Manitoba Hydro

PO Box 815 • Winnipeg Manitoba Canada • R3C 0G8
Street Location for DELIVERY: 22nd Floor - 360 Portage Avenue
Telephone / *N° de téléphone:* (204) 360-3468 • Fax / *N° de télécopieur:* (204) 360-6147
mmurphy@hydro.mb.ca

February 2, 2010

PUBLIC UTILITIES BOARD OF MANITOBA
400-330 Portage Avenue
Winnipeg, Manitoba
R3C 0C4

ATTENTION: Mr. H. M. Singh, Acting Secretary and Executive Director

Dear Mr. Singh:

RE: CENTRA GAS MANITOBA INC. ("CENTRA")
ADVANCED METERING INFRASTRUCTURE

On September 16, 2009 the Public Utilities Board issued Order 128/09 with respect to Centra's 2009/10 & 2010/11 General Rate Application in which it directed Centra to file a business plan with respect to Advanced Metering Infrastructure ("AMI"). In Centra's 2010/11 Cost of Gas Application, filed December 23, 2009, Centra provided information in response to this directive in Tab 9 of the Application and advised of its intentions to file a status report on AMI.

The status report, included as an attachment to this letter, provides Centra's findings and results of the AMI pilot project, an assessment of the anticipated feasibility of current AMI product costs and benefits, and future technical factors and considerations which may impact the feasibility of the business plan in the future.

Centra is mindful of the PUB's direction and requirement to submit a business case prior to deployment of further AMI investment. Preliminary evidence and a thorough examination of the AMI industry suggests circumstances may develop in the future which will enhance the feasibility of this technology. Centra is therefore providing the enclosed status report and will keep the PUB apprised if future developments warrant revisiting of further AMI investment.

Should you have any questions regarding this submission, or prefer a paper copy, please contact the writer at 360-3468 or Greg Barnlund at 360-5243.

Yours truly,
MANITOBA HYDRO LAW DEPARTMENT
Per:

M Murphy

Marla D. Murphy
Barrister and Solicitor
Att.

Cc: Mr. B. Peters, Fillmore Riley
Mr. R. Cathcart, Cathcart Advisors Inc.
Mr. B. Ryall, Energy Consultants Inc.

EXECUTIVE SUMMARY

The current state of technology pricing, functionality and associated benefits of an Advanced Metering Infrastructure (AMI) solution for natural gas metering in Manitoba does not support an overall deployment strategy at this time. Manitoba Hydro will continue to monitor the AMI industry and through discussions with industry associations and vendors encourage improved functionality and lower pricing. When Manitoba Hydro can reasonably demonstrate an overall favorable strategy for the deployment of an AMI technology solution, Centra will provide a business case to the Public Utilities Board, prior to proceeding beyond the pilot project expenditures, as directed in Order 128/09.

What is AMI?

Advanced Metering Infrastructure (AMI) refers to systems that measure, collect and analyze energy usage from advanced devices such as electricity meters, gas meters, and/or water meters, through various communication media on request or on a pre-defined schedule. The network between the measurement devices and business systems allows information to be communicated from the meter to the utility and from the utility to the meter.

Preliminary Results - Benefit Assessment

Preliminary examination of the projected benefits and costs of an AMI solution for the natural gas system do not support deployment at this time. Under current product costing and functionality, Centra is projecting a net cost for natural gas AMI in Manitoba.

Preliminary examination of the projected benefits and costs of an AMI solution for Manitoba Hydro's electric system appear positive. Under current product costing and functionality, Manitoba Hydro is projecting a net benefit for electric AMI in Manitoba.

When natural gas and electricity net benefits are combined, preliminary examination projects a small net benefit.

The cost to install AMI equipment, software, hardware, and communication is considerably higher than the cost to install the more established Automated Meter Reading (AMR) technology for both natural gas and electric systems. However, the AMI functionality for electric systems is considerably more enhanced than that provided by the AMR systems while current AMI functionality for natural gas systems is only slightly more beneficial than offered by AMR.

Manitoba Hydro will continue to monitor the market and through discussions with industry associations and vendors encourage improved functionality and lower pricing.

Summary of Pilot Findings

The purpose of the AMI pilot project was to assess the latest technology solutions for operability and functionality in Manitoba's climate and service territory and to explore the impact of an automated meter communication system on Manitoba Hydro's overall operations and information systems.

