Cellular Endpoint for AMI Systems

GENERAL

The utility issues an RFP to procure an AMI system capable of meeting their current and future metering and operational needs with objectives of improving operational efficiency, increasing worker safety, enhancing customer service, and facilitating solution of customer billing complaints, water conservation initiatives, and distribution system management efforts.

The scope of work may include, but is not limited to, providing and installing a system which may include meters, endpoints, communications systems, Head End System (HES), Meter Data Management System (MDMS), system integration and all necessary training and installation support.

SYSTEM OVERVIEW

The cellular solution shall support targeted or full-scale deployments. The product shall leverage a cellular network that eliminates the operational and capital burden of a fixed network infrastructure. Data collection devices (collectors, gateways, etc.) are not required.

The cellular endpoint shall integrate seamlessly with other endpoint technologies (fixed network, touch read, AMR walk-by and drive-by) and use a cloud-based HES / MDMS software offered as a service (SaaS) that is scalable, reliable, and secure without the burden of implementation and data management..

CELLULAR NETWORK

The cellular network shall provide a reliable and secure means of data transfer. It shall have a dedicated core from commercial cellular networks to help facilitate the transfer of data during times of emergency and heavy usage, providing for message prioritization and protection against network congestion.

The cellular network shall also have encryption along the entire communication path from the endpoint to the tower to the core network.

CELLULAR ENDPOINT OVERVIEW

The cellular endpoint shall be a compact, ruggedized electronic device that is water resistant, designed to withstand harsh environmental conditions, and operate with existing utility assets (fixed network endpoints, AMR walk-by or drive-by endpoints, touch reads, etc.).

The cellular endpoint shall be two-way capable, transmit time synchronized 15-minute interval data over a cellular network 4 times per day, and have a backup mobile reading method in the event of an extended outage. To limit the opportunity of human error and provide for a consistent and predicable 20-year battery life, the endpoint shall require no programming or configuration. From the factory, the endpoint shall be programmed and configured for transmitting at its default, predetermined transmission intervals for operation on a cellular network with only a battery swipe necessary to initiate operation.

Each cellular endpoint shall have its own unique 9-digit identification number that is included in each transmission. The identification number shall be permanent and not modifiable. Additionally, this unique identification number shall be included on the endpoint label in numeric and barcode form along with applicable FCC information, date of manufacture, and manufacturer's designation.

The cellular endpoint shall be available as pit and wall form factors to support deployment in pits, vaults, walls, and basements. The pit endpoint shall work with any type of meter pit lid and have a through-the-lid, external antenna option for use with metal meter pit lids.

CELLULAR ENDPOINT PHYSICAL/MECHANICAL/ENVIRONMENTAL REQUIREMENTS

- The cellular endpoint's housing shall be constructed of a polycarbonate plastic compound capable of mounting both indoors and outdoors on a wall or pole and in a pit.
- The cellular endpoint shall be able to operate under a metal meter pit lid with a through-the-lid antenna option.
- The cellular endpoint shall be a fully submersible, potted device that adheres to the IP68 standard.
- All electrical components shall be encapsulated in potting to protect from moisture and water intrusion.
- The circuit board and battery of the cellular endpoint shall be protected and encapsulated by potting material for reliability and operation in a submerged pit environment or exposure to moisture.
- The endpoint shall withstand a 200-hour salt fog test as specified in the NEMA 4 standard.
- The endpoint shall be protected against static discharge without loss of data per IEC 1801-2, issue 2.
- Operating temperature: -22°F to +149°F (-30°C to +65°C)
- Storage temperature: -40°F to +158°F (-40°C to +70°C)
- Operating humidity: 100% condensing
- Power to the endpoint shall be supplied by a lithium-thionyl-chloride D-cell battery and a hybrid layer capacitor with a 20-year life expectancy and shall not be removable or field replaceable to ensure reliability throughout the life of the product.
- The cellular endpoint shall be labeled with the manufacturer's name, model number, unique identification number, required FCC labeling, and date of manufacture. The label shall also include a bar code of the unique identification number.
- The external antenna for the pit endpoint shall be designed for installation through the industry standard 1 ¾" hole in the pit lid and shall be capable of mounting to various thickness of pit lids from ½" to 2 ½".
- The external antenna for the pit endpoint shall be made of a metallic and polymer material to withstand traffic and have a dual seal connection to the endpoint housing.

CELLULAR ENDPOINT OPERATING INSTRUCTIONS

- The cellular endpoint shall be PTCRB certified.
- The cellular endpoint shall operate on the FirstNet broadband network.
- The cellular endpoint shall operate within FCC Parts 15.247 and 27 regulations.

