

RESOLUTION NO. _____

**A RESOLUTION DECLARING OFFICIAL INTENT REGARDING
CERTAIN CAPITAL EXPENDITURES TO BE
REIMBURSED FROM PROCEEDS OF AN OBLIGATION**

WHEREAS, the Village of Downers Grove, DuPage County, Illinois (the "Issuer"), has developed a list of capital projects (the "Projects") described in Exhibit A hereto; and

WHEREAS, all or a portion of the expenditures relating to such projects ("the "Expenditures") (i) have been paid within the sixty days prior to the date of this Declaration or (ii) will be paid on or after the date of this Declaration; and

WHEREAS, the Issuer reasonable expects to reimburse itself for the Expenditures with the proceeds of an obligation.

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Village Council of the Village of Downers Grove, DuPage County, Illinois, as follows:

Section 1. The Issuer reasonable expects to reimburse the Expenditures with proceeds of an obligation.

Section 2. The maximum principal amount of the obligation expected to be issued for the Projects is not in excess of \$4,000,000.

Section 3. All actions of the officers, agents and employees of the Issuer that are in conformity with the purposes and intent of this Resolution, whether taken before or after the adoption hereof, are hereby ratified, confirmed and adopted.

Section 4. This Resolution shall be in full force and effect from and after its passage and approval as provided by law.

Mayor

Passed:

Attest: _____

Village Clerk

EXHIBIT A

Description of Capital Projects

DISCUSSION:

Our Current System

The Village of Downers Grove has been providing water to its residents since 1894, and it is believed that metering of water began around the turn of the century. Between 1958 and 1960, the Village began installing a visual remote reading system utilizing a pulse-generated signal to the remote. We currently have approximately 15,344 meters in service. With the advances being made in communications, it is becoming increasingly difficult to find vendors to provide service and support on this system. The majority of vendors have been focusing their research, development and production time on newer, more advanced systems.

Prior to 1990, the Village maintained a staff of three (3) part-time meter readers who worked 6.5 hours per day for 15 days each month. The billing cycle at that time was quarterly, with the town divided into three sections. In October 1990, the Village contracted with Northern Illinois Gas to handle our readings, which allowed us to ability to go to a bi-monthly billing cycle. This service has been renewed every year since, however, it has come to our attention that NI Gas is in the process of phasing out this service. Although the Village has not received written notification yet, other towns have been notified that their contracts will not be renewed. If this is in fact the case, the Village will need to find an alternative solution to meter reading by October 2001.

Basic Water Meter Connection

When discussing AMR, it is very easy to overlook the most significant piece: the water meter. It is important to understand the components that make up this part of the connection.

- ◆ Housing (also referred to as the pressure casing or main case) – main body of meter
- ◆ Measuring chamber – allows water to flow in and out of meter
- ◆ Register – keeps track of all water that flows through the meter
 - Pulse (rotating disc) – electro-mechanically produce an electric pulse for each unit of water (example - 1,000 gallon, 100 cubic ft). The pulse is transmitted over a two-wire conductor cable to the remote readout module to advance the digits on the module.
 - True encoder (oscillating piston) – encoder registers are access through a remotely mounted interface module. Power is transmitted from the remote to the register and provides a real-time reading from the registers odometer wheels (example - 1 gallon, 10 gallon, 1 cubic foot, etc.).
Many vendors have made modifications to the register to improve the reading capabilities, but these are the general categories as outlined by the A.W.W.A.

The AMR Solution

What is AMR?

AMR (automated meter reading) is the remote collection of consumption data from meters at the customer's premises to a remote central location using some form of communication medium (including but not limited to: telephone; power line carrier; cable TV; and radio frequency). Under a broader definition of AMR used by many companies, several other methods of meter reading are considered sub-forms of AMR. These forms include manual read (our current form of reading) and touch read. The latter are loosely termed AMR because they are not truly "automated".

The American Water Works Association (AWWA) Research Foundation noted in a 1992 report that the process of meter reading was evolving into a system. A system is a series of related components that, through their interaction, form a complex and productive whole. These systems include the following components or pieces:

- ◆ Water meter and register
- ◆ AMR interface device
- ◆ Meter reading software
- ◆ Meter reading hardware
- ◆ Training – hardware and software
- ◆ Service and support

Each of these components is important to the overall success of a complete AMR system, and all will be taken into consideration during the RFP evaluation process. For now, our main objective is selecting which communication medium would be most beneficial for the Village. In the water utility industry, the only communication mediums currently in use are touch, telephone and radio frequency. Following is a more detailed account of the options available and an idea of the benefits and drawbacks to each.

Touch Based AMR

Because the AMR industry in general does not view a touch read system as an "automated" way to read meters, there is no conclusive statistical analysis of the foothold this has in the industry.

