

AMI Technology and Services Request for Proposal

Appendix A: Functional, Technical & Services Requirements



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1 AMI Requirements

The AMI Solution shall meet the following requirements (functional and non-functional have been identified). To the extent possible, the AMI solution should leverage standard technologies in meeting the following requirements (e.g. IT standards, minimizing the use of proprietary technologies and protocols, etc.):

1.1 Vendor Requirements

The AMI Vendor must be able to meeting the following minimum criteria:

- Vendor shall have been providing AMI solutions for at least 5 years.
- Vendor shall have experience in managing the deployment of their proposed AMI solution.
- Vendor shall have been providing the technology proposed for at least 2 years (excluding firmware revisions and meter version changes) in a similar island environment.
- Vendor shall have at least one (1) million meter endpoints deployed and operating across North America in the proposed or the previous generation.
- Vendor shall have at least one customer with at least 100,000 metering endpoints deployed and operational utilizing the current Network design and HES.

1.2 AMI Functional Requirements

The proposed AMI system and necessary hardware/software components must be capable of supporting all electric meter forms as listed in Appendix F.

Offeror shall provide an AMI Coverage and Capacity Designs that will provide two-way communications to all electric and water meters, as well as any potential distribution equipment, streetlights and selected metering DI (distributed Intelligence) within VIWAPA's service territory. A set of files with the location information for each electric meter is provided in Appendix E. A summary of VIWAPA's communications infrastructure is included in Appendices G and H. The AMI Coverage and Capacity Design should meet the performance and capacity requirements described below for all of VIWAPA's endpoint devices. The Offeror is responsible for demonstrating the cellular data coverage for meters and/or network devices is sufficient for the proposed design.

For all the following requirements, the Offeror shall provide a summary for each requirement as to why the proposed solution Complies or does not comply with the requirements separate from answers provided in the attached Requirements Matrix.

1.2.1 Electric Metering / Endpoint Functional Requirements

Electric Metering/Endpoint Functional Requirements are:

- All electric meters must meet UL2735 at no additional cost to VIWAPA. In addition please provide details of UL Certification, i.e. 3rd party testing labs utilized in the compliance testing.
- All electric meters must support an internal operational temperature of no less than 100C (ideally 125C) and a humidity of 90% non-condensing. Internal components not capable of operating at the proposed minimum temperature must be identified and explanation provided as to how these components are operationally protected through F/W or hardware control. Components in question can include but may not be limited to super capacitors, batteries, temperature compensation devices and LCD.

- All electric meters must comply with all applicable ANSI C12.19 and C12.22 standards, including accuracy class (0.5% for single phase, .2% for Polyphase), data tables, protocols, security including encryption and safety. In the comment section please provide any additional applicable standards that the metering solution meets or complies with such as cellular Cat M1, LTE-M etc.
- All electric meters must comply with VIWAPAs standards for electric meters, test data, labeling and shipping.
- All electric meters must be tested, calibrated and programmed to VIWAPA's Meter Standard prior to being received at the designated VIWAPA or Offerors receiving facility.
- All electric meters must be solid state with no moving parts other than what may be necessary for service disconnect capability. Further the vendor is to provide a detailed overview of their disconnect design, switch reliability, switch rating, testing (include testing under full load), and life expectancy.
- All single phase electric meters must support the storage (at least 30 days) and reporting of at least 6 data logging channels of 15-minute data.
- All polyphase electric meters must support the storage (at least 30 days) and reporting of at least 12 data logging channels of 5-minute data.
- All electric meters must support VIWAPA's current rates and tariffs.
- All electric meters must support the recording of delivered, received and net (delivered - received) energy (kWh, kVARh, kVAh, Power Factor) registers as well as interval data with a granularity of at least 1 Watt-hour or 1 VAR-hour).
- All polyphase meters must support the recording of 4 quadrant energy registers and intervals with a granularity of 1 Watt-hour, 1 VAR-hour or 1 VA-hour.
- All residential (Single phase) electric meters must support 5-, 15- and 60-minute data logging. Support of multiple LP channels should be explained in detail.
- All polyphase electric meters must support 1-, 5-, 15- and 60-minute data logging.
- All electric meters must support the logging and delivery of voltage and current (average, instantaneous, minimum and maximum) data with 5-, 15- and 60-minute data logging.
- All electric meters must capture power quality information and make this information available, based on configuration, through the AMI Network and AMI HES as data and alarms/events.
- All electric meters must automatically capture a midnight snapshot of all register reads and make them available for retrieval for the 24 hours after midnight.
- All electric meters must be capable of recording "rolling" and "block" demand values. Rolling demand subintervals shall include resolution as small as 5 minutes.
- All electric meters must reliably manage and support the remote reset of the demand register on a scheduled (e.g. on billing cycle, daily, etc.) or adhoc basis and must record and report the successful reset of demand including time and date of last reset and number of demand resets.
- All VIWAPA electric meter forms must be either directly supported or a reasonable and suitable alternative be provided. Please refer to Appendix F for list of current meters
- All single phase self-contained electric meters (Forms 1S, 2S (Class 200 and Class 320) and 12S/25S) must support the option of a remote disconnect/reconnect switch that does not derate the class amps or impact temperature characteristics in any way. The disconnect switch must have a safe and reliable operating mechanism which will maintain state during a power outage and have the ability to record the last commanded state.