In January 2007, Manitoba Hydro began implementation of its AMI pilot project. Under the pilot, 4,500 pre-production Itron OpenWay electricity meters and 950 co-located Canadian Meter natural gas meters retrofitted with the Itron OpenWay Index were installed within Winnipeg and 198 Itron Centron electricity meters equipped with Cannon PowerLine Carrier technology were installed near Landmark, Manitoba. In Winnipeg, the pilot used Itron's latest wireless communication technology, the OpenWay meter. In rural Manitoba, the pilot used Cannon's established powerline carrier communication technology. The powerline system offers many similar features as the wireless system, but is more suited to regions with sparse population density.

Itron's Enterprise Edition Meter Data Management (MDM) and OpenWay Collection Engine systems were installed to store and manage the data. The MDM stores data from both Itron and Cannon meters and provides the OpenWay remote disconnect/reconnect function. The OpenWay Collection Engine controls reading and other communications with the meters.

The urban and rural AMI systems were tested to validate features available with the advanced meters. Both systems passed all required electric system tests. However, operational testing of the electric Itron OpenWay meters found that less than 10% of natural gas meters communicated with the electricity meters provided for the pilot project. Communication was possible only in situations where the natural gas meter was directly in the electricity meter's line of sight. Due to the fact that the units were pre-production models, there were different vintages of the ZigBee RF communication protocol in Itron's electricity and natural gas meters. Itron has made additional changes to the ZigBee RF communication with the newly released R7 electric OpenWay meter and these units were tested in Manitoba Hydro's Meter Shop during the summer of 2009. Testing confirmed the improved communication capabilities over significant distances and obstacles.

The pilot was effective in that Manitoba Hydro accomplished its objective of successfully installing an urban RF AMI system and a rural PLC system and exploring the available functionalities. Through the pilot, Manitoba Hydro has confirmed that moving to a broader deployment of an AMI solution for Manitoba Hydro's electricity and natural gas systems may offer significant benefits. The pilot project demonstrates that the technologies supporting an electric and natural gas solution are still evolving and that Manitoba Hydro has the opportunity to benefit from experiences in other jurisdictions.

As more of the larger utilities purchase, use and enhance the AMI solutions, Manitoba Hydro anticipates that:

- the unit cost of production AMI meters will decrease,
- options and functionality will increase, and
- many of the anticipated benefits will be validated.

Industry

To date, the main focus of market development for AMI has been for electric systems, with offerings for water and natural gas systems being limited primarily to meter reading.

Provincial and state government energy policies are driving AMI adoption in other jurisdictions. In those jurisdictions AMI is viewed as a means of addressing significant forecasted electricity capacity and supply constraints. Utilities appear to be investing in AMI in those jurisdictions (particularly in the United States) where utilities are capacity constrained and where government funding has been made available to support Smart Grid infrastructure investment.

Generally speaking, most natural gas utilities are not pursuing AMI at this time. Those choosing to invest in metering systems are either deploying AMR for the first time or enhancing their existing AMR system. Publicly available information suggests that some natural gas utilities, such as Terasen Gas in British Columbia and Alabama Gas Corporation in Alabama, are pursuing Mobile AMR technologies. Where legislative support exists allowing for investment recoveries, some utilities, such as the Southern California Gas Company, are investing in AMI for their natural gas system.

Future in Manitoba

AMI for electricity and natural gas services offers considerable potential for enhanced customer service offerings. Due to the significant investment and commitment required under an AMI deployment, Manitoba Hydro will require further confirmation of the anticipated future benefits and a more detailed analysis of the project risks before a strategy and supporting business case can be completed.

When a substantive business case supporting AMI can be achieved, Corporate approval of the strategy, budget and schedule will be sought. Following that approval, Centra will submit its business case to the PUB. The cost consequences of any subsequent deployment of AMI for the natural gas business will be addressed in subsequent General Rate Applications brought forth by Centra.

TABLE OF CONTENTS

1.0 Status Statement

The current state of technology pricing, functionality and associated benefits of an Advanced Metering Infrastructure (AMI) solution for natural gas metering in Manitoba does not support an overall deployment strategy at this time. Manitoba Hydro will continue to monitor the market and through discussions with industry associations and vendors encourage improved functionality and lower pricing. When Manitoba Hydro can reasonably demonstrate an overall favorable strategy for the deployment of an AMI technology solution, Centra will provide a business case to the Public Utilities Board prior to proceeding beyond the pilot project expenditures as directed in Order 128/09.

