

CEO ORIENTATION

IESO's Smart Metering Entity (SME)

August 2nd, 2017

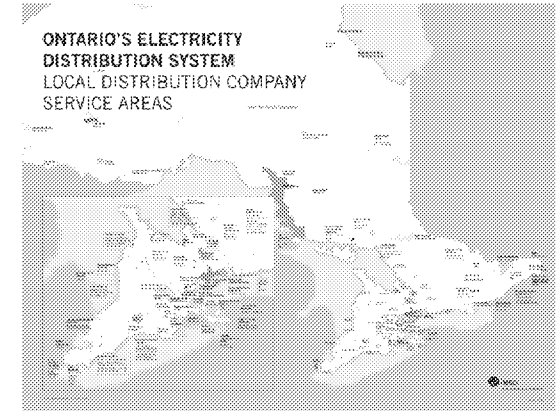
Outline

- I. The Object of the SME, Core Business Functions and Operations
- II. 2016 OEB Orders to the SME
- III. 2017 SME Fee Submission
- IV. Other Key Initiatives & Future Opportunities

I. The Object of the SME, Core Business Functions and Operations

IESO's Smart Metering Entity

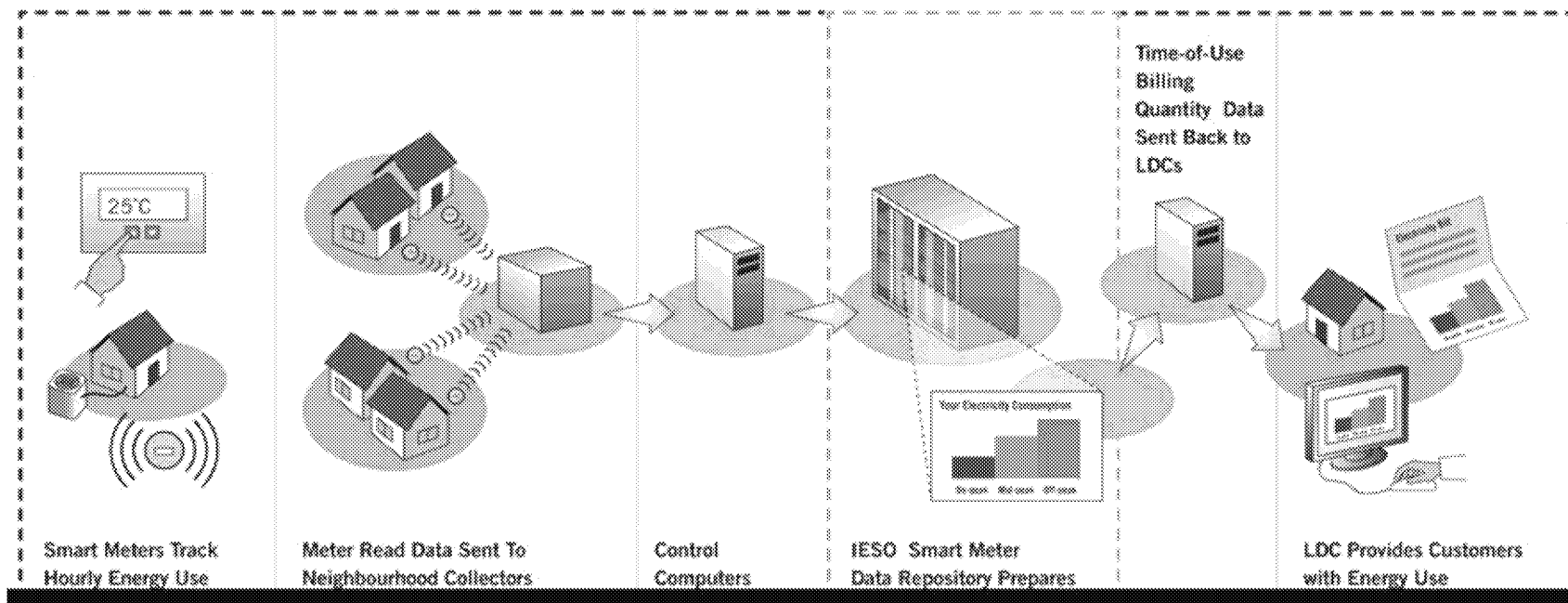
- The IESO, as the designated Smart Metering Entity (SME), is responsible for the operation of the Ontario central meter data repository – the Meter Data Management and Repository (MDM/R)
- The MDM/R is a central hub, providing a common platform for storing, processing and managing hourly electricity consumption information in a reliable and secure manner and supporting LDCs TOU billing.
- The SME functions as a quasi-independent entity within the IESO - while distinct from a budget / FTE perspective from the rest of the organization, it leverages a number of shared services across the organization (IT, legal, communications, procurement, etc).
- Late 2016, the SME licence was renewed for 5 more years and included the provision for collection of additional information from the LDCs as of January 1st 2017 and the development of a Third Party Access plan to enhance the value of the data in the MDM/R.
- By September 2017, the SME will be filing an application for a new smart metering charge of \$0.59*/meter/month effective January 1st 2018 and effective for 5 years which will cover provisions for third party access implementation costs in addition to the core MDM/R operational costs. The fee is currently \$0.79/meter/month.



