



The Regional Municipality of Halton

Report To: Regional Chair and Members of Regional Council

From: Jim Harnum, Commissioner, Public Works
Mark Scinocca, Commissioner, Finance and Regional Treasurer

Date: June 20, 2018

Report No. - Re: PW-18-18/FN-25-18 - Long Term Water Meter Strategy

RECOMMENDATION

1. THAT the approach outlined in Report No. PW-18-18/FN-25-18 re: "Long Term Water Meter Strategy" be approved for Halton Region's long term water metering program.
2. THAT Regional Council authorize staff to initiate the development of a detailed implementation plan for the installation of a Region-Wide Advanced Meter Infrastructure System to be brought forward to Regional Council in mid-2019.
3. THAT the Regional Clerk forward a copy of Report No. PW-18-18/FN-25-18 to the City of Burlington, the Town of Halton Hills, the Town of Milton and the Town of Oakville for their information.

REPORT

Executive Summary

- In July 2016, Regional Council received for information Report No. PW-29-16/FN-22-16, re: "Long-Term Water Meter & Billing Strategy" for a long-term strategy for meter reading, billing, and replacement to ensure Halton Region's residential and Industrial, Commercial, Institutional (ICI) customers are provided with a reliable, sustainable, cost effective, and customer service focused metering and billing program.
- Water meters ensure that appropriate revenues are collected to fund the water and wastewater operating program, sustain high levels of service and ensure that the existing water and wastewater infrastructure is kept in a state-of-good repair. Accurate meters are also essential to provide fair billing for all of Halton Region's residential and Industrial, Commercial and Institutional customers.

- Halton Region retained EMA Canada Inc. to assist in the development of a Long Term Water Meter Strategy.
- The comprehensive review included consideration of industry and technology trends, benefits, and the experience of other large municipalities that have implemented new meter technologies such as Automated Meter Reading (AMR) or Advanced Meter Infrastructure (AMI) technology.
- AMI technology was found best suited to meet Halton Region's long-term objectives.
- Benefits of AMI technology include revenue protection, improved operational efficiency, enhanced customer service, improved distribution system performance monitoring and environmental benefits.
- In combination with the planned end-of-life meter replacement capital program, full AMI implementation can be accomplished in 3 years at an estimated additional cost of \$21.1 million and accommodated within the 10-year rate budget with minimal impact to the current rate forecast.
- With Regional Council's approval staff will initiate the development of a detailed implementation plan for Council's information anticipated for mid-2019 with AMI system implementation commencing in 2020.

Background

The basic function of a water meter is to log the amount of water consumed for fair and accurate billing of both water and wastewater services. As of December 31, 2017 Halton Region owned more than 159,500 water meters installed in residential and Industrial, Commercial and Institutional properties throughout the Region. Of this, there are approximately 8,300 meters installed in Industrial, Commercial and Institutional facilities and 151,200 installed within residential homes. These meters vary in size with the smaller meters, typically 40 mm or less, for residential homes and larger meters up to 250 mm, with associated higher flows and consumption for Industrial, Commercial and Institutional customers.

Water meters ensure that appropriate revenues are collected to fund the water and wastewater operating program, sustain high levels of service and ensure that existing water and wastewater infrastructure is kept in a state-of-good repair. Accurate meters are also essential to providing fair billing for all of Halton Region's residential and Industrial, Commercial and Institutional customers.

Water meter reading and billing is currently contracted out to the four Local Hydro Distribution Companies (LDCs). Halton Region and the LDCs continue to work cooperatively to provide timely and accurate water meter reading, billing and collection services to the benefit of our mutual customers. This cooperation includes on-going

quality assurance and quality control processes in order to ensure the billing and collections services are efficient and accurate.

Through Report No. PW-29-16/FN-22-16, Regional Council approved the Pulse Meter Replacement project and the Large Meter Maintenance and Replacement program to address immediate risks of inaccurate meters from outdated and/or inefficient meter technology and in that report, Council also approved the development of a Long Term Water Metering and Billing Strategy.

This report updates Regional Council on the Pulse Meter Replacement and Large Meter Maintenance projects and recommends a progressive Long Term Water Meter Strategy that meets the needs of Halton Region through leveraging technology to better serve the residential and Industrial, Commercial and Institutional customers for the present and into the future.