2.0 Background

2.1 Current Meter Reading Practice

Manitoba Hydro outsources the majority of its meter reading requirements to Manitoba Hydro Utility Services (MHUS), a wholly owned subsidiary of Manitoba Hydro. Generally, a customer's meter is manually read by MHUS staff every second month. Meter readers typically use portable hand-held devices to enter meter read data. Bills are presented to customers on a monthly basis and thus a bill based upon estimated consumption is prepared for the months in which meters are not read.

In addition, Manitoba Hydro has over 74,000 "self read" customers who are asked to provide regular meter readings. These customers are primarily located in low density, rural areas of the Province.

2.2 What is Advanced Metering Infrastructure (AMI)?

Advanced Metering Infrastructure (AMI) refers to systems that measure, collect and analyze energy usage from devices such as advanced electricity, natural gas and/or water meters through various communication media on request or on a pre-defined schedule. This infrastructure includes hardware, software, communications systems, associated customer information and billing systems and meter data management (MDM) software.

AMI is notably characterized as a system that facilitates two-way communication between customers and the utility. The network between the measurement devices and business systems allows information to be communicated both from the customer to the utility and from the utility to the customer. This enables customers to either participate in, or provide, demand response solutions, products and services. By providing information to customers, the system can assist a

change in energy usage from their normal consumption patterns, either in response to changes in price or as incentives designed to encourage lower energy usage use at times of peak-demand periods or higher wholesale prices or during periods of low operational systems reliability.

2.3 Technology Options

Automated Meter Reading (AMR) represents meter reading technologies with one-way communication of the meter data. Advanced Metering Infrastructure (AMI) represents technologies that provide two-way communication from the utility to the meter and the meter to the utility.

2.3.1 Mobile AMR

Under this configuration, an electronic receiver/transmitter (ERT) meter communicates a reading to a mobile unit, either a person walking by with the handheld unit or a vehicle driving by with a personal computer. As the mobile unit passes the meter, it sends a signal to "wake-up" the meter, and then the meter sends the reading.

2.3.2 Fixed Network AMR

Under this configuration, the meter communicates a meter reading over a communication network (e.g. radio frequency, telephone, cellular, powerline carrier, etc) when it receives a signal to "wake-up". This system supports one way communication from the meter to the utility.

2.3.3 Fixed Network AMI

Under this configuration, data communication is two-way. Both the utility and the meter communicate over a communication network (e.g. radio frequency, telephone, cellular, powerline carrier, etc) with data able to move from the meter to the utility and from the utility to the meter.

3.0 Manitoba Hydro AMI Pilot Project

Developments in the communication technology and functionality of AMR and AMI have increased the potential benefits. Manitoba Hydro has and continues to explore the feasibility and business justification for automating meter communication.

3.1 Pilot Project Objectives

The purpose of the AMI pilot project was to assess the latest technology solutions for operability and functionality in Manitoba's climate and service territory, and to explore the impact of an automated meter communication system on Manitoba Hydro's overall operations and information systems.

3.2 Pilot Project Background

In 2004, Fixed Network AMR technologies appeared to be highly promising and Manitoba Hydro proposed to explore this opportunity under a pilot project, looking at the best technology solutions available for Manitoba Hydro's operating conditions and business environment.

In May 2006, prior to pilot initiation, Itron introduced the OpenWay Advanced Metering Infrastructure (AMI) concept to replace their Fixed Network AMR product. Although not commercially available, the OpenWay AMI meters offered more potential benefits. The additional benefits of the AMI system included a two-way communication network that could be utilized not only for electric and natural gas meter communication but also for home area network and potentially water meter reading and distribution automation. Other features fully incorporated within the physical meter included the ability to remotely load limit, disconnect, and reconnect meters.

In January 2007, an agreement for the pilot project was signed by Manitoba Hydro and Itron Canada Ltd to explore a hybrid solution for Manitoba. Under the pilot agreement, up to 5,000 pre-production wireless Itron OpenWay electricity meters and 1,000 co-located Canadian Meter natural gas meters retrofitted with the Itron OpenWay Index were to be installed within Winnipeg and up to 200 Itron Centron electricity meters equipped with established Cannon PowerLine Carrier technology were to be installed near Landmark, Manitoba. The powerline carrier (PLC) system offers many similar features as the wireless system, but is more suited to regions with sparse population density. Itron and Cannon were co-operative business partners.