** to be confirmed on July 31st 2017*

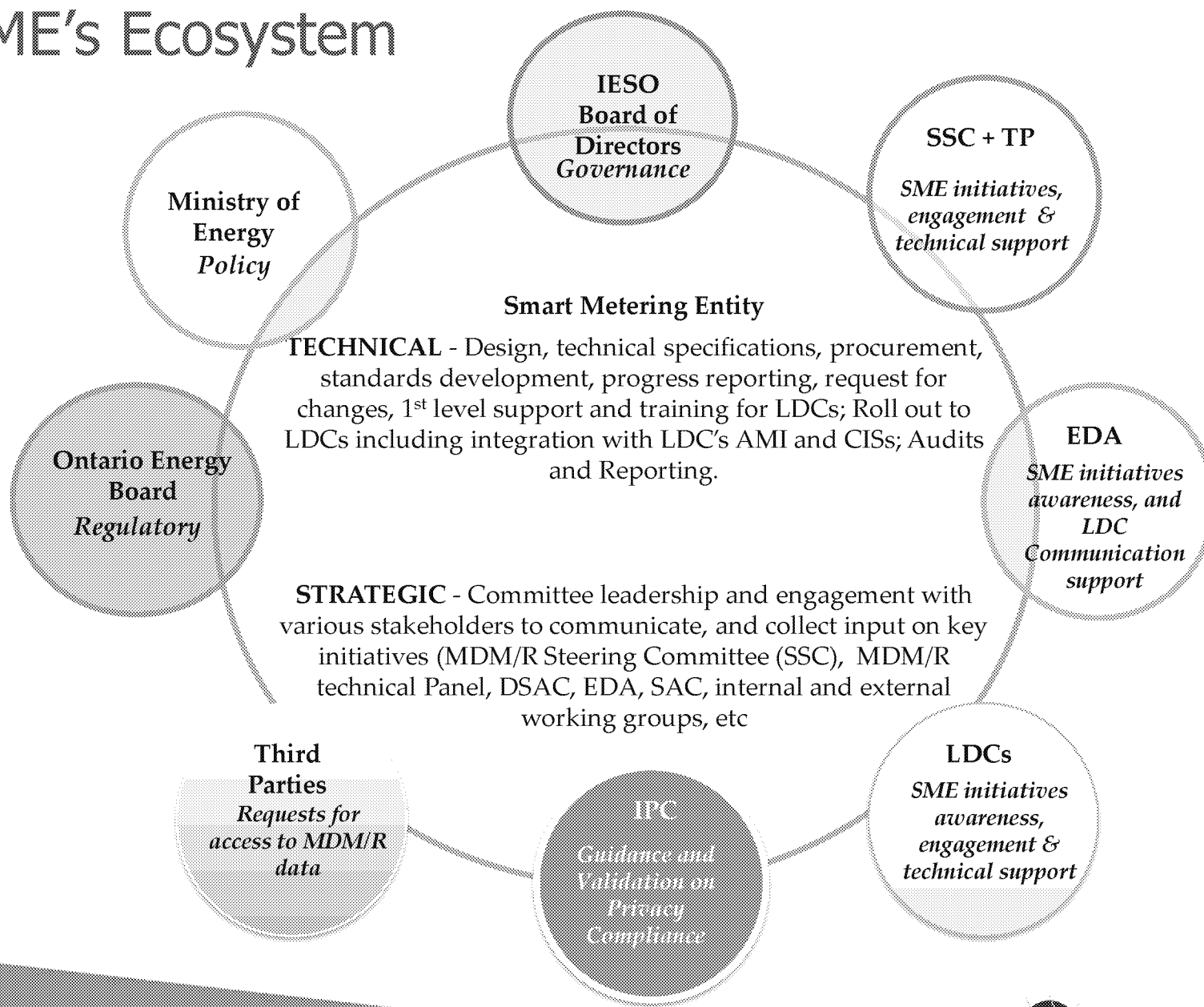
Ontario's Smart Metering System

- One of the largest shared service systems in the world – supporting 66 LDCs and 8 authorized agents
- One of the largest transactions systems in North America – adding 100 to 120 million records every day



- Reliably processing meter reads and delivering data for billing of all residential and small general service customers <50kW in Ontario

SME's Ecosystem



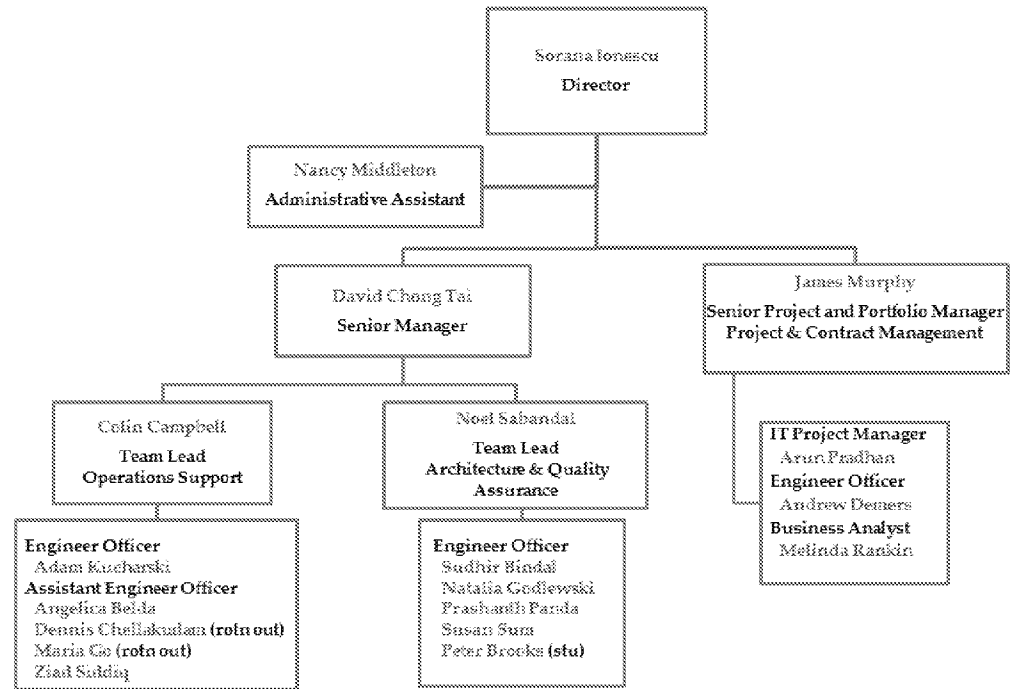
SME Organization

- 17 FTEs supporting Operations, LDC Help desk, Architecture and Quality Assurance and Project & Contract Management.

