Smart Meter Initiative

Meeting Notes
Metering Working Group

September 8, 2004 Ontario Energy Board
24th Floor, Room 1
2300 Yonge Street

The metering working group met held its second meeting on September 8. Notes taken during the meeting follow.

1. Attendance

Tim Vanderheide	Bluewater Power Distribution Corp.
Hugh Bridgen	Chatham-Kent Hydro
Doug Currie	Hydro One Networks Inc.
Rowan Jones	IMO
Gary Rains	London Hydro
Luc VanOverberghe	Measurement Canada
Bob Myers	Oakville Hydro Energy Services
Al Stanbury	OEB Consultant
Robert Lake	Peterborough Utilities Services
Rocco Logiudice	Toronto Hydro-Electric System
Ken Quesnelle	Woodstock Hydro Services Inc.

2. Today's Retail Market

Ken Quesnelle, Woodstock Hydro Services Inc., provided the following overview of metering:

In today's retail electricity market the point of sale and point of measurement are not always the same location. Adjustments are made to account for this as well as allocate the system losses not physically captured by the metering devices. The intent is to have system losses attributed to customers in correlation to their energy use but not location on the system.

The various customer classes are billed for either energy alone or energy plus demand and possibly power factor. Consolidation of the various cost components related to energy and delivery are currently consolidated in either a distributor or a retail consolidated bill. Some totalizing of interval occurs but is generally restricted to very local (same property) commercial and industrial loads.

Further discussion developed a consensus that:

- customer classes defined in section 9.2 of the Distribution Rate Handbook; and
- points of demarcation and loss adjustment procedures defined in the Distribution System and Retail Settlement codes

would not require amendment due to the smart meter implementation.

Section 10.3 of the Distribution Rate Handbook may require reconsideration. Residential customers with interval meters are required to pay the spot market price. The addition of in-home signaling for critical calls and demand response on a separate system may enable equivalent to smart meter requirements and interval metered residential consumers may want access to rated developed for smart meters. Installation of a separate control/signaling system may not be possible in some locations depending on the smart meter technology selected by the distributor.

2.1 Bill Queries

Some concern was expressed regarding resolution of billing queries for smart metered consumers. In today's billing system the utility account representative can view the consumers consumption data and the query with the consumer. The introduction of interval data may complicate the display of consumption and would force a re-design of existing bill query management systems.

2.2 Separately Metered Consumption

At a small number of consumer locations electric heat is separately metered from the rest of the residential consumption. These are a vestige from conservation programs introduced in the '70s and '80s. Should two smart meters be installed and totalized? Should the service be required and one meter installed?

➔ For future discussion: A reasonable assumption is that the utility should be able to consolidate the metering at these locations. Rewiring of the service to reduce the number of meters to one may be required. The question of who should pay for such re-wiring needs to be resolved.

2.3 Metered Quantities

The smart metering system will need to accommodate reading of reactive power and facilitate the calculation of power factor penalties for commercial and industrial customers.

➔ For future discussion: Number of consumers subject to power factor penalty who do not already have interval metering.

3. Existing Utility Billing Systems

Tim Vanderheide provided the following information on existing utility billing systems.

- Smart Metering will have an impact on virtually all utility back office systems. The magnitude and specific impact will be dependant on metering technology, AMR technology, rate design, bill presentment requirements, customer feedback requirements, and future undetermined flexibility requirements.
- The systems that will most likely have the biggest impact include: meter reading and meter interrogation system, VEE systems, retailer communication systems (EBT), settlement systems and customer information systems (CIS).
- The most obvious impact will be the inability of the existing systems to handle the sheer volume of data. In most cases meter read data will increase from 6 or 12 reads per year to 8760 reads per year.

As well, most existing systems are not capable of handling the complex billing functions that would be required to cover all foreseeable rate structures. In addition, depending on the bill presentment requirements and customer feedback requirements most system are not capable of two way communications or DMS/DR functionality.

