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<u>Ontario Energy Board Staff Discussion Paper</u>

Implementation Plan for Smart Meters in Ontario

RP-2004-0196

July 19, 2004

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1 INTRODUCTION AND PAPER OVERVIEW

1.1 The Directive

On July 16, 2004, the Ontario Energy Board received a directive from the Minister of Energy under section 27.1 of the *Ontario Energy Board Act, 1998.*

In it the Minister directs the Board to provide him with an implementation plan for the achievement of the Government of Ontario's smart meter targets. The policy of the Government of Ontario is to install 800,000 smart meters by December 31, 2007 and for all Ontario consumers by December 31, 2010.

This project has been assigned Board file number RP-2004-0196. The full text of the is available on the Board's web site (www.oeb.gov.on.ca) under Regulatory Calendar | Active OEB Key Initiatives | Smart Meter Initiative.

1.2 Scope

In making its report to the Minister, the Board will develop a plan for implementing smart meters in Ontario. In particular, the Board has been asked to identify the mandatory technical requirements that will define what a smart meter is for Ontario. The plan will identify the mandatory technical requirements for smart meters and the support operations of distributors; set priorities; identify regulatory mechanisms for the recovery of costs; and identify how barriers can be mitigated. It will establish interim targets and establish a process for purchase, installation and reporting of results. In addition, the report will address the competitive provision and support of smart meters and the need for and effectiveness of non-commodity time of use rates. Consideration of non-commodity time of use rates is a part of the 2006 Electricity Distribution Rate process.

1.3 Overview of this Paper

Section 1 is the description of the project. Section 2 is some brief information that may be useful for the discussion. Section 3 lists the elements of the plan and gives some initial options to encourage discussion. Stakeholders are encouraged to comment. Section 4 discusses options for cost recovery. Section 5 discusses the functions listed in the Directive as background to establishing technical requirements. Section 6 discusses options for ownership of the meter. Section 7 discusses other identified barriers that will need to be overcome to meet the Government targets. Section 8 lays out the next steps in the Board's consultation process.

Appendix A is the text of the Directive. Appendix B is a glossary of terms. Appendix C is a summary of benefits of advanced metering created by the New Metering Technology Working Group for the Office of Gas and Electricity Markets (Ofgem).

2 BACKGROUND

The Board has previously expressed concern about the demand/supply balance in Ontario. In the its Report to the Minister of Energy, it stated that:

> ...supply is falling behind demand. Ontario is facing tight supply conditions that are expected to continue past 2007. Problems with existing nuclear plants, transmission system constraints, and lack of investment in new generating plants contribute to these conditions. Coal power that releases harmful emissions now accounts for about one-quarter of our electrical generation, and government policy direction would end this by 2007. New supply and investment in transmission are part of the solution, but cannot be built fast enough to meet our needs.... By reducing consumption and using electricity more efficiently, the province can reduce the rate at which demand is growing.[1]

[1] "Report of the Board to the Minister of Energy: Demand-side Management and Demand Response in the Ontario Electricity Sector", Ontario Energy Board, March 1, 2004, p.1.

The policy of the Government of Ontario is to install 800,000 smart meters by December 31, 2007 and for every Ontario consumer by December 31, 2010. The objective of the policy is to help consumers control their electricity bills though conservation and demand response.

As the Board noted in the Report to the Minister of Energy,

> "...three conditions are needed to make consumers change the amount or timing of their consumption:
>
> – a price that changes over time in response to demand and supply forces;
> – the ability of consumers to see and respond to a price signal; and
> – measurement of the response so that consumers get credit for their action."[2]

Dynamic price

Currently, wholesale consumers and large, interval-metered, retail consumers pay the hourly Ontario energy price (HOEP) from the IMO-administered real-time energy market based on their usage. Large, non-interval metered, retail consumers pay the HOEP based on their accumulated usage mapped to their distributor's net system load shape.

Designated consumers[3] pay 4.7¢ per kWh on the first 750 kWh of their monthly consumption and 5.5¢ per kWh on the balance. This is an increasing block structure that attempts to put a lower price on electricity for essential needs. It is still essentially a fixed price. Since most distributors read meters and bill every two months, many distributors simply apply a 1500 kWh limit for the lower price tier.

The Board is in the process of developing a Regulated Price Plan for residential and small business consumers without retail supply contracts. The RPP is expected to be in

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[2] Ibid, p. 23

[3] Defined in section 56 of the *Ontario Energy Board Act, 1998* and associated regulations.

place by May 2005. Although details are to be developed following a process with public input, the Board has announced the principles in its business plan. A regulated price plan will:

- reflect the true cost of electricity;
- be stable;
- be supportive of demand-response and conservation; and
- not be a barrier to investment.

In reflecting the true cost of electricity and supporting demand-response, a regulated price at some point is likely to have a time-dependent component.

Price response

Under any form of dynamic pricing, consumers can choose to manually or automatically change the amount or timing of their use of energy because of price signals. The response may be overnight scheduling of energy-intensive processes like pulping, steel-making, baking or laundry. Or it may be installing more energy efficient equipment for peak activities such as lighting, air-conditioning or freezers.

