

**OKLAHOMA STATE UNIVERSITY
PURCHASING DEPARTMENT
FOR OSU AND THE OKLAHOMA
A&M INSTITUTIONS**

Date: July 13, 2011

**INVITATION TO BID
THIS IS NOT
AN ORDER**

STILLWATER, OKLAHOMA 74078

Competitive Bid No: W036575-PTB No Bid Received After: July 28, 2011 - 03:00 PM

Buyer: Patrick Biggs

DAYS REQUIRED FOR DELIVERY: _____ RETURN SEALED BIDS TO: _____
TERMS: _____

**PURCHASING DEPARTMENT
OKLAHOMA STATE UNIVERSITY
1224 N. BOOMER ROAD
STILLWATER, OKLAHOMA 74078**

F.O.B. Oklahoma State University - Stillwater, OK (Freight Included)

BIDDER AGREES TO COMPLY WITH ALL TERMS AND CONDITIONS.

ITEM NO.	QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
1	1 Lot	<p>Provide and install Power Monitoring Equipment for the campus of Oklahoma State University, Stillwater, OK as per the attached terms and conditions (2 pages), general conditions (1 page), specifications (30 pages), and continuation sheets (2 pages).</p> <p>Specify manufacturer, brand name, and/or applicable part numbers of all products. Include complete product information and technical specification sheet with bid.</p> <p>The contract term for the software license/maintenance will be from date of award through June 30, 2012 with the option to renew annually for four (4) additional one-year periods upon mutual agreement.</p> <p>All inquiries during the bid and bid evaluation process must be directed to the OSU Purchasing Department at 405-744-5984, fax 405-744-5187, or purchase@okstate.edu.</p> <p>PLEASE MARK OUTER ENVELOPE: SEALED BID: W036575-PTB July 28, 2011 - 03:00 PM</p>	\$ _____	\$ _____

THIS BID INVALID IF NOT SIGNED

AFFIDAVIT:

STATE OF _____ COUNTY OF _____ of lawful age, being first duly sworn, on oath says that:

1. (s)he is the duly authorized agent of _____, the bidder and/or contractor submitting the competitive bid and/or procuring the contract which is attached to this statement, for the purpose of certifying the facts pertaining to the existence of collusion among bidders and between bidders and state officials or employees, as well as, facts pertaining to the giving or offering of things of value to government personnel in return for special consideration in the letting of any contract pursuant to the bid to which this statement is attached: 2. (s)he is fully aware of the facts and circumstances surrounding the making of the bid and/or the procurement of the contract to

a. to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding, b. to any collusion with any state official or employee as to quantity, quality or price in the prospective contract, or as to any other terms of such prospective contract, nor c. in any discussions between bidders and any state official concerning exchange of money or other thing of value for special consideration in the letting of a contract, d. to paying, giving or donating or agreeing to pay, give or donate to any officer or employee of the State of Oklahoma, any money or other thing of value, either directly or indirectly, in procuring the contract to which his statement is attached.

IMPORTANT

COMPANY _____ DATE _____

BIDDER

SIGNED BY _____ PLEASE PRINT NAME _____

Name & Title

ADDRESS _____ VENDOR FEI OR SS Number: _____

CITY, STATE & ZIP _____

PHONE _____ FAX _____ EMAIL _____

This is submitted as a legal offer and acceptance by the Oklahoma State University Purchasing Department constitutes a binding contract.

BIDS MUST BE RETURNED ON THIS FORM AND/OR ATTACHED PAGES. RE-COPIED LISTS WILL NOT BE ACCEPTED.