- Most of what is currently being considered for this initiative is achievable from a systems perspective; however, it must be stressed that at this time the existing systems are not capable of handling the transition phase or the end state of the Smart Metering initiative.
- An important item is clarification of the requirements for bill presentation which will force change in utility settlement systems.

Further discussion indicated that the Bill 100 requirement that an account be split between the distributor and a retailer for part of the day will necessitate extensive change to existing retail settlement systems. Bill 100 also enables utilities to provide direct load control on a for profit basis.

4. Interval Meters

Gary Rains provided the following information interval metering:

The OEB's Distribution System Code establishes certain thresholds for the installation of interval meters, but permits the LDC to adopt a lower threshold. The pertinent sections of the Code are replicated below for convenience of reference:

- 5.1.3 As of the date this Code comes into force a distributor shall have six months to provide a MIST meter installation for any existing customer that has an average monthly peak demand during a calendar year of over 1 MW. A distributor shall install a MIST meter on any new installation that is forecast by the distributor to have a monthly average peak demand during a calendar year of over 500 kW, for the purposes of measuring energy delivered to the customer.
- 5.1.4 A distributor may set a threshold level for installation of MIST meters other than that required by section 5.1.3. as long as the threshold is delineated by customer class in the distributor's Conditions of Service and sets a threshold lower than that required by section 5.1.3.

Earlier in the year, London Hydro lowered its threshold for interval metering from 500 kW to 200 kW, and is contemplating a further reduction to 150 kW in Q1 or Q2 of 2005. An informal survey of 33 LDC's was conducted (via e-mails and voice messages) to ascertain their prevailing threshold. As of this date, only 17 have responded with results as tabulated in the attached spreadsheet. The spreadsheet will be updated and distributed to work group members in the forthcoming days (or weeks) when the other respondents reply.

Demand Threshold Survey - Interval		
Name of contact	**Utility Name**	**Interval Metering Threshold (currently)**
Kevin Boggs	Burlington Hydro	200 kw
Sean Pook	Grimsby Power	200 kw
Dominic Longo	Cambridge and North Dumfries Hydro	200kw
Wilf Meston	Kitchener-Wilmot Hydro Inc.	200kw
Tony Vanden Boomen	London Hydro	200kw
Dave Arms	Festival Hydro	250 kw
Cliff Ballinger	Niagara Falls Hydro	250 kw
Mike Frey	Waterloo North	250kw
Hans Paris	Guelph Hydro Electric Systems Inc.	300kw
Jim McGill	Hydro Vaughan	500 kw
Glen Wallace	Thunder Bay Hydro	500 kw
Malcolm King	Utilities Kingston	500 kw
Bruce Craig	Whitby Hydro Electric Corp	500 kw
Terry Cout	Hamilton Hydro	500 kw
Mark Pearce	Enwin	500 kw
Tim Tope	Chatham Kent Hydro	500 kw
Danny Tosolini	St Thomas Energy	500 kw
Ken Quesnelle	Woodstock Hydro	500 kw
Bob Lake	Peterborough Utilities	500 kw
Lorne McCandless	Hydro One Brampton	500 kw
Scott Robertson	Hydro Ottawa	500kw
Greg Ballinger	St Catharines Hydro	500kw
Terry Wheeler	Middlesex Power	500kw

22 Respondants to date Survey results Sept. 10th 2004.

The relationship between threshold level and number of customers isn't necessarily linear. Customer load information was extracted from London Hydro's customer information system and arranged in 50 kW bins as shown in the attached spreadsheet -- it will be seen that in the 450 - 499 kW class there are 8 customers, in the 400 to 449 kW class there are 17 customers ... in the 100 - 149 kW class there are 245 customers, and finally in the 50 - 99 kW class there are 694 customers; ie the number of interval metered customers will increase dramatically (probably some power function but not sure what the exponent would be) as the threshold is reduced. It is believed that this pattern would be fairly representative of other mid-size utilities throughout the Province.

