

Request for Proposal Advanced Metering Infrastructure (AMI)

PURPOSE

The City of Lake Ozark has a need for Advanced Metering Infrastructure and Meter Reading (AMI).

TECHNICAL CONTACT

Any questions concerning technical specifications or Statement of Work requirements must be submitted no later than August 31, 2022 at 11:00 a.m. and be directed to:

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BACKGROUND INFORMATION

The City of Lake Ozark desires to acquire and install an AMI system to further improve meter reading and the quality of service to customers in and around Lake Ozark. In addition, the AMI system will provide detailed data on usage and consumption to aid in system planning along with outage reporting capabilities and other benefits.

TECHNICAL REQUIREMENTS

The following section includes a list of minimum technical requirements for the AMI provider(s). Vendors interested in submitting a proposal are required to meet these specifications in order for their proposal to be considered.

Lake Ozark desires a two-way, fixed AMI communications network for water meters which offers remote monitoring and control functions to meters on the Lake Ozark system. This system must be a total RF point-to-point (PTP) system; Lake Ozark will provide data backhaul from collector/gathering point to Utility network and connection to Internet for hosted head-end AMI system. If bidder would like to provide pricing for more than one solution, that will be acceptable. Be sure to indicate which price reflects which solution. The City of Lake Ozark will not purchase bidder's proposed AMI system unless it has been successfully deployed at twenty five or more utilities that are at least similar size to Lake Ozark and the AMI system operates and fully interacts with Lake Ozark's utility billing system. Bidder must be able to add water endpoints in the future, and those endpoints must be able to communicate bi-directionally/two-way with the same AMI system that bidder proposes for the current meter system without any additional hardware except where existing RF coverage is not in place. The offered AMI solution shall address and support the following requirements:

System Overview and Architecture

Provide an overview and block diagram or equivalent of bidder's proposed solution describing all equipment. Describe the effect(s) of weather conditions on the equipment, and how it might interfere with the endpoint's transmissions. Describe the typical failure rates of each piece of equipment. Describe all single points of failure and potential communication bottlenecks, for example:

1. Endpoint
2. Endpoint to collector communication path
3. Collector
4. Communications

General Requirements

Bidder's proposed solution shall provide the attributes and functionalities listed below. If bidder's proposed solution does not meet certain general requirements, please specify. All such exceptions should be individually listed and described in full in an attachment submitted with Bidder's proposal:

1. Two-way, fixed-network, fixed or engineered path communications system
2. Communications medium to the meters is to use an RF based private licensed frequency technology. If an unlicensed frequency is proposed, specify how the system is protected from interference from other devices. Specify all operating frequencies, FCC compliance, and bidder's role in securing any necessary licensing or operating permits
3. Daily retrieval of all meter data with at least 98.5% of all meters successfully read over a 4-day billing window without estimation.
4. All collected data should be time-stamped by endpoint
5. The host system must transmit all necessary billing data to the customer information system within 24 hours of the end of the billing cycle
6. The communications system shall support real-time, on-demand meter reading requests for water metering and shall have an average response time of less than 120 seconds for water meters.

7. Specify connection bandwidth to hosted server for overall system and for each collector/data gathering device to meet the above transmission time, given estimated number of water meters.
8. The communications system shall enable remote reconfigurations to all endpoints without a field visit.
9. Daily usage readings read directly from the meter register rather than using calculated readings.
10. Daily demand usage and theft/tamper alert data shall be available over communications system. Theft tamper should be a positive indication independent of traditional tilt and vibration alarms
11. All alarms, including power failure, shall be programmable by event type and be reported by an unsolicited event message
12. Communications over system to be initiated either by the host system (hosted server) or at the meter point
13. Broadcast messaging and endpoint grouping capabilities
14. Ability to monitor and report communication statistics from each endpoint
15. Utilization of standard TCP/IP connections for data transfer between endpoint collectors and hosted server
16. Information stored in commercial meters that are in ANSI C 12.19 format should be up loadable via the AMI system.
17. Hosted server for all AMI functions at bidder's location. Required server reliability of 99.9% or greater. Provide details of data backup system, backup, security and redundancy.

