Lessons Learned from a Successful Water Meter Replacement and AMR System Installation

Afsaneh Jabbar, P.E.
Assistant Director of Water & Wastewater
Meter Replacement and AMR System Installation - Project History

- Desire to update meter inventory and upgrade technology.
- Project Development 2007-2008
- New Utility Billing Software implemented 2008
- Project Implementation 2009-2010
- Post implementation measurement & verification 2011+
Meter Replacement and AMR System Installation

Project Metrics

Pre-Project

- Average age of meters was 33 years
- Average unaccounted water at 13%
Meter Replacement and AMR System Installation

Project Metrics

Post-Project

- 29,046 new Sensus meters
- Sensus FlexNet AMR system
  - Transmitters, Omni-directional antennas, Gateway base stations, Data servers
- GPS locates for all new meters
Meter Replacement and AMR System Installation

Project Metrics

- First year additional revenue estimated at $815,000
- First year estimated O&M savings $289,000
- Projected implementation duration 12 months
Water meter replacements and AMR system installation can be self funding

- Replacing old meters creates an incremental increase in revenue due to increased measurement accuracy of new meters
- AMR system can create opportunities for operational and maintenance savings
Parameters Influencing Revenue

- Consumption Baseline
- Water and Wastewater Rates
- Meter Accuracy
A Revenue Model was developed to estimate the level of revenue increase

- First step in development of the revenue model was a determination of the water and wastewater baselines
- Average annual water consumption and wastewater volumes were calculated from historical data for each meter size within each classification
- Consumption baseline increases slightly in years after implementation to account for expected increase in population at properties vacant during development of the project.
Testing was performed to determine existing meter accuracy

- Representative Meters of each type and size were selected for testing
- Small meters were bench tested offsite by 3rd party
- Large meters were tested in-situ by 3rd party.
- Average accuracy of small meters tested was approximately 80%.
Characteristics of the new meters

- 20 year accuracy warranty
- 100% lead free
- No internal moving parts to wear out reducing repair
- Low flows measurements
- Intelligent alarms built into the meter such as
  - Data logging
  - Leak detection
  - Tamper proof
  - Reverse flows
Key Components

- Transmitters – attached to the meter and send meter information, battery-powered
- Omni-directional antennas – used to transmit data from transmitters to gateway base stations, usually located on meter lid
- Gateway base stations – components which receive the meter information and send to data servers, strategically located throughout service area to provide coverage redundancy
- Data servers – compile data for billing and analyzing
Water and wastewater rates are applied to estimate the dollar value of increased meter accuracy

- Water and wastewater rates were evaluated prior to project implementation
- New rates were factored into the revenue model
Revenue Model estimated first year post implementation Revenue Increase of $815K

Parameters affecting Revenue Increase in subsequent years

- Changes in consumption baseline
- Meter accuracy and
- Rate changes
Operational & Maintenance Savings

Reduced Meter Repair Costs

Elimination of Meter Readers

Reduced Vehicle Maintenance Costs

O&M Savings: First Year
$289K
Operation and Maintenance Post Implementation

- Attrition of meter readers

- Sensus Maintenance Service
  - Tower Gateway Base Stations repair/replace
  - Software Upgrades
  - Phone support
Revenue Increase and O&M Savings over 15 years were able to fund project cost

Project Cost

$10.6M

Revenue Increase

+ O&M Savings
How the project was financed

- The project was financed using State Revolving Funds
- Schedule of Savings
  - Year # 3 Additional Revenue $1,231,289
Program Development: Issues to consider for meter replacements

- Compatibility of existing meter registers with AMR system
  - Repair vs Replace
  - Existing meter replacement program
  - Age of existing meters
- Accuracy of existing meters
  - Percentage unaccounted water
  - Potential to enhance revenue
- Opportunity to evaluate the meters
  - Size & Type
  - Adopt new metering technology
Program Development: Issues to consider when implementing AMR

Meters
- Compatibility of existing meter registers with AMR system
- Retrofit vs Replace meters
- Existing O&M costs
  - Number of meter readers/attrition
  - Meter read/billing frequency
  - Risk management claims

Operation & Maintenance
- AMR system O&M costs
- Number of estimations, re-reads or errors per billing cycle
- Billing software status
- Existing customer service issues

Customer Service
Implementation Program
Construction challenges and Infrastructure improvements

Accurate Infrastructure Survey

- Establish quantity
  - Type
  - Size
- Condition Assessment of Existing
  - Meters
  - Valves
  - Vaults and Pits
Implementation Program

Develop system for

- Receiving and Storing
- Customer notification process
- Schedule and Distribution
- Tracking of materials

Develop an effective system of integration between new AMR data and existing billing system
Benefits of AMR for The City and Our Customers

**Operation & Maintenance Savings**
- Reduces meter reading costs including salaries and benefits
- Reduces fuel costs, vehicle maintenance and repairs
- Fewer employee injuries; e.g., locations with fenced yards, dogs, insect bites, landscaping
- Lower insurance costs (mileage, property, risk etc.)

**Revenue Enhancement**
- Leak detection
- Theft detection
- Meter reading frequencies and billing cycles can be optimized

**Customer Service**
- Improved input accuracy = Improved billing accuracy
- Provide customer with more detailed information (leak awareness, high consumption)
Lessons learned

- Majority of revenue increase is generated by small meters
- Scheduling
- Pay schedule
- Installation Issues and Delays
- Audits and Inspections
- Software
- Hardware
- Staffing Requirements