Smart Meter Initiative

Meeting Notes
Metering Working Group

September 1, 2004 Ontario Energy Board
24th Floor, Room 2
2300 Yonge Street

The metering working group met held its first meeting on September 1. Notes taken during the meeting are appended.

1. Working Group Members

1	Al Stanbury	OEB Consultant
2	Bob Myers	Oakville Hydro Energy Services
3	Doug Currie	Hydro One Networks Inc.
4	Gary Rains	London Hydro
5	Guy Dacquay	Measurement Canada
6	Luc VanOverberghe	Measurement Canada
7	Hugh Bridgen	Chatham-Kent Hydro
8	Ken Quesnelle	Woodstock Hydro Services Inc.
10	Robert Lake	Peterborough Utilities Services
11	Rocco Logiudice	Toronto Hydro-Electric System
12	Rowan Jones	IMO
13	Tim Vanderheide	Bluewater Power Distribution Corp.

2. Meeting Schedule

Session	Date	Time	Location	Meeting Room
1	September 1	1:00-4:00	2300 Yonge	Room 2, 24th floor.
2	September 8	10:00-4:00	2300 Yonge	Room 1, 24th Floor
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5	September 22	10:00-4:00	2300 Yonge	Room 1, 24th Floor
6	September 30	10:00-4:00	2300 Yonge	Room 2, 24th Floor
7	October 5	10:00-4:00	2300 Yonge	Room 2, 24th Floor

3. Presentation

Al Stanbury delivered a presentation that outlined:

- Must and optional functionality requested by the Minister
- Objective, deliverables and schedule
- Basic, advanced and enhanced levels of functionality for a smart metering system
- Achieving the goal could mean two separate communication systems: one carrying readings to the data collection system the other carrying load control or price information back to the customer

4. Discussion

4.1 Need for Smart Meters

Heritage power is expected to be delivered at fixed rates. The day ahead market will smooth volatility in the spot market, independent generators need a flat rate to obtain financing. All of these factors lead to a less need for price response.

Smart metering would enable response to system conditions; facilitate price awareness and a culture of conservation.

The possibility of implementing critical peak pricing in time-of-use meters was discussed. Existing time-of-use meters have up to eight rate bins. If the critical hours were known in advance the meter could be set up to record consumption in these periods. One barrier to the concept might be recording of energy in a critical bin on a non-critical day since only a few critical calls are expected each year.

4.2 Need for Interval Data & Regulation of Interval Data

The smart metering system must produce interval data to enable hourly pricing. Two methods of delivering interval data were discussed:

- Interval meters with on-site storage of time stamped meter readings
- "Dumb" meters, lacking mass memory, read hourly with time stamping and data storage at the master end

- ◇ Measurement Canada clarified that it has no plans to regulate processes that use time stamped energy readings were used for billing of energy only charges.
- ◇ Measurement Canada indicated that, at present, time stamping must be done in the meter if a demand charge will be calculated from time stamped energy readings.

  It was mentioned that the lowest cost option may be time stamping at the master and that it may be possible to determine the maximum error due to propagation delays in the time synchronization system.
- ◇ Measurement Canada indicated that it plans to standardize the way demand will be calculated from time stamped readings.

  Discussion followed regarding several kinds of demand already approved by Measurement Canada for in-meter calculations and the need for these to be available to utilities to support existing rates.

➔ For future discussion:

- There may be a need for additional flexibility to support unforeseen rate options and totalization.
- The means and need for regulation of demand calculation systems would need to be discussed when the nature of the smart metering system is known.

4.3 Time Synchronization

Synchronization of time was discussed. This can be accomplished using central control or tolerances on clocks within each meter. Meters in the wholesale market have internal clocks and require synchronization every two weeks due to the time tolerances of the five minute market.

➔ For future discussion: how could time synchronization be best achieved in an automated meter reading system?

4.4 Viability of Dial-Up Solutions

Experience in current wholesale market, where 2000 meters read daily, indicates that there are problems with 2% of the data each day. It may not be possible, or cost effective, to implement daily dial-up access for the much more numerous smart meters.