Deployment Services & Management Scope

Bidder's proposed solution shall provide the services listed below. If bidder's proposed solution does not meet certain general requirements, please specify. All such exceptions should be individually listed and described in full in an attachment submitted with Bidder's proposal:

1. Project Management
2. Training
3. Documentation / Scope of work / Time Line of deployment with milestone time line
4. Support for both software and hardware
5. Software licensing & Maintenance program
6. Software integration

AMI Communication Requirements

The AMI solution shall support either a single- or multi-layer infrastructure (i.e., local-area network (LAN) and wide-area network (WAN)).

The LAN must utilize two-way communication from the endpoint device to the collector for all water devices.

The WAN must support from the collector device to the central host server wired connectivity: TCP/IP-based Ethernet using single-mode fiber optic connections.

The AMI solution must support the following two-way communication methods:

1. Scheduled data messages (hourly with time stamp)
2. Proactive messages (unsolicited messages sent as events occur)
3. On-demand messages (in near real-time)
4. Broadcast messages (also providing control functions)

The AMI solution shall be designed so that increases in data requirements (e.g., moving from daily reads of all customers to hourly reads of all customers) do not raise the operation and maintenance cost of the system.

The City of Lake Ozark will provide communications via TCP/IP protocol from collectors to the central host server. Bidders shall provide an estimate of the total number of collectors (and repeaters, if applicable) required to read a specific set of meters. In the event of communication loss from endpoint to collector or collector to central host server, there must be no loss of data or endpoint information.

Bidder shall describe how the communications capacity and responsiveness can be expanded to meet Lake Ozark 's future growth of both meters as well as other communication requirements. Bidder shall also provide bandwidth estimates for all communications back to hosted server.

AMI Hardware Component Requirements

Water Meters - 5/8", 3/4", and 1" Sizes

Type

Solid state, battery operated electromagnetic flow measurement system with a hermetically sealed, glass covered, electronic register with a programmable 9-digit display.

Conformance to Standards

Must conform to American Water Works Standard C-700 and C-710 as most recently revised with respect to accuracy and pressure loss requirements, or other appropriate American Water Works Standard. Must be compliant with ANSI/NSF Standard 61 Annex G.

Register

The register must be an electronic device encapsulated in glass with 9 programmable digits utilizing a liquid crystal display (LCD). It will have indicators for flow direction, empty pipe, battery life and unit of measurement. The register must be hermetically sealed with a heat tempered glass cover and be tamper-resistant. The register shall not be removable from the measuring sensor. The register shall utilize a magnetic coupling technology to connect to a touch read, radio read or fixed base meter reading system in either an inside or pit set installation.

Measuring Element

The measuring element shall be made of a non-corrosive, lead-free glass fiber reinforced, PPS (polyphenylene sulfide) based resin. A battery powered magnetic flow sensor utilizing silver/silver chloride electrodes will be utilized to measure the velocity of the water which is linearly proportional to the volume. The measuring element will have no moving parts and will be specific for each size.

External Housing

The register and measuring element will be an integrated unit housed within a thermal plastic external casing. This integrated unit will not be removable from the external housing. The systems shall have the size and direction of water flow through the system imprinted on the external housing.

Strainers

Each system must be provided with a replaceable, corrosion-resistant synthetic polymer strainer screen.

Performance

The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. Maximum headloss through the meter / strainer assembly shall not exceed those listed in the following table per meter size. The meter must be warranted to perform to the accuracy levels set forth below for twenty (20) years from the date of shipment.

Minimum Operating Characteristics

Meter Size	Low Flow (95% Min.)	Operating Range (98.5-101.5%)	Pressure Loss (Not to Exceed)	Maximum Operating Pressure
5/8"	0.03 GPM	0.11 – 25 GPM	4.0 PSI @ 15 GPM	200 PSI
5/8" x 3/4"	0.03 GPM	0.11 – 35 GPM	2.0 PSI @ 15 GPM	200 PSI
3/4"	0.03 GPM	0.11 – 35 GPM	2.0 PSI @ 15 GPM	200 PSI
1"	0.11 GPM	0.4 – 55 GPM	2.0 PSI @ 25 GPM	200 PSI

Pressure Capability

System shall operate up to a working pressure of 200 pounds per square inch (psi), without leakage or damage to any parts. The accuracy shall not be affected by variation of pressure up to 200 psi.