It is important to remember that energy use is a means to an end and that not all commercial or residential activities can be changed. Just-in-time activities, whether heating steel billets for rolling, cooking food for meals or lighting, are poor choices for load shifting. Activities that create something that can be stored for later use, such as lumber or clean laundry, are more appropriate. Equipment that is on constantly such as freezers, refrigerators or storage water tanks are opportunities for energy efficiency or peak interruptions that don’t affect performance.

A price signal is the link between the dynamic price and the response.

Measurement of response

As the Board noted in its Report to the Minister:

> "Accurate and timely measurement is important to ensure that a consumer gets credit for changing the amount or timing of his/her electricity consumption. Otherwise, as with the original spot-market pass-through based on net system load shape, some consumers will be under rewarded for their activities and some consumers will see undue benefit.
>
> "Advanced metering technology is important to enable demand response in the retail market. However, debate exists on what meters are appropriate for various consumer groups and when/how they should be deployed. The Board notes that meters are a tool, and without pricing changes and the ability to respond, meters alone are not sufficient to help consumers change their behaviour or control their electricity bills."[4]

A smart meter is at a minimum capable of reporting usage according to predetermined time criteria. This could include time of use or interval meters. In addition, smart meters may be connected to a remote or automatic meter reading system that may or may not feed into a feedback system for consumption and spending on a real or close-to-real time basis. They may have bi-directional communication allowing them to receive signals that change the time criteria, change the tariff, control external devices, etc.

2.1 Current requirements

The Distribution System Code of the Board calls for a metering inside settlement time (MIST) meter for any new distribution customer with an average monthly peak demand during a calendar year of over 500 kW and any existing distribution customer over 1000 kW. The DSC also requires a distributor to install an interval meter (either MIST or metering outside settlement time) for any customer who requests one. The customer pays the full incremental cost.

[4] Ibid, Report of the Board to the Minister of Energy, p. 25.

Non-OEB-licenced generators (those whose generation is entirely for self-consumption) are metered in the same manner as any other load.

According to the Retail Settlement Code of the Board, interval meter data must be used to calculate settlement costs (section 3.3.1). Retailers must have access to current, interval data for either a billing period or 30 days through the Electronic Business Transaction system (s. 11.1). Interval consumers must have access to interval data by EBT system, direct access or printed on the bill (s. 11.2). Customers can have the right to interrogate their meter or to assign that right to a third party (s.11.2). This allows customers to read their meter directly rather than use distributor data. Consumers can request in writing that historical usage date be provided to third parties (s. 11.3).

2.2 Advanced metering considerations

2.2.1 Benefits for customers

The primary objective of the Government policy on smart meters is to give consumers more control over the energy part of their electricity bill. Smart meter technology enables consumers to pay the actual price for the electricity at the time that they actually use it.

A fixed price for energy averages out the market costs for the electricity dispatched to meet load at high and low priced periods. If prices are dynamic but use is accumulation metered, then a consumer's use is mapped to a net system load shape. An individual consumer pays for his or her use based on the aggregated use pattern of similar consumers.

When individual use is interval metered, a consumer who normally uses less energy in peak times and/or can shift more use into off-peak times will pay less for energy. Conversely, a consumer with more on-peak use will pay more. By controlling use, both types of consumer have the opportunity to control their bills.

In a study conducted for EA Technology, the authors concluded that for residential applications:

> "Better billing feedback produced savings of up to 10% in electrically heated homes in cold climates, mainly using simple manual methods. In the absence of electric space heating, smaller savings are likely, but some of the automatic measures here [in the U.K.] could produce new types of saving - for example in refrigeration - which would not be possible manually. Load shifting is easier than load reduction so cost savings are easier to achieve than energy savings, but both would probably lie in the 0 - 5% range for a home without electric heating."[5]

It is important to note that consumers who use more peak energy will pay more for the same amount of electricity. This will include schools, hospitals and residential consumers with electric heat. Some of these consumers will take action to lower their bills. Demand-side management (DSM) programs could be targeted to vulnerable consumers with poor access to capital to help them act. Studies have shown that the fuel poor[6] do save when smart meters are used but it is not clear if that is at the expense of their comfort.[7]

2.2.2 Benefits for the system and the market

Another primary objective of installing smart meters is to decrease Ontario's overall peak demand.

When the system peak is lowered and the system is operating at less than capacity, then;

- reliability is improved;
- required capacity is lower (all other factors being equal);
- system losses are lower;
- less congestion management is necessary; and

[5] "A review of the energy efficiency and other benefits of advanced utility metering", A.J. Wright et al. for EA Technology, April 2000, p.16.

[6] Ofgem defines households as "fuel poor" if, in order to maintain a satisfactory heating regime, they would need to spend more than 10 per cent of their income on all household fuel use.

[7] Ibid., "A review of the energy efficiency and other benefits of advanced metering", p. 2.

– uplift charges are lower.