- All single phase electric meters equipped with remote disconnect/reconnect switch must be able to sense and report load side voltage and provide the current state of the switch to the head-end system.
- All electric meters equipped with disconnect/reconnect switch must report the successful and unsuccessful operation of the switch on the display and through the AMI network.
- All electric meters must support remote upgrade/reprogramming of any firmware resident in the meter including communications, metrology, HAN, and any other resident firmware. Please provide details in a one- or two-page attachment as to how the communications module can update any meter, regardless of manufacturer, or if it is possible at all.
- All electric meters and programmable endpoints must provide verification of success or failure for any configuration change (meter program) or firmware upgrade.
- All electric meters must be capable of being reconfigured remotely (over the air by the AMI HeadEnd System) with respect to data logging, register collection, event reporting, event threshold, etc. Please provide details in a one- or two-page attachment as to what remote configurations result in a loss or reset of data in the meter.
- All electric meters must have a temperature sensor and generate high temperature alerts with the ability to detect hot socket issues and send error messages/flags accordingly. Vendor is to provide a 1- or 2-page attachment describing how the temperature sensor is used, the location of the temperature sensor within the meter, the algorithm and configurations available to determine that a high temperature alert should be generated and one or two reference utilities where the temperature sensing capability is deployed and in use.
- All electric meters must have the capability to “arc” detect. Please include a 1-page attachment on the ability to detect arcing and how the event is identified and reported to the head-end system.
- All electric meters must sense and report the electric phase serving the meter and alarm if the phase(s) change as part of the site monitoring or diagnostics.
- All electric meters must identify which substation is serving the meter and if the substation changes.
- The AMI electric meters must not require any manual configuration during discovery or provisioning.
- All electric meters will be supported but Meter Tools suitable for meter shop and field use with the ability to interrogate, program or functionally test the meter metrology and communications.
- All AMI electric meters must support Distributed Intelligence apps which can be downloaded remotely to the meter.

1.2.2 AMI Communications Network

AMI Communications Network requirements are:

- All communications equipment must meet the applicable FCC standards for the frequency of operation.
- All network equipment must meet applicable ANSI and NEMA standards. Vendor is to provide a list of all applicable and compliant standards such as
 - NEMA Enclosure Rating (NEMA 250-2014)
 - NEMA rating 4 / 4X / 5

- IEC rating IP4 / IP5 / IP6
- All communications equipment must provide two-way communications to all levels of the network.
 - Note - If HAN is supported in the meter it shall be deployed in the off condition but will be tested to validate functionality prior to deployment
- The AMI communications network, if based on open communications standards, must fully comply with the standard. Vendor shall describe all standards supported for both present and future releases of the network.
- The AMI communications network must cover 100% of VIWAPA's meters/endpoints and selected alternative meters: refer to the attached document for meter types and forms.
- The AMI communications network must cover 100% of VIWAPA's electric meter population; refer to the meter locations within VIWAPAs service territory.
 - Vendor is directed to provide a 2 or 3 page write up describing how the proposed network will support communications to all applicable endpoints at the required performance levels as specified in this requirements section. VIWAPA expects that any AMI meter will be discovered as quickly as possible after its installation and will perform at a minimum performance level within 24 hours of installation. Include any limitations of the communications network which preclude meeting this requirement.
 - Vendor is directed to provide utility references and a subsequent reference plan indicating how the vendors technology supports similar meter deployments in a similar island environment supporting rural and urban network design.
 - **NOTE:** The network as proposed is required to cover 100% of VIWAPA's metering and network needs with redundant communications paths. In the event the proposed network requires more than 5% additional equipment (from that proposed in this RFP response) to meet the 100% coverage requirement, the vendor, at their expense will provide additional equipment, will cover any installation, operations and maintenance, and cover any additional network backhaul cost such as the use of cellular meters, additional collector site, repeaters, etc.
- The AMI Communications network must be scalable to meet VIWAPA's data and growth needs including the potential strategic deployment of 5% DI meters if so desired at some point in the future. Describe how the proposed network can scale to support regional or localized growth and any potential limitations that could negatively impact the proposed design.
- The AMI Communications network must support remote firmware upgrade and electric meter program to all endpoint devices and all network devices. Provide additional details on the firmware upgrade process, the management of upgrades via HES or other means and the safeguards in place to prevent endpoint or network equipment upgrade failures.
 - Vendor is instructed to provide a 1-2 page attachments describing firmware upgrade capabilities of the network and how this process recovers from outages during the download, or installation process.
- The AMI Communications network must support real-time events or alarms from all endpoint devices. Please describe how the events and alarms are prioritized and routed. How does the AMI system deal with large outages, for example island wide outages or

power rotations on a feeder level? Is a bottleneck created with a large number of outages? Does it take time for these messages to be processed?