Pulse Meter Replacement Project Update

The Pulse Meter Replacement project was initiated in 2017 to accelerate the replacement of approximately 12,000 outdated pulse water meters that cannot be read electronically via touchpad. The number of pulse meters to be replaced was originally estimated to be 13,000 as per Report No. PW-29-16/FN-22-16. However, as a result of further field verification the total number of pulse meters replaced through this program has been updated to 12,000. With the cooperation of residential and Industrial, Commercial and Institutional customers across Halton Region the replacement project has been very successful with 93 per cent of the meters being replaced in approximately 8 months. The outstanding replacements will require additional coordination with individual residents and Industrial, Commercial and Institutional customers and it is anticipated that by the end of 2018 all pulse meters will have been replaced with high resolution encoder meters with touchpads. There have been very few customer complaints throughout the project.

Large Meter Maintenance and Replacement Project Update

As identified through Report No. PW-29-16/FN-22-16, larger water meters need to be maintained on a regular basis to ensure accuracy in billing, and to mitigate risk of potential revenue loss. Due to the larger water volumes and consumption that typically accompany larger water meter installations, inaccuracies can lead to significant revenue losses for the Region. The focus of this program is to ensure continued meter accuracy through site assessments, meter testing and calibration, as well as selective meter replacements where necessary. In the large meter category Halton Region's top 15 per cent of water consumers accounts for nearly 60 per cent of Halton Region's annual large meter water consumption.

In Halton Region approximately 625 meters are in the large meter category. As part of the site assessments, meters are identified for testing to confirm their accuracy. Meters that are not within acceptable accuracy ranges and that cannot be calibrated are then scheduled for replacement.

Since October of 2017, the program is progressing well with 80 per cent site assessments completed and 87 meter accuracy tests. Testing results concluded that approximately 15 per cent of tested meters were operating outside of accepted standards for accuracy. Inaccurate meters will be calibrated where possible and seven were identified for replacement to date. In addition, the site assessment can identify water meters that are the wrong type or size for the installation and contribute to inaccurate billing and 28 such meters were found and will be replaced in 2018.

Throughout the remainder of 2018, site assessments for the remaining large meters will be completed in addition to any necessary meter tests, calibrations and subsequent replacements.

Discussion

Halton Region requires a long-term strategy for meter reading, billing, and replacement that will ensure meter infrastructure will support radio frequency reading (remote) technology in the future. Water metering, reading and billing are critical components of Halton Region's service delivery. The Strategy will study how Halton Region can leverage new technology to help enhance customer service and reduce costs. Radio frequency reading technology provides more timely, accurate and consistent water meter readings and would address increased meter reading and billing frequency issues. Responsible water use and management will protect and enhance the water resources available to Halton Region.

To assist Halton Region in developing the Long Term Water Meter Strategy, EMA Canada Inc. was retained through a competitive process in mid-2017.

EMA Canada Inc. were tasked with reviewing the current state of Halton Region's water meter reading and billing programs, examining water meter industry and technology trends, researching the experience of other municipalities that have implemented new remote read meter technology and evaluated the benefits of leveraging new technology and providing appropriate strategy recommendations.

To guide the development of the long-term strategy a number of meter program objectives were identified as follows:

1. Maintain a consistent service level to meet or exceed customer expectations;
2. Enhance customer service through increased access to data, including consumption information, high consumption or stopped meter alerts and reliable accurate water consumption reading;
3. Improve customer self-service functionality;
4. Improve efficiency and reduce the cost of operations;
5. Improve data driven decision making; and
6. Maintain a reasonable water billing and reading cost.

EMA Canada Inc. completed a current state assessment by reviewing water meter billing data, meter work order history and records of issues and complaints.

The current meter technology in Halton Region requires meters to be read bi-monthly via touchpad for residential customers and read monthly via touchpad for Industrial, Commercial and Institutional customers. This involves a meter reader walking up to each residential and Industrial, Commercial and Institutional property to “touch” the reading device to the touchpad, which is located on the outside of the building. The touchpad is physically connected to the water meter inside the building by a wire, which transmits the meter read. Once the meter reading device has the data, the meter reader manually enters the read into a logging device before the information is finally sent to the LDC for billing.