When consumers take action to shift energy use to off-peak periods, the demand peak will be lower, but off-peak demand will rise. See Figure 1. The price of the resources to meet the increased demand in off-peak periods will be higher. Even so, the nature of the

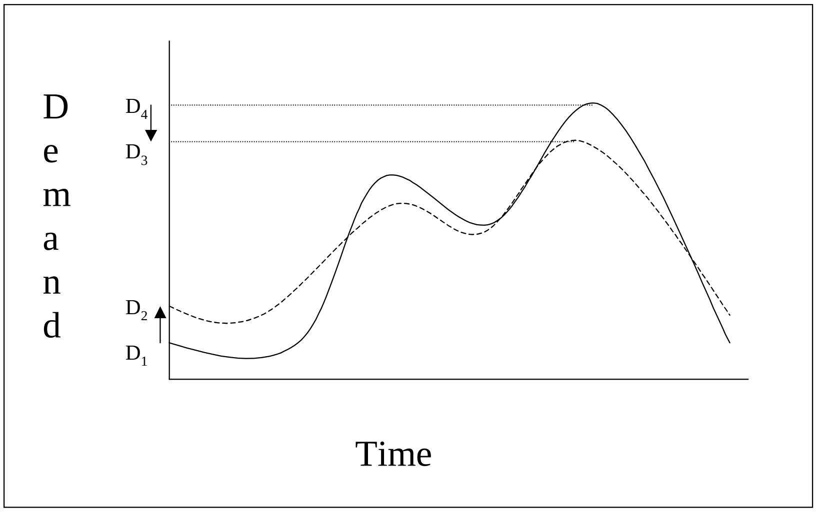

Figure 1: Demand curve changes with shifted load

price-demand curve likely means that the price increases in off-peak periods are likely to

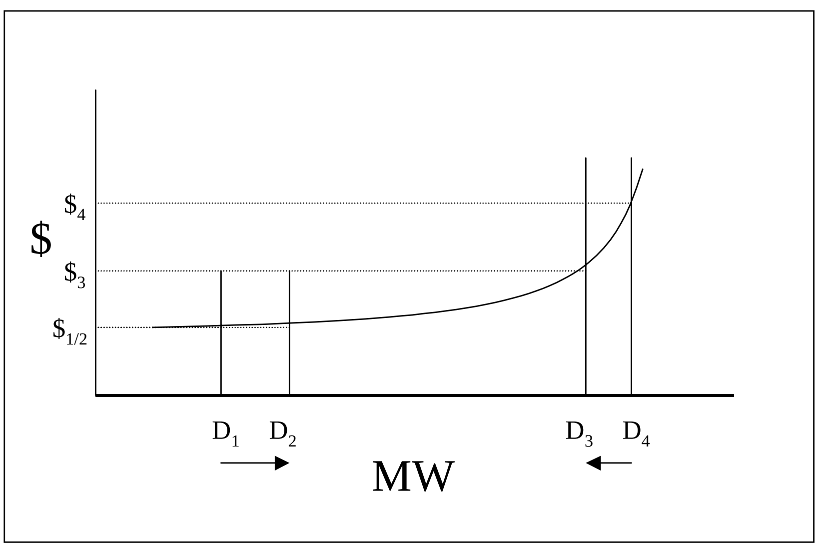

Figure 2: Electricity Price/Demand curve for shifted load

be less than the price decreases in peak periods.[8] See Figure 2. Overall, the total cost to the market to meet all demand should be lower.

2.2.3 Benefits and risks for generators

When the system peak is lower, some high-margin peaking plants may end up being dispatched fewer hours. When the off-peak demand is higher, some base and intermediate plants will be dispatched more often. In a competitive generation market, these risks and benefits are borne by the shareholder of the asset.

2.2.4 Benefits for retailers

Retailers may benefit in two ways. They can structure an offering to a consumer based on a true consumption profile. Also, they can mitigate their risk by tying the offer to load control services. In this way, they avoid buying energy at peak periods and control their costs.

2.2.5 Benefits for distributors

Depending on the system installed, the distributor could have many benefits:

- lower meter reading costs;
- theft and tamper detection;
- account automation leading to fewer customer disputes;
- fewer estimated bills;
- true reads on customer change;
- improved bill collection; and
- broader application of time-of-use distribution rates; including the potential to apportion system losses to the cause.

However, any activities that tend to decrease overall distribution throughput compared to what was used to determine revenue requirement may affect a distributor's revenue.

[8] "Mandatory Rollout of Interval Meters for Electricity Customers: Draft Decision" Essential Services Commission, March 2004, p. 49.

Appendix C contains a more detailed list of benefits from advanced metering created by the New Metering Technology Working Group for the Office of Gas and Electricity Markets (Ofgem).

3 ESSENTIAL ELEMENTS OF AN IMPLEMENTATION PLAN

The objective of the implementation plan for Ontario will be to minimize costs and maximize benefits to give value to consumers, the system, the market and market participants (particularly distributors). The central question is how to harness the economies of scale possible in a mass deployment of over 4 million meters while recognizing that there are over 90 electricity distribution companies in Ontario. The following discusses some of the issues and possible options. Board staff invite comment on the issues.

3.1 Procurement Strategy

One of the ways to maximise economy of scale is through a comprehensive procurement strategy for meters and related technologies rather than having each distributor source its requirements separately. For example, a single entity could release a request for proposal, contract with one or more suppliers and arrange supply and delivery. Alternatively, each distributor could determine its own requirements and an agent could collect similar orders for joint purchases.