Revised 12/09/09

**BOARD OF REGENTS
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**TERMS
AND
CONDITIONS**

1. Sealed bids will be opened by the Oklahoma State University Purchasing Department at the office of the Director of Purchasing or designee, 1224 N. Boomer Rd., Stillwater, Oklahoma, at the time and date shown on this bid. Bids received after the time shown will not be considered.
2. Bids are to be submitted in a sealed envelope containing only one bid. Envelopes are to be clearly marked with bidder name and address in the upper left corner and with **COMPETITIVE BID NUMBER AND CLOSING DATE AND TIME** in the lower left hand corner. The Purchasing Department reserves the right to reject any or all bids or parts of bids.
3. This contract may be bid and awarded on an **ALL OR NONE** basis, by individual line item or groups of items, whichever is in the best interest of the University.
4. The bid shall be submitted on this approved form. Alternate forms will not be accepted. Quotations must be typewritten or written in ink, and corrections must be initialed. Penciled bids will not be accepted. Any bid award and subsequent payment will be made on the basis of bidder's name as shown on the Invitation to Bid.
5. Bidders shall submit only **ONE** bid per item and guarantee unit price to be correct.
6. Firm prices shall be bid **F.O.B.** requesting agency and include packaging, handling, shipping, and delivery charges fully prepaid by the vendor.
7. The vendor shall deliver merchandise as bid. **NO** deviations shall be made.
8. No interpretation of the meaning of the plans, specifications or other contract documents will be considered valid unless such request for interpretation is addressed to the Office of the Director of Purchasing and is received at least five (5) days prior to bid due date fixed for the opening of bids. Any and all such interpretations and supplemental instructions will be in the form of written addenda to the specifications and will be mailed to all prospective bidders if the competitive nature of the bidding is affected.
9. **MANUFACTURERS' NAMES AND APPROVED EQUIVALENTS:** Any manufacturers' name, trade names, brand names, information and/or catalog numbers listed in a specification are for information and not intended to limit competition. The bidder may offer any brand for which he is an authorized representative, which meets or exceeds the specification for any item(s). If bids are based on equivalent products, indicate on the bid form the manufacturer's name and product number. Bidder shall submit with this proposal, sketches, and descriptive literature, and/or complete specifications. Reference to literature submitted with a previous bid will not satisfy this provision. The bidder shall also explain in detail the reason(s) why the proposed equivalent will meet the specifications and not be considered an exception thereto. Bids which do not comply with these requirements are subject to rejection. Bids lacking any written indication of intent to quote an alternate brand will be received and considered in complete compliance with the specifications as listed on the bid form.
10. All bids submitted are subject to Oklahoma State University Purchasing Department and/or Board of Regents Purchasing Policies and Procedures and these General or any Special Conditions and specification listed herein-all of which are made a part of this bid invitation by reference.
11. This bid is submitted as a legal offer and any bid when accepted by the Oklahoma State University Purchasing Department constitutes a firm contract.
12. This form must be made out in the corporate name of the bidder and must be fully and properly executed by an authorized person and signed in ink with full knowledge and acceptance of all its provisions.
13. Oklahoma laws require each bidder submitting a competitive bid to an agency of the State of Oklahoma for goods or services to furnish a signed statement of non-collusion, therefore, this bid is invalid if not signed.

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14. Cash and other discounts may be considered and evaluated in the bid award. However, cash discounts may be considered only if for a period of twenty (20) days or more.

15. All bids must be submitted exclusive of Federal Excise Tax and Oklahoma State Tax. In all cases where a federal tax exemption is required, please make such notation on your bid and an Exemption Certificate will be furnished to the vendor with the Purchase Order.

16. If bidding "all or none", either by groups of line items or by total of line items this must be clearly stated on the Invitation to Bid response.

17. **REQUIRED DELIVERY DATE:** In the event a required delivery date is specified on this bid the successful bidder will be expected to meet this date. Failure to meet the required delivery date during the performance of the resulting contract could be cause for termination.

18. If not submitting a quotation on this Invitation to Bid, please return noted "No Bid". Any bidder who fails to return the third (3rd) consecutive Invitation to Bid may be removed from the bid list at the discretion of the Oklahoma State University Purchasing Office.

19. Bidder acknowledges and approves the Terms and Conditions contained herein and attached hereto and by submission of this bid agrees these Terms and Conditions shall supersede any Terms and Conditions offered by the bidder.

20. In entering into any contract resulting from this bid the bidder agrees to comply with Equal Employment Opportunity requirements as stipulated in Executive Order 11246 and Executive Order 11375 and all subsequent amendments thereto and superseding orders.