The pilot ended in the summer of 2009 with the laboratory testing of the improved communication capabilities of the new production ready Itron OpenWay R7 electric and natural gas meters.

3.2 Pilot Project Technical Infrastructure

Under the pilot, approximately 4500 Itron OpenWay Radio Frequency (RF) electricity meters and cellular telephone relay meters were installed in higher density areas of central Winnipeg (i.e. North River Heights, West End, North End, West Kildonan and Maples). In addition, approximately 950 Canadian Meter natural gas meters equipped with the Itron OpenWay RF Indexes were installed at locations with the OpenWay electricity meters. The electricity meters communicated with the natural gas meters through a 2.4GHz Zigbee[1] RF.

[1] ZigBee is a specification for a communication protocol using small, low-power digital radios based upon an IEEE standard.

In addition, 198 Itron Centron electricity meters equipped with Cannon PowerLine communication technology were installed in the area outside of Landmark, Manitoba to test their suitability in low density rural areas.

Itron's Enterprise Edition Meter Data Management (MDM) and OpenWay Collection Engine systems were installed in order to store and manage the data. The MDM stores data from both Itron and Cannon meters and provides the OpenWay remote disconnect/reconnect function. The OpenWay Collection Engine controls reading and other communications with the meters.

3.4 Pilot Project Findings

Manitoba Hydro accomplished its objectives of successfully installing an urban RF AMI system and a rural PLC system and exploring the available functionalities of automated meter communication.

3.4.1 Technical Performance

Technical testing of the electric and natural gas AMI systems were undertaken through the pilot project.

Electric AMI Meters - The urban and rural AMI systems were tested to validate features available with the advanced meters. The urban OpenWay System from Itron passed all tests. The Power Line Carrier system from Cannon did not include the remote load limiting, disconnection and Time of Use (TOU) metering function that was available with the Itron OpenWay Models.

Testing for both the urban and rural systems included an evaluation of the read reliability rate, read accuracy, on demand read, read retrieval, end point voltage, net metering, time synching, outage status, and tamper flags. The urban system testing also included disconnect/reconnect, load limiting, and TOU rates functionality.

Natural Gas AMI Meters - Operational testing of the electric Itron OpenWay meters found that less than 10% of natural gas meters communicated with the AMI pilot electricity meters. Communication was possible only in situations where the natural gas meter was directly in the electricity meter's line of sight. Due to the fact that the units were pre-production models, there were different vintages of ZigBee RF communication protocols in Itron's electricity and natural gas meters. Itron has made additional changes to the ZigBee RF communication with the newly released R7 electric OpenWay meter and these units was tested in Manitoba Hydro's Meter Shop during the summer of 2009. Testing confirmed the improved communication capabilities over significant distances and obstacles.

Home Area Network Devices - Operational testing of the OpenWay collection engine was also undertaken during the summer of 2009 within a lab setting for commercially available Home Area Network Devices, such as thermostats, displays and load controllers. Laboratory results showed that the collection engine could communicate temperature or cycling commands to thermostats, information messages to the displays, and on/off commands to the load controllers.

3.4.2 Implementation Findings

Manitoba Hydro gained valuable knowledge and experience with regards to the process of implementing the technology infrastructure to support an AMI system in Manitoba. This experience included coordinating a large number of meter exchanges for both electric and gas, setting up the MDM and collection engine for managing data, operating the MDM and collection engine, and communicating consistent messages with staff and customers to support the deployment.

Through the pilot, Manitoba Hydro was able to experience many of the enhanced functions offered by an AMI system. Manitoba Hydro was able to:

- Receive accurate electric readings and events,
- Store and review regular electric data population in the MDM system,
- Update meter firmware remotely
- Disconnect/reconnect and load limit electricity meters remotely,
- Identify electric supply issues through blink counts,
- Identify occurrences of concern through volt and tamper detection, and
- Better define process and operational impacts of automated meter communication.