- The AMI Communications network must support message prioritization and ensure that firmware upgrades do not impact the network availability for data collection, endpoint control and endpoint events. Provide message prioritization hierarchy, example startup vs last gasp vs reads vs remote disconnect/reconnect.
- All AMI Communications network devices must continue to operate for at least a minimum of 6 hours following a power outage. Please provide a 1- or 2-page overview of your battery backup solution, mounting requirements and provide an overview and timeline for maintenance requirements for both deployed and in storage network devices.
 - Note – For pricing purposes quote with no battery backup, 4 hours, and 8 hours of battery backup.
 - What happens if these batteries die? Does a truck need to roll?
- The Communications network must support QOS. Please provide details on how the QOS derived i.e. link quality and signal strength. If the proposed solution supports BER metrics, please provide additional details.
- The AMI Communications network should provide for the daily collection of registers and intervals at better than 99.5% reliability (e.g. 99.5% of the registers (midnight snapshot) and 99.5% of the intervals from yesterday must be received and available at the AMI HES by (6:00AM) today). Please provide a 2-to-3-page description, as an attachment of the daily collection of data from all proposed endpoint devices. This description should provide an architecture description of all data flows and transports along with timelines and specifics for retries and data gap filling.
- The proposed communications network must support, at a minimum, 98% of On-Demand reads, Demand resets and/or Disconnect/Reconnect commands being successfully completed within 30 seconds. Please describe how the proposed network will support this operation within the required time frame.

1.2.3 AMI Head End System Operational Requirements

AMI Head End System Operational Requirements are:

- The AMI Head End System must operate with virus protection software.
- The AMI Head End System must have application-level alerts.
- The AMI Head End System software must include sufficient documentation and training to allow VIWAPA to operate without use of Vendor professional services.
- All HES data must be stored in database. Use of flat files or other non-database mechanism for storage of AMI data is unacceptable.
- The AMI HES must include standard reports and dashboards for the monitoring and reporting of the data collect and communication performance and exceptions, as well as the operational status of each metering or network device. Vendor must provide list of standard reports, preferably with examples or screenshots.
- The AMI HES must support network-monitoring capability. In a 1- or 2-page attachment provide details on the network monitoring capability and how network performance is monitored on a daily basis.

- The AMI HES must have rules-based login capabilities with privileges. The AMI HES must integrate with VIWAPA's standards/ solution for the assignment of such rules. HES must support single sign on using Active Directory out of the box.
- The AMI HES must support the automated device discovery and configuration of installed devices.
- The AMI HES must include the complete database schema to allow custom reports and queries to be developed against the system.
- The AMI HES must support integrations through MultiSpeak Version 4.1 and must maintain compatibility with the any upgrades. Vendor must provide a complete manual of standards interfaces supported including the supported version of MultiSpeak (versions, web methods, etc.)
- The AMI Solution must support the integration to Harris MeterSense MDMS as well as Naviline CIS (please provide a list of billing systems supported).
- The AMI HES must manage the associated AMI network equipment providing configurable reports on system status, health, and connectivity through all levels of the network.
- The AMI HES must include tools to monitor performance of AMI Network and overall AMI solution in order to identify baseline performance and recognize any performance deterioration.
- The AMI HES must manage firmware versions, initiate upgrades, and validate results.
- The AMI HES must support grouping of devices for the purposes of specific operations such as outage management, voltage optimization, etc. The AMI HES must have interfaces, tools and services to manage these groups.
- The AMI HES must have the ability to autonomously monitor the health of the system and provide messaging or alarms to VIWAPA's personnel in the event of operational issues.
- The AMI HES must provide tools for the detection and management of misconfigured or orphaned endpoints.
- The AMI HES must accurately maintain system time synchronization across all devices to ensure accuracy of data.
- The AMI HES must support a configurable and programmable schedule for communicating with all endpoints. Different schedules may be utilized in support of VIWAPA's customers.
- The AMI HES must support the configuration of collection schedules and delivery schedules to collect selected data (e.g. voltage, kWh) from one to all AMI in near real-time (e.g. collect data every 15 minutes and deliver data every 15 minutes). Please describe any limitations the HES may have in the real-time data collection or real-time data delivery requirements.
- The AMI HES must receive and forward any event or alarm, including power outage and power restoration alarms, initiated from the AMI meters and transmitted through the AMI network with no delay and no data loss.
- The AMI HES for each coverage plan must have sufficient data processing performance to support the requirements of each coverage scenario.
- The AMI HES must have sufficient data processing performance to support the every 5-minute handling of voltage measurements from 5% of the electric meters.
- The AMI HES must have sufficient data processing performance to support the every 15-minute handling of 15 minute consumption data from 100% of the electric meters.