Touch read systems have come a long way since they were first designed as an enhancement to the visual read system. Today's touch systems can either be installed on state of the art meters, or can be retro fitted to work on the older pulse generator meters. Touch systems work in generally the same manner; they remain idle until an electronic reading gun or wand is placed on the touch pad. A signal gets sent to the register, and a reading is taken in whatever manner is called for by the meter configuration. The register then returns the reading to the touch device and the reading gun or wand.

This form of meter reading has been on the market for at least 20 years. Below are some highlights of a touch system that have been proven over time.

Pros –

- Very affordable
- Eliminates reading and billing errors
- Increase the cash flow with fast read-to-bill turnaround
- No battery to be changed out

Cons –

- No on-demand reads
- Requires meter reading staff
- Readings cannot be automated – only data can once stored in handheld device
- Limited data collected

Telephone Based AMR

Type of Telephone –

- ◆ Outbound – Central office initiates a call to the meter, which responds and transmits the meter information to the central office.
- ◆ Inbound – (standard telephone option currently being deployed) AMR device calls the central office at a prescheduled time.
- ◆ U.T.T. – Utility Telemetry Trunk – Central office initiates call to meter without ringing the phone line. The meter responds with reading information.

All though all three forms of telephone have their own pros and cons, below are some general observations:

Pros –

- Requires no telco involvement except for 800 numbers (Inbound)
- Increase the cash flow with fast read-to-bill turnaround
- On-demand read capability (Outbound and U.T.T.)
- Call out information for detection of tampering, outage, leak detection (all)
- Usage profiling (all)
- No battery required in most cases (all)

Cons –

- Requires telco involvement (Outbound and U.T.T.)
- Telephone number database administration (fee for service) (Outbound and U.T.T.)
- Requires active telephone service (all)
- High installation cost due to "hard wiring" remote and meter to the telephone line (all)
- In most cases requires 5 to 7 year visit for battery change-out (all)
- No on-demand reads (Inbound)
- Data confidentiality concerns by the customer (all)

Over the last three years, industry trends have shown a decrease in shipments of telephone based AMR units. Total annual shipments for telephone went from 362,104 in 1997 down to 125,847 in 1999¹. This decline reflects not only the impact of some of the inherent issues with telephone technology, but also the advancement in other AMR technologies since the early 1990's.

R.F. (radio frequency) AMR

Radio frequency communication as we know it today is based on an idea patented by actress Hedy Lamarr and composer George Antheil in August of 1942. Their "Secret Communications System" (frequency hopping) was ahead of its time, making use of several key digital concepts well before the invention of digital electronics. The patent was handed over to the U.S. Navy to be used in WWII as a radio guidance device for U.S. torpedoes. They believed that the Navy would implement it right away to stop Hitler, but the Navy declared the system unfeasible and shelved the patent. The patent expired in 1959, but the military kept the concept of "frequency hopping" under wraps. In the 1960's there were changes made to the original patent, and the updated version became known as "spread spectrum technology". In 1981, this technology was declassified and a new generation of communications was opened to the general public. It wasn't until the 1990's that the true capabilities of this technology were realized. R.F. can be generalized when referring to the system highlights. Below is a listing of the basic pros and cons to selecting radio as a communication medium:

Pros –

- Eliminates missed or inaccurate read
- Competitively priced for densely populated areas
- Has had the most extensive installation history for residential meters (all utilities)
- Significant reduction in meter reading staff required

- Increased data collection capabilities – leak detection, tamper detection, etc.
- On-demand reads (fixed point only)
- Increase the cash flow with fast read-to-bill turnaround

Cons –

- Battery powered units require change-outs every 7 to 10 years (average warranty – some can actually last past warranty period)
- Private network option requires purchase of infrastructure (collectors, towers, etc.)
- “Shadowing” causes inaccessible reads (tree growth, new construction, etc. block signal)
- Predominately one-way communication (two-way has been emerging)
- Requires in-house expertise

Total annual shipments for R.F. for 1997 were 3,945,346; 3,510,811 in 1998; and 4,085,480 in 1999¹. Figures for 2000 are projected much higher because many utilities held off on AMR due to Y2K concerns.

Spread spectrum is the basic principle behind the many forms of R.F. communications. Since this is the most varied category, below we have broken down the most popular systems available using this technology.

Radio (handheld)

There are many potential benefits to a handheld radio solution over the touch pad, the most obvious is not having to walk up and make direct contact with the remote. This allows the meter reading staff to either walk down the sidewalk or slowly drive down the street. In either scenario, the handheld device sends a signal to “wake up” the remote, which in turn communicates with the register to obtain the exact meter reading from the registers odometer, and the signal is sent back to the handheld through the remote. This entire process usually takes place within a 2 to 5 second period. Depending on the number of readers, the Village’s meters could be read within 2 weeks or less. These systems were not designed to be used as a drive by unit. But, if needed, a special antenna can be purchased to boost the signal distance for the handheld.