Advanced Reporting

The system must be capable of having at the minimum the following reporting capabilities:

1. Programmable leak detection
2. Programmable reverse flow detection
3. Empty pipe alarm
4. Tamper alarm

5. Programmable data logging capability must include:
6. Peak flows and volumes within intervals
7. Minimum of 5,000 data points
8. Intervals must be programmable from 15 minutes to daily

Alarms must be logged including date and time of event. Logs must be downloadable.

Performance Warranties

In evaluating bid submittals, warranty coverage will be considered. All bidders are required to submit their most current nationally published warranty statements for water meter maincases, registers and measuring chambers.

Shipment Verification

A statistically controlled sample of each shipment will be tested by the utility to insure each shipment meets the utility performance and materials specifications.

Water Meters - 1-1/2", 2", 3", 4", 6", 8" and 10 Sizes

Scope

These specifications set forth the minimum acceptable design criteria and performance requirements for cold water meters including the following potential service applications and general considerations:

1. Intended where a wide flow range is anticipated
2. Measurement of water usage for critical billing applications
3. Measurement intended for typical commercial and industrial applications requiring lower flow sensitivities
4. Measurement of constant low to medium flows up to high flow usage
5. Conformance to Standards - The meter package shall meet or exceed all requirements of ANSI/AWWA Standard C701 and C702.
Each meter assembly shall be performance tested to ensure compliance.

Maincases

The meter maincase shall be of epoxy coated ductile iron composition. The epoxy coating shall be provided as standard fusion-bonded and adhere to NSF for non-lead regulation compliance.

Performance

The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. Maximum headloss through the meter / strainer assembly shall not exceed those listed in the following table per meter size.

Minimum Operating Characteristics

Meter Size	Low Flow (95% Min.)	Operating Range (98.5-101.5%)	Intermittent Flows (98.5-101.5%)	Pressure Loss (Not to Exceed)
1-1/2"	0.25 GPM	0.5 – 160 GPM	200 GPM	6.9 PSI @ 160 GPM
2"	0.25 GPM	0.5 – 160 GPM	200 GPM	4.3 PSI @ 160 GPM
3"	0.5 GPM	1.0 – 400 GPM	500 GPM	3.2 PSI @ 400 GPM
4"	0.75 GPM	1.5 – 800 GPM	1000 GPM	6.4 PSI @ 800 GPM
6"	1.5 GPM	3.0 – 1600 GPM	2000 GPM	5.5 PSI @ 1600 GPM
8"	2.5 GPM	4.0 – 2700 GPM	3400 GPM	4.0 PSI @ 2700 GPM
10"	3.5 GPM	5 – 4000 GPM	5000 GPM	4.5 PSI @ 5000 GPM

Measuring Chamber

The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring chamber shall be capable of operating within the above listed accuracy limits without calibration when transferred from one maincase to another of the same size. The measuring shall be so configured to capture all flows as specified above, without the requirement of an automatic valve.

Direct Magnetic Drive System

The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. The direct drive system is designed to extend service life, enhance low flow sensitivity and provide extended flow capacity and overall accuracy of the meter assembly. Any and all additional intermediate, magnetic or mechanical, drive couplings are not acceptable.

Electronic Register

The meter's register is all-electronic and does not contain any mechanical gearing to display flow and accurate totalization. The electronic register includes the following partial list of features:

1. AMR resolution units fully programmable
2. Pulse output frequency fully programmable
3. Integral data logging capability
4. Integral electronically resettable accuracy testing feature
5. Large, easy-to-read LCD display
6. 10-year battery life guarantee

Maximum Operating Pressure

The meter assembly shall operate properly without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psig).

