads for a POD and creating Meter Data that has completed the VEE process for the POD. For example data processed on Thursday will include Meter Reads received by 5 a.m. for Wednesday and Billing Quantity data produced for the prior Sunday.

For use in processing the current Daily Read Period, any new data or any changes to data already in the MMD must be received by the MMD by the end of the previous Daily Read Period. This is

<sup>17</sup> Operational decisions on which files to load first will be made by the operator of the MDM/R but the ability to prioritize file loading is required to facilitate these decisions.

because data for the Daily Read Period may be transmitted to the MDM/R anytime after the end of each interval and the MDM/R needs accurate MMD data to correctly process the data. It is expected that the MDM/R shall support an override mechanism (with auditing) to allow the LDC to send updates where the information in the MMD is discovered to be inaccurate.

If it is required to provide the previous day's Meter Reads or Billing Quantities to customers then the LDC shall also have access to the data at the same time that it is made available to customers so that the LDC may access the data to deal with customer enquiries. Data based on Meter Reads that have not passed validation, has been estimated, or has been edited shall include a notice to that effect when presented.

The MDM/R shall also provide access to Meter Read data and Billing Quantity data via an API<sup>18</sup> for LDCs, Billing Agents, and authorized Interested Parties once it is available. This includes the TOU data and Meter Read data that have been through VEE.

Please see *MDM/R Services and Performance Levels* specification, Section 5.1 for the high level data processing timeline and expected service levels for key events in the processing of Meter Read data and the production of Billing Quantity data.

## 3.6 Disseminate Data from the MDM/R

The MDM/R shall disseminate data in a number of different ways, as identified below.

### 3.6.1 Data Transmitted to LDC / Billing Agent for Billing

There are two categories of transmission between the MDM/R and LDCs /Billing Agents for billing<sup>19</sup> as described below. Note that all billing quantities sent to LDCs and Billing Agents whether scheduled or requested shall be archived.

- Automated Billing Quantity data transmitted at pre-determined intervals<sup>20</sup>; and
- Specific Billing Quantity data transmitted in response to a request.

The category of transmission shall be at the option of the LDC / Billing Agent.

LDCs / Billing Agents will have the option of receiving the Meter Read data associated with the Billing Quantities.

This flexibility shall include Billing Quantities sent out to support the cancel/rebill process where the MDM/R shall support sending the new Billing Quantities the next day or the next billing cycle for any POD. If cancel/rebill Billing Quantities are required sooner by the Billing Agent this can be provided by the MDM/R in response to a request (second bullet above).

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<sup>18</sup> Application Program Interface, which is the interface (calling conventions) application program used for accessing services provided by another module.

<sup>19</sup> As noted in the assumptions, some LDCs may outsource billing to a third party, in which case the third party would need to have authorization to receive billing data.

<sup>20</sup> It is expected that some LDCs will require Billing Quantities aggregated by TOU bucket each day while some will require them aggregated by billing cycle. The MDM/R shall have the capability to support both provisions.

The MDM/R shall have the capability to group PODs together by POD classifications as specified in Section 3.3. The MDM/R shall have the capability to perform aggregation of and report on meter reads and billing quantities by POD or by groups of PODs for the purpose of providing aggregated hourly data for various POD classifications to support LDC and/or Billing Agent business processes.

During the initial stage of implementation the MDM/R shall provide LDCs with Billing Quantity data for each POD registered in the MMD. As a minimum, the MDM/R shall be able to accommodate the following rate structures and scenarios:

- Hourly (for Residential and C&I);
- Regulated Price Plan;
- Critical Peak Pricing

If there is no consumption for a particular TOU period or CPP period, the Billing Quantity reported by the MDM/R for that period shall be zero<sup>21</sup>.

Later stages of implementation could supply support for the following:

- Demand values;
- Sub-metering
- Net metering; and
- Distributed generation.