- Supported on site by IBM, the Operational Service Provider (OSP) who provide the daily operations, maintenance and support.

- A number of other vendors are providing support to the MDM/R and the DataMart operation as follows:

- Siemens/eMeter – Application software vendor for the MDM/R
- Oracle – Database vendor for the MDM/R
- Affinity – Providing application support for the DataMart
- Compugen – Hosts and Manages the infrastructure for the DataMart
- ServiceNow – Provides the SAAS service for the HelpDesk and the primary interface for interaction with all LDCs



The MDM/R in Numbers

The MDM/R processes about 1/3rd of the total global VISA transactions volume, at a speed that is about 1/3rd faster than VISA's

Service Delivery Points	Residential: 3.8m, Small General Service: .4m
AMI Supported	Sensus, Elster, Trilliant, Tantalus, SmartSynch (5, 15, 30, 60 minute intervals; most are 60 minute)
Interval Reads	~ 100m – 120m per day (processing 20 to 28 million per hour)
Billing Requests	200K to 300K per day
Data Size	200+ billion rows of data

MDM/R DataMart

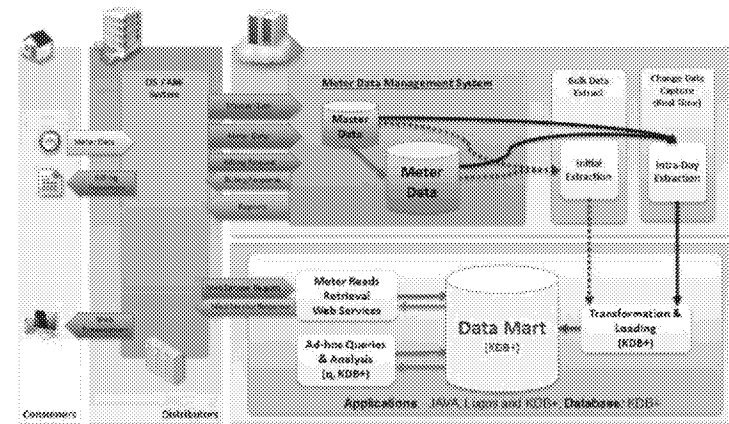
- The MDM/R DataMart is a synchronized copy of the MDM/R production database but with 24/7 access and extreme speeds, and is intended to be used for fulfilling web services requests, data extract requests and other ad-hoc queries without impacting the core operations of the MDM/R.
- Query performance is improved over the MDM/R
 - Meter read retrieval web services requests can span up to 365 days, compared to the 100 day limit of the MDM/R
 - Meter read retrieval web services requests to the DataMart can retrieve data older than what is available from the MDM/R (i.e. prior to the MDM/R archive date)
- The system is 24/7/365 with no scheduled outages so is ideal for fulfilling client portal requests.
 - Currently averaging 55,000 web service requests per day
- The DataMart functionalities will support data analytics in the future and the third party access operations.

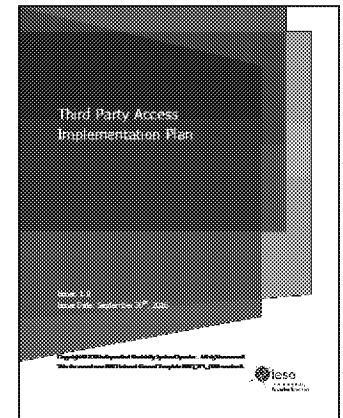
Reporting & Audit Requirements

- The SME is required to submit to the OEB, on a quarterly basis a report that outlines the SME's performance, service levels and an update on various SME initiatives that are of interest to the OEB (sample report attached)
- The SME is also required to submit to the OEB and Annual Variance Cost Account report to explain any cost and revenue variances to the approved budget and provide a justification as to whether the excess revenues should be returned or the smart metering charge recalculated (sample report attached).
- The SME undertakes yearly a CSAE 3416 Controls Audit of the MDM/R. Audit results are presented to the IESO's Audit Committee of the Board and released by the IESO CFO in the form of an assurance letter to the LDCs requiring this information for their own financial audits (2016 report attached)
- The SME presents for information or approval to the IESO Board of Directors any items of substance (next planned presentation is on the new SMC filing and new 5 year SME budget)
- Various other meetings are being held and presentations provided to ensure stakeholders awareness and participation in SME's initiatives, either through the SSC (open and closed calls with the LDCs), province wide LDC events, SAC, discussions with the Ministry, OEB, IPC, EDA, LDCs and others.