Strainers

The meter strainer shall be integral and cast as part of the meter's maincase. The strainer's screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration for the purpose of maintaining a full unobstructed flow pattern. The strainer body shall be a coated ductile iron fusion-bonded epoxy identical to that of the meter's maincase. All fasteners shall be stainless steel capable of maintaining the following static pressure ratings and physical dimensions:

Meter Size	Maximum Operating Pressure	Centerline to Strainer Base	Overall Length (Not to Exceed)
1-1/2"	200 PSIG	2-5/16"	13"
2"	200 PSIG	2-5/16"	15-1/4" or 17"
3"	200 PSIG	4-1/8"	17" or 19"
4"	200 PSIG	4-3/4"	19" or 23"
6"	200 PSIG	5-3/4"	23" or 27"
8"	200 PSIG	6-3/4"	30-1/8"

10"	200 PSIG	8-1/2"	41-1/8"
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Straightening Vanes

A straightening vane assembly is mandatory and shall be positioned directly upstream of the measuring element. The straightening vane assembly shall be an integral component of the measuring chamber.

Connections

Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration. The 3", 4" and 6" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

Certifications and Markings

All sizes of meter packages shall display the sizes, model, manufacturer name, and direction of flow. Such display shall be cast on the side of the meter maincase.

Guarantee and Maintenance Program

Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of shipment. In addition, the meter supplier shall submit nationally published literature clearly outlining its factory maintenance program and current price schedule covering complete measuring chamber exchange.

Water Meter Endpoint Devices

The Meter Transceiver(s) must be an electronic device that allows for the connection to an absolute encoder register. As defined by pre-programmed settings, the Meter Transceiver shall interrogate the encoder register and transmit the meter reading and other information to a collector. The Meter Transceiver shall be compatible with Sensus, Neptune (ProRead), Badger ADE, and Elster (Sensus protocol incorporated) absolute encoder registers. The Meter Transceivers shall attach to meters with Sensus encoder registers by TouchCoupler technology, or they shall easily retrofit to existing meters with encoder registers in the field. The Meter Transceiver shall be manufactured in both non-pit and pit set models. The Meter Transceiver should have the capability to have at least two registers attached to one Meter Transceiver. The Meter Transceiver shall have the ability to be mounted on a wall. The pit set Meter Transceiver shall have the ability to be mounted in a pit set environment or an underground vault. The non-pit and pit set Meter Transceiver shall have the battery and electronics encased in High Density Polyethylene (HDPE) waterproof design.

Physical /Mechanical Requirements

Non Pit Meter Transceiver:

1. The non pit Meter Transceiver housing shall be constructed of a polycarbonate plastic compound.
2. The battery and electronics will be housed in High Density Polyethylene (HDPE). The Meter Transceiver shall be capable of operating at temperatures of -30°F to +165°F (-34°C to +74°C) with a humidity of 0 to 95%.
3. The Meter Transceiver must be waterproof and capable of exposure to water spray and splash. The Meter Transceiver shall provide a location for a tamper deterrent seal.
4. The Meter Transceivers must be capable of being field retrofit to existing meter / encoder register installations using TouchCoupler or wired connections

Pit Set Meter Transceiver:

1. For pit or vault applications, the pit Meter Transceiver antenna shall be designed to be installed through the industry standard 1-3/4" hole in the pit lid with no degradation of transmission range. The pit set Meter Transceiver antenna unit will be capable of mounting to various types and thicknesses of pit lids — Cast Iron, Aluminum, Concrete, Composite or Plastic from 1/2" to 2-1/2" in thickness. The pit set Meter Transceiver design shall not require the replacement of the pit lid material to plastic to improve the propagation of the RF signal.
2. The device shall be capable of operating at temperatures of -30°F to +165°F (-34°C to +74°C) and be 100% submersible.
3. The Meter Transceiver circuit board and battery will be encapsulated in High Density Polyethylene (HDPE) for superior water ingress protection. The pit set Meter Transceiver must be suitable for operation in flooded pits and be able to be submerged for extended periods of time. The range will not be affected when the pit is flooded, provided the pit Meter Transceiver antenna is not submerged under water.
4. The pit set Meter Transceiver antenna shall be made of a material to withstand traffic.
5. The pit set Meter Transceiver shall provide a location for a tamper deterrent seal.
6. The pit set Meter Transceiver must be capable of being field retrofit to existing meter using TouchCoupler connections or wired connections for encoder register installations.