Radio (mobile)

A mobile R.F. solution offers many of the benefits of the handheld, but with some improvements: faster reading capability, few meter readers needed, etc. With mobile R.F., it would take the Village no more than 2 to 3 days (barring equipment breakdown, emergency operations, etc.) to completely read all meters in service. Mobile units also give meter readers the ability to obtain readings anywhere, anytime, any weather conditions. With touch and handheld, the meter readers would need to be allotted enough time to handle their readings under any circumstances, and that can mean more than one billing cycle.

Radio (fixed-point network)

A fixed-point network is the newest offering in the area of radio frequency technology for the water utility industry. There is more involved in the actual deployment of a fixed-point network, but the benefits make the extra investment worth considering.

A central computer would control the fixed network. This central computer would be programmed to call or receive a call from collector points at a specific time every day. The collector communicates with the remote device, obtaining 2 or more readings per meter per day, as well as programming the remote to report readings at different intervals. The collector stores this data and downloads this information to the central computer at the designated time daily. By being able to receive readings on a daily basis, the Village can utilize the data to provide customers with a usage profile and also to more accurately monitor low or high usage, zero consumption, leak detection, and tamper detection on an individual and village-wide scale. The key is the ability to obtain the most data possible about what is actually happening with meters in service. Most fixed-point network vendors have designed their programs as web-based, which means that it can be obtained from any computer on our network through a normal web browser. Most have also designed several management utilities to help monitor the entire system.

Hybrid AMR

The term hybrid refers to any system that uses more than one given communications medium throughout their system. According to our survey results, 19% of the municipalities with AMR have more than one type of system in place, some even using different vendors for each type of architecture. The majority are currently in the process of upgrading from one system to another.

Implementation and Cost

To assist in preparing the AMR deployment schedule and budget figures, we contact Badger Meter to conduct a Life Cycle Cost Model. This model takes into account data provided by the Village, as well as industry standards and published data from many vendors. We are proposing a 5-year AMR deployment with the following installation totals:

2001/02 -	30 % (4,603 meters)
2002/03 -	20 % (3,068 meters)
2003/04 -	20 % (3,068 meters)
2004/05 -	20 % (3,068 meters)
2005/06 -	10 % (1,537 meters plus any loose ends)

Included in this packet is the more detailed outline of their analysis. Below you will find a breakdown of the overall project costs and pay-back periods:

System	Total Project Cost	Present Value of Project Investment	Project Pay-Back (in yrs)
Badger/Itron - mobile radio	\$3,412,086	\$3,163,379	5.2
Schlumberger/Hexagram - fixed point network	\$3,740,958	\$3,469,398	5.6
Badger/Hexagram - fixed point network	\$3,949,719	\$3,659,955	5.7
Sensus - mobile radio	\$4,292,904	\$3,972,485	6.2

These figures are representative of the pricing we would expect in response to our RFP. The only major factor that could change these figures would be the installation costs, which were based on industry standards.

Communication will be one of the driving factors in the success or failure of a complete rollout of an AMR system. We are in the process of designing the various publications that will be sent to all customers, hopefully addressing ahead of time any questions or concerns they may have. Work will also need to be done to organize specific geographic sections of town for change-out and to notify customers when the contractor will be in their area. It will also be critical that the Village has an open line of communication with the vendor and contractor. There are many cases where the contractor will encounter difficulties during a change-out, and we will need to work with all those involved to make sure issues are resolved in a timely manner.

ATTACHMENTS

1. AMR System Schematics
2. AMR Survey Questionnaire
3. AMR Survey Results - No AMR
4. AMR Survey Results - With AMR
5. Life Cycle Cost Model Results
6. Selection Process, Evaluation Criteria and Compliance for RFP
7. RFP Evaluation Form
8. RFP Scoring Criteria

RECOMMENDATION

Since Downers Grove began providing water to residents, we have made very few changes to the type of equipment being placed in service. For many years we have shelved the need to improve our system in anticipation of a complete upgrade. Current conditions require that a change is made, and we have taken these past 10 months to do our best to develop a solution for all our concerns.

We have carefully examined the technologies available, studied our survey results, initiated many site visits, and have considered what features we are looking for in an AMR system. It would be the recommendation of this committee that the Village pursue the purchase and implementation of a Fixed-Point Network AMR system. Although the initial costs for this system may be more than previously budgeted, we would be afforded the ability to grow into a system that will withstand its expected 20-year life span.

¹ *The Scott Report on AMR Deployments*, Fourth Edition, May 2000, Howard A. Scott, Ph.D., Cognyst Consulting, L.L.S., Pequannock, NJ 07440