### 3.6.2 Request from LDCs and/or Interested Parties

The MDM/R shall respond to inquiries received on ad hoc and regular bases. It is expected that such inquiries will be constructed from predefined parameters, to be developed as part of the MDM/R's business processes in a way that balances the need for information with the cost of providing such information. Some examples include:

- A request for historical data for a specific POD or group of POD for a specific time interval, either in the form of hourly or TOU Billing Quantity data and Meter Read data; and
- A request for aggregated data relating to a set of pre-determined demographic or firmographic parameters.

The MDM/R shall respond to LDC requests for information to complete final bills, as an example, in addition to information to allow them to meet their ongoing billing requirements.

The MDM/R shall respond to inquiries from authorized interested parties. Authorization for access to Meter Read and Billing Quantity data shall be controlled by the LDC or other entity identified as the primary authority for granting data access.

The MDM/R may be required to limit ad hoc queries during heavy data processing periods. As necessary, the MDM/R shall provide functionality to enforce this requirement or shall provide access to data using a mechanism that does not affect operational processing.

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<sup>21</sup> Note that zero does not indicate missing readings, but indicates a valid reading of zero consumption.

### 3.6.3 Messages

The MDM/R shall send error messages to LDCs in accordance with the Service Levels identified in the MDM/R Service and Performance Levels specification upon detection of the errors or anomalies related, but not limited to the items identified below.

#### On Receipt of the Meter Reads

- Meter and POD identification<sup>22</sup> check;
- PODs<sup>23</sup> are valid for the indicated LDC;
- The number of intervals for each POD relative to the number specified in the data transfer;
- The interval size for each POD;
- Time check of POD;
- Zero consumption on active meters<sup>24</sup>; and
- Unsuccessful transmission of Meter Reads from any one POD<sup>25</sup> during any three (3) month consecutive time period.

#### Exceptions Identified During the VEE Process

The MDM/R shall report any problems identified with Meter Reads or estimations made to Meter Reads to the LDC. The LDC can be expected to investigate and resolve any exceptions identified by the MDM/R. If the data quality is such that estimated values cannot be generated then new values (from the AMI, or edited by the LDC) shall be loaded after they have been provided to the MDM/R.

### 3.6.4 Report Generation

The MDM/R shall be self-monitoring. The MDM/R shall automatically generate reports identifying operational abnormalities within the MDM/R. The MDM/R shall have multiple mechanisms through which to immediately identify staff of any anomalies. As required, the MDM/R shall generate and transmit reports including but not limited to those described below.

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<sup>22</sup> The POD stored in the MDM/R relates to the meter location or premise. Therefore, change out of a meter at the same location will retain the same POD in the MDM/R. A meter change out must be identified in the MMD and the MDM/R must record the date and time of the change and the removed and installed readings of the replaced meters (provided from the AMI). If the meter/POD combination in the data transfer is inconsistent with the MMD (perhaps due to late notification of a meter change out) the MDM/R will inform the AMI operator.

<sup>23</sup> If a record contains no POD but does include a meter id, the meter id shall be validated and the AMI operator shall be notified that the POD is missing. If the MMD has an association of the meter id with an existing POD this should be provided to the AMI operator in the notification.

<sup>24</sup> This needs to be configurable to allow for genuine periods of zero consumption that do not cause unwanted error messages.

<sup>25</sup> The AMI specification requires that Meter Reads unsuccessfully collected or transmitted shall not be due to the same AMI component (including, without limitation, any AMCD) during any three (3) month consecutive time period. The MDM/R can only track unsuccessful reads by POD and report that to the AMI operator.

## Non-Critical MDM/R Reporting

Non-critical reports generated from the MDM/R shall include, without limitation:

- Confirmation of successful transmission of Meter Reads from all AMCCs;
- Confirmation of all updates to the database dealing with additions, moves or changes to any POD, meter, or LDC;
- Reports related to Meter Reads<sup>26</sup>;
- Unsuccessful capture of Meter Reads; and

## Critical Reporting

Critical events are defined to include any MDM/R operational issue that could adversely impact the receipt of Meter Reads during any Daily Read Period and the timely transmission of Billing Quantity data. The MDM/R shall immediately identify and report any critical event. Operational issues that shall be included in any reporting of a critical event include, without limitation:

- Failure to receive Meter Reads;
- Discrepancies relating to POD and/or Meter ID data provided by the LDCs;
- Memory, disk or database capacity issues; and
- Network failures.

