



TAHLEQUAH PUBLIC WORKS

TPWA

AUTHORITY

**ENERGY EFFICIENCY BUSINESS CASE
(BUSINESS PLAN)**

**AUTOMATIC METER READING AND
REPLACEMENT PROGRAM**

DWSRF P40-1021701-02

September 16, 2011

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Tahlequah, Oklahoma

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SEP 20 2011

WATER QUALITY DIVISION

Introduction

This Business Case (business plan) is prepared to present the long-term advantages and efficiencies of a program to replace and update the Tahlequah Public Works Authority water meter system with new meters and an automated meter recording and reading system. This report will present a number of advantages of the system, and show energy efficiencies of this Automatic Meter Reading (AMR) program and replacement.

Although the AMR system is categorically qualified for Green Project Reserve (GPR) requirement of the American Reinvestment and Recovery Act (ARRA) this report will provide justification to support the savings projected.

Community

The Tahlequah Public Works Authority (TPWA) is a beneficial trust of the City of Tahlequah with the purpose of providing certain services to the community that cannot be provided by the individual. Water supply is one of the most important services provided. In addition, it is reasonable that the Authority would provide the most cost effective system available. Reduction in operating cost and the expansion of service through improved efficiencies are primary goals of any agency responsible to the local community.

Purpose

The purpose of the AMR program is multi-functional. Reduction in cost of operation and energy savings is primary, but just as important are the improvements in service to the customer and the conservation of resources. This plan will discuss the advantages of improving services through automatic and remote reporting and its accuracy. The benefits of keeping the system in full operation through emergency responses to events such as fire, flood, ice storms and tornados are also noted although not discussed in detail.

Accountability for water use is a very high-level responsibility to the community and is a primary purpose of the plan. Studies have shown that a significant percentage of water pumped is not fully accounted for in the current meter-reading system. Achieving reduction in lost water is a primary goal of this AMR project. By reducing water loss, the efficiency of the system is improved, resulting in conservation of water and reduction in energy use.

In addition this report will address the areas of: 1) most efficient equipment being used; 2) design and operational considerations and practices followed for energy efficiency; and, 3) amount of electric energy and gallons of fuel saved.

Existing System

TPWA has approximately 7,300 water customers. Of those, approximately 6,100 are residential customers and approximately 800 are large and small commercial customers. There are yet other customers of various types that are included in the total count. The oldest meters, approximately 50% of the entire system, are meters that have been in service approximately 20 years. They are positive displacement meters and primarily consist of Rockwell, Sensus and Neptune brands. Following side-by-side field testing, TPWA has concluded that under-registration by these aging meters is a significant component of unaccounted-for water as indicated below.

When viewed in retrospect, the trend for unaccounted-for water has dramatically escalated. Based on water production and billing data for the 5.5 year period beginning January 2006 and ending June 2011, unaccounted-for water has trended from 19% to 39% (excluding anomalies). This percentage calculation is made according to the following mathematical formula:

$$\text{Unaccounted-for water} = \frac{(\text{water treated} - \text{billed consumption})}{\text{water treated}}$$

Staff conclusion is that this significant upward trend in water loss is attributed in large measure to deteriorating meter accuracy. The recent side-by-side testing referred to above has shown this inaccuracy to account for approximately 14% of the loss. Following this conclusion, a multi-disciplined group of Staff and Board members investigated prospective options for implementing a system-wide water meter change-out program and the multiple benefits of simultaneously implementing an AMR solution.

Finally, and related to the overall cost of system operations, TPWA responded last year to approximately 912 water meter-related work orders or repairs (not including water turn on or turn offs). The bulk of this activity was to check for water meter leaks. This amount of activity increasingly limits TPWA's ability to respond to water main leaks and leak prevention.

Automatic meter reading and replacement project (AMR)

The AMR project consists of initially replacing more than 6,100 water meters with new high accuracy meters and automated meter reading registers and transponders. Only for purposes of this business case and for purposes of the intended use of DWSRF funding, it is not intended that all meters are changed out.

The program will also include the deployment of data collection equipment and data interpretation software integrable to the utility billing system.

The intention is to compose bid requests with specifications (without brand preference) for water meters so as to ensure the selection of an American-made meter with brass fittings that capitalize on technology allowing for a prolonged useful life supported by no moving parts. Doing so will satisfy the TPWA management preference for equipment

selection following review and examination of available meter product offerings supported by the assurance of AMR compatibility for water as well as natural gas and electric.

Related to the project is the intention to install a data collection system utilizing "drive-by" or "walk-by" capability and not fixed-base. A TPWA Technical Memorandum provided to DEQ states the justification and rationale for this level of technology selection.

The end point site will record up to hourly reading of customer water use and will routinely report data on a schedule that is yet to be determined (the potential is to report data daily but the preference will probably be weekly or bi-monthly reporting).