MDM/R Operational Excellence

- The MDM/R service levels remain consistently very high
- The MDM/R has successfully supported several mergers of the LDCs, with many more planned in the future
- In 2016 the MDM/R Annual CSAE 3416 Audit resulted in a 7th consecutive year of “no qualifications” result
- The MDM/R DataMart, an exact replica of the MDM/R but with 24/7 access and extreme speeds, is now in production with some LDCs already using it for web services and own data queries
- An LDC Dashboard that gets frequently updated gives the LDCs visual insights of their metering performance, with ongoing user training
- Toronto Hydro’s MDM/R Integration, the last LDC in the province to integrate, is now underway





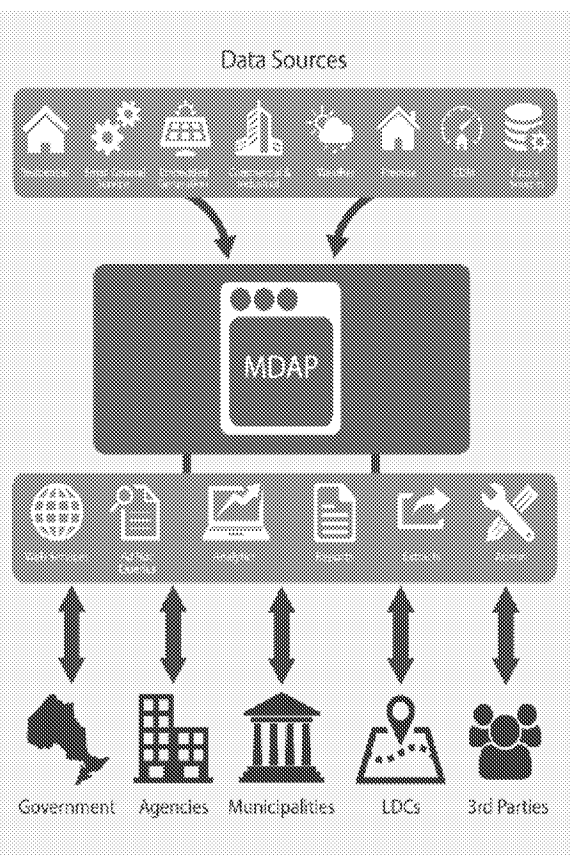
II. 2016 OEB Orders to the SME

History of MDM/R Data Initiatives

MDM/R Data Access Platform (MDAP)

Ministry-led (MoE, MarS, IESO)

Final report Oct 2015



Foundation Project

IESO-led (Working Group)

Final report Nov 2015

Foundation Project Final Report

Purpose:

Assess the potential and suggest a path for enhancing the value of the smart meters investment in Ontario and to harness the value of the MDM/R data set for designing conservation and demand response programs, system planning, policy development, academic research and to support innovation in Ontario.

Recommendations:

1. Add **premise address information and premise occupant change occurrences** (or GPS)
2. Provide a **framework for third party access to personal information** and to personal information that has been de-identified to render it non-personal.
3. Adopt a **robust de-identification approach to ensure that privacy is protected** as per FIPPA compliance requirements

2016 OEB Orders to the SME

IESO-led (2016 Working Group, 2017 DSAC)

Implementation starting Jan 1st 2017



Ontario Energy Board
Commission de l'énergie de l'Ontario

DECISION AND ORDER

EB-2016-0284

"Effective January 1, 2017: **the SME shall collect** the following information associated with each meter (modified where necessary to sufficiently render it non-personal information):

- a. The postal code
- b. The distributor rate class
- c. The commodity rate class
- d. Occupant change data

The next SME licence application (Fall 2016) will also be required to address the **Implementation Plan with respect to third party access** to this enhanced SME data, including an assessment of the cost implications."