Options could deal with who would administer that process, how contracts would be awarded and how payments and deliveries should be coordinated.

3.2 Implementation priorities

The province’s electricity system needs immediate relief from constraints due to the system nearing capacity. The objective of setting implementation priorities is to maximise initial benefits through addressing potential opportunities while controlling costs through strategic deployment. The Directive requests the Board to address priorities in the implementation plan. The following sections discuss some possible priority areas.

3.2.1 All over 50 kW

The group that already has dynamic prices is a likely priority for meter installation. The benefits would not depend on a pricing change since each account can pay for the energy as consumed rather than the energy applied to a net system load shape. There are approximately 450,000 General Service consumers in Ontario, some of which are under 50 kW. Approximately 20,000 large distribution consumers already have MIST meters for which they have paid[9]. The benefits to larger consumers in terms of having an interval meter and being able to shift load are more clearly defined: they have existing dynamic prices; they pay demand charges for distribution rates; they have larger loads to shift; and energy may make up a higher portion of their overall expenses.

3.2.2 New homes

If the implementation plan does not address new installations (homes and businesses), these will receive standard meters that will be replaced with smart meters no later than 2010. Focussing on new installations would limit the creation of new stranded assets.

3.2.3 Congested areas

The benefits to the system as a whole as outlined in section 2.2.2 are greatest when peak reductions are seen in areas where the system is already at its capacity limit. These areas are identified by congestion constraints and out of merit generation dispatch. One such area is the downtown Toronto core. The benefits are reduced system losses because of reduced current, reduced congestion costs because of out of merit generation dispatch and avoided investment in unnecessary infrastructure upgrades.

[9] Ontario Energy Board figures as reported by electricity distributors under Report and Record-keeping Requirements, Q2 2003.

The benefit that any individual consumer would see on their bill would be small. Congestion costs and transmission charges do not have a locational component. The charges and the savings are socialized so system benefits would accrue to all the consumers on the system rather than the individual consumers taking action.

3.2.4 Self-selection

An approved implementation plan could rely on self-selection. Consumers who are eager to have smart meters and dynamic pricing would be the ones who have lower than average load profiles (low on-peak use, higher off-peak use or fairly flat profile) or foresee savings from easy changes in behaviour. Changes will give quick system benefits. As successive customers with better than average load profiles leave the net system load shape, the remaining customers will tend to have higher peak demand and therefore pay higher prices.

The Essential Services Commission of Victoria, Australia stated that:

> "If customers with low cost profiles install interval meters and thereby are removed from the calculation of the average profile, then the cost of the average profile would increase. Some customers that initially have above average cost profiles would end up having below average cost profiles and, consequently, an increased incentive to install interval meters...The average profile cost would thus increase for customers still remaining without interval meters, and the whole process would repeat itself..."[10]

The ESC concluded that, under this strategy, the consumers that have the most on-peak load to shift get interval meters and the inducement to shift load last. Therefore the benefits of getting high peak-demand consumers to shift load tend to come at the end of the roll-out period. This means that the net benefit is lower compared to other roll-out strategies.

[10] Ibid, "Mandatory Rollout of Interval Meters for Electricity Customers: Draft Decision", p.19.

Vulnerable consumers on net system load shape until late in the process may be particularly disadvantaged.

Even if the plan does not rely on self-selection, it should identify if consumers are allowed to request meters ahead of schedule. Since the RSC and DSC currently allow consumers to request interval meters at their cost, amendments may be considered to these sections to address this specific concern.

3.3 Interim targets

The Government of Ontario has set targets for the implementation plan.

Implementation Date	**Target**	**Installations per month** (based on a start date of May 1, 2005)
December 31, 2007	800,000	25,000 (over 32 months)
December 31, 2010	All (approximately 4,300,000)	~100,000 (over 36 months)

Table 1. Implementation targets

The calculation of installations per month does not include any new sites.

As part of the implementation plan provided to the Minister, the Board will identify interim targets to help assess progress toward the two main targets. While it may not be possible at this initial stage, comments on establishing interim targets would be helpful.

3.4 Process driver

The Directive does not specify who will be the primary driver of the process. A single entity will likely be needed to drive the work, to coordinate the actions of distributors and other participants, to track progress against the targets and to apply rewards/penalties for compliance.

4 COST RECOVERY

The cost categories for meters are:

- Meter
- Installation
- Maintenance (repair and reseal)
- Reading (set-up and ongoing)
- Data storage
- Data manipulation, aggregation and provision
- Settlement

Some of these cost centres may be areas where the distribution company can save through advanced metering. Although automatic meter reading may have a capital cost, there are potentially ongoing savings. Although increased data storage requirements also require an investment, the load profile and system information available may permit identification of operational savings. Better tracking of power flow and enhanced management of the power network can help identify opportunities for lowering losses, avoid unnecessary system upgrades, and help identify power theft.

The current policy under the DSC is for consumers to pay the full incremental cost of installing and supporting interval meters. This has tended to limit installation since few consumers, even those with variable rates, could justify the added cost on bill savings alone. Since the benefits of smart metering accrue to many parties as discussed earlier, the challenge is to find a cost recovery method that also spreads costs in a fair manner.