21. Bids may be rejected unless the above procedures are followed. The University reserves the right to reject any and all bids if it is in the best interest of the University to do so.

22. If services include the use or disclosure of Patient Health Information (PHI) then a HIPAA Business Associates Agreement will be required prior to the beginning of services.

23. If this purchase involves information technology products or services, they must be in compliance with the accessibility to information technology standard of Section 508 of the Workforce Investment Act of 1998.

TYPE OF BUSINESS: PLEASE CHECK ALL THAT APPLY.

Large Business _____

Small Business _____

- 1. Small Disadvantaged-Owned _____
- 2. HUBZone Business _____
- 3. Women-Owned _____
- 4. Veteran-Owned _____
- 5. Service Disabled Veteran-Owned _____
- 6. Sheltered Workshop _____
- 7. Historically Black Colleges & Universities _____
- 8. Registered in Central Contractor Registration _____

_____ Yes/ _____ No

**STATE OF OKLAHOMA
BOARD OF REGENTS
for
OKLAHOMA A&M COLLEGES**

CONTINUATION SHEET
To Accompany Requisition No. **W036575-PTB**

ITEM NO.	QUANTITY	UNIT	DETAILED DESCRIPTION – DOUBLE SPACE BETWEEN ITEMS	UNIT PRICE	AMOUNT
			<p><u>GENERAL CONDITIONS</u></p> <p>Proposals for the work called for in these specifications are to be delivered to the Office of the Director of Purchasing, 1224 North Boomer Road, Oklahoma State University, Stillwater, Oklahoma.</p> <p>The owner does not obligate himself to award the contract to the low bidder, but reserves the right to make the award to the best interests of the owner and may make such investigation as he deem necessary to determine the ability of the bidder to perform the work. The owner reserves the right to reject any bid if the evidence submitted by or investigation of such bidder fails to satisfactorily convince the owner that such bidder is properly qualified by experience to carry out the obligations of the contract, and to satisfactorily complete this work according to the specifications.</p> <p>The owner reserves the rights to waive any informality and to reject any or all bids. The right is reserved to award the proposal, which, in the opinion of the University, represents the best value to the University.</p> <p>The owner reserves the rights to observe the work being performed and to terminate the purchase orders if, in the department's judgment, satisfactory progress is not being made.</p> <p><u>Status Verification System</u> – By submitting a bid for services, the bidder certifies that they, and any proposed subcontractors, are in compliance with 25 O.S. §1313 and participate in the Status Verification System. The Status Verification System is defined in 25 O.S. §1312 and includes but is not limited to the free Employment Verification Program (E-Verify) available at www.dhs.gov/E-Verify.</p> <p style="text-align: center;"><u>INSURANCE</u></p> <p>The successful bidder will be required to maintain such insurance as will protect him as well as the owner from its contingent liability from claims under Worker's Compensation acts and from any other claims for damage as public liability from operations under this contract, whether such operations are by himself or any subcontractor or anyone directly or indirectly employed by them. Certificates of such insurance shall be filed with the owner before a Purchase Order can be issued, and shall be subject to the owner's approval of adequacy of protection.</p> <p style="text-align: center;"><u>AFFIDAVIT OF COMPLETION</u></p> <p>Any contract shall, in lieu of bond, demonstrate by means of an affidavit of payment, of all indebtedness incurred by such contractor or his subcontractor who performs work in performance of such contract, for labor and materials and repairs to and parts for equipment used and consumed in the performance of said contract. The required affidavit will be attached to the purchase order issued to the successful bidder and <u>must</u> accompany the invoicing for final payment.</p>		

SPECIFICATIONS

Scope and Quantity

The purpose of this specification is to purchase a power monitoring system at The Oklahoma State University Stillwater campus. This will be a pilot project to investigate the accuracy, reliability, ease of use and usefulness of the information provided by these meters and software.

This project will have three basic meters (Section 11), two Ethernet gateways (Section 15), four advanced meters (Sections 12-14), the required software (Sections 1-10), seven device licenses, and onsite setup.

Oklahoma State University Physical Plant will provide the required servers, computers, and monitors.