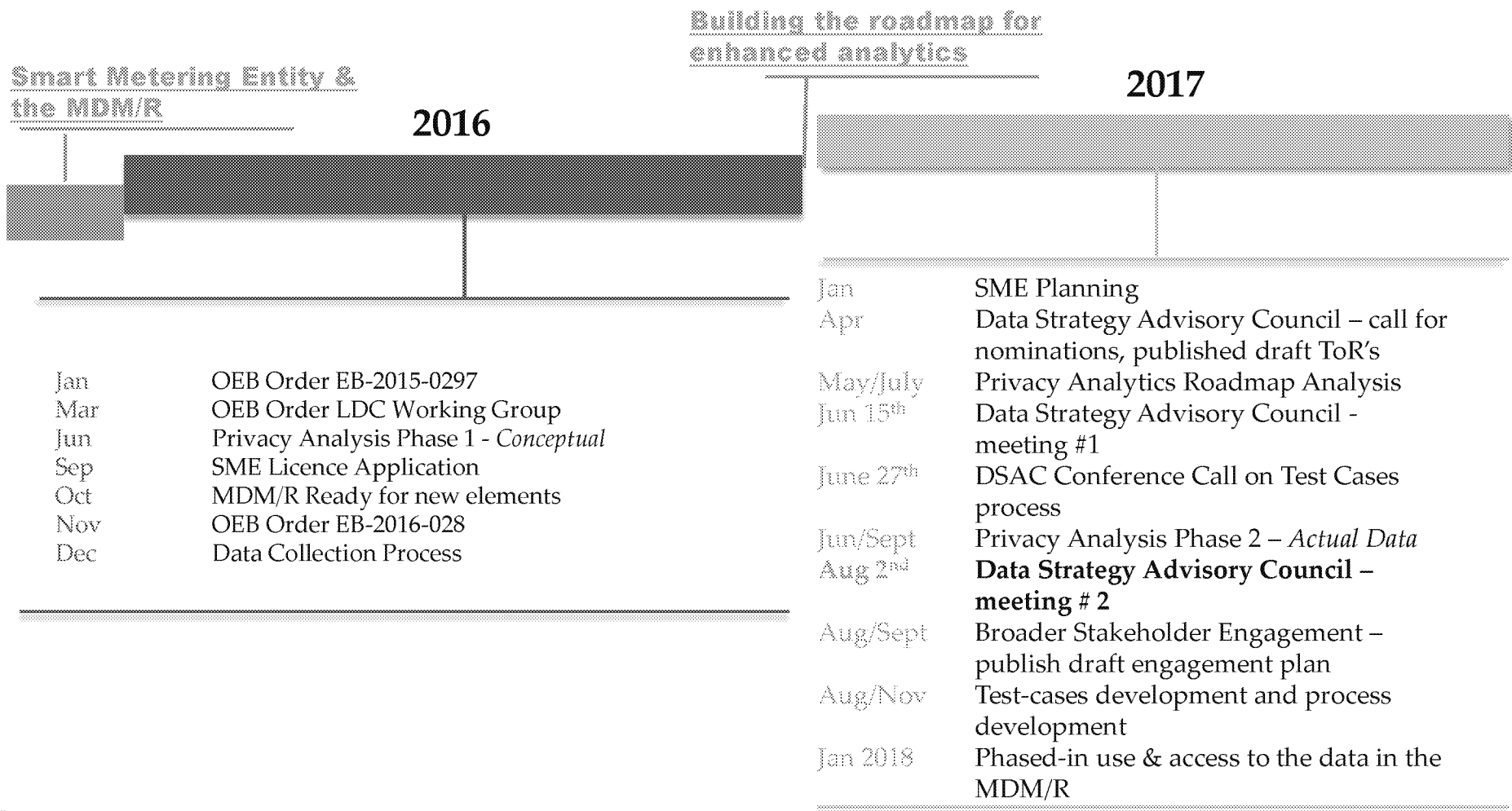
Privacy Framework

Information Type/ Privacy Considerations	PERSONAL INFORMATION (PI)	NON-PERSONAL INFORMATION (De-identified / Anonymized)
Governing Law for IESO	FIPPA	Non-FIPPA
Data Projects	MDAP, Foundation	2016 OEB Orders to the SME
Requirements for IESO	Authority to Collect, Use and Disclose	N/A
Notice and Consent Requirements	- For collection: Notify individual to whom the information relates of legal authority and principal purpose for use of information - For use or disclosure: Consent of individual may be required	N/A
Value of Data & Analytics	High	Medium
Other Requirements	Corporate Data Governance Program	

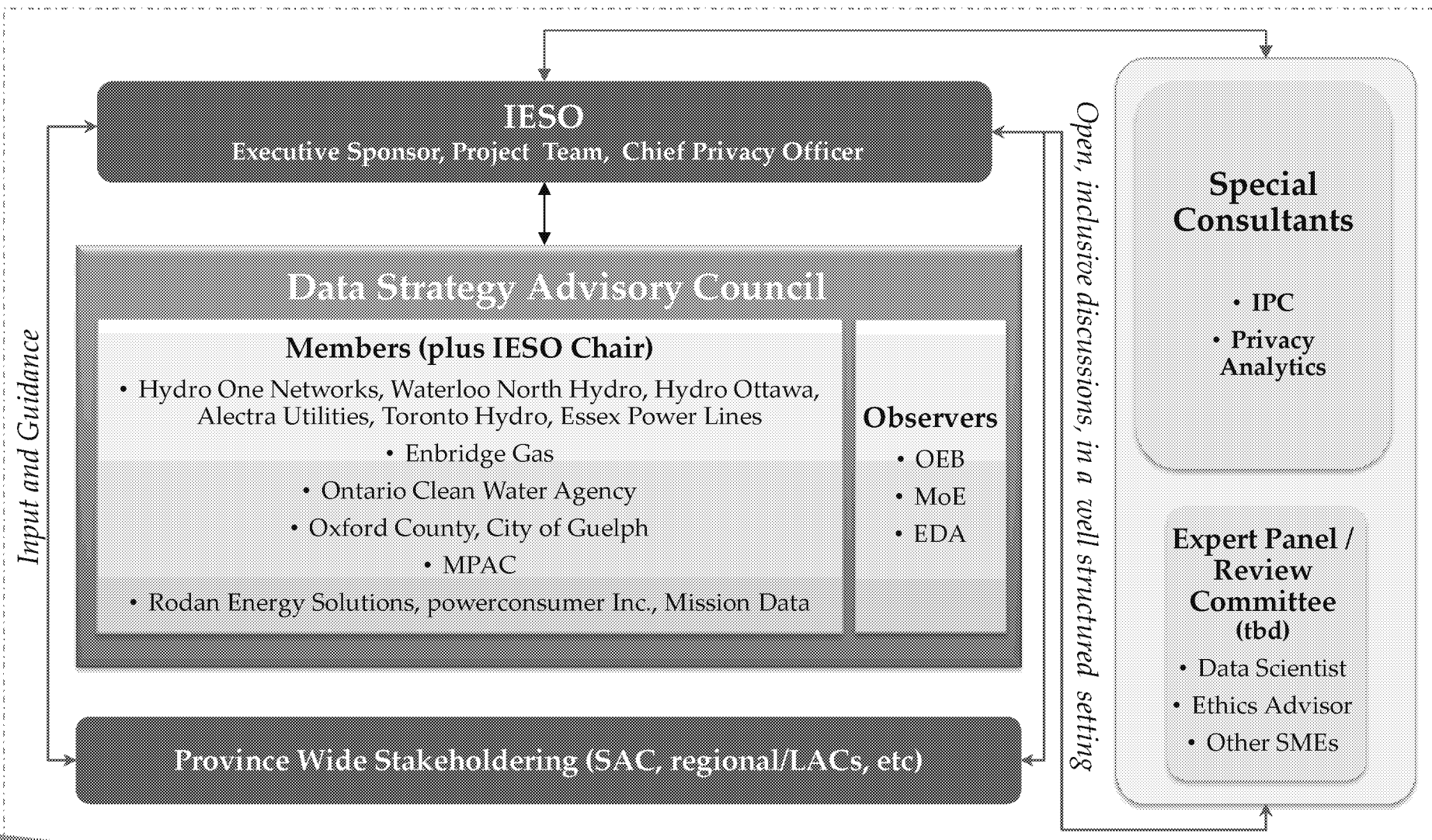
OEB Order Summary to Date

- In 2016 the SME licence was renewed for 5 more years and included the provision for collection of additional information from the LDCs as of January 1st 2017 and the development of a Third Party Access plan to enhance the value of the data in the MDM/R.
- Effective January 1, 2017 the SME started collection of the following additional data fields in a manner that was sufficiently rendered non-personal information:
 - a. 6 digit postal code (unique dwelling postal codes masked under W8W8W8)
 - b. distributor rate class
 - c. commodity rate class
 - d. occupant change date, generalized at yearly levelAdditionally, all previous address information was removed from the MDM/R to ensure max privacy compliance.
- As of now, LDC are close to 100% compliant with the additional data collection requirements