➔ For future discussion:

- Are these issues with availability of the data of dial-up or are these issues arising from validation after data is collected.
- Would dial-up be an effective solution is some situations?

4.5 Prepayment Meters

Prepayment meters meet some of the requirements of a smart metering system. Time of use can be implemented because the meters can be programmed to deliver a dollar volume of energy based on time-of-use rate bins.

Consumers develop a keen cost and consumption awareness because they relate the number of trips to the store to purchase energy cards directly with their consumption. High price periods would mean more frequent trips and initiate conservation. This awareness can lead to overall energy consumption savings in the order of 15%.

A challenge for prepayment meters might be response to critical calls and the need to change rates seasonally.

4.6 Third Party Access to Data

The ministerial directive requires that consideration be given to third party access to meter and non-commodity data so that consumers can assign access to agents who could then provide energy management and other services. Under the present distribution code, the distributor is required to provide access to consumption data to third parties.

➔ For future discussion: The questions direct access via automated meter reading by the third party and provision of non-consumption data by the distributor will need to be covered.

4.7 Standard Communications Protocol

Distributors with automated meter reading systems indicated that, ideally, the choice of automated meter reading system should not limit the choice of meters.

➔ For future discussion:

- Need for standard communication protocol or interface
- Need for meter independent automated meter reading system

4.8 Mass Memory in the Meter

The distributors with automated meter reading indicated that, in their experience, no automated meter reading system can deliver 100% of meter readings all of the time. Some on-board data storage would be required so that readings can be collected later when network or meter specific issues are resolved.

➔ For future discussion: How much mass memory is required? What process would be used for estimating missing readings? What rate of manual readings would balance the benefit of redundant communication paths?

4.9 Existing Interval Meters

Consumers with interval meters and who are on the HOEP are not expected to access to the future Retail Price Plan and many would not require installation of additional new equipment to implement smart meter functions such as load control and local display of consumption data.

Access to consumption data was discussed. Some HOEP consumers already have next day access to meter readings via the internet. Some already have dial-up access to the meter or obtain a KYZ pulse stream directly from the meter.

➔ For future discussion: Will there be any interval metered customers on the registered price plan, or it successor. If so how should they be metered?

4.10 Settlement Time Frame

The need to collect data is driven by two requirements: issue of bill and local display of consumption data.

➔ What will be the billing period for smart meters?

4.11 Local Display of Consumption Data

The group discussed the difference between settlement data and local consumption feedback. There is potential for disputes when the local information display does not match the bill.

Measurement Canada indicated that under its new type approval policy for displays, a means of display must be provided at the metering location, however, the manner in which that display is

provided will not be regulated. The consumption data contained within the meter would be used to resolve disputes.

Measurement Canada will consider data stored within the meter to be correct.

➔ For future discussion: Local display must match the bill. How can this be accomplished?

4.12 Pre-Implementation Data

Utilities with existing energy efficiency program suggested that the smart metering system should be implemented for one full year before implementing the corresponding smart meter rate plan(s). This would allow analysis of before and after change in consumption patterns, provide data to support marketing to target consumer and rate design before new rates were implemented.

4.13 Opting Out

➔ For future discussion: Can a consumer opt out of the smart meter program with potential impact on the meter implementation plan is a particular zone.

4.14 Verification of Meters during Implementation

Accredited meter verifier's use compliance sampling to reverify meters. The meters in any one group may be installed over a wide geographic area that may not match the boundaries of a proposed area of implementation. Measurement Canada was asked if it would consider a temporary suspension of normal meter verification requirements to facilitate the smart meter roll out.

Measurement Canada indicated reverification is a fundamental requirement of the Act. The Act enables the President of Measurement Canada to consider granting dispensations from verification and sealing, but these are evaluated carefully on a case by case basis.

4.15 Bulletin E-26

Measurement Canada has proposed a change in policy for meters reverified by 100% inspection and meters reworked by the accredited meter verifier. The proposal would increase the cost of reverifying affected meters.

The policy may impact the range of options available for implementing a smart metering system since the cost of one option, retro-fitting existing meters with automated meter reading devices, could be increased.