Collector Equipment

Collector equipment shall:

1. Connect to wide-area network (WAN) using standard TCP/IP connections with single mode fiber connectivity
2. Continue to collect and retain data if communications to the central host server are disrupted.
3. Withstand temperatures of -40°C to +65°C. Provide other temperature ranges and specs for equipment. If air conditioning is required for normal operation please specify.
4. Allow minimum of 30 days of storage, with data available for local download or via remotely from the head-end software system
5. Be within one minute of the system reference time (e.g., National Institute of Standards and Technology)
6. Provide a minimum of 30 days of data storage in the collector if WAN is unavailable
7. Any network device placed in the field must meet the following minimum requirements:
 - i. Utilize a 120/240 VAC power input, or stand alone solar panel. If solar, how long will battery operate equipment if fully charged?
 - ii. Utilize an outdoor NEMA enclosure, rated for -40°C to +50°C, with remote antenna capability, that can be pole- or wall-mounted Verify collector/gatherer to ensure proper configuration
 - iii. Allow remote firmware upgrades
 - iv. Utilize encrypted communication methods to ensure data security
8. Not rely on any collector or endpoint device as a single point of failure for data retrieval of any specific endpoint's data
9. The system's data collectors shall have, at a minimum, 8 hours of battery backup and remain fully operational during that time; no data loss may occur if life of the battery is exceeded. Specify operating time of battery as well as useful life.
10. Be available locally or remotely from the central host server. On site availability to collection devices to upload data in the event of extended backhaul outages.

Hosted AMI Server

Hosted AMI server shall:

1. Be fully provided, maintained, backed up, and supported by Bidder. Server shall be on Bidder's premises. Hosted server shall exceed 99.9% reliability and uptime to Lake Ozark.
2. Be capable of control and monitoring functions for AMI technologies to provide future feature flexibility. Be web browser-based

3. Provide a one-page dashboard of system health, with hyperlinks to screens and reports showing additional detail. Provide details on the type of information available on the dashboard
4. Have defined APIs and MultiSpeak® version 4-compliant interfaces to allow for existing and planned software applications. Have flexible billing extracts which interface to the Lake Ozark existing utility billing application
5. Offer customized reports
6. Support both report generation and online viewing of reports.
7. Be capable of routing meter or communications system diagnostic data, battery alarms, tampering alerts and other non-billing data to other utility applications
8. Provide audit reporting capabilities
9. Provide methods of user authentication

Bidder shall provide an estimate of the capacity/bandwidth required between the central host server and the collector equipment.

Bidder shall provide screen shots of hosted AMI server dashboard and key reports available from the proposed system.

Bidder shall provide details of the system's MDM capabilities, if available, as well as optional pricing of MDM if not included in standard AMI system.

Bidder shall describe available IT hosting services, including disaster recovery and data backup capabilities provided at the hosting site.

Bidder shall describe and estimate annual maintenance and software agreements. Describe different levels of service, if applicable.

Advanced System Requirements

AMI System Training Requirements

The bidder must identify standard training procedures for Lake Ozark 's personnel. It is preferred that a variety of class formats (e.g., online, classroom) be available. Describe whether the training is required or optional, how many days of training for system operators (and installers), and include course descriptions.

AMI System Implementation Requirements

Bidder shall describe its account management approach, including the turnover process from presale through post-implementation support.

For this project, bidder shall be responsible for supplying, delivering, training, and ensuring the proposed AMI system is operational prior to full deployment. This shall include, but not be limited to:

1. AMI system deployment management and support
2. Network deployment planning and installation training
3. Hosted system controller configuration and setup
4. Support for the development of an interface to the utility billing system and other enterprise applications
5. Establishing with the utility and supporting initial functional testing of the system
6. Utility and subcontractor (if required) support for complete field network and meter installation
7. Describe any specialty tools required for installation or maintenance of system.

Product Warranties

The Bidder shall provide detailed warranty information with its proposal, including warranties for all hardware, software, etc. A complete description of all warranty coverage shall be included in the proposal.