Key Milestones

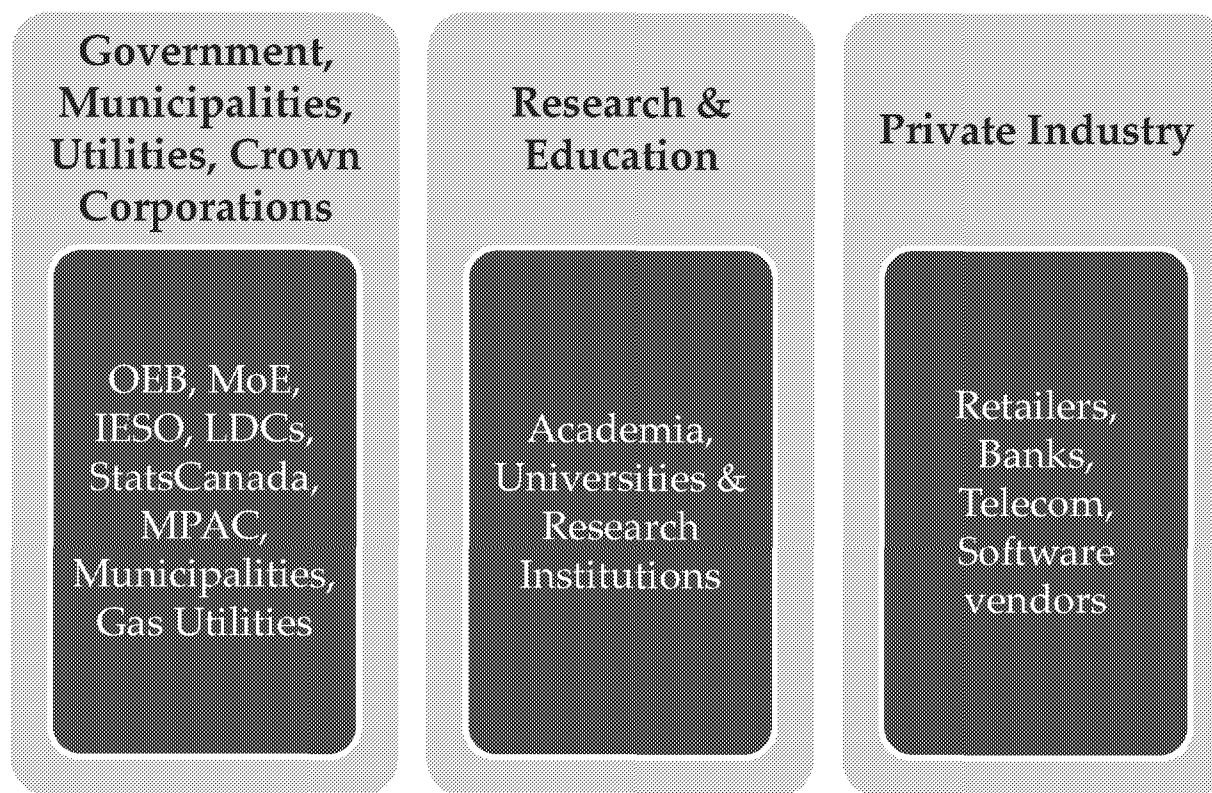


Third Party Access – Input & Engagement Model



Third Party Interest

- Over the years, several organizations have expressed an interest in leveraging the electricity consumption data in the MDM/R, for various applications.



Submitted Test Case examples

Oxford County

Purpose: To create an accurate electricity baseline that leverages hourly electricity data for the purpose of improving efficiency, encouraging energy conservation and aiding in the transition to renewable energy.

Description: Create an energy dashboard to establish electricity loads and to track the community progress toward renewable energy goals.

Benefits: Supplying net energy throughout Oxford County from renewable resources no later than 2050. Lesson learned will be applied to all energy resource types utilized in Oxford County

Enbridge Gas

Purpose: To establish electricity consumption load profiles to help predict the green house gas (GHG) impact of the Ontario Power system or power grid

Description: Compare consumption profiles, to establish and understand, when it is most feasible to engage the hybrid systems (like electric air source heat pumps, micro CHPs, Geothermal heat pumps, battery storage and photovoltaic, thermal storage).

Benefits: Reduction in GHG emissions

Test Case examples (cont'd)

City of Guelph

Purposes:

1. Support for energy mapping
2. Requesting monthly/annual consumption to create an emissions inventory for the region

Description:

1. Aggregating with other data sets to create an integrated geospatial representation of energy consumption.
2. Electricity consumption will be multiplied by emissions factors to estimate the emissions generated in the GTHA.

Benefits:

1. Assist with identifying priority areas for implementation of programs supporting energy efficiency, distributed generation and conservation.
2. Ultimately reducing GHG emissions and meeting emission reduction targets for Ontario and the GTHA municipalities.