- The AMI HES must support typical demand response applications. Please describe demand response applications which your solution has supported.
- Vendor to provide complete documentation of system including an “as built” document.

1.2.4 Outage Management

Vendor is to provide a 2- or 3-page detailed overview of how an outage restoration with your AMI solution works in totality (i.e. from the point of outage detection to the point where all outages are cleared using the criteria as defined above for a small and large scale outage in both a rural and urban setting for the proposed network solution). Please provide how the remaining 5 or 10% of the meters are cleared and the associated timeline. Additionally, the vendor is asked to provide this information in scenarios where the network equipment has remained operational due to battery backup and where the network has powered down due to an extended outage.

- The AMI HES must provide a standards-based (MultiSpeak 4.1) interface for delivery of outage and restoration alarms for verifying power restoration/status. Please provide a 1- or 2-page attachment explaining your current outage process and standards implementation.
- AMI HES must provide integration to Milsoft Dispatch OMS –need to expand
- The AMI Solution must provide filtering of momentary and "false" outages. The AMI HES must receive and store these filtered outages, but not deliver a notification. Please provide a 1- or 2-page attachment on how the proposed solution will allow momentary or false outages to be configured to VIWAPA’s own requirements.
- The AMI Solution must support the capture and delivering of blink, or momentary outage, counts. In a one- or two-page attachment please provide a detailed explanation of how blinks counts are identified, recorded, and reported for the proposed solution.
- The AMI Solution must meet the outage performance of >90% successful receipt and delivery of outage events in small scale outages (less than 20 meters). Provide the anticipated performance or timeframe for the detection of outage in this classification.
- The AMI Solution must meet the outage performance of >60% successful receipt and delivery of outage events in large scale outages (more than 5,000 meters). Provide the anticipated performance or timeframe for the detection of an outage in this classification and how the network will handle the influx of messages.
- The AMI Solution must meet the outage performance of >95% successful receipt and delivery of restoration events in small scale outages (less than 20 meters). Provide the anticipated performance or timeframe for the outage restoration notification to be delivered for this outage classification.
- The AMI Solution must meet the outage performance of >90% successful receipt and delivery of restoration events in large scale outages (more than 5,000 meters). Provide the anticipated performance or timeframe for the outage restoration notification to be delivered for this outage classification.
- The AMI Solution should maintain power during a power outage to allow the effective transmission and delivery of messages. Please describe the "holdup" time of the AMI meters and AMI network under a power outage condition. Please describe how messages are repeated or retried by the AMI meter and within the AMI network to maximize the successful delivery of outage messages.
- The AMI Solution should have filtering capabilities to reduce or eliminate reporting of false outages. Please describe all filtering available within the AMI Solution, including

momentary outages, known outages (planned outages), open service orders, bellwether meters, network equipment, etc.).

- The AMI Solution (HES, Network and Meters) must be able to ping up to 3,000 meters and get a response in less than 5 minutes.
- The AMI Solution must deliver outage duration information with any outage or restoration message.
- The AMI Solution (HES, Network and Meters) must be able to receive all restoration messages within 5 minutes of the power restoration, regardless of the number of meters impacted.

1.2.5 Asset Management

Asset Management requirements are:

- The AMI Solution must capture and monitor the configuration, including firmware, of all endpoint and network devices.
- The AMI Solution must provide a standard interface to an Asset Management System to monitor, verify and change device configuration, firmware version and status. If such interfaces are not available, please indicate when these standard interfaces will be available.
- The AMI Solution should support the delivery of information to an Asset Management System. Please describe all interfaces and capabilities of the capture and delivery of endpoint device configuration, programming (Program ID), firmware version and status. Please provide a brief discussion on your solution's philosophy for management of endpoint device configuration by the AMI HES vs. an external asset management solution.
- The AMI Solution should manage the endpoint and network devices. Please describe the asset management capabilities of the AMI HES relative to endpoint configuration, endpoint firmware and any applicable endpoint security.
- The AMI Solution, in coordination with the MDM or Naviline will support the provisioning of new AMI meters. Provisioning is the automated process of identifying newly installed AMI meters, or removed AMI meters and the interaction with the AMI head end to ensure that the meter and system are correctly configured to deliver the required data on the required schedule. Describe your system's automated processes, flexibility and exception management in support of this activity. Include one reference (for each of the indicated MDM) where this automated provisioning process is in production.

