

## **AMI STANDARDS FOR TRANSMITTER HARDWARE**

### **Transmitters**

Transmitter housing made of plastic shall be tested using Izod impact resistance standards and identify the level of strength of the material. Transmitter shall be provided in a waterproof casing rated IP8 or better (submersion up to 1 meter of depth) in accordance with the IP code, IEC standard 60529. Transmitter shall continue to function in a temperature range -22°F to + 149°F (-30°C to + 65°C). Transmitter units shall be provided with a unique bar code that enables the utility to readily link the installed transmitter with the address/meter.

### **Wiring**

Connections for AMI transmitters shall use 22 gauge copper vinyl clad wiring per AWG. Wiring convention shall employ a 3 wire connections red, green and black with white as spare. Wires shall be labelled R, B, G (and W) as are terminals on the meter and transmitter. Connectors shall be standard devices fully resilient to wet conditions per UL 486D.

### **Battery** (revised 11/20/14, 2/23/15)

AMI transmitter battery life shall follow the warranty period of the transmitter unless there are cases where excessive use through two way communication is presented. For systems using true two way communication (including most AMI systems and migrating AMR to AMI systems), the data management system shall provide clear indication of battery remaining life and in all cases shall provide a warning that battery failure can occur within 6 months. For two way systems, the vendor shall provide clear examples of to what extent battery use can be shortened by possible uses including 1) extracting 5 minute reads for a one week period (as part of use study or evaluation of meter sizing) 2) extracting 4 special reads per read that may be requested (as in transient properties where responsibility for the bill changes hands).

If the vendor should indicate that the battery is replacement in the transmitter, the vendor shall describe how water tightness can be maintained after the transmitter case has been opened.

### **Product Warranty**

Vendor shall provide a minimum 10 year warranty (replacement provided at no cost including shipping) on the transmitter with a 10 year diminishing reimbursement for the cost of the replacement unit. An option for 15 years and 5 shall be included with any change in price clearly stated in the bid for utility analysis. Vendor shall provide currently available options for the disposal of lithium batteries in the transmitters, describing removal procedure from transmitter and outlets for disposal. Vendor shall indicate how their company currently disposes of lithium batteries and the transmitter casings. Vendor shall provide an estimate of the unit cost for the disposal based on current costs.

## **Transmitter Placement**

Vendor shall be knowledgeable about the proposed locations of the transmitter including placement at meter which can be inside a building below grade or in exterior subsurface vaults and meter pits (metal lids) and shall provide sufficient information to the utility at the time of bid about what measures may be required to obtain readings (example external wall mounted transmitter, nonmetallic pit lids). Vendor shall provide brackets for a variety of transmitter mountings to include locations at the meter or in close proximity to the meter (interior settings), in pits and on walls. Brackets shall be rugged and meet impact standards (noted for transmitters). At installation of the transmitter, the vendor shall provide an optional method to provide coordinates of the meter/transmitter using GPS or some other coordinate convention.

## **Connections** (revised 11/20/2014)

Connections for AMR/AMI transmitters shall use 22 gauge copper vinyl clad wiring per AWG. Wiring convention shall employ a 3 wire connections red, green and black with white as spare and comply with standard convention for color. Wires shall be labelled R, B, G (and W) as terminals on the meter and transmitter. Connectors shall be standard devices fully resilient to wet conditions per UL 486D and IP68. Wiring shall be solid and not stranded unless permitted by the utility.

## **AMI STANDARDS FOR DATA COLLECTION HARDWARE/SOFTWARE**

### **Time stamping of reads** (revised 11/20/2014)

AMI systems shall be fully capable of transmitting 24 hourly reads and must transmit at least once daily. It is preferred that reads be timed to be collected on the hour. AMI transmitters in true two way systems must be properly time synchronized at least once per day. Two way systems must be capable of upgrading the software in the transmitters as well as maintaining time and providing reads on demand. Vendor shall fully describe these features including the capabilities and limitations of its system - if described as "two way" (capable of collecting reads from individual units on demand, capable of reprogramming individual and group transmitters - altering the frequency of reads for example).

### **Propagation Study**

Vendors will provide a propagation study that documents the appropriate number of collection and repeating devices using suitable locations for collectors and repeaters for the meter reading area. Vendors should be prepared to provide a cost maximum within the bid based on propagation information such that if additional collection (repeater) equipment is necessary, it is provided at no cost to the utility. Utility should be informed of any assumptions made on location of

units (including height and specific locations) and verify in advance that the collector layout is acceptable. Vendor should utilize information provided about collector locations if available and refrain from assuming locations of excessive height or strategic position without conferring with utility.