If the system for this pilot project meets all the expectations of OSU the complete project could involve 250 more meters and associated devices.

The following specification is a guide for minimum expectations and is based on Square D PowerLogic® ION Enterprise software, PowerLogic® ION 8600, PowerLogic® ION 5600, and PowerLogic® Ethernet Gateway (EGX).

Each vendor shall provide a list of sections that deviate from the specification and provide detailed information explaining how that deviation is equal to or better than the specification.

Vendor proposals will be evaluated by a predetermined committee. The committee will evaluate each section of the vendor's proposal and each section will be given a rating by each committee member. The ratings will be totaled and a selection made.

Electrical Power Monitoring and Control Software

1.0 General

- 1.1 The Power Monitoring and Control Software is desired to be a web-enabled monitoring system intended to monitor an entire electrical distribution infrastructure, from incoming utility feeds down to low voltage distribution points.
- 1.2 The system is desired to be designed to monitor and manage energy consumption throughout an enterprise, whether within a single facility or across a network of facilities, to improve energy availability and reliability, and manage and measure energy efficiency.
- 1.3 The software is desired to be a standard product based on a successful, proven software platform.
- 1.4 Key features should include but not limited to:
 - 1.4.1 Data acquisition for metering devices, sensors, and other intelligent electronic devices
 - 1.4.2 Power Quality analysis (including harmonics, and voltage and current sinusoids)

- 1.4.3 Power Quality Compliance to international standards:
 - 1.4.3.1 IEC 6100-4-30 class A
 - 1.4.3.2 EN50160
- 1.4.4 Graphical displays of information
- 1.4.5 Reporting tools with standard reports
- 1.4.6 Interactive historical data analysis
- 1.4.7 This power monitoring system should function as an Energy Monitoring system and have the ability to integrate Water, Air, Gas, Electric, and Steam (WAGES). This includes software graphics, reports, networking, and WAGES blocks that store and scale WAGES values.
- 1.4.8 Power Factor monitoring and control
- 1.4.9 Interoperability with disparate devices and systems through OPC Client and OPC Server
- 1.4.10 The software shall have the capability of running on a virtual server
- 1.4.11 Third Party Device Integration through Modbus RTU and Modbus TCP protocols
- 1.4.12 Support real-time data display and control actions for multiple users for applications such as sub-metering, load monitoring / shedding, real-time pricing and generator control
- 1.4.13 Expansion of system through distributed IO servers
- 1.4.14 Software is desired to be scalable in size by using a per device licensing fee. At the time that the per license fees equal the unlimited device costs, these fees will be credited toward an unlimited device license package.
- 1.4.15 Software shall be configured not programmed.
- 1.4.16 Screen design and system setup shall be able to be performed by Oklahoma State University personnel with no special codes or costs required.
- 1.4.17 The power monitoring supplier must have existing systems installed of similar size and scope within 250 miles of OSU, and to include major universities.
- 1.4.18 The supplier shall have been in the power monitoring business for at least twenty years.
- 1.4.19 The successful vendor must provide a complete turn-key system designed and proven to be compatible in all respects without any third party components, specialized services, software, or special programming. The completed system including all setup, training, software, and hardware and design technologies shall be the product of one manufacturer and its subsidiaries.

2.0 Required Submittals:

- 2.1 All persons and firms submitting proposals must demonstrate a history of competency and successful experience in providing services for public authorities, counties, and/or agencies of the State including, State institutions of higher education.
- 2.2 Persons or firms submitting proposals shall submit the names and addresses of three (3) individuals who are familiar with the proposer's experience and competence.
- 2.3 Type and amount of similar services provided within the last two (2) years.
- 2.4 Number of years firm has been in business as well as growth of firm economically and staff wise for the past two (2) years.