Inherent in a mass deployment of meters is the issue of stranded assets. Existing meters have varying un-amortised values on distributor books. The cost recovery strategy needs to identify how this value will be treated and any possible ways to minimise it. It is likely that new installations in any class will be installation priorities to avoid the potential to increase these stranded costs.

It is possible that consumers in some rate classes will be priorities for installation and it is also possible that the technical requirements established for rate classes will be different. Cost recovery methods could also be different for different rate classes.

One approach is to allow the capital investment in assets and systems into rate base and spread the increase in rates across all customers in a class. The cost of meters for early adopters would be partially paid by consumers who have not received them. This may be justified because all consumers will enjoy system benefits caused by the first meters installed.

4.1 Meter charge

Another approach is to itemize a meter charge on the bill. This charge could include amortized capital costs and ongoing costs. This meter charge could potentially apply only to consumers who have a smart meter. Alternatively, during a transition period, the old and new costs could be socialized to spread costs and benefits across the rate class.

A separate, distinct meter charge is a step toward contestability of meter provision and service since it sets out an identifiable charge with which a private provider can compete. It will require distributors to unbundle all metering costs from the rest of their services.

As noted in 2.2.5, distributors may realise operational savings on meter reading, customer service and customer connection costs. Ongoing operational savings could be used to offset the meter charge if metering is the responsibility of the distributor or to offset other operational charges if metering is contestable.

4.2 Third tranche

It is also possible that capital investments in meters and/or enabling infrastructure such as data storage and advanced meter reading will be eligible for the DSM funds available to distributors from the next instalment of their allowable return on equity beginning March 1, 2005. However, distributors should be wary of investing in smart meters until the provincial technical standard for smart meters is developed.

4.3 Combination

The Board could also combine the above options and/or adopt different approaches for different rate classes.

Any change to distributor rates currently requires the Minister to give permission for distributors to apply to the Board for new rate orders.

4.4 Third party provision

With or without contestability there are possibilities for innovative third party funding.

Board staff invite comments on costs, distributor savings and cost recovery proposals.

5 METERING FUNCTIONS

The Minister directed the Board to consider the technical requirements and additional functions to establish mandatory and optional requirements for smart meter installations.

The objective in developing technical requirements will be to provide enough standardization to ensure that systems are compatible and economies of scale can be realised while allowing enough flexibility so that the individual needs of regions and applications can be accommodated.

A smart meter is at a minimum capable of reporting usage according to predetermined time criteria. Advanced meter reading systems, advanced feedback, and the ability to control the meter and even internal loads increase benefits and costs. The Australian regulatory approach has been to mandate a minimum interval function and let the addition of features be market based.[11] In considering optional functions, the Board will balance the benefits and additional costs.

5.1 Measurement

The primary function of the meter is to provide information for settlement. Therefore the primary requirement for a meter is that it can be used in conjunction with the commodity price and delivery rate schemes. The Directive requires that a smart meter be adaptable or suitable, without removal of the meter, for seasonal and time of use commodity rates, critical peak pricing, and other foreseeable electricity rate structures.

Currently, wholesale consumers and some retail consumers pay the hourly Ontario energy price (HOEP) from the IMO-administered real-time energy market. The regulated price plan for residential and small business consumers is under development at the Board and is expected to be in place by May 2005.

The RPP may include peak and off-peak pricing. In many jurisdictions peak for commodity pricing is considered 8 am to 8 pm on weekdays. The IMO defines peak as hour 07 to 22 (7 am to 10 pm) for Monday to Friday.

5.2 Reporting

5.2.1 To billing entity (utility)

The primary requirement for reporting is for the information to the utility to match the settlement periods. The Directive requires that a smart meter be adaptable or suitable, without removal of the meter, for seasonal and time of use commodity rates, critical peak pricing and other forseeable electricity rate structures.

Measurement Canada prohibits retroactively changing the price for a commodity already consumed. Some pre-paid meter configurations depend on customer swipe cards to

[11] "Joint Jurisdictional Review of the Metrology Procedures", Essential Services Commission et al. December 2003, p. 69.

update tariffs. Since CPP periods are seldom identified more than 24 hours in advance, the distributor cannot know that the consumer will swipe the meter during this period. This could be a problem for pre-paid meters that do not have direct bi-directional communication under critical peak pricing. Board staff invite comment on this.

Board staff are also interested in comments on whether or not time-of-use meters can meet the requirement.

The reading method could be walk- or drive-by wireless or some form of automatic reading. The method of reading will determine the availability of the data to the utility.

5.2.2 To consumer

Feedback to consumers regarding their consumption is important to influence use. The Directive requires that the metering system be capable of providing customer feedback with data updated no less than daily.

It is not clear that this level of feedback is necessary to capture most savings. A review of international research conducted for EA Technology[12] noted that improved billing information including graphical displays comparing current use to previous months or to the previous year induce sustained action. Normative displays where a consumers use is shown compared to other similar consumers can also be a powerful inducement to change. Receiving true bills rather than estimated bills is also a factor.