3.4.3 Lessons Learned

Through the pilot project a number of learnings were highlighted which should be taken into consideration prior to a broader deployment of this type of technology solution:

- Technologies and software will continue to evolve over the implementation period of a broader deployment, therefore, the utility must recognize this and factor into the AMI solution chosen;
- Infrastructure cost of AMI is greater than that of AMR;
- Deployment timelines may be affected by delays in Measurement Canada approvals on “next generation” or evolving technology meters;
- It may be more cost effective and may result in less customer disruption in the course of implementation if the Corporation obtains Measurement Canada certification for field exchange and resealing of natural gas indices;
- Purchasing commercialized production meters provides operational benefits and reduces project risks;
- Technology costs or the available functionality of natural gas AMI offerings may change such that the systems may become more cost effective;

- An internal and external communication plan is important for successful implementation;
- A designated workforce is required to support effective mass deployment; and
- A well defined and flexible data communication configuration is required to ensure effective and consistent communication now and in the future (e.g. data priority on cellular communication networks, optimal location for cell relays).

While moving to full deployment of an AMI solution for Manitoba Hydro's electricity and natural gas systems may offer significant benefits, the experience of the pilot project demonstrates that the technologies supporting an electric and natural gas solution are still evolving and that Manitoba Hydro has the opportunity to benefit from experiences in other jurisdictions.

As more of the larger utilities purchase, use and enhance the AMI solutions, Manitoba Hydro anticipates that:

- the unit cost of production AMI meters will decrease,
- options and functionality will increase, and
- many of the anticipated benefits will be validated.

4.0 The AMI Industry

To date, the main focus of the marketplace for AMI has been for electric systems, with offerings for water and natural gas systems being limited to meter reading.

4.1 Government Perspectives

Provincial and state government energy policies are driving AMI adoption in other jurisdictions, with the focus on managing electricity capacity concerns. Ontario and British Columbia have established provincial policies on the implementation of AMI as a means of alleviating significant forecasted electricity capacity constraints. Both Ontario and British Columbia have mandated the implementation of smart meters. Ontario was the first province to mandate implementation with the focus of the technology being to allow for measurement in hourly intervals, data storage, and transmission of meter readings to a central billing system on a daily basis for customer access and billing purposes. British Columbia was the second province to mandate implementation. BC Hydro received proposals for an AMI solution in July 2008; however, as of January 2010 a contract has still not yet been awarded. Alberta has not mandated implementation of smart metering at this time; however, they have established a provincial energy strategy supporting adoption.

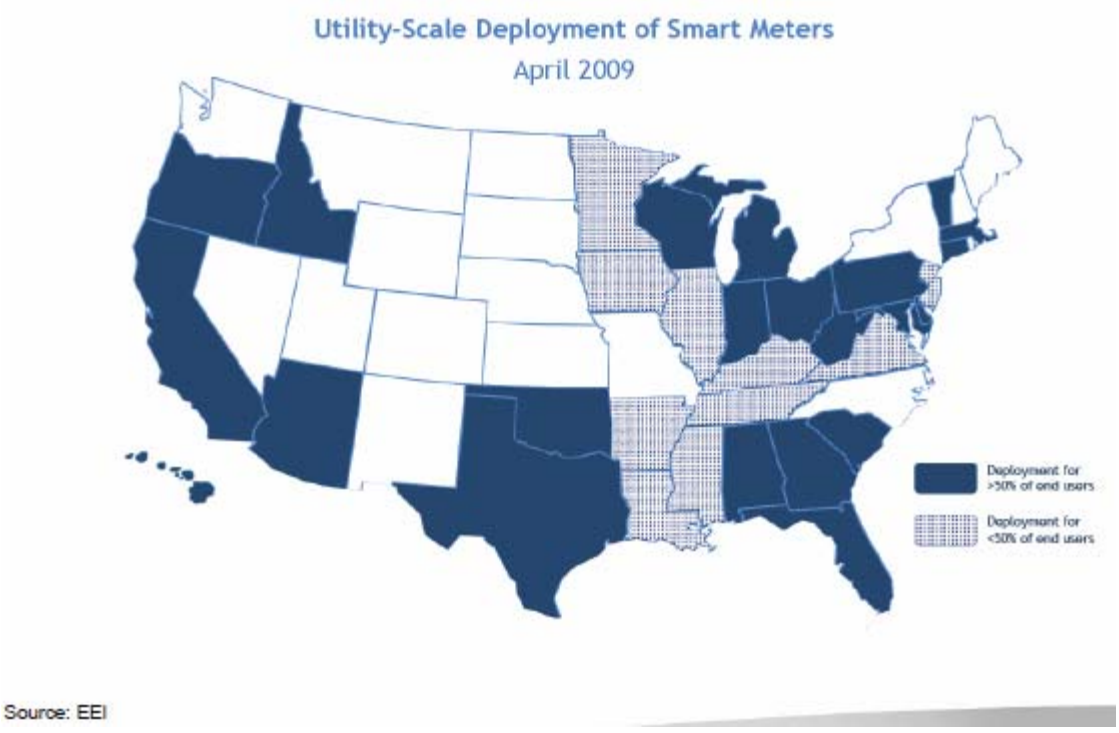
Manitoba and Quebec do not face the same immediate electricity capacity constraints. As such, the business case supporting AMI in Manitoba is based upon