The MDM/R shall prioritize critical events in order of importance.

### 3.6.5 User Interfaces

The MDM/R shall provide the capability for both the MDM/R operator and external users to view and make changes to Meter Read data.

#### MDM/R Operator Interface

The MDM/R shall have an internal user interface to allow the viewing, editing, and management of the processes and data in the MDM/R. Some of the information that the MDM/R shall provide across the user interface includes information about which data transfers have loaded, which data transfers are waiting to load (set to low priority), which data transfers are currently loading, and which data transfers have failed syntactic and/or semantic checks.

If a data transfer fails to load, the MDM/R shall send an internal message and, as required, a notice of failure to the AMI operator. The MDM/R shall generate and record information that provides an explanation for the failure. This information shall be made available to an MDM/R operator via a user interface that allows the operator to sort and search through the error reports.

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<sup>26</sup> Such as reports relating to consistent VEE exceptions by POD that have not been resolved by the LDC.

## External User Interface

The MDM/R shall have an external user interface to allow the viewing and/or editing of Meter Read data by the LDC or other entity identified as the primary authority for data access. Viewing and editing of Meter Read data by the LDC or other external entity will be restricted to the PODs and related meter ID numbers for which the LDC or external entity has been identified as primary authority. This external editing capability will be used to support editing during the VEE processes.

### 3.6.6 Presentment

#### Public Information

The MDM/R shall have the capability to present data and reports in a way that is accessible by the public, for example, by supporting access mechanisms such as web and automated voice recordings.

#### Customer Information

Customer specific data shall be made available for presentment directly by the MDM/R or by another party such as the LDC. Where such data is presented directly by the MDM/R, the MDM/R shall incorporate standard security login IDs and passwords relating to the applicable PODs in lieu of authentication by possession of a single key<sup>27</sup>. This security shall apply to both IVR and direct customer web presentment.

### 3.6.7 Future Billing Process Option

The MDM/R may have the future capability to process and generate customer bills directly as a billing agent for those LDCs requesting such a service. If developed, this function may require additional transmission of data between the MDM/R, LDC and possibly customers via the internet or other acceptable means.

The MDM/R shall provide a non-disruptive mechanism for including the data and functionality associated with billing into its architecture such that the billing functionality can be integrated with the MDM/R and use the information in the MDM/R and MMD.

## 3.7 Data Management

The following subsections describe the requirements for the MDM/R with respect to data management. Section 3.8 provides data management and storage requirements that are related to, and therefore dependent on, MDM/R business processes; the latter are not defined in this Specification.

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<sup>27</sup> Responsibility for collecting the ID/password shall rest with the LDC and these would be submitted to the MDM/R via the CIS interface

### 3.7.1 Data Aggregation

A key function of the MDM/R is to aggregate meter data for purposes such as billing, reporting and analysis. With respect to billing, the MDM/R shall aggregate validated Meter Reads to support the rate structures used by LDCs on a daily basis.

With respect to data aggregation, the MDM/R shall do the following:

- Support dynamic business environments through batch (for use with MMD) and interactive (for the MDM/R operator) interfaces to define new reasons for aggregating data<sup>28</sup>;
- Support complex aggregation needs including meter totalization and subtraction, making sure not to double-count PODs that are collecting aggregated data;
- Apply service multipliers to Meter Read data when aggregating Billing Quantity data for transformer type meters;
- Support the use of virtual PODs where no physical meter exists, through the aggregation and/or subtraction of data from other PODs<sup>29</sup>
- Provide the capability to pre-aggregate frequently aggregated data and to store the results in order to avoid re-aggregating the data each time it is requested; and
- Store the versions of data used to perform the aggregation as a lookup in the MDM/R. If a version of data for a POD is updated, the MDM/R shall check against the data versions stored in any pre-aggregated format. If the earlier version is part of an aggregated set of data, the MDM/R shall flag the data as outdated and schedule it for re-aggregation.

