

IMPROVING WATER EFFICIENCY AND CUSTOMER SERVICE

The Case for Advanced Metering Infrastructure At The Madison Water Utility

April 2009

The Madison Water Utility (MWU) is anticipating a move toward a new technology in the way water meters are read and, consequently, the frequency of customer billing. The purpose of this paper is to provide an overview of the technology and benefits of its use and to outline a roadmap for implementation.

Current Methodology:

MWU has approximately 65,000 accounts and each customer is billed twice a year (6 month billing). The city is divided into six meter reading sections and a sixth of the customers is billed each month based on readings taken at six-month intervals. Three full-time meter readers utilize a hand-held electronic device to manually enter readings from a remote register located on the outside of each home or business. The remote register is connected by a wire to the water meter within the premise and the reading is pulsed from the meter to the outside register. The data contained within the hand-held device is downloaded each day into the utility's billing system.

Proposed Methodology:

Over the past twenty years, **Automated Meter Reading (AMR)** has gone through several evolutions including telephone reads and then radio reads utilizing a drive-by system. Now a fixed network **Advanced Metering Infrastructure (AMI)** has been developed. A fixed network allows the collection of meter data remotely through the deployment of high-powered meter transmitters and data collection units (DCUs) installed at high points throughout the service area. MWU estimates approximately 18 of these DCUs will be installed at elevated locations owned by the water utility, the city, or perhaps the university (see attachment).

In addition to capturing meter readings, peripheral equipment will be utilized to detect leaking services and water mains and send signals to the DCUs. Meter readings will be transmitted several times a day and will be available to the billing system and clerks on their computers to assist with customer inquiries. Billing frequency will be increased from semi-annually to monthly, and the need for estimated bills will be virtually eliminated.

Benefits

Summarized below are some of the benefits to be derived from an AMR/AMI fixed network system.

1. *Customer Incentive for Conservation*

MWU's conservation strategy includes providing incentive for customers to reduce irrigation during peak demand periods through an inclining block rate structure. The current six-month billing process is inadequate in this regard. AMR/AMI will allow monthly billings that could provide a price signal to customers to reduce their demand during peak periods. Combining the implementation of AMR/AMI with a conservation-based rate structure is a crucial tool for reducing customer demand on the water system during peak periods.

2. *Improved Customer Leak Detection*

Accounts that have an unusual usage pattern will be flagged automatically and brought to the attention of MWU staff. Potential leaks can be investigated and brought to the attention of customers. Leaking toilets alone have accounted for a loss of 32 million gallons in one year (and this is just the toilets identified using the current system). This is equal to a day's pumpage for the entire city. Leaking faucets, toilets, and service lines across the entire water system amount to a sizable amount of water wasted, but AMR/AMI technology will quickly highlight unusual customer demands. This will prevent further loss and expense to the customer.

3. *Customer Access to Consumption Data*

Customers will be able to log on to the system via the web and view their water consumption data, which will be updated daily. This will provide a valuable tool for customers to actively manage their water use.

4. *Accurate and Frequent Water Loss Assessment*

MWU will be able to more accurately and regularly assess water loss throughout the system. The current metering process allows for monthly snapshots of metered customer usage (based on billing cycles) for comparison to overall production numbers. The AMR/AMI system will deliver customer usage information on a daily basis. This will be compared to daily production information to assess revenue vs. non-revenue usage during differing periods of demand (i.e., the percentage of unaccounted for water might be higher during peak usage periods compared to non-peak usage periods). Currently, MWU evaluates revenue vs. non-revenue water on an average annual basis based on data available. AMR/AMI will allow MWU to determine the true non-revenue percentage of water delivered under varying customer and system usage patterns.