4.16 Goal of the Smart Meter Implementation

The overall goal of the smart meter implementation is under stood to be a 5% reduction in the 24 GW provincial demand.

4.17 What Is the Final Product of the Working Group

The product of the working group is a report recommending metering requirements, identifying barriers to implementation and identifying qualitative costs. The goal is preparation of purchasing specifications for meters.

4.18 Arrangements for September 8 Meeting

The following participants volunteered to prepare brief overviews of the following:

1.	Ken Quesnelle	Today's retail electricity market
2.	Tim Vanderheide	Existing Utility Billing Systems
3.	Gary Rains, Hugh Bridgen	Interval Meters
4.	Robert Lake	Existing Energy Efficiency programs
5.	Rocco Logiudice	Installation Issues
6.	Bob Myers, Rowan Jones	Deployment Issues
7.	Doug Currie	Ownership of Meters and Systems

Access to the meeting room: We will meet in the elevator lobby on the 24th floor just before 10:00. Al Stanbury will have an access card to allow attendees into the working session. If Al is not there for any reason go to reception on the 26th floor and ask the receptionist to call the meeting room and Al will let you in.

OEB Smart Meter Consultation

Metering Issues Working Group

Meeting 1

Chair: Allen Stanbury

What is a smart meter?

- A system that adds timing to usage information
  - Time-of-use & Seasonal rates
  - Critical Peak Pricing
- A system that provides feedback to consumers
  - “Real time” display of consumption information
- Enables Demand and maybe Price Response
  - Load control and reduction
  - Load aggregation
  - Thermostat set back
- Communication Network
  - To make the consumers aware
  - To switch rates without meter removal
  - Enable demand (and maybe price) response

Minister's Directive for Technical Specifications

- Must
  - Measure and indicate electrical usage during prescribed periods
  - Adaptable to seasonal, time-of-use, Critical Peak Pricing, and other foreseeable rates without removal
  - Capable of remote reading and providing the consumer feedback on energy consumption updated no less than daily
  - Bi-directional communication except in certain circumstances where impractical
- Additional functionality
  - Immediate feedback on usage, pricing, spending
  - Load control activated by the consumer or distributor
  - Multi-reading: gas, water, electric
  - Anything else that might be desirable: e.g. aggregation of dispatchable load

Minister's Directive

- Identify barriers to rapid deployment and propose solutions
- Address competitiveness in the provision and support of smart meters
- Identify technical specifications for smart meters
- Consider measures and conditions by which customers can have access to metering data and assign access to third parties
- Identify cost recovery mechanisms
  - Our group needs to identify costs

Costs & Benefits

- Some Potential Benefits
  - Better information for utility operation
    - Voltage profiles & loss analysis
  - Optimized asset loading and load balancing
    - Defer substation and feeder upgrades
  - Outage data and outage response
  - Voltage Level and Power Quality Reporting
  - Automated outage reporting
  - Avoid construction of new generation
  - New energy service opportunities
  - Fewer billing queries and disputes

Costs & Benefits

- Some Costs
  - Investment in AMR system and meters
  - New billing software needed to enable new rates
  - New interfaces into existing billing systems
  - Support for data to third parties
  - Data storage at the distributor
  - Lots of others...

What is our objective?

- Minimum requirements for a smart metering system
- Specifications for advanced and enhanced systems
- Qualitative cost and benefits
- Barriers to implementation and possible solutions

Project Targets

- October 8: End of working group sessions
- OEB approval of draft plan: October 27
- Stakeholder Comment on plan: Nov 1 to 25
- OEB Approval of Final plan: Dec 17
- Submission to the Minister: Dec 23

Technical Proposal

- Three alternatives:
  - Minimum mandatory requirements
  - Optional Advanced Requirements
  - Optional Enhanced Requirements

Enhanced System (Possible definition)

- Bi-directional system with automated meter reading, automated load control, demand and price response, appliance level load control, medical & fire/security alarm monitoring, voltage & power quality reporting, automated outage reporting, instantaneous in-house display of consumption in dollars to the appliance level
- All integrated into one system with 5 minute reads
  - Market opportunity: most of the enhanced features could be provided by a third party energy services company at market price

Advanced System (Possible Definition)

- Bi-directional system with 15 minute reads
- In-home display of current energy consumption information
- Internet access to consumption details
- Remote control of load
- Could be two separate communication systems
  - Outbound: Standard automated meter reading system
  - Inbound: To control loads or signal critical peak

Minimum System (Possible Definition)

- Two separate systems with 60 minute reads
  - AMR to read meters with same day access to data
  - Separate load control system
    - Critical peak signaled by a light in the home
  - Can we eliminate the in-bound signal?
    - Consumer responds to critical call carried by the media

How could TOU be Implemented?