### 3.7.2 Data Versions

The MDM/R shall provide access to meter data through the use of data versions. Versions of data within the MDM/R shall represent qualitative business concepts related to the data. The MDM/R shall manage the business rules that define the context<sup>30</sup> of a version. Each time a Meter Read is changed, the MDM/R shall update versions of data that are specific to the POD and that calendar day. The MDM/R shall have the capability to automatically store and retrieve meter data by specific data versions.

The MDM/R shall provide for versioning of both meter data and all derived data (i.e. Billing Quantity data). The MDM/R shall provide for identifying the relationship of versions of derived data to the underlying versions of Meter Read data.

It is important to understand that a qualitative data version does not represent a specific set of data that were loaded together but that qualitative versions represent business concepts related to the data

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<sup>28</sup> The MDM/R shall support data aggregation by various indices including but not limited to POD, LDC, retailer, or demographic/firmographic attributes.

<sup>29</sup> As per Section 3.3, the MDM/R shall have the capability to group PODs together by POD classifications. The MDM/R shall have the capability to perform aggregation of and report on meter reads and billing quantities by POD or by groups of PODs. Each POD may belong to none, one, or many POD classifications.

<sup>30</sup> The full set of required versions to be supported, their definitions, and hierarchies for access to the underlying data will be defined later, however it is anticipated that there will be a small number of version types that need to be implemented in order to meet basic requirements (to be defined during the detailed design process).

that control why the data are to be accessed. When the underlying data referenced by a version changes (i.e. the version now points to different data loads for some or all intervals) these changes shall be tracked for audit purposes. Implicit in all this therefore is the need to control access to the meter data through the use of an internal service that is capable of implementing this logic

### 3.7.3 Audit Trails

The MDM/R shall have the capability to complete an audit trail for all Meter Reads in order to record events involving the processing of data. As a minimum, the MDM/R shall track how, when, and why a change was made to a Meter Read, and identify the person or process that performed the change.

The MDM/R shall make this information available in a form that supports an end-to-end audit of data from receipt of the Meter Read to the preparation of Billing Quantity data. For example, if a bill is disputed, the MDM/R shall be able to identify the raw data that were used to create the Billing Quantity data provided for use in the calculation of the bill. This will require recording which versions of Meter Reads were used to create consumption data that were sent to a LDC / Billing Agent for billing and records of edits for audit purposes. With respect to the latter, the records could include the timestamp of the edit, the user who performed the edit, and details of the edit. The MDM/R shall provide a mechanism to enable the identification of Meter Reads that have been edited or estimated, including the capability for users to enter comments to describe the nature of edits made.

The MDM/R can be expected to use actual data to replace estimates and edits, once available. All new data will be processed through VEE.

### 3.7.4 Validation, Estimation and Editing (VEE)

All Meter Reads received by the MDM/R are subject to VEE<sup>31</sup>. The MDM/R shall implement an automated VEE process.

The MDM/R can be expected to document and publish all algorithms used to validate or estimate Meter Reads, clarified with examples, flow charts and definitions. The MDM/R shall retain all such algorithms for future retrieval and auditing. The MDM/R shall provide for the application of different validation and estimation algorithms<sup>32</sup> to different groups of PODs.

#### Validation

The MDM/R shall check Meter Reads for anomalies. The actual algorithms to be applied in completing these checks will be defined at a later date. A validation process that allows the MDM/R to specify different validation rules for specific PODs or groups of PODs is preferred, to provide for differences according to firmographics / demographics in different LDCs.