reductions in operating costs and improved revenue collection, not demand reduction or avoided generation costs. Hydro Quebec has initiated a pilot project, targeted to end in March 2010, to assess the benefits of TOU metering and rates and critical peak pricing within their market. At this time, Hydro Quebec has not determined whether the additional functionalities of AMI will provide benefits which offset the costs of AMI infrastructure.

4.2 Utility Perspectives

The direction of electric, natural gas and combined electric/gas utilities differs as a result of differences in the local market situation and business environment from jurisdiction to jurisdiction.

- *Electric Utilities*: In the United States, several electric utilities are implementing AMI systems, particularly in situations where there are electricity capacity constraints and where government funding is available to support Smart Grid infrastructure installations. This is evident in several jurisdictions across the United States (refer to Figure 1.1). Examples include Southern California Edison and Sacramento Municipal Utility District in California and Georgia Power in Georgia. In Canada, the largest area of deployment is in Ontario where energy policies support infrastructure investment and includes adoption by utilities such as Toronto Hydro, Power Stream, Horizon and Hydro One.



- *Natural Gas Utilities*: Most natural gas utilities are not pursuing AMI at this time. Publicly available information suggests that some natural gas utilities, such as Terasen Gas in British Columbia and Alabama Gas Corporation in Alabama, are still pursuing Mobile AMR technologies. Where legislative support exists allowing for investment recoveries, some utilities, such as the Southern California Gas Company, are investing in AMI for their natural gas system.

- *Combined Electric/Gas Utilities*: Where utilities are capacity constrained and where government policy or funding supports exist, utilities are exploring AMI systems. Some utilities which had already converted to mobile AMR, such as Xcel Energy in Minnesota, are investing in AMI for their electric system and planning to enhance their existing AMR system for natural gas.

4.3 Vendors/Suppliers

The main focus of meter manufacturers for AMI systems has been on electricity. This focus arises from demand in larger markets, such as California, the northeastern states and Ontario, where electric utilities are facing significant capacity constraints and where state and provincial governments have mandated Smart Metering requirements. Most regions facing these circumstances are pursuing TOU Rates and Critical Peak Pricing to provide customers with the appropriate price signals as to the cost of providing power. AMI provides these utilities with the ability to measure energy usage by time periods and bill the customer accordingly with the goal of shifting energy use to off-peak periods.

Prior to Manitoba Hydro undertaking a broader implementation of AMI the Corporation will pursue a competitive bid process to obtain the most beneficial combination of pricing and enhanced functionality. A number of consultants, meter/equipment manufacturers, communication providers and software vendors operate within in the North American marketplace. These vendors/suppliers continue to enhance and expand their service offerings to meet the evolving needs of customers and utilities.

4.4 Product Functionality & Associated Benefits

As mentioned, the primary focus of vendor/supplier product enhancements and research/development to date has been in the area of electricity supply. This is evident in the list of available features.

Electricity Meters - The functionality and benefits available to Manitoba Hydro through the current electric AMI solutions are as follows:

- Regular Meter Readings
  - Reduced data collection costs

        - More frequent meter reading with fewer data entry errors
        - Interval readings
    - Customer Billing
        - Reduced lag in the "read-to-bill" cycle
        - Reduced costs associated with reductions in re-billing for meter reading corrections
    - Account Management (Remote disconnect/load limit/reconnect)
    - Tamper & Theft Detection
    - Customer Inquiry & Administrative Support
    - Distribution System
        - Locating intermittent faults
        - Voltage recording
        - Peak load data
        - Feeder outage detection
        - Ice melt switching

In addition, AMI is the leveraging technology that is expected to support the overall development of Smart Grid. The two-way communication and data exchange supports future product offerings, such as Home Area Networks, and will help utilities manage emerging system demands, such as plug-in hybrid vehicles, and distributed generation. For additional information on emerging matters, please refer to Section 6.0.