> “Studies [in the US] indicate that quite crude forms of feed back on energy use - more frequent billing, comparisons of consumption with other households, use of graphics - could generate significant reductions in consumption.”[13]

[12] Ibid, “A review of the energy efficiency and other benefits of advanced metering”, p. 2.

[13] Report to the Department of Trade and Industry from the Smart Metering Working Group, Ofgem, April 2001, section 4.2.

These savings are due to analysis of usage printed on bills and does not rely on real-time display.

The authors of a Norwegian study[14] concluded that the link was as described in Figure 3.

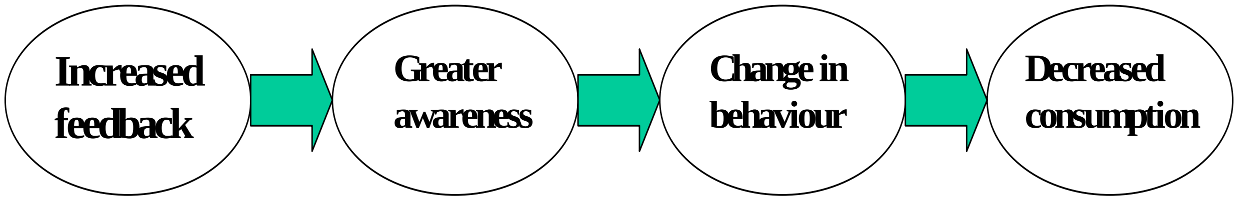

Figure 3: Consumer response to feedback information

The opposite of this link is the direct debit syndrome where a consumer's bill is paid automatically without the consumer having to notice the cost or usage.

It is possible to have real-time display of usage directly to the consumer in addition to the distributor reading arrangements.

5.2.3 To customer designate

A customer's designate (a retailer, energy services company or auditor) should be able to receive historic consumption information in a timely and usable fashion. This is required by the current Retail Settlement Code (section 2.6) with specifications about the type of data supplied, the timing of the information and the format. The RSC indicates that the EBT system is a preferred method of transferring data.

The Retail Settlement Code does not direct distributors to provide real-time data if available. Real-time data can be access with a read-only passcode to the meter or data accumulator. For the purposes of building management and load control, the designate may require real-time information.

[14] H Wilhite and R Ling, Measured energy savings from a more informative energy bill, 1992.

Some jurisdictions are considering or using real-time consumption data for remote monitoring of vulnerable consumers such as the elderly or supported living clients.[15]

5.3 Data storage

Many distributors bill residential consumers every two months to create 6 data sets (period and usage) per consumer per year. With hourly interval metering, there will be 8760 data sets per year as well as the process to validate, estimate and edit the data.

A consistent format for meter data repositories can allow the raw data to be configured for various purposes: settlement, distribution system analysis, load profiles for retailers, and conservation end-uses such as load control and energy audit.

5.4 Bi-directional communication

Bi-directional communication allows the distributor (or others with access to the system) to send messages to the meter in order to change the parameters of the meter (e.g. to change price for prepay systems), to signal the user (e.g. for critical peak pricing or for system emergency conditions), and ultimately for load control.

Enel is installing an advanced metering system in 30 million Italian locations that can read interval consumption remotely; change the tariff; and connect, disconnect or load limit an installation[16].

Bi-directional communication is also a platform for other, non-distribution services: home alarm, home monitoring, etc.

The Minister's Directive emphasises consideration of bi-directional communication and directs the Board to identify mandatory technical requirements except where the Board

[15] Ibid, Report to the Department of Trade and Industry from the Smart Metering Working Group, section 4.5.

[16] "Automatic Meter Management: The future has already started", Enel presentation, June 8, 2004.

finds the options available are impractical. Board staff invite comment from stakeholders on the advisability of bi-directional communication.

6 OWNERSHIP

Currently, retail metering is a non-contestable function of the distributor. All meters belong to the distributor, even if consumers have made a capital contribution, and meter charges are included in the distribution charge by customer class.

In many jurisdictions where the electricity industry has been restructured, meter provision and service have been made contestable. Competition in meter provision is expected to drive innovation and competition in meter service is expected to lower prices. So far, some of these jurisdictions have found little movement in meter provision or service particularly among residential consumers.

> [Legislation] places the supplier under an obligation to provide a meter to a customer, except where the customer provides, with the supplier's agreement, his own. Currently most suppliers obtain service from the 'in area' DNO [Distribution Network Operator]...[17]

Other structural barriers in these markets may be causing the slow development of competition. Meter contestability may be desirable in Ontario to help achieve the smart meter targets.

The Board invites comment on the issue of contestability of meter service and provision, potential barriers and potential solutions.

[17] "The provision of metering services by new electricity distribution network operators: Decision document", Ofgem, June 2004, p. 1.