3.0 Power Monitoring Software Components

- 3.1 The software is desired to be web enabled, user friendly, suitable for operation on the computer workstations, to provide a robust, reliable and secure data network.
- 3.2 The software should support the easy integration of other third party intelligent electronic devices (IED's), such as, the existing Aquasuite to Mod hopper devices. This should include the ability to do graphics and reports.
- 3.3 The Power Monitoring Software shall have core components operating as services in Windows operating systems. The core services consisting of or equal to the following:
 - 3.3.1 Connection Manager - to manage connection request for all power monitoring system components
 - 3.3.2 Log Server – provides power monitoring system historical data storage and retrieval
 - 3.3.3 DDE Server – enables inter-application distribution of power monitoring system data
 - 3.3.4 Site Server – manages interactions between local and remote power monitoring system components
 - 3.3.5 Network Router – to manage data traffic between servers in the power monitoring system
 - 3.3.6 Virtual Meter – provide system-wide aggregation, control and mathematical analysis of power monitoring data
 - 3.3.7 Query Server – to provide client access to live and archived databases
 - 3.3.8 Alert Monitor – to receive alarm information generated by exception from metering devices outside of normal polling cycle
- 3.4 The Power Monitoring software shall provide 5 levels of user security:
 - View – The viewer shall be permitted to view information. No change privileges allowed
 - User – Same as View, but is able to initiate control functions
 - Controller – Same as User, but is able to initiate communications

- Operator – Same as Controller, but is able to modify configurations
- Administrator – Same as operator but is able to set level of user security and login

4.0 Data Storage and Data Sharing

- 4.1 The Power Monitoring Software shall use the current version of Microsoft SQL Server Express Edition or Microsoft Server Standard Edition as the database to store and retrieve historical data.
- 4.2 Data storage/retrieval application should have the ability to autonomously retrieve from any or all devices in the power monitoring network and provide the following abilities:
 - 4.2.1 Interrogate and download and store logs of interval data stored onboard metering devices.
 - 4.2.2 Interrogate and download logs of alarm and event data stored onboard metering devices.
 - 4.2.3 Interrogate and download logs of waveform capture data stored onboard metering devices.
 - 4.2.4 Interrogate and download logs of interval data stored onboard Schneider Electric Micrologic circuit breaker control units.
 - 4.2.5 Interrogate and download logs of alarm and event data stored onboard Schneider Electric Micrologic circuit breaker control units.
 - 4.2.6 Interrogate and download logs of waveform capture data stored onboard Schneider Electric Micrologic circuit breaker control units.
 - 4.2.7 Interrogate and download logs of interval data generated by the software system (software-based logging).
 - 4.2.8 Interrogate and download logs of alarm and event data generated by the software system (software-based alarming).
 - 4.2.9 Automatically re-arm the waveform recorders, upon upload of information.
 - 4.2.10 Automatically detect downstream devices that are Modbus-mastered on ION metering devices, and store logged data in the database associated to a unique name for each downstream source.
 - 4.2.11 Detect unknown measurement quantities provided by devices in the network, and automatically generate appropriate database references for those quantities without user intervention.
- 4.3 The database should have the capability to record all information to a minimum of 1ms precision.
- 4.4 Provide a facility to archive, trim, and backup the database on demand, or on a schedule.
- 4.5 Provide a facility to view historical data from archived databases

- 4.6 Support user initiated changes to the database, with the following abilities:
 - 4.6.1 Support on-line changes (while the Data storage/retrieval application is running)
 - 4.6.2 Suffer no interruption to its operation while changes are being made
 - 4.6.3 Requires no restart once the configuration has been performed.
- 4.7 The Power Monitoring Software shall store all information related to the network configuration in a Microsoft SQL database, to include but not limited to the following:
 - 4.7.1 All devices in the Power Monitoring network
 - 4.7.2 All communications gateways in the Power Monitoring network
 - 4.7.3 All distributed IO servers and other load-distributing application servers in the Power Monitoring system
 - 4.7.4 All modems supported by the Power Monitoring Software
 - 4.7.5 Network configuration settings
 - 4.7.6 Connection schedule for:
 - Serial sites
 - Modem sites
 - Ethernet sites

5.0 User Interfaces

- 5.1 The Power Monitoring and Control Software should provide, at a minimum, the following types of graphical user interfaces:
 - 5.1.1 Graphical Display interface
 - 5.1.2 Historical Reporting interface
 - 5.1.3 Device Configuration interface
 - 5.1.4 Network Configuration interface