Test Case examples (cont'd)

Ontario Clean Water Agency

Purpose: OCWA intends to use the energy data to augment the existing process to benchmark facilities against one another to target energy conservation efforts on underperforming facilities.

Description: Integrate energy consumption data with existing process data and KPIs to trigger energy conservation activities.

Benefits: To identify energy saving opportunities for the 800 water and wastewater treatment /distribution /collection facilities across Ontario

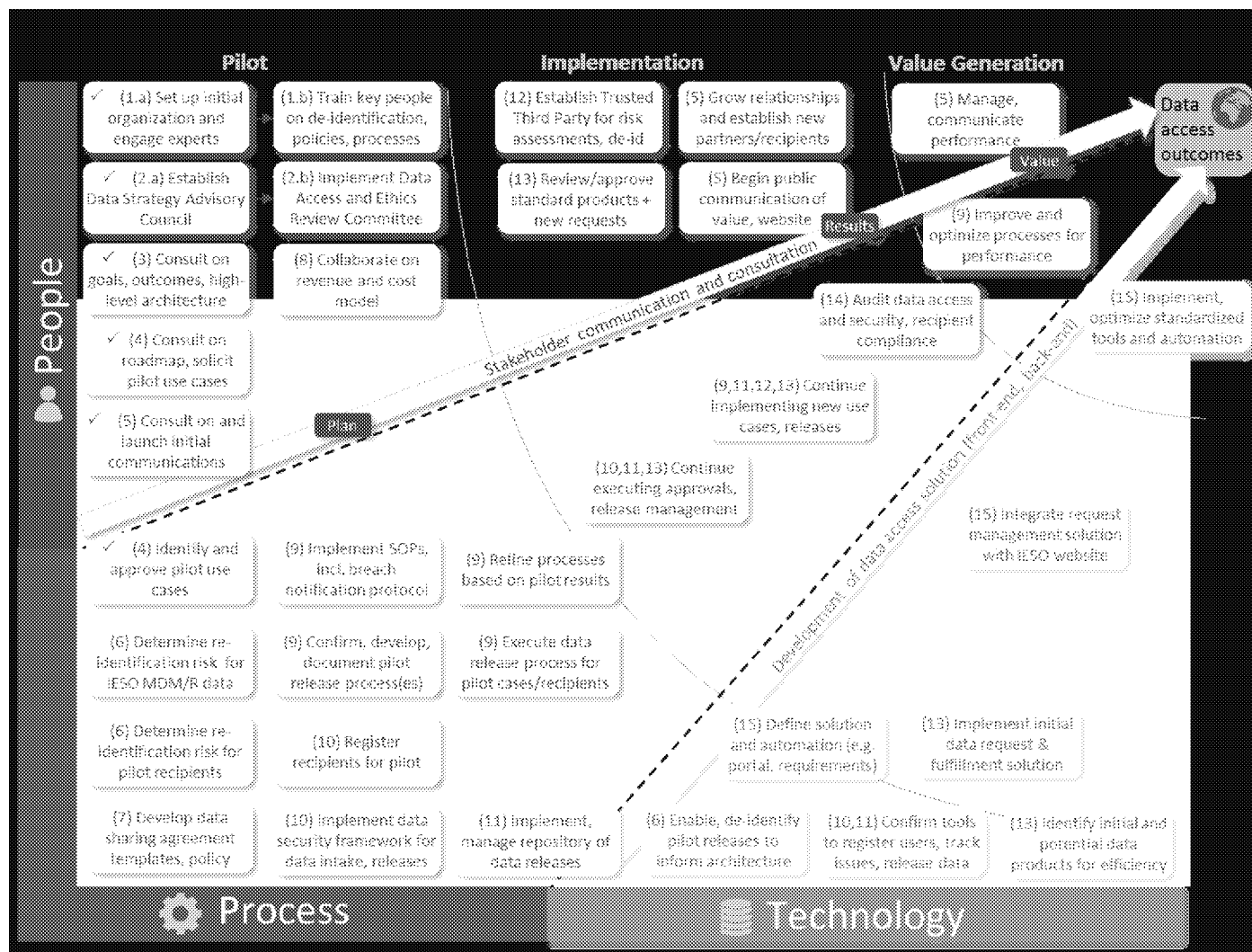
IESO

Purpose: To improve short and long term electricity demand forecasting for Ontario.

Description: Acquiring historical data at the meter level with Rate Class and Occupant Change information.

Benefits: Improve system modelling and demand forecasting efforts in order to make more informed decision making in terms of regional planning, adequacy assessments and analysis of the impact of conservation programs on electricity demand in all time frames

Third Party Access Roadmap



III. 2017 SME Fee Submission

Summary

- The current 5-year budget was set till the end 2017, and the current 5-year SME fee (\$0.79/ meter/ month) is set to expire by October 2018.
- The SME will apply for a new 5-year budget and fee covering the period 2018 – 2022, by September 2017. The new fee is projected to be \$0.59*/meter/month, which is \$0.20 or 25% less than the current fee of \$0.79/ meter/ month.
- The total requested revenue of \$168*MM will cover the following operational & financing requirements:
 - Core MDM/R operational costs of the MDM/R for the next 5 years, including an important system refresh (EnergyIP 8.x)
 - Provisions for MDM/R data use & access projects (either for LDC's own data or for third parties as per 2016 OEB Orders to the SME)
 - Outstanding SME debt (of the original ~\$100MM) - recovered almost in full by end of 2017 (well in advance of original schedule) and related financing costs