By reducing the threshold from 500 kW to 200 kW, London Hydro will be converting 175 installations in the field and will be stretching existing resources for the next three years to accomplish this task (in addition to normal work activities) -- we try to coordinate the interval meter installation with seal expiry year to minimize/optimize labour expenditures.

London Hydro Interval Metered sites		
Customer Load	**Total Number of Meter Installations**	**Number with Interval Metering Already**
50 - 99 kW	694	2
100 - 149 kW	245	0
150 - 199 kW	135	2
200 - 249 kW	65	4
250 - 299 kW	32	0
300 - 349 kW	32	0
350 - 399 kW	21	0
400 - 449 kW	17	0
450 - 499 kW	8	0
500 - and above	271	268

Hugh Brigden provided the following information on how existing interval meters fit into the smart meter initiative

- Existing Interval Meters have a single communication mode option. All vendors have future plans for a second communication port at an additional cost. Currently a customer or third party can dial in under a read only password.
- KYZ outputs are an available option that would allow a means of determining load or performing load control.
- There is no commercially available real time display outside the meter.
- Interval meters meet the requirements of determining when power is used.
- Interval meters fall short for sending price signals, which is more a communications problem rather than a meter issue.
- Interval meters provide customers with enough data to manage and control.
- The meter types are approved as check meters by the IMO but cannot be direct replacements as wholesale installations require 4 quadrant.
- Biggest problem is sections 11.1 & 11.2 in the Retail Settlement Code requiring customers or third party agents' direct access to the meter. Providing access to the meter data outside the meter is preferable so this does not inhibit LDC choice of communications to the meter.

Further discussion indicated that few customers look at interval data via web services presently offered by Ontario distributors. Experience indicates that MV Web is suitable for data presentation for up to 2500 to 3000 consumers but may be challenged to handle more accounts than that. Statistic Canada indicates that 60 to 65% of Canadian homes have internet access so not all homes could use the internet to access consumption data.

Effective display of consumption information is essential for the success of the smart meter initiative. Meter independent solutions such as Blue Line were mentioned but not discussed in details.

➔ For future discussion:

- Security of data for meters accessed by wireless automated meter reading and the need for security measures. What principles apply?
- Customers without access can access consumption data through IVR. What are the implementation issues with IVR?

5. Existing Energy Efficiency Programs

Robert Lake provided the following information on existing energy efficiency programs:

- Green Communities Association, with member organizations in a number of large and medium sized cities in Ontario, through funding provided by EnerCan, are doing an Energuide for All Electric Homes. The program gives an energy efficiency rating to all electric homes, for those that want to participate. The program is quite limited.
- Prepayment meters are used extensively in Woodstock but are not used in other LDC's in Ontario. Woodstock has about 25% of their customers using prepaid meters. Woodstock estimates that electric energy consumption drops about 15% after prepaid meters are installed.
- Sub-metering systems are offered by only a few service providers throughout Ontario. At present they are used mostly on bulk metered apartments and the bulk bill is then

prorated to individual units based on the submeter readings. While the potential to install submetering systems is huge, there are relatively limited applications in place today.

Submetering: Further discussion indicated that a significant number of consumers are metered by submetering systems and would not be able to contribute to conservation under the smart meter initiative. This concern is recognized by the OEB and is considered out of scope for the present smart meter initiative. A different solution for submetering installation is required and many such installations already have some smart metering capabilities which may be extended by the operator to implement savings possible under future rate plans.

Prepayment meters: Discussed also was the feasibility of using prepayment meters to implement time-of-use and seasonal rates. This is possible by changing the programming of cards which are usually purchased weeky due to limits on the maximum purchase. The card can be marked to show the rate structure and the consumer is limited to two cards. Interval data is not feasible since the card can store 720 readings but performance at the pay station is slow.

➔ For future discussion:

- Critical peak calls are expected only a few times a year. In order to form an estimate of the expected call frequency, the IMO was asked to provide data on the frequency of 3% and 5% voltage reductions, calls to dispatchable load and public appeals.
- Implementation of time-of-use and seasonal rates for pre-payment customers. Initial discussion indicates that both are feasible.