FIELD AND INSTALLATION OPERATIONS

- To avoid field splicing during installation, the cellular endpoint shall have the option of being manufactured prewired and potted to the register and made available with Nicor in-line connectors.
- No programming or provisioning shall be required to configure the cellular endpoint at installation.
- The endpoint shall feature an "auto-detect" feature that automatically scans and detects the appropriate register protocol, allowing a quick and error free install operation.
- The endpoint shall be pre-configured from the factory in a single mode that supports cellular AMI and backup mobile messages.
- The cellular endpoint shall be activated with a magnet swipe of the housing cover.
- The cellular wall endpoint shall offer a configurable back plate to provide various mounting options on masonry, wood, pipe, and other building materials that can support the weight of the endpoint assembly.
- The cellular endpoint shall support a maximum of 500 feet when using Neptune E-CODER registers and 200 feet when connecting to Sensus protocol registers, allowing for extra length of wiring to be used in pit, vault, and basement installations to ensure no strain is placed on the wired connections of the endpoint and register.

- To guarantee proper installation and cellular signal, the cellular endpoint shall be compatible with a field tool that can verify cellular connectivity and a valid meter reading of the endpoint. The field tool shall be capable of operation with iOS or android devices.

DATA TRANSMITS AND STORAGE

- The cellular endpoint shall interrogate the meter register for consumption and event data every 15-minutes. This interrogation schedule shall not be configurable, and the event data shall include continuous flow, intermittent flow, and reverse flow.
- The 15-minute interval data shall be transmitted to the HES / MDMS over the cellular network every 6 hours.
- At each transmit, the endpoint shall provide all the 15-minute interval data collected since the last successful cellular transmit. This transmit schedule shall not be configurable.
- The transmission schedule shall provide for a maximum elapsed time of no more than eight hours from when the meter is read to when the reading is available in the HES / MDMS.
- The endpoint shall store up to 96 days of 15-minute consumption and event data.
- In the event of a network outage or a failed cellular transmit to the HES / MDMS, the endpoint shall still interrogate the meter register, store the data, and track what has been successfully transmitted over the cellular network. The endpoint shall automatically backfill any data that has not been transmitted successfully to the HES / MDMS with the next successful cellular transmit.
- The cellular endpoint shall support a mobile back-up message that automatically transmits every 30 seconds after 72 consecutive hours of failed cellular transmits. The endpoint shall stop transmitting the mobile messages after a successful cellular transmit and automatically backfill any data that has not been transmitted successfully to the HES / MDMS

TIME SYNCHRONIZATION AND SYSTEM COMMANDS

- The cellular endpoint's clock shall be time-synchronized from the cellular network with every cellular transmission and provided an accuracy of +/- 1 second.
- The cellular endpoint shall support remote, over-the-air firmware updates.

LEAK AND HIGH FLOW DETECTION

- The cellular endpoint shall provide leak detection capability by monitoring each 15-minute consumption interval during a 24-hour period.
- If all 15-minute intervals record water consumption, the cellular endpoint shall report a Continuous Consumption event.
- If 50 of the 96 intervals during a 24-hour period record water consumption, the cellular endpoint shall report an Intermittent Consumption event.
- The leak detection event data shall be provided to the HES / MDMS at least four times per day.

BACKWARD FLOW DETECTION

- The cellular endpoint shall support backward / reverse flow detection.
- The cellular endpoint shall report a Minor Reverse Flow event when backward flow is detected between the minimum and maximum values.
- The cellular endpoint shall report a Major Reserve Flow event when the backflow flow detected is greater than the maximum value.
- The minimum value shall be equal to 1 reserve digit change of the 8th wheel on the odometer display and the maximum value shall be 100x the minimum value.
- The reverse flow event data shall be provided to the HES / MDMS at least four times per day.

SECURITY, TAMPER DETECTION AND PREVENTION

- The cellular endpoint shall support encryption along the entire communication route, from the endpoint to the cell tower to the network core.
- The cellular endpoint shall provide a seal wire for tamper resistance of the meter housing.
- The cellular endpoint shall provide a unique error code for a tamper event that is transmitted to the HES / MDMS. The endpoint shall check for tamper with each 15-minute interrogation of the register and not clear the error code until the event has been resolved.

REGISTER COMPATIBILITY

The cellular endpoint shall be compatible with Neptune ARB®V, ProRead®, ProCoder™, E-CODER®, and MACH 10® registers. The cellular endpoint shall also be compatible with registers using the Sensus UI-1203 protocol.

- Neptune MACH 10, ARB V, ProRead, E-CODER, and ProCoder
- Sensus ECR II, ICE, iPerl, Electronic Register and OMNI
- Hersey/Mueller Translator
- Badger ADE and HR E|LCD
- Elster/AMCO InVision (Sensus protocol version)

MULTIPLE METER REGISTERS

- The cellular endpoint shall not support a dual port option.
- The cellular endpoint shall have no restrictions for operating in close proximity of each other or other endpoints.

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