7 OTHER CONSIDERATIONS

7.1 Measurement Canada requirements

Measurement Canada has announced its policies on time of use metering and is preparing specifications for multi-rate register functions, the regulation of telemetering, requirements for the location of the display of measurement data and the establishment and apportionment of legal units of measurement outside of an approved electricity and gas meter.[18]

Some of the relevant policies include:

- With regard to the use of a meter's interval or load profile metering functions in association with telemetering devises in electricity and gas measurement for the purpose of establishing a legal unit of measure outside of an approved meter, such functions must be processed and recorded in approved devices.
- Considerations for interval data include that the combined energy and timestamp information must be retained in an approved meter until in has been downloaded and that the source meter must contain an interval storage register which records cumulative energy consumption.
- Where telemetering devices are used to transmit electricity or gas measurement data from an approved meter which incorporates a single energy register, and this information is used for the purpose of allocating a unit cost to a specific measured quantity, Measurement Canada proposes that this practice can be deemed to fall outside of the Agency's mandate.

[18] "Summary of Project, Proceedings, Revised Policies, and Further Considerations", Guy Dacquay, Measurement Canada, September 5, 2003. (Http://strategis.ic.gc.ca/epic/internet/inmc-mc.nsf/en/h_lm03261e.html.

- Regarding the display of multi-rate measurement information for consumer use, the measurement of time alone would not be regulated by Measurement Canada as this is deemed to fall outside its mandate.

7.2 Production and Installation

The installation schedule estimated in Table 1 is significant. Meters must be produced, verified in accredited meter shops according to Measurement Canada standards and installed. The associated systems changes must also be made.

For comparison, Enel in Italy is installing 40,000 meters per month. There are 7000 people involved in production and installation. Enel established training and qualifications for installers.

The Board invites comment on the production and installation requirements to meet the government policy targets.

8 NEXT STEPS

8.1 Phase I: Interest and Comment

The Board announced its approach to fulfilling the Directive on July 19, 2004 through a letter to stakeholders and posting to its public website. The Board invited participation in consultations. Stakeholders have until August 3, 2004 to reply. Please see the web-site under Regulatory Calendar | Active OEB Key Initiatives | Smart Meter Initiative for the letter and instructions on how to express interest.

All interested stakeholders will be contacted at each stage of the consultation.

Board staff have issued this discussion paper to all interested stakeholders to set the scope of the project and identify issues. The Board invites comment on any aspect of the project. Instructions for filing comments are also in the above letter.

8.2 Phase II: Working Group

A small sub-group of representative stakeholders will form one or more working groups. Staff and stakeholders will discuss and expand on the issues to develop implementation plan elements for the Board's consideration. Written materials and meetings are anticipated.

Working group(s) will meet from August through October, 2004.

8.3 Phase III: Draft Report of the Board

The Board will release its draft implementation plan in mid-November for general stakeholder written comment by mid-December 2004.

The Board's implementation plan will be delivered to the Minister by February 15, 2005.

APPENDICES

A Glossary

Critical Peak Pricing (CPP)	Typically under critical peak schemes, there are set peak and off-peak price levels. In addition, prices for energy in a limited number of critical periods may be several times normal rates. These periods are identified 24 hours in advance and may be for the full peak period or may only include the afternoon and early evening hours.
Demand response	Actions that result in short-term reductions in peak energy demand.
Demand-side management	Actions which result in sustained reductions in energy use for a given energy service, thereby reducing long-term energy and/or capacity needs.
Display	A device which provides a visual representation of measurement quantities and other relevant information.
Dynamic Pricing	The sale of electricity to a consumer based on prices that change with time. This may be Real Time pricing, prices that change based on defined criteria or critical peak pricing.
Energy conservation	Any action that results in less energy being used than would otherwise be the case. These actions may involve improved efficiency, reduced waste or lower consumption, and may be implemented through new or modified equipment or behaviour changes.

Energy efficiency	Using less energy to perform the same function. This may be achieved by substituting higher-efficiency products, services, and/or practices. Energy efficiency can be distinguished from demand-side management in that it is a broad term that is not limited to a particular sponsor such as a utility, a retailer or an energy services company.
Fixed pricing	The sale of electricity for a price that does not vary with time. The current two-tier price is a fixed price since the criterion is usage-based rather than time-based.
Hourly Ontario Energy Price (HOEP)	The electricity energy price determined by the IMO on an hourly basis by a straight average of the applicable 5 minute Market Clearing Prices.
Interval metering	An application which uses a time-stamping method to apportion energy consumption to a specific time period. The energy data is provided in the form of pulses which represent a specific quantity. As the consumer demand for electricity changes, the meter continuously monitors the energy and generates and /or records pulses proportional to the purchaser consumption. At preprogramed and predetermined intervals the device emits a time pulse or markets the data stream. This data is now interval data. This interval will never have another pulse added by the meter.
Load profile metering	An application which uses a series of consumption data for each interval over a particular time period. The load profile may be considered either as an average load (kW) or total consumption for each interval, and may be used in a time-related electricity demand application.

Load management	Activities or equipment to induce consumers to use energy at different times of day or to interrupt energy use for certain equipment temporarily in order to meet the objectives of reducing demand at peak times and/or load shifting from peak to off-peak.
Net system load shape (NSLS)	The hourly demand curve of a specific distributor once all interval metered loads have been removed. The distributor may have one NSLS or several based on rate classes.
Real Time pricing	The sale of electricity of gas based on rates which can be changed at any given time.
Real-time Energy Market (RTEM)	The IMO administered electricity market.
Telemetering system	All devices an equipment use to interpret source electricity or gas meter information at a distance.
Telemetering device	A device used in a telemetering system to duplicate the register reading of the source meter. Examples of electricity and gas telemetering device types include: - pulse generators and recorders (mechanical and electronic), - totalizers, - duplicators, - prepayment devices, - automatic meter readers and - remote registers.