5. ***Targeted Focus for Leak Detection Efforts***
AMR/AMI will allow MWU to focus on areas of the distribution system that are losing the most water, thus allowing for the most efficient use of limited resources. By metering the flow in and out of individual pressure districts, as well as the usage of customers in that district, MWU would be able to better focus leak detection efforts on finding and repairing leaking water mains. This would lead to a more efficient use of capital dollars to achieve the greatest reduction in non-revenue water.
6. ***Improved Cash Flow***
MWU cash flow will be improved through faster implementation of future rate increases. Currently, when new rates are implemented they are pro-rated over 6 months. With AMR/AMI this will be accomplished in 30 days.
7. ***Reduced Vehicle Costs and Emissions***
Meter Reading vehicles will be taken off the road, reducing vehicle and fuel costs and pollution from emissions.
8. ***Reduced Lost Time Injuries***
AMR/AMI will reduce lost time injuries and the resulting loss in productivity. In 2008, lost time injuries from meter reading resulted in 61 full days and 211 restricted days.
9. ***Efficient Final Meter Readings***
AMR/AMI will virtually eliminate the cost and time associated with taking final meter readings for customers moving out. In 2008, 1500 hours were required to obtain 6,000 readings.
10. ***Elimination of Remote Reading Device Maintenance***
AMR/AMI implementation will eliminate the need to install or repair remote reading devices. There were approximately 1100 of these in 2008.
11. ***Quick Detection of Stopped Meters and Registers***
AMR/AMI will quickly detect stuck meters and registers. If a meter is stopped due to tampering it will be detected immediately.
12. ***Salary Savings***
AMR/AMI will result in salary savings. The three Meter Readers will be retrained and placed in vacancies as they become available.

Implementation Timeline and Costs

The implementation of an AMR/AMI system will begin in 2009 and conclude in 2011. A preliminary timeline of events is summarized below:

2nd Quarter-2009: Prepare a Request for Proposal (RFP) to select a consultant that would prepare the primary RFP to evaluate and select a vendor for a fixed network system. This consultant would also later work with the MWU project manager to manage the implementation of the system.

3rd Quarter-2009: Completion of the RFP and distribution to fixed network AMR/AMI vendors.

4th Quarter-2009: Selection of a vendor and beginning of the project scope to include:

- Meters and metering technology
- Back office integration
- Meter data management
- Distribution control
- Customer enablement

1st Quarter-2010: Begin AMR/AMI implementation starting with an isolated test area.

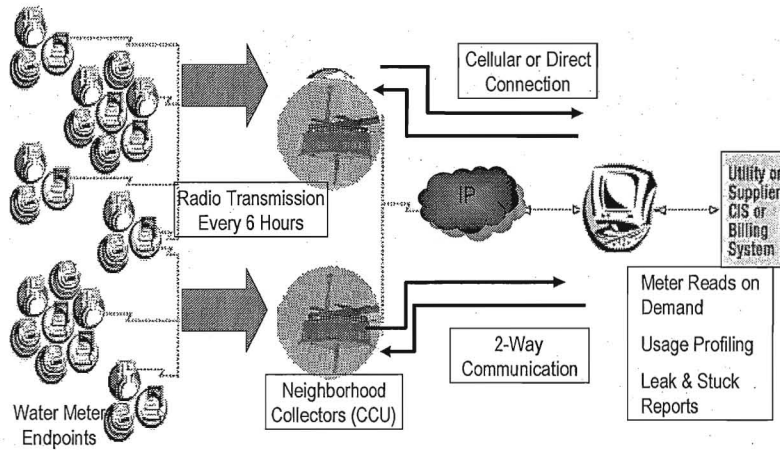
2nd Quarter-2010 through 2nd-3rd Quarter 2011: Complete entire system-wide implementation to all 65,000 locations.

A general estimate of the total project cost is \$10-12 million. This cost will be spread over two years (2010 and 2011) and financed with revenue bonds, or possibly the Qualified Energy Conservation Bond (QECCB) program. The approximate cost impact to the customer to service the principal and interest on this debt will be \$20 per year, or 5 cents per day. One method of generating the required revenue would be to increase the meter charge accordingly. The current meter charge is \$25.50 every 6 months for residential customers.

Summary

Because MWU has always been at the forefront of meter reading (remote devices, hand-held computers), meter testing and replacement, and because our customers have enjoyed low rates, the 6-month system has been adequate. However, because of changes in metering technology, mandates from the Public Service Commission, annual rate increases becoming more frequent, and an increasing awareness of the need to conserve water resources, now is the time to progress to a new technology so MWU can better serve its customers and maximize available water resources.

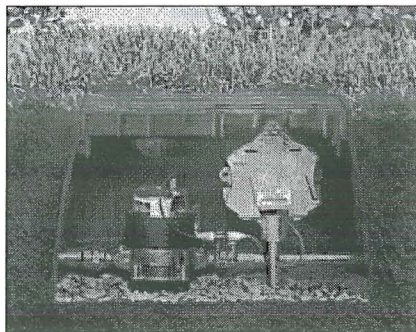
What is a Fixed Network?