6. Installation Issues

Rocco Logiudice led the discussion on meter installation issues and provided the following notes:

1. Meter location
   a) Recommended point of sale – should be left as is for retail market
   b) Recommended loss adjustment processes – presently kWh consumption is adjusted with a loss factor, also the majority, if not all utilities, use a 1% loss adjustment for primary metering. Customers also receive a transformer allowance if they own the transformers.

2. If competitive metering service were introduced where should the utility interface be located?
   a) The metering must be the responsibility of the utility, any energy service could be done after the meter.
   b) Utilities also identify a demarcation point, typically for overhead it's at the mast connection and for underground it's on the line side of protective device (usually tap box)

3. Some other installation issues that will delay smart meter installation or the inability to install smart meters include:
   a) Inside meters - The location of many meters will make hard wire communication options difficult and the radio remote system a challenge, therefore any reference for inside display must be of a wireless technology. Also, it may be a good idea to relocate meters (services) outside, where practical. This should be at the owner expense.
   b) Reverification requirements: A temporary suspension of reverification program may be required to facilitate the smart meter implementation. Staff levels are set for normal reverification and maintenance work, a temporary suspension will help in concentrating forces to smart meter installation geographically and maximize efficiencies.

c) Meter availability - 3 phase 3 wire 600V meters used for delta services are no longer available from most manufacturers, this will hinder the installation of smart meters for certain class of customers.

4. Upgrading from 2.5 to 3 element Meters
   a) What current programs are in place? – Toronto Hydro uses 3 element meters on upgraded services or new services
   b) Should upgrading be mandatory when converting to a smart meter?
      - No, for transformer rated meters since the change being made is not substantial but upgrading is done by most utilities when the service is upgraded. Upgrading should be optional as this would slow down the smart meter installation process due to outage requirements and overtime cost.
      - For self contained meter upgrading to 3 element metering will not be an issue since the change can easily be accommodated without an extended outage.

5. Two Element Metering and Arithmetic KVA Demand – always has been a controversial issue. Distribution utilities for the most part have balanced loads, also regulatory requirements specify vectorial totalizing when multiple circuits are added but the more correct method is arithmetic demand. Methods of calculating demand may be reevaluated under Measurement Canada's "New Directions" initiative. A review of metering theory indicates that arithmetic KVA demand can not be applied to two element metering.

6. Will all existing meter installations conform? Will there be a need for Waivers? - Some existing installations may not conform to the physical requirements of a smart meter installation.

7. Deployment Issues

Bob Myers led the discussion on the deployment issues and provided the following notes:

Note: The issues considered here will be effected by Smart Meter technology eventually selected (i.e. TOU meters, Interval meters - AMR systems, etc)

- Many utilities are currently operating at levels exceeding their available resources.
- Many utilities use line staff to install metering. Skill levels may be insufficient to implement Smart meters and associated support/communication systems that may be required
- Will meters be compatible with utility settlement system? Will interfaces be required?
- Some utilities currently contract out meter services. Do contractors have proper resources for implementing Smart meter system?
- Will there be sufficient resources available from outside contractors to meet demand of utilities opting to contract out their Smart meter implementation?
- Utilities will require time to investigate and determine preferred technologies. New procedures and conditions of service would have to be addressed.
- RFP or tenders may be issued. Time line for implementation will be effected by this.
- How will costs of Smart meters be recovered?
- Communication system (AMR) required if Smart meters have interval metering capability.

- Communications systems may be hybrid solution. This will increase skill level required.
- Need for outside contracting will be influenced by volume of meters to be upgraded and any mandated schedules.
- External contractors will be required to provide services and personnel with proper credentials and qualifications.
- Contractors must operate under utility safety rules. Safety will be major issue.
- Utilities may opt to contract product evaluation and system design and implementation
- Can meters be entered in billing system using current procedures.
- Will interfaces be required between Smart meters and settlement systems
- Will settlement systems handle volume of Smart meter data (This will be influenced by meter technology, I.e. Interval or TOU)
- Will settlement systems be compatible with any new rate structures introduced
- Data warehouse services may be required
- New procedures for documenting meters may be required

Note: Recent OEB Joint Load Data Research Study to acquire residential load profiles using interval metering provided some insight into issues with implementing smart metering at residential level.