1.2.6 Distribution Operations

Distribution Operations requirements are:

- The AMI must support the collection and delivery of voltage and power quality data from all, or selected, AMI meters.
- All voltage and power quality collected must be delivered via standard interface (Multi-Speak or IEC 61968-9).
- The AMI Solution must provide real-time configurable and field updatable alerts for high and low voltage situations at any AMI meter.
- The AMI Solution must support the capture and delivery of instantaneous, peak, high and low voltage measurements from any AMI meter every 5 minutes. Describe, in a 2- or 3-page attachment, the voltage measurement and accuracy. The AMI Solution must support this 5-minute requirement for at least 5% of the installed AMI meters.

1.2.7 Distributed Intelligence

VIWAPA has an interest in the next 3 to 5 years, in making sure that the proposed solution can grow and expand to meet their grid modernization needs throughout the expected life of the system. As such the Offeror, in this section (no more than 10 pages), should describe their existing capabilities and future roadmap for Distributed Intelligence (DI), or Edge Computing, including but not limited to:

- Current electric meter platforms (both Proposer manufactured meters and alternate supplier meters) that support DI
- Future electric meter platforms that are planned to support DI, and the development roadmap for these
- Application platform on which DI is based (operating system, development environment, etc.)
- Description of how applications are managed in the meter or communications module.
- Description of how applications are managed in the HES.
- Description of HES APIs for external applications to manage the applications
- List of applications currently deployed
- Description of DI dashboards or reporting capability.
- Description of any DI related analytics capability and why the DI application is best suited for the proposed analytics.
- Description of how the proposed DI application may use multiple events or data to derive potential grid edge failures or events.
- Description of how data created by DI applications is incorporated into regular data collection and delivery activities including the possible utilization of data channels or customer events and alarms.
- Description of how the deployment of DI applications can impact the overall bandwidth of the AMI network and potentially impair regular data collection and what control mechanisms are in place to reduce or eliminate any bandwidth contention.
- Description of any safeguards the overall solution has to prohibit network saturation.
- Description of the typical process for downloading a DI application to a single meters or a group of 5,000 meters including timings of the process.
- Description of any application certification or testing process that is provided to validate that the application is not harmful to overall operation or security.
- Description of any remote recovery/reset process in the meter that would allow remote recovery of a meter that might have been rendered non-functional due to a DI application.
- Description of any DI user's group or application sharing forum that the Proposer may be facilitating.

1.2.8 AMI Tools

AMI Tools requirements are:

- The AMI Solution must include tool(s) for the Meter Shop to test and configure all proposed AMI meters, modules and endpoints.
- The AMI Solution must include ruggedized tool(s) for the Meter technicians to troubleshoot, configure and read AMI meters, disconnect/reconnect endpoints in the field.

- The AMI Solution must include ruggedized tool(s) for the RF Field technicians to troubleshoot, configure and read all proposed AMI network equipment in the field.
- The AMI Solution must include ruggedized tool(s) for AMI RF field personnel to troubleshoot, interrogate, and analyze the AMI communications network and provide coverage information, i.e. links, signal strength, and performance
- The AMI communications tools must support the decryption and encryption of endpoint devices and network devices as necessary to perform troubleshooting, RMA and configuration. Please provide a 1- or 2-page attachment on field tool security and how the security is implemented to meet current and if possible known future requirements.
- The AMI Tool Solution must support the ability to operate the service switch on-site at or near the meter and determine the switch position with the appropriate field tool.
- The AMI Solution must provide updates to tool(s) for future products such as those that might be needed to support new sensing endpoints such as feeder monitors, transformer monitoring, etc. Please provide a 1- or 2-page attachment on how field tool development and release is synchronized with product release or new product development.

1.3 AMI Technical Requirements

Bidder shall provide detailed hardware, software and networking requirements for their proposed solution. These requirements should include storage requirements to maintain on-line access for 3 months of meter data for the configuration as described below. Fully describe any third party software necessary but not supplied as part of the software license. Fully describe all third party software included in the software license and any specific terms of use governing the included third party software. Identify options for delivering proposed solution as a service or hosted via cloud service providers. For the purposes of sizing, Bidder should assume the following mix of meters and meter data and should describe the ability to support real-time meters:

- 50,000 of Residential Meters: 15 Minute kWh Delivered, kWh Received, 15 Minute kVARh Delivered, Volts RMS and 3 Register Reads collected every 4 hours
- 5,000 of Commercial Meters: 5 Minute kWh Received, 5 Minute kWh Delivered, 5 Minute kVARh leading, 5 Minute kVARh lagging Intervals, 5 Minute Volts RMS (per Phase) intervals and 6 Register Reads collected every 1-2 hours
- Volts Instantaneous collected and delivered every 5 minutes from 5% of commercial and residential meters.