Natural Gas Meters - The functionality and benefits available to Manitoba Hydro through the current natural gas AMI solutions are as follows:

- Regular Meter Readings
    - Reduced data collection costs
    - More frequent meter reading with fewer data entry errors
- Customer Billing
    - Reduced lag in the "read-to-bill" cycle
    - Reduced costs associated with reductions in re-billing for meter reading corrections
- Account Management
- Tamper & Theft Detection
- Customer Inquiry & Administrative Support

As mentioned, to date, the AMI industry has invested less effort in enhancing functionality for natural gas AMI solutions when compared to electric AMI applications.

5.0 Costs & Benefits Assessment

Manitoba Hydro's approach to assess the feasibility of AMI in Manitoba is to ensure that the recommended direction will benefit ratepayers. As such, the benefits being examined are categorized as:

1. Financial - cost reductions and improved revenue streams.

2. Productivity/Operational - productivity improvements.
3. Qualitative - non-quantifiable benefits.

5.1 Preliminary Financial Assessment

In PUB Order 128/09, Centra was directed to file a business plan with respect to the AMI project by January 15, 2010, and prior to proceeding beyond the pilot project expenditures. The PUB indicated that the business plan should include an assessment of the economic and non-economic benefits of AMI, including safety-related matters, for both the meter reader and for Centra's customers. Although Manitoba Hydro and Centra have determined not to proceed with a formal business plan with respect to AMI expenditures at this point, the following information has been provided to the PUB to address the matters raised in Order 128/09.

Preliminary examination of the benefits and costs of an AMI solution for the natural gas system do not support deployment at this time. Under current product costing and functionality, Centra is projecting a net cost. The cost to install AMI equipment, software, hardware, and communication is considerably higher than the cost to install the more established AMR technology, with current AMI functionality being only slightly more beneficial than AMR.

Preliminary examination of the benefits and costs of an AMI solution for Manitoba Hydro's electric system appear positive. Under current product costing and functionality, Manitoba Hydro is projecting a net benefit. The cost to install AMI equipment, software, hardware, and communication is considerably higher than the cost to install the more established AMR technology; however, the AMI functionality for electric systems is considerably more enhanced than that provided by the AMR systems.

When natural gas and electricity net benefits are combined, preliminary examination projects a small net benefit.

Manitoba Hydro continues to detail project impacts and risks prior to providing a strategy and supporting business case for corporate review.

The current state of technology cost, functionality and associated benefits from an AMI solution for the natural gas system in Manitoba do not support an overall deployment strategy at this time. Manitoba Hydro will continue to monitor the developments in the AMI industry and through discussions with industry associations and vendors encourage improved functionality and lower pricing.

5.2 Productivity/Operational Benefits

Productivity benefits include reductions in the time that staff spend on meter reading, collection and inquiry support in situations where the reduction in those

activities could present opportunities for other valued-added work to be completed. Preliminary analyses suggest material productivity gains may be possible after full AMI deployment.

5.3 Qualitative Benefits

Qualitative benefits of implementing an AMI system in Manitoba would include improvements to customer and employee safety and reduction in environmental impacts.

Safety - Reduction in injuries and lost time for staff driving or walking on site to access meters to obtain meter readings.

Environment - Manual meter reading operations require meter readers to travel from location to location to perform readings. In the 2008/09 fiscal year, MHUS staff travelled approximately 734,000 km to perform meter reading activities. The adoption of AMI may significantly reduce this travel requirement, therefore resulting in an estimated annual reduction of approximately 250 tonnes of CO2 equivalent emissions.

6.0 Future Considerations

There are potential industry developments that may have an impact on the future feasibility of the implementation and operation of AMI systems for both natural gas and electric meters in Manitoba. Some of these developments are noted in the sections below.

6.1 Measurement Canada

- Manitoba Hydro may consider exploring the requirements necessary to obtain Measurement Canada accreditation to perform in-field retrofits and resealing of natural gas meters as the preferred approach under a broader deployment of a natural gas AMI solution.