* to be confirmed on July 31st 2017

Other Key Fee Submission Provisions

- Approval to retain a \$2.5 million contingency fund, similar to the IESO's OEB approved contingency fund of \$10 million, will be sought. The SME does not currently have a contingency fund.
- Approval for a Balancing variance account to track any over or under collections will be sought. The proposed \$2.5 million contingency fund will be tracked in this account.
- Approval to provide a report on the balance in the account to the OEB annually and return any amounts in excess of the \$2.5 million contingency fund to ratepayers

Costing for the core MDM/R Operations

- With the MDM/R reaching a healthy level of maturity over the last few years, the ongoing operational costs are expected to be on par or lower vs. previous budget period.
- At this budgeted level, the SME will be able to include a number of additional high value add services for the LDCs and the province such as:
 - DataMart (for LDCs web services and for LDCs own access to data & analytics)
 - Third Party Access to the MDM/R data
- At the same time, an important refresh is required in 2018/2019 to ensure the high levels of service for the LDCs and potentially new functionality in support of third party access projects
- The SME has completed negotiations with the OSP (IBM) that will ensure this technical refresh can be absorbed within an upcoming contract renewal option that will be exercised in 2018, and will extend the term of the current contract with IBM from 2022 to 2024.

Costing for Third Party Access project

- The SME intends to begin providing access to data the OEB has required it to collect in 2018
- While timing and associated fees for third party access have not been finalized, the SME is seeking to set the fees for access without OEB oversight as there is a competitive market for similar information:
 - Examples include: Canadian Institute for Health Information (CIHI), Municipal Property Assessment Corporation (MPAC) and others
- The SME will seek to retain a \$2.5 million contingency fund in the Balancing variance account, similar to the IESO's OEB approved contingency fund of \$10 million.
 - The SME is required to submit a fee application with the OEB and the OEB may make orders approving or fixing just and reasonable rates for the SME to meet its obligations under the Ontario Energy Board Act, 1998 and the Electricity Act, 1998 and the SME cannot charge a fee except in accordance with an order of the OEB.

Third Party Access costing considerations (cont'd)

- While not finalized, the monetization formula proposed below would ensure that key energy sector organizations (MoE, OEB and IESO) can leverage the value of the data in the MDM/R through the smart metering fee.
- Other third parties, in the non-profit (eg: municipalities, academia) or for-profit sectors (eg: service providers, retailers) will be able to use/ access the data at a cost that reflects the fixed costs incurred by the SME and a per/hour rata, that will depend on the nature of the organization and market demand conditions.

Organization type / examples of cost components	Government (MoE, OEB, IESO)	Non-profit Organizations	For Profit Organizations
IESO Labor	Absorbed (in the new SMC)	Fixed Costs + \$/hour	Fixed Costs + \$\$/hour
RRD Analysis			
Technology			
Audits & Post - Evaluation			

- It will be proposed that excess revenues generated from 3rd parties will be ultimately be returned to ratepayers through the Balancing variance account.

Timelines

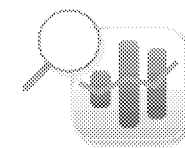
Date	Event
September/ October	SME Fee application filed with the OEB
	OEB issues Notice of the application to the SME
	SME provides notices as required, which will include all past interveners
	Parties register as intervenors
	Issues list finalized
	Interrogatories on the evidence are due from parties
October / November	Responses to interrogatories are due from the SME
	Settlement conference
	Settlement package filed with the OEB
	OEB staff comments on Settlement filed
December / January	OEB decision on settlement
	Argument from SME on any issues not settled
	Argument from intervenors
	Reply argument from SME
	OEB decision on the outstanding issues

IV. Other Key Initiatives & Future Opportunities

Net Metering

- The SME has been requested to provide technical and costing considerations related to a potential implementation of net metering via the MDM/R
- SME's initial assessment is that regulatory and legislative changes will be required to ensure that the definition of an "electricity customer" includes the *generation* side
- The SME's technical assessment is that the MDM/R would be capable of accommodating net metering without a major overhaul
- Costing considerations to be further provided in the next weeks

MDM/R Data Governance Project



- The SME initiated a project that will ensure the high quality of the data required for high quality analytics.
- Conclusions to date show that the general health of the quality of the MDM/R energy consumption data is **good**, with issues concentrated with a handful of LDCs, and a small number of SDPs within those LDCs.
- SME will work individually with the LDCs who need to address their specific data issues any with any other LDCs wishing to correct existing anomalies to ensure a clean data flow into the MDM/R.
- While impractical for most LDCs to correct past data anomalies, the SME will work with the LDCs to correct the basis for those anomalies going forward

MDM/R Terms of Service

- On March 9, 2017 the OEB issued a notice of intention to amend its DSC and proposed the deletion of section 5.4.1. as no longer required:

“A distributor shall, upon being requested to do so, enter into an agreement with the Smart Metering Entity or the IESO, in a form approved by the Board, which sets out the respective roles and responsibilities of the distributor and the Smart Metering Entity or the IESO in relation to metering and the information required to be exchanged to allow for the conduct of these respective roles and responsibilities.”

- Accordingly, the Terms of Service document has been updated to incorporate key governance and operating provisions from the former LDC/SME agreement, and for items that were no longer valid since the LDC/SME Agreement was originally drafted several years ago.
- The revised ToS was discussed with the MDM/R Steering Committee (SSC) and input is currently being incorporated.
- Following the finalization of the Terms of Service with the SSC, the document will be socialized with the larger LDC community.

Future Opportunities for the MDM/R

- Including new customer classes in the MDM/R:
 - Adding the C&I customer class for a holistic view of the province (general service >50kW and less than 4,999kW) – feasibility study for Hydro One finalized and communicated
- Distributed Generation (DER):
 - An MDM/R with more granular, “real-time” information on the distribution side could give the IESO Control Room “more eyes” on the system with immense benefits for short term and long term planning

Thank You!

The SME Team