### **AMI Collection Redundancy**

The data collection system shall be designed to insure data redundancy such that the loss of data from an individual data collector or repeater is clearly conveyed to the utility in a timely fashion (within 48 hours). An alarm about faulty collection shall be immediately conveyed to the operator in AMI. Alternatives for the system may include (1) functioning fully with the loss of a collector or repeater without interruption of data flow, (2) for migrating systems, the ability to readily switch back to AMR collection for the short term or (3) provide immediate (48 hour service) to restore units and recover data that would (must) be stored.

### **Radio Transmission**

Radio transmissions from the system must operate within the FCC approved licensed or unlicensed (scientific and medical band (ISM) band) frequencies permitted for meter transmissions. If a license is required, the vendor must clearly identify the responsibility for securing the license and how it is to be paid initially and going forward. The vendor must identify the system as a fixed, direct sequence or "hopping" frequency system. Utility ownership of any FCC license is highly preferred (vendor may facilitate). If the ownership of the license is granted to the vendor, the license must revert back to the utility if relationship with vendor terminates.

Vendor shall identify issues regarding obstacles to effective transmission and reception of data including transmission problems with metal meter pit lids, metal lid vaults, building structures and transmitters set below grade. Remedies for such issues (e.g., composite lids, use of wall mounted transmitters to outside of building) shall be identified in the vendor bid so the utility can examine possible options and additional costs. The vendor shall design the system to achieve a data retriever rate of 99% of reads and read related alarms.

Vendors shall identify the interval, duration and strength of radio signals from radio transmitting AMI devices (including the nature of frequency hopping if employed). Vendors shall provide any documentation it possesses concerning health related concerns and the use of their devices to aid the utility in the effort to assuage concerned customers.

### **Transmission Security**

Vendor should convey all data available from meter or stored in transmitter to data management system using secure (encrypted) format that meets the Advanced Encryption Standard (AES) encryption standard (National Institute of Standards and Technology (NIST) for type 4 uses.

Vendor shall describe any and all data that cannot be conveyed by its data collection system that exist at the meter or MIU level that is not encrypted.

### **Data Management Options**

Vendor shall fully describe options (and costs) for delivering data from collection system directly to the utility computer network, to the vendor or third party MDM site (with utility access using FTP site) as directed by the utility. Vendor shall identify system ability to migrate from AMR to AMI.

Vendors shall identify any third parties with which they have provided data formatting information to allow that party to provide meter data management. Vendor shall identify any distinctions in data information that are different between the third party and their own MDM system.

Vendor shall identify all third party monitors and actuators (valves) that can communicate with the data collection system and convey information to either the meter data management or the monitoring vendor software. If data conveyance does not use the third party monitor software, any partial data not provided shall be identified.

### **Data Management Alarms**

Utility is aware that different alarms (backflow, tamper, variations in use) can have different meanings depending on the meter and transmitters. Vendor shall identify parameters such as duration (e.g., backflow every 15 minutes), exact nature of alarm (e.g., tamper means cut wires, continuous use can mean water consumption every hour for x days). The data transmission shall convey the meaning of each alarm clearly (through common format and/or receiving by MDM).

### **Data Management Reports** (revised 11/20/2014)

AMI MDM shall be capable of providing a utility list of MDM reports (as included by the utility in a separate list). MDM shall have specific standard reports and be configurable to prepare other reports as required by utility. Standard reports shall include various listings of accounts by error types, individual user history with comparative features (day to day by days of the week, week to week, month to month and ability to compare two or more meter consumptions side by side).

MDM error reporting shall include identification of locations with missing reads, metered accounts identified as unbilled with usage, accounts identified as active with zero use and accounts identified as active with usage at variance to past history (as available).

The platform provided to the utility shall be equipped with visualization tools, customer user metrics displaying reads and usage. Where possible, the structure, format storage and integration of data shall employ industry standards.

Vendor shall describe its ability to make data available to the water customers of the utility through selective access to account information provided by the MDM. Vendor shall describe how the utility is able to control extent of access by customer and how data is secure.