Rowan Jones led the discussion on competitive metering service and provided these notes for the record:

This discussion does not consider communication and data management or who pays for services in the market.

Three alternatives were discussed:

1. No MSPs
   a) MSPs would not do any work in retail
   b) LDCs own all the meters and do all the work
   c) LDCs would be the contractor under MC
   d) LDC would ensure compliance with MC regulations
   e) Benefits:
      i) Clear responsibility of ownership
      ii) Cleaner fit to E&GI Act
      iii) Standardization within a geographic area
      iv) LDCs know how to run a retail metering system
      v) No requirement to qualify MSPs or monitor performance
      vi) Requires coordination only within the LDC
   f) Disadvantages
      i) Not market price - may not be the most cost effective under all circumstances
      ii) LDCs have their own standards, many are different
      iii) MSPs in the wholesale market cannot expand
      iv) Lack of resources to implement 800,000 p.a.
      v) LDCs likely have to contract out for MSP services anyway

2. MSPs sub-contract to the Distributor.
   a) MSPs would work for the distributor
   b) The role of contractor remains with the distributor
   c) The MSP may supply and install the meter, respond to MTRs, seal expiry etc
   d) Ownership may be the LDC or the MSP
   e) MSP ensures compliance with MC to the satisfaction of the LDC
   f) LDC would be the regulator in effect, making sure the MSP responds to MTRs
   h) Benefits:
      i) Clearer responsibility of ownership & MC role
      ii) Standardization within a geographic area
      iii) Cost effective - market price
      iv) MSPs can expand their organizations
      v) LDCs do not have to expand staffing to supply & install 800,000 meters
   i) Disadvantages
      i) How to license MSPs
      ii) LDCs have their own standards , each is different
      iii) LDCs reliant on the MSP for performance
      iv) Requires LDC/MSP coordination e.g. meter replacement

3. Fully Competitive Market
   a) MSPs do all the work
   b) MSPs supply & install meters, maintain and comply with MC requirements
   c) Ownership is the MSPs
   d) Performance standards required for MSPs, but who would define the required standards ands who would be the regulator?
   e) Responding to MTRs - how would an MSP be notified, how should they respond?
   f) MSPs responsible to the consumer?
   g) Benefits
      i) Standardization is possible - province wide
      ii) Cost effective - market price
      iii) MSPs can grow and become effective, viable organizations
      iv) LDCs do not have to expand staffing to supply & install 800,000 meters
   h) Disadvantages
      i) The role of contractor would need to be clarified with MC (including billing disputes)
      ii) LDCs reliant on the MSPs
      iii) Response to local requirements needs to be incorporated
      iv) Certification of MSPs and monitoring of performance would be required by a regulator
      v) LDC may have a problem with disconnections
      vi) What happens when the customer calls the LDC
      vii) Redundant staff in LDCs

8. Ownership of Meters and Systems

Doug Currie led the discussion on ownership of meters and provided the following record of discussion:

The contractor's responsibilities can only fall upon the LDC as per the E&GIA (The Act defines the "contractor" as any person or body that has undertaken to supply electricity to any purchaser). A third party providing a turn-key service does not change this.

This also applies to the obligation to settle disputes - the Act only specifies the contractor and the purchaser as having these obligations. The procedure that would be followed to settle a dispute (raised through MC) is outlined in Sections 23 and 24 of the Act.

While it is possible for a third party to own the AMR/Load Control/Price Response portion of the meter while the LDC retained ownership of the meter, in most cases, this would be problematic, especially in the area around access to the communications system.

Access to meter data should only be for the LDC and the customer, however, either should be allowed to designate an agent to act on their behalf and thereby access the data. The only exception here would be that the regulator may require the data, depending on the position they took in the Retail market.