- Traditional two bucket meter but...
  - Start and stop times cannot be remotely changed
- AMR with hourly reads
  - Produces interval data at the master end
  - Off/On peak periods can be adjusted seasonally
  - Beginning and duration of critical periods can be adjusted easily without replacement

Is an Interval Meter a Smart Meter?

- Rewards consumer for respecting critical power system calls
- Enables rate switching with out replacement
- But...does not provide easy local access to consumption data
  - But installation of a separate signaling system could make an interval meter a component in a smart metering system
- Hold on...What about current interval metered customers?

Minimization of Impact

- Want to minimize change to:
  - Existing meter installations
  - Utility metering practices
- Meter ownership
  - Ownership and Contractor's responsibility
  - Could AMR be owned by someone else?
- Competitiveness Means: More options for
  - Utilities, Consumers, Third parties
  - Responsibility for metering would stay with the LDC
- Must use existing off-the shelf equipment
  - But this is a six year project: Technology will change throughout

The Goal

- 5% reduction in 24 GW Provincial Demand
  - Through load shifting
  - Energy savings if possible
- Price awareness
- Culture of conservation

Metering Working Group

- Are your concerns on the issue list?
- Any concerns with the proposed schedule?

For Next Week

- Today's Electricity Market
- Existing utility billing systems
- Interval Meters
- Pre-payment meters
- Sub-meters
- Installation Issues
- Deployment Issues
- Ownership of Meters and Systems

Metering Working Sessions

Proposed Schedule for OEB Metering Working Sessions

We will require several working sessions meeting during the period September 1 to October 8. All meetings will be at held at OEB office, 2300 Yonge Street on the north west corner of Yonge and Eglinton.

Here is the proposed meeting schedule:

Session	Date	Time	Location	Meeting Room
1	September 1	1:00-4:00	2300 Yonge	Room 2, 24th floor.
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This schedule is not final. Your input is needed to ensure we cover the right issues. And we may discover new issues as we progress. My guess is that we will need five sessions but I have scheduled seven in case we need them. Please try to keep your schedule as open as possible until October 8 incase we need more than seven sessions.

Are Your Concerns Included?

Please review the outline following. If there are other items that need to be covered, or some that can be dropped, please let me know be return e-mail at: al.stanbury@ieee.org. I would also like to know which items are high priority for you.

Proposed Agenda

Session 1

1. Re-Introductions
2. Presentation: What is a smart meter?
   a) Rate options that must be supported
   b) Alternatives that could meet the objective
   c) Is an interval meter a smart meter?
   d) What about existing conservation initiatives?

3. Presentation: Welcome to the Metering Consultation Team
   a) Why are smart meters required? What end result is sought?
   b) Overview of project
4. Work plan and schedule
   a) Schedule
   b) Issues: What need to be added to or deleted from the agenda?
5. Assignments for session 2

Session 2

1. Today's retail electricity market:
   a) Where is the point of sale in the retail market today?
   b) What loss adjustment processes are used in the retail market? Why?
   c) What customer classes exist?
   d) Which classes are billed on energy, demand, power factor?
   e) What bill consolidation and totalizing services are provided today?
2. Existing Utility Billing Systems