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<sup>31</sup> VEE places is high computational and data management requirements on the MDM/R. It analyzes historical and current data to search for anomalies in the new data and raises error reports and updates the MDM/R with the data that has been estimated to replace problem data. To ensure LDCs have data for billing purposes in a timely manner the MDM/R shall have the capability to prioritize PODs for VEE based on billing cycle/billing date requirements.

<sup>32</sup> This is to support the potential for different estimation techniques to be applied to metropolitan meters versus rural meters and to support different techniques to be used for residential and commercial meters.

## Data Estimation and Editing

The MDM/R shall apply data estimation techniques when actual Meter Reads are not available in order to create estimated Meter Reads and Billing Quantities. The method of estimation shall be automated.

The MDM/R shall accommodate the ability to apply customized estimation techniques for non-conforming commercial and industrial loads, or for groups of PODs that require special rules, or that should not have estimation applied to them.

The MDM/R shall provide for editing of Meter Read data by both the MDM/R operator and authorized external users, though the mechanisms may vary (see section 3.6.5). Viewing and editing of Meter Read data by the LDC or other external entity will be restricted to PODs and related meter ID numbers for which the external entity has been identified as primary authority.

### 3.7.5 Manage Clock Changes

There are two time zones in Ontario – Eastern Time Zone and Central Time Zone. The MDM/R will operate in Eastern Standard Time (EST) throughout the year. The AMI will be required to provide date- and time-stamped data in EST via the AMI interface to the MDM/R. The MDM/R shall also return data to the LDC in EST. Clock changes for local prevailing time for data presentment by the MDM/R will be managed by the MDM/R.

## 3.8 Data Storage and Non-Functional Requirements

### 3.8.1 MDM/R Master Directory (MMD)

The MMD within the MDM/R will maintain the relationships between PODs, meters, LDCs, AMI Operators, and other authorized Parties. This allows the MDM/R to manage access rights to information to ensure the protection of privacy.

LDCs will continue to manage the customer interface and maintain all customer data. Pursuant to the *Functional Specification for an Advanced Metering Infrastructure*, however, LDCs will be required to provide data to the MDM/R to enable the latter to maintain the associations noted above. Processes/procedures will be required to ensure that the LDCs provide such data to enable timely and accurate updates to the MMD. The POD shall be assigned by the MDM/R and shall be a unique identifier that identifies the point at which delivery is metered or calculated based on input from one or more smart meters.

Updates to the MMD will be received and processed by the MDM/R in accordance with section 3.5 of this document and with the MDM/R Service and Performance Levels specification. The MDM/R shall maintain consistent MMD information with both the applicable AMI and the LDC CIS for each POD. For each LDC the AMI or CIS will be designated as the primary source for changes, for specific POD attributes. If changes are received from the primary system for a POD attribute, the MDM/R shall update the MMD and then forward the changes to the other (non-primary) system. The MDM/R shall acknowledge receipt of MMD updates but shall not send an acknowledgement for changes made to the MMD except by exception to describe any changes that could not be made. If the origin of the update is not the primary system for the attributes that have changed, the MDM/R shall

not make any changes to the MMD and shall respond to the sending system with an error notification and notify the primary system of the attempted updates

The MDM/R shall acknowledge receipt of MMD updates and send an acknowledgement for changes made to the MMD. The MDM/R shall be capable of forwarding MMD updates onto other systems. For example the MDM/R may receive MMD changes from a CIS, apply those changes to the MMD, and forward the changes to the AMI such that the CIS, MDM/R and AMI remain synchronized.

### 3.8.2 Reference Data

The MDM/R shall receive and process incremental updates related to changes in POD information received from the LDC.

Before making changes to the MMD, the MDM/R shall validate the source of the information received. The MDM/R may be required to report any unauthorized<sup>33</sup> provision of POD-related data to the entity currently registered with the MDM/R as authorized to provide such data.