Project benefits (abstraction)

The unaccounted-for water is a significant contributor to inefficiency in overall energy use. Additionally, the providing of customer service based on the manual reading of meters currently results in high annual mileage and the associated heavy fuel consumption and emissions. The greatest measurable benefits of this project will come from efficiency and operational improvements. Project benefits are more fully described following.

Water distribution service improvements

Without a comprehensive meter change-out program the percentage of unaccounted-for water due to under-registration is expected to grow.

Customer service

The system will provide many improvements in customer service. The data collection on an hourly basis will allow for quick response time in determining leak information for the customer. The system will provide tools to determine if leaks are continual or intermittent and will also provide for the ability to estimate the cost to customers for loss of water. In addition, the records will provide the customer a pattern of water use by the customer to help explain high water use or abnormal use. The system will improve response time for identifying excessive water use from weeks to days.

When customers have concerns regarding water consumption, customer service representatives will have access to hourly usage data for each account. This data may be presented to the customer in graphical format to assist the customer in evaluating usage or detecting abnormal flow patterns. However, the data collected also allows the utility to proactively alert the customer in advance. This knowledge may result in profile changes or changes in usage habits. The resulting efficiency in consumption reduction and conservation is estimated between 2% and 4% annually and is noted in the Energy savings paragraph below.

Manpower reduction

The installation of an AMR system will allow current meter readers to be re-tasked to help ensure the efficient operation of the system and to allow staffing for additional, planned operations. Although no loss of jobs is anticipated, TPWA has plans for additional operations in other areas of the overall system. Re-tasking meter readers will allow TPWA to avoid (or reduce) the additional cost that would otherwise be required. That additional cost is estimated at \$28,000 annually.

Fuel consumption savings

TPWA currently averages approximately 76 call-outs per month on water service-related issues. Approximately 35% of these calls are to check aging water meters for leaks. An additional 35% of such calls are to install or replace water meters. It is estimated that at 8 miles per call-out, approximately 5,100 miles are driven yearly. By aggressively replacing aging meters while working with customers to reduce the number of call-outs, the number of trips may be reduced by 75% resulting in more than 3,800 fewer miles being driven or nearly 300 gallons of reduction in fuel consumption and associated vehicle emissions. Using current IRS allowances for value of miles and using current fuel prices, these savings are estimated at \$3,100 annually.

Besides miles driven by technicians and mechanics for the purposes stated above, it is clear also that fewer miles will be driven by meter readers because of a substantial change in the meter reading routine. However, as noted above, the schedule for meter data collection has not yet been determined. Also, it is clear that fewer miles will be driven for purposes of meter re-reads. Accordingly, it is felt that while noting such savings is important, those savings have only been speculated at \$2,100 – which speculation is thought to be conservative. This figure results in a total, combined estimated fuel savings of \$5,200.

Energy savings

TPWA incurs annual energy costs of approximately \$190,000 in producing and distributing water to customers. A tabulation is shown following which quantifies savings as an offset to the overall energy cost of unaccounted-for water.

	<i>% reduction of annual cost</i>
<i>Improved leak detection; early notification</i>	3%
<i>Customer education and conservation</i>	1%
<i>Total</i>	4%

As an offset to the energy cost associated with producing and distributing water to customers, it is foreseeable that a 4% reduction may be achieved. Using the current energy cost, a 4% reduction is equivalent to an annual savings of \$7,600.

Improved accuracy in data collection, reporting and billing

Meter replacement is projected to improve accuracy of recording water use by an increase of 14%. Financial reporting for FY 2011 showed water revenues at \$2,495,753. This number ignores write-offs or bad debts. The value of increased data collection and reporting accuracy at 14% is equivalent to an annual revenue increase of \$349,405.

Summary of benefits

BENEFIT	ANNUAL SAVINGS IN \$
Customer Service savings	Not quantified
Manpower cost reduction or savings	\$28,000
Fuel consumption savings	\$5,200
Energy savings	\$7,600
Improved accuracy savings	\$349,405
Total	\$390,205

System and project implementation cost

In a letter to DEQ requesting that this project be placed on the project priority list (which was approved) the program cost was estimated at \$1,500,000. This figure was arrived at by TPWA management as a result of interviews with vendors for smart meters and data collection equipment and software. These are the principal drivers of the project cost (contingency, legal and financial services costs are also estimated and are included in that figure).

Business Case Summary

This business case presents the advantages of completing an AMR system which includes and provides for enhanced customer service, reduced water loss (unaccounted-for water), improved leak detection capability, reduced in manpower cost or savings, improved fuel and energy savings and improved accuracy in meter reading and accounting. The pay back is also notable. Straight-line pay back of \$1,500,000 has been assumed for purposes of this business case. Annual operational savings of \$390,205 are also considered. Accordingly, a pay back period of 3.8 years is calculated.

In consideration of the foregoing this analysis shows the proposed project would an asset to the community and is one for which DEQ approval is requested.