   Overview of existing distributor billing and settlement functions, interfaces to the IMO and retailers:
   a) What potential impact might smart meters have on existing billing systems
   b) What portions of the existing billing system will be required in the future
3. Interval Meters
   a) How do the existing interval meters fit into the smart meter initiative?
      - Wholesale, Retail and Future Interval Meters
   b) At what level do distributors install interval metering now?
   c) If the requirement for interval meters were reduced to 50 kW what would be the impact?
4. Existing Energy Efficiency programs
   a) Prepayment Meters
   b) Sub-Meters
5. Installation Issues
   a) Meter Location
      i) Recommended point of sale
      ii) Recommended loss adjustment processes
   b) If competitive metering service were introduced where should the utility interface be located?

c) Upgrading from 2.5 to 3 element Meters
   i) What current programs are in place?
   ii) Should upgrading be mandatory when converting to a smart meter?

d) Two Element Metering and Arithmetic KVA Demand

e) Will all existing meter installations conform? Will there be a need for Waivers?

6. Deployment Issues

a) The smart meter initiative will require rapid installation of meters on a massive scale. Would existing utility procedures and staff levels be adequate to meet the challenge? Will utilities need to retain installation services?

b) If external services were retained what procedure, training and test equipment would be required?

c) What procedure would be used for registering the meter into the billing system?

d) If competitive meter service providers were introduced to the market, how would installation information flow from the installer to the LDC?

e) If there were a single smart meter implementation and monitoring agency, what would be the impact on:
   i) Back Office Operations for Distributors
   ii) Field operations for Distributors
   iii) Training/Certification and Test Equipment for Installers

7. Ownership of Meters and Systems

No-one is suggesting utilities give up ownership of meters but if third party service provider were to provide a turn-key service to utility:

a) Who should take on the contractors' responsibility under the Electricity and Gas Inspection Act?

b) Who would have the obligation to settle disputes? What procedure would be followed?

c) Could a third party own the AMR/Load Control/Price response portion of the meter while the utility retains ownership of the meter?

d) Who should have access to the metering data and why

Sessions 3 & 4

1. Requirements of the Smart Metering System

a) Billing determinates:
   i) Billing interval: 15, 30 or 60 minutes?
   ii) Do we need to measure demand? What type(s)?
   iii) Will power factor penalty be required?
   iv) Distributed generation: Do the meters need to record flows in separate registers or should net metering be used?

b) Billing Calculations for Smart Metering Systems:
   i) What calculations could be carried out in the billing system
   ii) What calculations could be carried out in the meter

c) What data could be collected beyond billing determinates
   i) Power Quality, Voltage, Outage Monitoring
   ii) Other opportunities: Alarm monitoring
   iii) Who should have access to this information?
   iv) Should these functionalities be mandatory? Who should provide them?

d) Remote control of meter

   How could the ability to modify and switch rates without removal of the meter be accomplished?

e) Remote control of loads
   i) What technical solutions exist for direct load control
   ii) Must the meter be involved in the load control path

f) Advanced Real-Time Feedback to Consumers
   i) What is the minimum real-time information that should be made available to consumers and how often
   ii) What is the minimum format that should be required

2. Smart Meter Specification

a) What is the Minimum Functionality to be specified?
   i) Critical Peak Pricing, TOU, Seasonal
   ii) Re-programming without removal
   iii) DSM control
   iv) Net Metering
   v) AMR
   vi) Walk-by/Drive-by wireless reading

b) Data collection:
   i) Where will energy readings be time stamped
   ii) How will data transmission be initially confirmed
   iii) How will of meter malfunction and data transmission issues be detected
   iv) How will incorrect consumer identification be detected
   v) Data storage and data access issues

c) Minimum specification for local real time display of consumption data
   i) How could this be achieved
   ii) Display on the meter: What is required

d) Minimum specification for reprogramming without replacement

e) Data Collection Process
   i) What physical mechanism(s) will be used
   ii) What protocol(s) must the meter support
   iii) What protocol is required into the utility billing system

f) Data storage
   i) Is data storage in the meter required? How much?
   ii) What data should be stored in the LDC information systems
   iii) Should there be one provincial repository for smart metering data?
   iv) What is the minimum data required for dispute resolution?

Session 5

1. Identification of Remaining issues
2. Review of recommendations for minimum requirements for a provincial smart metering standard

Session 6 & 7

If required:

1. Remaining Issues
2. Enumeration of unresolved issues