- Measurement Canada has proposed changes to the requirements of their Compliance Sampling Program in order to improve the statistical validity of the sampling program. It is expected that these changes, if implemented, will substantially increase the number of electric and natural gas meters exchanged annually. Consequently the business case supporting AMI may become more favorable as the analysis may include only the incremental cost of installing the AMI meter versus non-AMI meters for a larger number of customers

6.2 Product Enhancements

The industry is recognizing that additional functionalities are required to further justify utility investment in natural gas AMI systems. Based upon discussions with industry participants, the following list of potential and preferred natural gas functionalities are being or are expected to be considered by AMI system vendors/suppliers:

- Pressure sensor devices on metering and regulation apparatus
- Corrosion detection devices
- Carbon Monoxide or natural gas emission detectors
- "Strained riser" detection devices
- Remote disconnect of the natural gas service
- Daily metering information to facilitate settlement with natural gas commodity supply contracts
- Distribution system load analysis and modeling
- Software to set min/max for typical use on a service and report unusual use to the customer and/or utility
- Software to use the more granular resolution on AMI meters to facilitate leak detection

Although industry participants have identified interest in these desired options, no AMI vendor has committed to delivery of any of these options within any specific time frame or cost. Recently, Itron announced that it is currently developing systems to allow their long-established Fixed Network AMR solution to gather pressure data and to monitor cathodic protection. It is anticipated, that once proven, this functionality will be configured to work within Itron's OpenWay natural gas AMI solution.

6.3 Time of Use Rates

As mentioned, the focus of AMI deployment is in jurisdictions facing electricity capacity constraints. Utilities are looking to TOU Rates and Critical Peak Pricing as one more tool to assist in managing these significant concerns.

The PUB has directed Manitoba Hydro to investigate the implementation of TOU electricity rates for large industrial customer classes, which already utilize sophisticated metering technology. Manitoba Hydro is currently investigating TOU rate alternatives for the 43 General Service Large customers with service of at least 30 kV. These customers are already equipped with MV90 interval metering.

TOU Rates and Critical Peak Pricing strategies are not required nor are they generally applicable to the natural gas industry and are therefore not a significant driver behind natural gas AMI implementation.

6.4 Smart Grid and the Application of AMI Technologies

The Smart Grid is a bi-directional electricity and communication network that provides the ability of the distribution and transmission systems to self diagnose and to adjust energy flows. It includes software and hardware applications for a dynamic, integrated, and interoperable optimization of electric system operations, maintenance, and planning; distributed generation interconnection and integration; and feedback and controls at the consumer level.

The ability of the system to self-diagnose and adjust energy flows will result in higher reliability and a reduction in restoration times. Service interruptions can create customer dissatisfaction and more specifically for commercial/industrial customers may have significant financial impacts such as lost productivity.

AMI is one of the enabling technologies supporting Smart Grid. AMI creates the critical link for the distribution system to interact with Home Area Networks (HAN) allowing the customer to access new technologies and energy service options. AMI provides customers with the ability to install HAN which interconnect appliances throughout the home and are capable of interacting on a real-time basis with the electric system infrastructure. This technology would allow customers to view, analyze and adjust their energy use patterns. AMI and HAN technologies provide the opportunity to present new choices for customers, such as TOU rates and the ability to modify energy consumption to limit peaks or shift loads and, in the future, integrate sources of renewable energy such as small wind and solar generation or supply energy to the grid from electric storage devices such as plug-in hybrid electric vehicles.

7.0 Conclusion & Next Steps

AMI for electricity and natural gas services offers considerable potential for enhanced customer service offerings. Due to the significant investment and commitment required under an AMI deployment, however, Manitoba Hydro requires further confirmation of the future benefits and a more detailed analysis of the project risks before a strategy and supporting business case can be completed.

Manitoba Hydro will continue to monitor the AMI industry, the progress of Measurement Canada changes and the emergence of additional natural gas functionalities. When a substantive business case supporting AMI can be achieved, corporate approval of the strategy, budget and schedule will be sought. Following corporate approval of the business case, project strategy and budget, Centra will submit a business case to the PUB. The cost consequences of any deployment of AMI for the natural gas business will be addressed in subsequent General Rate Applications brought forth by Centra.

Once approved, implementation of the AMI strategy will occur with the issuance of RFPs for equipment, installation, software, and consulting; the selection of consultants and vendors; and ultimately the implementation of the AMI technology solution.