Currently in Halton, approximately 1 million individual touchpad reads are conducted annually. Manually reading and inputting the data presents a risk of inaccurate reads and billings. In addition, inaccessibility of the meter or the touchpad leads to estimated reads and potential errors.

Implementation of radio frequency reading technology would significantly improve the ease with which meters are read, reading reliability, accuracy and access to data by replacing the need to manually conduct an individual touchpad reading and manually enter the read into a logging device. There are two main radio frequency reading technologies available today: Automated Meter Reading (AMR) and Advanced Metering Infrastructure (AMI).

Automated Meter Reading (AMR)

AMR technology eliminates the exterior touchpad and replaces it with an AMR radio transmitter. Typically, AMR and AMI radio transmitters are powered by a small battery within the transmitter with a life expectancy of approximately 20 years. Meter reads can be obtained at a distance versus physically contacting the touchpad. When in proximity, the reading device automatically records the meter reading that is being transmitted from the AMR radio on each residential or Industrial, Commercial and Institutional property. AMR technology is available in both walk-by and drive-by applications.

Advanced Metering Infrastructure (AMI)

AMI technology also eliminates the touchpad and replaces it with an AMI radio transmitter. With an AMI system, water meter readings are transmitted automatically from the residential or Industrial, Commercial and Institutional property via a radio Wide Area Network (WAN) to a system of data collectors placed strategically throughout the community. Data collectors are typically mounted on poles, towers or buildings and send water meter consumption data to a data warehouse or Meter Data Management software system for billing, reporting and analysis. Since the readings are captured remotely, manual or drive-by meter reading costs are eliminated. AMI systems can be configured to capture meter reading on a more frequent basis.

Benefits of Radio Frequency Reading Technology

EMA Canada Inc. conducted a review of the benefits of leveraging AMR and AMI technology and in meeting Halton Region's long-term objectives.

The benefits can be grouped broadly into the following categories:

- Revenue protection;
- Operational efficiency;
- Enhanced customer service;
- Improving distribution system performance; and
- Environmental benefits.

Revenue Protection

AMR and AMI technology can both be used to protect Halton Region from revenue losses from manual read errors and/or inaccurate read estimates. Consumption data trends can be analyzed either manually or through Meter Data Management software to detect stopped and slowing meters, tampering, and backflow events. The on-demand nature of AMI technology means that data is more readily available without having to visit the meter to download or collect data as would be required with AMR technology and therefore has distinct advantages over AMR. With AMI, customers can also be alerted earlier to abnormal high water consumption, which may mitigate write-offs and or severity of bill disputes and aid in providing a higher degree of customer service.

Operational Efficiency

Currently, some meters are hard to access due to either location or barriers, such as fencing or even inclement weather, and cannot be read by touchpad and resulting in estimated meter reads. Both AMR and AMI technologies would virtually eliminate this issue and any errors associated with estimated reads. For high volume Industrial, Commercial and Institutional customers, estimated reads can result in significant differences from actual consumption that would need to be adjusted on subsequent bills leading to potential disputes and or revenue losses. In addition, availability of data may reduce the need for field investigations to diagnose potential meter issues, which cause increased labour/contractor costs. Final reads and special readings can be obtained on demand with AMI technology without a field visit. With AMR technology, a field visit for final reads would still likely be required.

Enhanced Customer Service

AMI and AMR technology can be used to improve customer service. The availability of data increases the likelihood of first call resolution in the event of a reading and billing inquiry. For instance, in dealing with escalated complaints, such as high billing disputes, consumption data can be used to identify trends in consumption and pinpoint occurrences of high consumption or continuous consumption (leaks), including duration.

Potential disputes due to estimated readings as a result of inaccessible meters are also minimized. AMI technology provides an added advantage over AMR in that alarms can be set up to enable Halton Region to alert customers before a high water bill is received. Alerts can also be set up for other consumption patterns such as a stopped meter or any other type of abnormal consumption. Currently, Halton Region can only detect high consumption based on bill-to-bill review frequency and there is limited ability to proactively notify customers. Using the alert functions of AMI and Meter Data Management software systems, Halton Region would have the opportunity to notify customers of possible irregular consumption trends or possible leaks prior to billing.