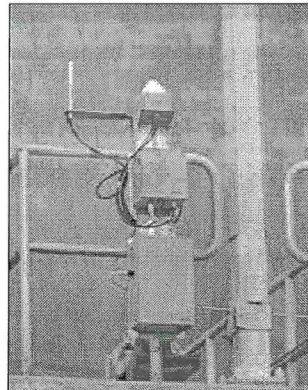
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Fixed Network Hardware

The MIU Fixed Network Endpoint in a typical meter box installation

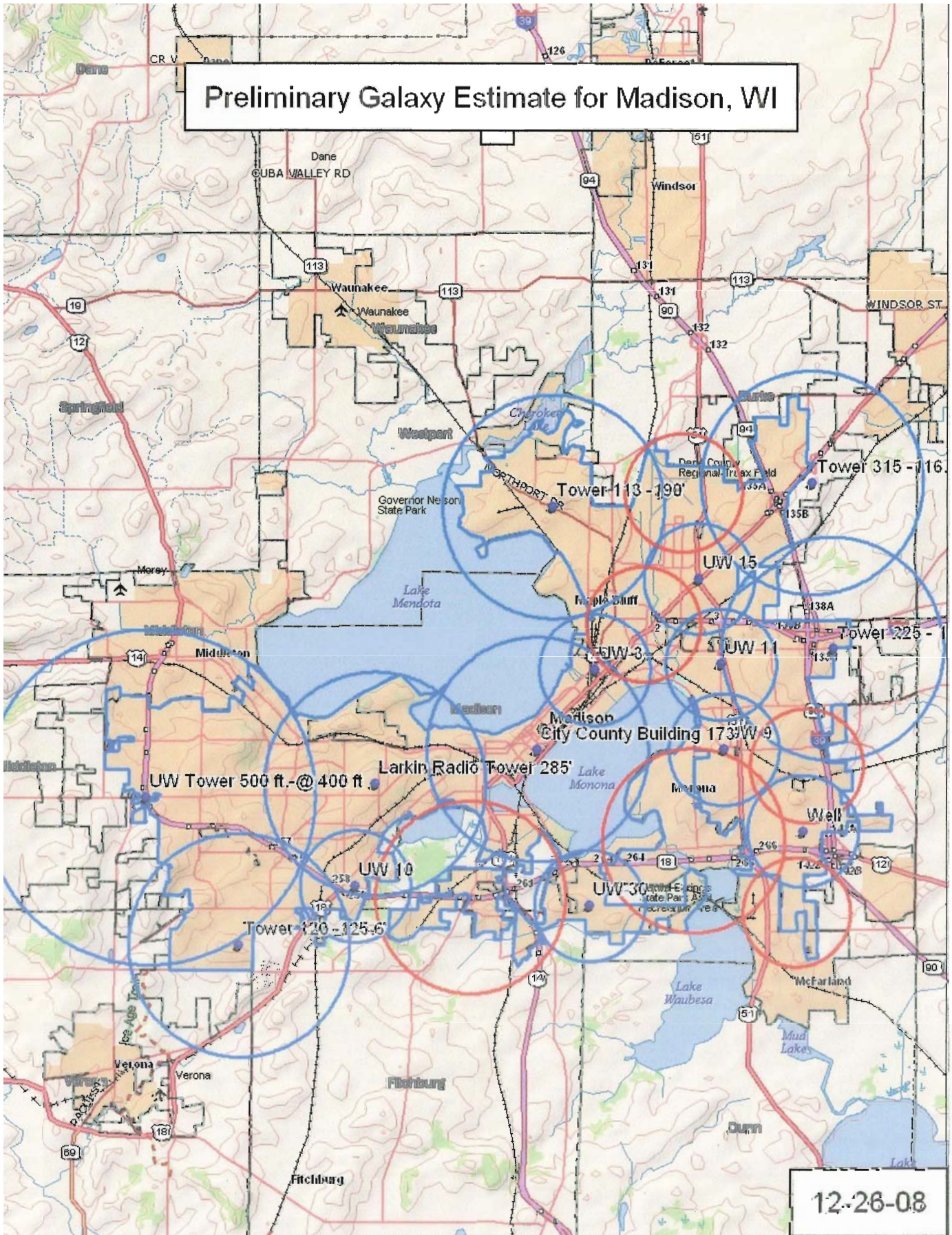


The Collectors, Cell Control Units (CCU's), have multiple mounting and information sending options.



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Preliminary Galaxy Estimate for Madison, WI



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