## **AMR/AMI REQUIREMENTS FOR INTEROPERABILITY**

**Definition** – Interoperability is the ability for two applications or systems to interact in a pre-defined manner to perform the tasks that are effectively communicated by at least one of the parties). For AMI tasks will include, but not restricted to communication of meter reads, various alarms, shutoff valve operation and acoustic monitors. Interoperability is the ability for the two applications or systems to work concurrently using a defined interface established through contracts and standards or as outlined in the specification/statement of work. In general, interoperability can be tested; passing tests is based on both compliance and demonstrated interoperability as defined in the scope of the tests. Contractor shall indicate their willingness to operate a system that can be interoperable (working co-dependently) with transmitters and collectors and meter data management systems from other systems. This requires a commitment to open architecture, sharing protocols, especially data formats in transmissions.

The Contractor shall make the configuration of the meter related data from the meter/transmitter available to the utility and third parties specifically the utility meter data management company (Global Water Fathom). Contractor must describe any limitations and if this can be provided, indicate any additional initial costs and annual fees. Open communication is divided in three categories and contractor shall clearly indicate his compliance/noncompliance with each.

1. AMI transmitter signal sent to data collectors/repeaters    COMPLY   Ω   YES       Ω   NO

COMMENT DO NOT deviate from definitions provided. If there is a lack of clarity, please advise.

2. Interoperability provided with the data stream from the AMI collectors to receivers (coming directly from the data collector prior to the data display device)    COMPLY   Ω   YES       Ω   NO

COMMENT

3. Data transfer from receivers to meter data management system  
COMPLY  YES  NO

The Contractor must be willing to make the content and presentation of all transmissions (format) available to the utility at the end of the contract (5 years) to allow an efficient transmission to the next generation of AMI, whether from the same or another manufacturer. The Contractor shall advise if they are willing to participate in the creation of a universal data collection device (handheld, vehicle, mesh or star AMI). COMPLY  YES  NO

COMMENT

The Contractor (AMI) must indicate a willingness to work with third party Contractors that have other forms of system monitoring other than firms with which they have existing agreements (assuming that the third party is identified and willing to work with the Contractor).

- |   |   |
|---|---|
| 1. Acoustic monitoring for leak detection | COMPLY <input type="radio"/> YES <input type="radio"/> NO |
| 2. Pressure monitoring                    | COMPLY <input type="radio"/> YES <input type="radio"/> NO |
| 3. Temperature monitoring                 | COMPLY <input type="radio"/> YES <input type="radio"/> NO |
| 4. Water quality monitoring               | COMPLY <input type="radio"/> YES <input type="radio"/> NO |
| 5. Shutoff valve operation                | COMPLY <input type="radio"/> YES <input type="radio"/> NO |

Programming the transmitters and other interface equipment should be accomplished employing commonly used computer appliances such as in today's market toughbooks, tablets or smart phones. Contractor shall provide suitable connecting cables (that employs common interfaces such as USB port. Contractor shall make available the software including upgrades for the

projected life of the MIU reflecting the use of current Microsoft systems and maintain suitable upgrades over the life of the contract without compromising interoperability. Contractor will commit to common connectors and connections as found in the industry.

COMPLY Ω YES Ω NO

COMMENT

### AMI Standards for Interoperability

In order to promote interoperability, a prescribe list of data format elements are being designed to contain a string of characters to describe features that should be common to all AMI systems, though differences will exist with alarms and their meanings (that can be addressed by keying off the AMI vendor code. Contractors shall confirm their commitment to a migration to this system or subsequent developed layout in the future with a transition to a next generation of units and without undue delay. COMPLY Ω YES Ω NO

#### DATA FORMAT ELEMENTS

AMI vendor code (two alphanumeric characters descriptive of vendor and their system in use)

multiple characters for the **route number or sector** of the system

multiple characters for the **read type** (AMR/AMI manual or other read type)

multiple characters for the **data collector** (for AMI the collector ID and for AMR the vehicle operator)

multiple characters for the **premise identification number**

the **meter** number

the **MIU** number

the **number of digits in the read**

the **resolution of the read** (xxxx.xx)

one character **cubic feet or gallons**

the **reading**

the **time stamp of the read (date and time)**

**use alarms** (probably two characters to describe use (high, continuous low, zero)

**backflow alarm** (multiple characters to describe level, count)

**tamper alarms** (codes for each type-alignment, wire discontinuity electromagnetic, dry, disconnected, etc.)

COMMENT