1.4 AMI Security Requirements

The AMI Solution must provide a security implementation certified by the vendor that the following standards are met or provide a roadmap to the implementation of such standards or sub-bullets as outlined. The AMI Solution must be reviewed and certified by a third party on an annual basis.

- AMI Solution must provide a secure upgrade process for hardware, software, communication messages and endpoint devices, including PKI lifecycle management and scanning for malicious files and detection of viruses.
- AMI Solution must provide an authentication process to verify the originator of a transmission or message in the event of message spoofing, “man in the middle” or replay messaging attacks.
- AMI Solution must provide an authorization process to validate any individuals “right of access” to the system Head End or subsequent control and monitoring screens.

- AMI Solution must provide an authorization process to validate communications on the AMI Network at all levels (WAN, LAN, & HAN). Any unauthorized or rejected messages should be logged.
- AMI Solution must provide an environment sufficient to warrant the confidentiality of information to ensure that data is not exposed to unauthorized persons, processes (interfaces), and or devices.
- The AMI Solution must provide for data integrity to provide assurance that data as transmitted, displayed, or received by an end-device has not been tampered with.
- The AMI Solution must provide the sender of data proof of delivery while the recipient of such data is provided the senders identity as a form of non-repudiation.
- The AMI Solution must be encrypted from end to end and must be compliant with current NERC standards as set forth in The National Electric Reliability Council (NERC) Urgent Action Standard 1200 – Cyber Security
- The AMI Solution should be regularly subjected to penetration and other security audits from a reputable third-party security firm and reports made available to VIWAPA.
- The AMI Solution and bidder should address additional security standards as follows:
 - IEC 62351 Parts 1-8 Information Security for Power System Control
 - IEEE 1686-2007 Security for Intelligent Electronic Devices (IEDs)
 - End-point and communications security.
 - NERC CIP 002-009 Cyber Standards for the bulk power system
 - NIST Special Security Publication SP 800-53 & NIST SP 800-82. Cyber Security Standards and guidelines for Federal Information Systems for application in Bulk Power System
 - FIPS140-2 Security Requirements for Cryptographic Modules

1.5 AMI Non-Functional Requirements

AMI Non-Functional Requirements are:

- The AMI Solution must support communication standards, such as WiSun, IPv6, 802.15.4e and 802.15.4g, cellular Cat M1, etc.
- The AMI Solution must support MultiSpeak standards (and provide a roadmap for future MultiSpeak version compliance).
- The AMI Solution should be easily integrated with VIWAPA's current and future enterprise system landscape.
- The AMI Solution should be easily integrated with or provide engineering reports and easy data extractions in support of the distribution network or need for AMI analytics for the purpose of planning and operations.
- The AMI Solution must be user friendly to support access by internal users with the appropriate security settings for access or management of access based upon operational department or individual need.
- The AMI Solution must contain no feature which cannot be configured, reset or resolved with only Vendor interaction.

2 AMI Services Requirements

VIWAPA requires the following professional services to be provided in addition or in support of the AMI Solution:

2.1.1 Program Management and Solution Implementation

Program Management and Solution Implementation requirements are:

- Develop and maintain a detailed “turnkey” project plan and controls for the implementation and acceptance of the AMI Solution and all integration necessary to fully implement the AMI network. This includes implementing procedures for project control, project tracking and reporting of progress.
- Manage the ordering of the required meters including the meter configuration, meter labeling, communication modules and the integration of such if and as required to meet VIWAPA’s metering requirements.
- Assist in the receipt, inspection and testing of new AMI meters, AMI communication modules and AMI network equipment.
- Assist in the ordering and sizing of any applicable servers and databases required to support VIWAPA’s AMI Solution requirements. This should include a detailed and comprehensive Server and Database Deployment Document that completely defines the hardware, software and configuration specification of all servers comprising the AMI Solution.

2.1.2 System and Network Analysis

System and Network Analysis requirements are:

- Develop a detailed coverage plan for the AMI communication (per section 2.3.2.2) network, which ensures that any meter installed in VIWAPA’s service territory, will meet the AMI performance requirements (Section 3.3). This network plan or plans must include the number and location of any communication devices and is expected to be accurate within 5% (in other words, the Offeror will guarantee that the amount of network equipment will not exceed the plan by 5%). The Offeror must update this network plan during deployment and provide a final “as built” Coverage and Capacity Plan representing the finally deployed network. Offeror should perform detailed RF propagation studies on VIWAPA’s service territories in developing its response.
 - Note: All costs for any additional network infrastructure beyond 5% proposed as part of this RFP shall be the responsibility of the Offeror, including any equipment costs, equipment installation costs, as well as any future maintenance costs or recurring fees.