Additional enhancements with AMR and AMI technology include the potential of setting up a web portal so customers can track and monitor their own water usage and set alerts through a computer or an application on their mobile device in near real time. This is similar to the customer account portals being used by hydro companies. Customized views and the ability to set up alerts will enhance the customer's ability to react to changes in their water consumption. With AMR technology, the information available via a web portal would be less immediate as only the actual collected read at the frequency of the drive or walk-by would be available.

Improving Distribution System Performance

AMI technology can also provide water system management benefits. In combination with area specific district metering, AMI systems could provide enhanced monitoring of unaccounted-for-water within the system such as system leaks in the actual distribution pipes as well as detect water theft from hydrants. Additional consumption, flow and time of use data can be leveraged to support a more robust water balance analysis than can be done presently with the data available.

As a compliment to Halton Region's backflow prevention program, AMR and AMI technology could be used to monitor for and detect backflow events, which could head off ongoing threats or intrusions into the water distribution system.

Environmental Benefits

AMI eliminates the need to access or drive to each property and thereby eliminates vehicular greenhouse gas emissions and aids in energy conservation. AMR technology would still require meter readers to drive by each location so that the data could be transmitted to the meter reader.

Although Halton Region could be considered a region with plentiful clean fresh water, this is not to be taken for granted and with changing weather patterns, there may be times when peak summer demands create stress on the system and can result in water restrictions. Through better access to water consumption data by customers and Halton Region, AMI technology would also be aligned with and support continued water conservation initiatives including consumption monitoring during base and high demand times.

The following table summarizes the benefits identified and considered that were detailed in the preceding sections and whether they can be achieved with Halton Region's current technology, AMR and/or AMI platforms. As shown in the table, AMI technology fully addresses Halton Region's long-term water meter reading & billing objectives.

Assessment of Reading Technology's Ability to Deliver Business Drivers				
Business Driver Category	Business Drivers	Reading Technology		
	Description	Touchpad	AMR	AMI
Revenue Protection	Supports increased reading/billing frequency		✓	✓ ✓
	Detect meter tamper/water theft/zero consumption/stopped meters - Residential			✓ ✓
	Detect meter tamper/water theft/zero consumption/stopped meters - ICI			✓ ✓
	Detect misapplied meters		✓	✓ ✓
	Reduce usage on inactive accounts		✓	✓ ✓
	Reduce uncollected revenue write-offs			✓ ✓
Operational Efficiency	Reduce billing exception processing		✓	✓ ✓
	Detect register and wiring problems			✓ ✓
	Same day final and special reading			✓ ✓
Enhanced Customer Service	Improved handling of high water bill complaints			✓ ✓
	Customer side leak detection			✓ ✓
	On-line customer portal - Residential			✓ ✓
	On-line customer portal - ICI			✓ ✓
	Customer controlled e-mail alerts			✓ ✓
Improve Distribution System Performance	District metering			✓ ✓
	Dynamic water balance monitoring			✓ ✓
	Detect backflow		✓	✓ ✓
	Water pressure monitoring			✓ ✓
	Frozen pipe alert			✓ ✓
Societal Benefit	Less vehicle miles			✓ ✓
	Water conservation - Peak Demand			✓ ✓
	Water conservation - Events Management			✓ ✓
		Partially	= ✓	
		Fully Delivers	= ✓ ✓	

Municipal Scan

As part of EMA Canada Inc.'s assignment, a scan of nine municipalities was carried out. These municipalities are similar in size, customer base and number of meter accounts of Halton Region.

The scan assessed each municipality's approach to metering including operational aspects such as meter maintenance and customer service, meter reading and billing practices, and technology.

Of the nine municipalities, three have implemented AMI and two have received approval for AMI implementation. An additional two municipalities either have implemented AMR or received approval for AMR implementation. The remaining two municipalities have

implemented partial systems where some meters have been upgraded to automated technology but the majority of meters are still read manually.

The scan found that all municipalities completed an AMR or AMI technology assessment and in the majority of cases considered both financial and non-financial benefits to inform the decision to move to AMR or AMI.

The financial benefits supporting AMR or AMI technology were found to be common amongst most of the municipalities and include reducing manual meter reading costs and improving revenue from meter replacements. All municipalities that have implemented AMR or AMI technology identified integration with planned meter replacements as a significant factor in deciding to implement an AMR or AMI system.