The MDM/R shall be capable of receiving notification about the addition of new premises<sup>34</sup>, new meters, removal of meters<sup>35</sup>, and changes to POD information from the LDC in order to update the MMD. The MDM/R shall, in turn, transmit any changes to the relevant AMI Operator. This will ensure that the MMD contains the necessary information with which to process the incoming Meter Reads from the AMI once the changes are in effect. The MDM/R will provide acknowledgements of any additions, deletions and changes to the MDM/R Master Directory by system interface or direct notification to the LDC. The LDC will be responsible for ensuring meter and POD information in their meter information systems are synchronized and up to date.

### 3.8.3 Meter Reads

The MDM/R shall receive and store Meter Reads from the AMI either as:

- interval consumption data and a register reading at least once per day and/or;
- interval register reads for each interval.

The MDM/R shall store Meter Reads, interval consumption data, and Billing Quantity data (calculated from the Meter Reads). The MDM/R shall optionally support the storing of other interval data such as, but not limited to, demand, volts, amps, power factor. The MDM/R shall also support different interval sizes for different PODs or groups of PODs, as may be required in the future.

The MDM/R shall, as a minimum support Meter Reads for the following interval sizes: 60 minutes, 30 minutes, 15 minutes, 10 minutes, and 5 minutes. The MDM/R shall also be capable of maintaining multiple interval sizes for TOU, CPP, and similar rate structures. The MDM/R shall store only Meter Reads for provided for PODs that are associated with Small Volume Consumers and

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<sup>33</sup> For example, a billing agent inadvertently requesting data for meters that have their bills calculated by a different billing agent.

<sup>34</sup> The MDM/R will respond with a new POD to the LDC.

<sup>35</sup> The MDM/R shall accept removed/installed Meter Reads from the old/new meters.

Commercial & Industrial Consumers (one hour and 15 minute intervals respectively), not for any more frequent interval. If 15-minute interval data is collected for a POD that is billed by TOU, then the AMI is required to transform this into hourly Meter Reads before sending them to the MDM/R in accordance with the AMI specification.

The MDM/R shall support changes over time in the size of an interval over which Meter Reads are collected for any POD. Criteria that may cause changes to the size of an interval include:

- Invocation of a CPP period that truncates one or more existing TOU periods;
- Seasonal change of TOU periods; and
- Change in interval size for one or more class of PODs (e.g. from hourly to 15 minute intervals)

### 3.8.4 Data Archival and Restoration

While archiving requirements may be driven by business processes that cannot be described in this document (frequency and extent of data to archive and length of time to hold data for on-line and off-line accessibility, for example) and which will be dependent on the entity responsible for operation of the MDM/R, the following describes basic requirements for archiving and restoring MDM/R data.

The MDM/R shall provide the capability to archive and restore data to provide long-term storage, preservation, disposition, and distribution of Meter Reads, algorithms and associated data.

The MDM/R shall have the ability to report on PODs that have been retired from service but for which historical readings still exist. This and similar requirements mean that key data would not be archived but kept online at all times (e.g. POD ID) and that other data, such as the Meter Reads would be archived after a certain period, which shall be configurable to meet business requirements. It is expected that the archiving methodology employed by the MDM/R shall be designed to support the restoration process in preference to the archiving process<sup>36</sup>.

The MDM/R shall ensure that restored data can be processed without impacting the operations of the MDM/R. Furthermore, the MDM/R shall ensure that the restoration of certain data will not impact current versions of data in the MDM/R.

If bill calculation is implemented as a future requirement, the archiving process will be required to support the ability to associate billing calculations with specific versions of data. It shall also be able to support the archival and restoration of billing determinants and algorithms so that audits can validate historical calculations.

#### Data Retention Periods

Billing Quantity data and Meter Read data used by LDCs and Retailers as a basis for billing and GST calculations will be retained for auditing purposes and later retrieval by LDCs or Retailers. Revenue Canada requires that such records must be kept six years from the end of the fiscal period to which the records relate.

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<sup>36</sup> This may make the archiving process more difficult to design but will make the restoration process smoother. Since restoration will normally only be required to support a disaster situation, an audit, or a dispute this is the preferred approach.