2.1.3 HES and Integrations

HES Integration and Acceptance Testing requirements are:

- Assist in the development of environment and architecture design and documentation. This should include support for the deployed AMI network including but not limited to theory of operation, backhaul requirements, network capacity, network propagation studies, contingency, and Disaster recovery planning. This backup and recovery plan should include detailed disaster recovery plans for the loss of the AMI head end system. This should also include plans for how the AMI solution performs configuration management and configuration restoration. Provide disaster recovery plan and recovery time to fail over site for failed head end system—since its hosted.
- Requirements development and documentation. Offeror should conduct workshops with VIWAPA to establish detailed functional, integration and architecture requirements for

the AMI Solution and its implementation and document these requirements and configurations. Offeror shall deliver a comprehensive functional specification, integration specification including integration test strategy, the execution of unit testing for all identified test cases and architectural specification for the AMI Head End and related integrations. Offeror shall also manage and conduct all integration testing as required for the AMI Head End to meet the functional and integration specification as identified. VIWAPA will assist in CIS integration and will conduct User Acceptance Testing.

- Assist in setup and configuration of QA and Production environments. VIWAPA requires the creation of a QA environment of the required AMI hardware and server software configuration at VIWAPA's facility of choice. The QA environments will emulate the ultimate production system and can be used for on-site training and meter configuration or meter testing. VIWAPA will utilize these environments and the respondent should provide initial system installation and training.
- The Offeror must provide and support the performance of test procedures, any applicable simulation or propagation studies and monitoring methods to demonstrate proper functioning of the AMI Solution with VIWAPA systems through both QA testing and actual live production. Such support will include the development of the test plans and test scripts, supply of any test harnesses and test data sets, regular testing status reports, final test report, defect tracking and resolution, on-site assistance by the Offeror's engineering and IT experts during the testing to ensure troubleshooting and knowledge transfer that occurs in a timely and efficient manner.
- VIWAPA may conduct extensive security and intrusion testing on the Test environment. The Offeror will resolve any security issues identified as a condition to acceptance.

2.1.4 Network Deployment or Communication Equipment Installation Services

Offeror should describe their plan to address the following to deploy/install the proposed AMI network.

- Overall proposed network deployment plan for:
 - Warehousing of equipment on each island and the associated logistics of receiving, testing, and installation of all proposed network devices.
 - Installation Rate including month-by-month installation projections starting with St. John and ending with St Croix.
 - Handling all network device failures (RMA's)
 - Handling all RTU's and exceptions during the deployment process (Offeror should include their assumptions for the # and type of RTU's)
 - Handling any storm related issues such as deployment stand down
 - installation rate including month by month installation projections,
- Outline of the suggested network deployment team:
 - Project Manager / Safety Manager / Installation Auditor / Documentation Lead/ Installation Crews.
- Number of crews expected to be assigned to the project on a month-by-month bases to support projected installations.

- Example documentation set to be provided to VIWAPA per installation.
- Any warehousing recommendations with respect to maintaining inventory (Offeror or Contractor warehouse)
- An initial inclement weather plan
- Pricing - The Offeror shall submit the proposed cost schedule for installations, as part of the attached pricing spreadsheet, for all necessary activity including make-ready, pole installation, permitting, required flagging, documentation, and other expenses. Pricing is requested on a per activity basis with the acknowledgement that each site will have to be surveyed to understand the full amount of activities necessary to complete the installation.

The Offeror should describe the required roles and responsibilities for VIWAPA's team members to support the network equipment deployment.

2.1.5 Endpoint Deployment or Endpoint Installation Vendor Services

The Offeror should describe its project meter deployment methodology (no more than 5 pages each), to address the different deployment plans described below for electric meter deployment:

- Technology and implementation planning, describing how each of the electric meters will be ordered, received, tested, deployed, handled in the event of an RTU or exception and RMA'd if required.
- Warehouse setup, timing, expected number of warehouses required to cover St. Thomas, St. John and St Croix
- Integration of meter deployment Installation Management System to VIWAPA CIS
- Individual Meter exchange workflow definition
- Meter exchange high-level workflow to include retries and customer communications and appointment scheduling
- Meter incoming inspection and testing requirements including first Article Acceptance for meter program verification, labels, nameplate, etc.
- Inventory management and quality control
- Projected number of installers over the life of the deployment
- Meter installer hiring practices including utilization of local personnel
- Installer training program and quality control
- Field audits of installed meters
- Meter recycling
- Overall deployment KPI's
- Customer's Meter Service Repair (Electrician Requirements)

The Proposer shall include three high-level schedules, with milestones and checkpoints, for the deployment representing a 12-month, 18-month and 24-month meter installation period.