The benefits supporting automated technology were also found to be common amongst many of the municipalities. These include:

- Improving meter reading reliability;
- Moving to more frequent reading or billing;
- Reducing billing exceptions and estimated bills;
- Simplifying same day final and special reading;
- Customer side leak detection;
- Providing web-based customer support (includes automated email alerting, a customer account portal and the ability to view consumption data);
- Improving the detection of backflow and stopped meter flag alerts;
- Improving meter by-pass monitoring; and
- Promoting water conservation by allowing customers to monitor their usage.

Implementation Costs

EMA Canada Inc. completed a comprehensive financial business case analysis that included consideration of the current state of Halton Region's meter population, meter replacement/retro-fit costs, IT software, resource costs, existing capital funding, current meter change-out forecast, and LDC reading and billing costs.

EMA Canada Inc. also evaluated both AMR and AMI technologies versus Halton Region's current 10-year meter replacement capital program. Combinations of AMR, AMI and manual touchpad systems were evaluated, however due to the variation of service levels and complexity of maintaining multiple platforms, combination systems were not recommended.

Halton Region's 10-year capital forecast funding for meter replacement is \$22.4M. To leverage radio frequency technology, AMR or AMI will require additional capital costs of \$18.3M to \$21.1M. Through the system evaluation, it was determined that the current meter replacement plan and technology would not fully meet Halton Region's long term meter program objectives nor provide the potential enhanced benefits of more advanced radio read technology provided by AMR or AMI systems as described earlier.

The cost of implementing a region-wide AMI system would add an additional \$21.1M to the meter replacement capital program. The difference between the AMI and AMR technology is \$2.7M in capital costs. However, an AMR system will still require walk-by or drive by reads and associated reading costs. The cost difference of AMI compared to AMR will be largely offset during the 20-year life expectancy of the AMI meters due to the elimination of meter reading costs.

(\$Ms)	Status Quo*	AMR	AMI
Capital Cost	\$ 22.4	\$ 40.7	\$ 43.5
AMR/AMI vs Status Quo	-	18.3	21.1
AMI vs AMR	-	-	2.7

**Replacement included in 2018-2027 Budget & Business Plan*

Halton Region has been progressive over the last 10 years through its existing meter replacement program (including the recent pulse meter replacement project) where approximately 50,000 meters or 31 per cent of all meters are fully AMI compatible and would only require the installation of an AMI transmitter. The remainder of the meters will require retrofit or replacement to be compatible with AMI technology in addition to the installation of an AMI transmitter. The retrofit or replacement meter costs and the AMI transmitter costs are included in the implementation cost estimates.

Through the consultant's analysis of other AMI implementation projects, a reasonable timeframe, based on the current state of Halton Region's meter infrastructure, to implement the new technology and move to AMI region-wide would be 3 years.

AMI systems will also require additional information technology investments, which have been included in the capital cost estimates. These costs include collection and Meter Data Management software specifically designed to manage water meter data.

In order to provide the increased level of customer service and realize opportunities that AMI technology provides, additional or redeployed staff resources will be required. As it is difficult to predict the actual FTEs required at this time, staff resources will be addressed once the system has been established and staff resource needs have been better defined. Similar size municipalities have seen anywhere from one to three FTEs added or redeployed to manage an AMR or AMI system.

Additional Considerations

Smart Cities and Network Integration

Many municipalities have begun to consider and improve technology tools in alignment with the concept of Smart Cities. As Halton Region and other municipalities continue to advance technology, there is a natural progression to integrating and leveraging data from municipal systems. There are many definitions of a "Smart City", with a common objective of leveraging data and networks to increase operational efficiency, minimize

energy, improve citizen engagement and generally improve the quality of life for citizens through better access to information and smart technology.

Halton Region is currently undertaking several projects and initiatives that leverage data in alignment with the Smart Cities concepts, two of which are the Regional Advanced Traffic Management System (ATMS) and the implementation of adaptive street lights controls.

AMI systems also align well with Smart Cities' initiatives through gathering accurate consumption data and providing better access to this data for customers. Currently wide area network integration is still far from being standardized. There are many proprietary network systems within the AMI, AMR, traffic management and hydro metering areas that continue to evolve. Typically, each system is specific to the functionality required for each area and currently there are limited opportunities for integration across platforms.

Technology continues to evolve and there may be future opportunities for network integration, which will be considered through the development of the AMI implementation plan and future procurement process.