For volumetric planning the MDM/R may be required to store Meter Read data for a period of at least 12 months after the date that any meter ceases to be used as described in the *Electricity and Gas Inspection Regulations*.

### 3.8.5 Historical Data

The MDM/R shall be capable of storing data for on-line accessibility. The MDM/R shall also be capable of storing data off-line, as historical backup. The MDM/R shall have the capability of making all such data available to Interested Parties.

On-line availability of Billing Quantity data and Meter Read data will be for a minimum of 26 months.

It is expected that off-line data will be primarily used for audit purposes and to support ad hoc requests for, as an example, historical trend analysis.

As described in Section 3.8.4 specific Point of Delivery Meter Read data and Billing Quantity data will need to be kept to support all applicable audit requirements. Legal requirements may vary between Meter Read data and Billing Quantity data.

Meter Read data for public reference purposes for historical trend analysis need not be retained at the POD level but may be archived as aggregated data series to reduce data volumes. Such aggregated data will be kept indefinitely.

### 3.8.6 Security

MDM/R security can be divided into two areas: controlling external access to the MDM/R and controlling internal access to the data and functionality within the MDM/R. The MDM/R shall provide appropriate security measures to ensure confidentiality and protection of data by controlling access to data and functions depending on the level of authority of the user, and the sensitivity of the data. For example:

- Customers may only view data relating to their own consumption;
- LDCs may only see data relating to their own customers;
- Retailers may only see data relating to their own customers;
- Billing Agents may only have access to view billing quantities;
- LDCs may have the ability to edit Meter Reads for their customers;
- Some users may not have the ability to view MMD data;
- Only appropriately authorized users may have the ability to modify MMD data;
- etc.

#### Controlling External Access

Appropriate firewalls and security measures will be put in place to protect the information in the MDM/R. The MDM/R shall ensure that data transfers to and from the MDM/R are secured in order to prevent unauthorized access to MDM/R features and data.

## Controlling Internal Access to Data and Functionality

The MDM/R shall manage access to data and functionality to ensure that only those users that are authorized to use the system have access to it within their appropriate authorization level. The MDM/R shall maintain a record of users who have access to the system, identifying privileges for each user and maintaining of log of who accesses the system (identifying successful and unsuccessful attempts). When changes are made to a user's privileges, the MDM/R shall record the change made, the time of the change and who made it.

## Flexibility

The MDM/R shall provide a non-disruptive mechanism for including the concept of a customer into its data architecture such that the customer information can be integrated with the MMD, and one or more PODs at a minimum for each customer.

## Groups, Roles and Relationships

The MDM/R shall implement the above security and the access levels (see following section) through the use of users, user Groups, and Roles. This shall support the ability to assign a user to a party<sup>37</sup> and to a specific group or groups and for roles to be defined that can be applied to either groups or individual users. These roles shall define levels of access to MDM/R functionality and data.

### 3.8.7 User Authentication

The MDM/R shall only provide certain data to those parties authorized to receive such data. A process can be expected to be put in place to support the authentication of users (both for local and remote access). The MDM/R shall be responsible for authenticating data transfer requests prior to the release of any data.

A process can also be expected to be put in place to support the provision of different levels of access to different users and groups of users (interactive and batch). The MDM/R shall support the capability to offer different functionality to users based on their level of authority.

A registration process can be expected to be put in place through which to identify those parties the MDM/R is permitted to transmit data to and receive data from. It is also expected that each party interfacing with the MDM/R will be required to go through a rigorous registration process. The MDM/R shall support the automation of such a processes.

### 3.8.8 Reliability

The MDM/R can be expected to meet specific performance requirements related to the efficiency and effectiveness with which it reliably fulfills the requirements detailed in this Specification. Performance requirements are likely to be developed as part of the MDM/R's business processes.

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<sup>37</sup> Note that a party may be an individual or an organization. Thus while a user may belong to many groups, a party may also have many groups e.g. representing different departments with different levels of authority over the data. These groupings and authorities may vary over time.

**– End of Section –**

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