The Proposer should describe the suggested roles and responsibilities for VIWAPA's team members as well as a recommended structure for the team and the expected level of support these team members would need to provide. Any requirements or resources that VIWAPA needs to provide to achieve the schedule should be identified in this section, including estimates of time required from VIWAPA personnel by level (i.e., executive, IT, functional groups). This description should highlight any staffing differences between a VIWAPA-hosted versus SaaS implementation

2.1.6 Training and Documentation

Training and Documentation requirements are:

- Offeror must provide appropriate system manuals and documentation. Offeror must provide a plan to properly train specified utility internal personnel how to install, maintain and operate the AMI Solution. Further, the Offeror must provide training on how to use all applications and functions within AMI Head End Software for on-going operations and maintenance. Offeror should include a description and syllabus for all available and future training courses, and indicate whether such training is provided on-site.

2.1.7 Network Tuning

Network Tuning requirements are:

- Offeror must provide network tuning services during and after the network deployment, as necessary to achieve the required network performance, reliability and capacity specifications.

2.1.8 Managed Software as a Service

Managed Services requirements are:

- Offeror must provide the data center and the hardware and software (other than the AMI HES software which will be separately licensed by Owner) necessary for the AMI HES to host and provide access to the AMI HES and store the data.
- The AMI Head End System must be managed in the Offeror data center with Offeror responsible for the day-to-day monitoring, maintenance and management of the software application, servers and database.
- The Offeror data center must have and maintain SOC 2 Type II certification and undergo annual penetration testing.
- The Managed Services must support the Production AMI HES application for all Owner AMI meters.
- The SaaS services must support a Test/QA instance of the AMI HES application to support at least 1,000 AMI meters.
- The SaaS services in support of the Production AMI HES application must include Disaster Recovery with an RTO (Recovery Time Objective) of no more than 24 hours and an RPO (Recovery Point Objective) of no more than 24 hours.
- The SaaS services must include an annual disaster recovery test of VIWAPA's instance of AMI HES and a review and update of the Business Continuity Plan.
- The SaaS services must include upgrades of the AMI HES application, as well as DBMS (Database Management System) and operating system software as necessary.

- The SaaS services must include the following operational activities and must clearly describe VIWAPA roles and responsibilities (for avoidance of doubt any role not specified as VIWAPA's responsibility, will be the Managed Services provider's responsibility):
- Configure and maintain read schedules, exports, ping schedules and AMI HES background jobs, based on mutually agreed upon settings
- Manage the operation and configuration of the Network Devices, including the gathering and analyzing of network statistics and trends (with monthly reporting and recommendation for network optimization or improvement)
- Alert to VIWAPA upon an Incident with any Network Device within 24 hours of such Incident
- Manage firmware updates to Network Devices and Endpoints, as firmware is released and validated/approved by VIWAPA
- Provide unlimited access to all data collected into the AMI HES or generated by the AMI HES.
- Manage the monitoring of all installed AMI meters (for avoidance of doubt, all backoffice activities for AMI meters will be performed by the Managed Services provider and VIWAPA will be responsible for any field activities to investigate or remove/replace failed or failing AMI meters).
- The Offeror shall commit to a Service Level Agreement to meet all performance requirements
- The Managed services must include the following Service Level Targets, as well as details for how the service level is calculated, with a credit to VIWAPA for any month where one or more targets are not met with escalation of the credits for multiple consecutive months (e.g. 1x for 1st month, 1.5x for 2nd month, 2x for 3rd month) of failure:
 - 99.5% of Register Reads for Available Meters are collected, stored and exported to the MDMS no later than 6:00 AM (local time).
 - Escalating credits for levels >99.0% and <99.5%, >98.0% and <99.0%, >97.0% and <98.0%, >95.0% and <97.0%, <95.0%.
 - Maximum credit of 20%.
 - 99.5% of the Interval Data for Available Meters is collected, stored and exported to the MDMS no later than 6:00AM the following day
 - Escalating credits for levels >99.0% and <99.5%, >98.0% and <99.0%, >97.0% and <98.0%, >95.0% and <97.0%, <95.0%.
 - Maximum credit of 20%.
 - 98% of all control operations executed, with confirmation of receipt of the request and delivery of confirmation of the execution, within 60 seconds.
 - 99.9% System Availability where the AMI HES is available for use and all services and schedules are operational.
 - Escalating credits for levels >99.5% and <99.9%, >99.0% and <98.0%, >98.0% and <96.0%, <96.0%.
 - Maximum credit of 30%.
 - 99.9% Network Availability
 - Maximum credit of X%