Increased Water Billing Frequency

Although all of the local hydro LDCs have been legislated to move to a monthly billing cycle for all customers, Halton Region's water meters are still read and billed on a bi-monthly basis for over 151,200 residential customers. As stated in Report No. FN-44-15, re: "Annual Report on the Local Distribution Companies' (LDC) Agreement for Water and Wastewater Billing Services", there are currently numerous issues and costs associated with moving water to monthly billing.

Based on EMA Canada Inc.'s review, AMI technology addresses Halton Region's long-term objectives, is the least costly alternative that supports a move to monthly billing and it also resolves many of the technical issues around bi-monthly estimated reads.

If Council adopts the recommendation to proceed with AMI technology, staff will report back on the costs and benefits of moving to monthly billing once the system is fully implemented.

Long Term Meter Strategy Summary

Based on the comprehensive evaluation of the benefits and costs of AMR, AMI and Halton Region's current meter replacement capital program, EMA Canada Inc. has concluded with staff concurrence that a Region-wide AMI system best suits Halton Region's long term meter program objectives and leverages technology to provide a reliable, accurate and cost-effective customer service focused water metering program. EMA Canada Inc.'s recommendations can be summarized as follows:

- Develop a detailed implementation plan;

- Implement AMI technology for all residential and Industrial, Commercial and Institutional meters over a period of 3 years starting in 2020;
- Coordinate the planned 10-year meter change-out program with AMI implementation;
- Ensure all new or replacement meters are AMI compatible;
- Continue with the ongoing annual large meter maintenance program; and
- Evaluate staff resources required to support the AMI system and enhanced customer service levels once the AMI system is in place.

Next Steps

Subject to Council's approval of Report No. PW-18-18/FN-25-18, staff will initiate the development of a detailed implementation plan at a cost of \$400,000, which is anticipated to be presented for Council's consideration in mid-2019.

Conclusion

The implementation of automated metering infrastructure for Halton Region achieves Halton Region's long-term goal of a reliable, accurate, cost effective and customer service focused metering and billing program that positions Halton Region well for the future and leverages new technology to meet current and evolving needs of Halton and its residential and Industrial, Commercial and Institutional customers.

FINANCIAL/PROGRAM IMPLICATIONS

EMA Canada Inc.'s analysis concluded that AMI technology provides the long-term benefit opportunities, which is consistent with the findings of other municipalities that have implemented AMI systems. To finance the estimated \$21.1 million, funding from the water capital reserve will be utilized. As shown in the table below, water capital reserve funding will be smoothed through debt charge savings over 10 years to ensure that there is minimal impact to the rate forecast.

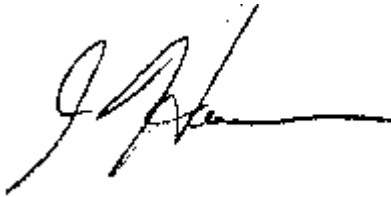
The implementation of the Long Term Water Meter Strategy will be reviewed as part of the 2019 budget process and reflected in the 2019 Budget and Business Plan for Council's consideration.

(\$000s)	2019	2020	2021	2022	2023-2028	Total
Capital Expenditures						
Replacement	\$ -	\$ 7,469	\$ 7,469	\$ 7,469	\$ -	\$ 22,408
Incremental AML	400	6,822	6,922	6,922	-	21,065
Total	\$ 400	\$ 14,291	\$ 14,391	\$ 14,391	\$ -	\$ 43,473
Financing						
Water Capital Reserve	400	14,291	14,391	14,391	-	43,473
Total	\$ 400	\$ 14,291	\$ 14,391	\$ 14,391	\$ -	\$ 43,473

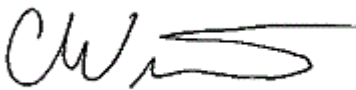
Respectfully submitted,



Kiyoshi Oka P. Eng.
Director, Water and Wastewater System Services



Jim Harnum
Commissioner, Public Works



Cyndy Winslow
Director, Financial Services and Payroll



Mark Scinocca
Commissioner, Finance and Regional Treasurer

Approved by



Jane MacCaskill
Chief Administrative Officer

If you have any questions on the content of this report,
please contact:

Kiyoshi Oka
Cyndy Winslow

Tel. # 7602
Tel. # 7048

Attachments: None