Time-of-use	The sale of electricity or gas based on rates established for certain times and seasons. A TOU function records the usage of electricity at certain times of the day over the length of the billing or meter-reading period. The TOU function has a pre-selected number of rate bins or registers. Each rate bin would have daily energy consumption accumulated with no specific time stamp, except that the consumption was recorded during a predetermined and pre-programmed time period.

B Potential Opportunities, Options and Potential Benefits

New Metering Technology Working Group Interim Report

May, 2002

The traditional purpose of metering has been the measurement of energy use. A number of additional functions have been added even to simple meters over time. Modern metering can offer a wide range of energy and non-energy benefits in addition to these traditional functions. The examples listed are split into the primary benefits, those specifically metering and energy related. The secondary benefits are other potential services for households that could be provided via advanced metering as they do not require abroadband connection, but could also be delivered through alternative technology. The majority of the example of primary benefits are covered by the DTI report, ‘Smart Metering Working Group Report’, Oct 2001.

Potential Opportunity/ Option/ Benefit	**Beneficiary**	**Party Driving Change**
PRIMARY BENEFITS		
Load Management, direct control of peak and off peak load allows customers peak and off peak loads to be switched on at the most convenient times.	Customer/ NGC/ Transco/ Distributor	Supplier/ Distributor
Embedded Generation, the benefits of which should be reductions in Carbon Dioxide emissions and increased energy efficiency. Bi-directional metering would aid in Settlements for these sites.	Customer /Environment	DTI/ DEFRA
Automatic monitoring of Supply Failure and restoration to inform a distribution business if a customers premises looses electricity supply.	Customer/ Distributor/ Supplier/ Transco	Distribution Business

Energy Efficiency and providing data on usage to customers can lead to greater energy efficiency and reduced carbon dioxide emissions.	Customer /Environment	DTI through Supplier/ DEFRA
Providing Balancing Services to NGC. New Metering Technology would offer potential for improved demand-side participation in Balancing Mechanism due to improved knowledge of consumption levels.	NGC/ Supplier/ Customer/ Transco	Supplier
Metering information services – cost of gas and electricity at peak times	Customer/ / Supplier	Supplier
Potential Opportunity/ Option/ Benefit	**Beneficiary**	**Party Driving Change**
Opportunity to have more functionality in the metering system because ‘objects’ between the meter and the data controller can be changed for example the tariff.	Customer/ Supplier	Supplier/Distributor/ Transco
Reduction in the use of estimates	Supplier/Customer	Supplier
True tokenless pre-payment metering can take place	Supplier/Customer	Customer/Supplier
Flexible tariffs/ pricing packages where smaller customers can respond to different time of use prices.	Customer	Supplier
Credit/ Prepayment Switching without changing meter	Customer	Supplier
Dual fuel metering can reduce cost of meter provision, data collection and standing charge to customer.	Customer/Supplier	Supplier/ Customer/Ofgem
Potential Reduction in Site Visits	Supplier/Customer	Supplier
Changes in system status (i.e. flow/tamper) can be detected immediately	Supplier/ Distributor/ Transco	Supplier

Enhanced management of overall power network	Distributor/ Transco/ Customer	Distributor/ Transco
Improvement to Change of Supplier Process	Customer/ Supplier	Supplier
SECONDARY BENEFITS		
Internet Connectivity via a meter	Customer	Supplier/ Other Vendors
New Technology would enable more information to be accessed via meters, for example, internet connection (gateway), banking security (Broadband)	Customer/ Supplier/ Distributor/ Other Vendors	(Banking)Supplier/ Other Vendors (Banking)
Appliance Monitoring for home appliances, for example monitoring of food supplies in a fridge and automatically ordering more food when supplies are low.	Customer	Supplier with other Vendors/ Appliance Manufacturers
Home Security and Monitoring of for example temperature, smoke.	Customer	Customer/ Other Vendors
Potential Opportunity/ Option/ Benefit	**Beneficiary**	**Party Driving Change**
Home Control, for example remotely controlled drawing of curtains, switching on lights, heating, turning on the oven, door monitoring and entry	Customer/ Supplier/ Distributor/ Other Vendors	Customer/ Other Vendors
Alert facility, for elderly people to call for assistance from a remote alarm carried with them linked to a metering system to pass the alarm onto the relevant person.	Customer	Department of Health/ Social Housing Providers
Health Monitoring enabling patients whom would otherwise have to stay in hospital to be monitored at home.	Customer	Department of Health
If load separation can be carried out effectively there can be positive effects on fuel poverty.	Customer	DTI/ DEFRA

Benefits beyond gas and electricity – cannot be predicted	Customer	Other Services

*Some of these opportunities and benefits already exist using advanced metering in other countries (for example Italy and Germany), such as monitoring of the elderly.