6.0 Graphical Display Interface

- 6.1 The Graphical Display Interface (GDI) shall provide the ability to create and view graphical representations of the Power Monitoring system, including electrical one-line diagrams, facility maps, plan views, floor layouts, equipment representations, and mimic displays.
- 6.2 The GDI shall provide the ability to display real-time information from the Power Monitoring system within the graphical displays, including numeric values, Boolean or discrete status values, and historical information stored in the database.
- 6.3 The GDI screens shall show all parameters which are available from the individual remote devices by device, including but not limited to all metered values, load status, alarm status, energy data, device position and/or status, device data logs, waveform capture, sag/swell events, etc. In addition, the screens should be capable (if allowed

- by the owner) of providing for suitable tripping, closing, and opening of appropriate remote devices.
- 6.4 The software Web Based clients shall not require loading of software to view all the system screens and data.
 - 6.5 The software shall allow unlimited screens and unlimited screen penetration to lower-level detailed screens.
 - 6.6 The software shall, at a minimum, provide the following screens as standard in the software (if supported by the device):
 - 6.6.1 Real-time device information like line to line and line to neutral voltage and current readings for all power meters in a line diagram format.
 - 6.6.2 Event logs
 - 6.6.3 Alarm logs
 - 6.6.4 Historical trend plots
 - 6.6.5 Real-time trend plots
 - 6.6.6 Waveform capture display with zoom in/out capability
 - 6.6.7 Harmonic analysis display
 - 6.6.8 Phasor display
 - 6.6.9 Time-of-use display
 - 6.6.10 Power quality display
 - 6.6.11 I/O status display
 - 6.6.12 Setpoint and setup display
 - 6.6.13 Device log and setup display
 - 6.6.14 CBEMA curve display
 - 6.6.15 One-click access to device logs, including long-term min/max, voltage, current, power, frequency and power factor trending.
 - 6.6.16 Flicker
 - 6.6.17 Number of nines availability
 - 6.7 The GDI shall, at a minimum, provide the following capabilities for ad-hoc historical analysis:
 - 6.7.1 Ability to view and trend all time-series historical data stored in the database
 - 6.7.2 Ability to view all alarm and event information stored in the database
 - 6.7.3 Ability to view and analyze waveform capture data stored in the database, including visualization of voltage and current sinusoids, histograms of harmonics, and phasor diagrams.

- 6.8 The software shall allow the user to set an unlimited number of individual computer alarms for all monitored parameters, such as setting low and high alarm levels for voltage, current, motor run time, etc.
- 6.9 These alarm levels should be independent of device built-in alarm levels. The alarm settings shall support signed values (+/-) as well as high and low limits.
- 6.10 The software shall support setting multiple limits, providing additional alarm points above or below the initial limit.
- 6.11 The software shall at least display the analog value that caused the alarm on the alarm screen (time and date stamped), and log same information to the event file.
- 6.12 The software must have a fully customizable alarm/event log where unlimited log views can be created by the user in real-time for organizing, filtering and prioritizing different alarms (e.g. PDU Alarms, Critical Alarms, Generator Alarms, General Alarms, All Alarms, etc.).
- 6.13 The alarm displays shall allow customized alarm annunciation of at least the following forms:
 - 6.13.1 playing of any .wav file
 - 6.13.2 loop the playback of any .wav file until the operator acknowledges the alarm
 - 6.13.3 Flashing of the program header in the Windows Taskbar
 - 6.13.4 Launching of a command line application
 - 6.13.5 Activate the output of any power monitoring devices or control point
 - 6.13.6 Message box pop-up
- 6.14 The GDI shall have the ability to create, edit, save and view diagrams for at least the following features:
 - 6.14.1 Support graphic characters, symbols and pictures
 - 6.14.2 Ability to import graphic object libraries from other Windows graphical applications
 - 6.14.3 Create user configured system diagrams
 - 6.14.4 Ability to display a number of diagrams simultaneously
 - 6.14.5 Ability to modify display formats
 - 6.14.6 Ability to use animation, including changing shape, flashing symbols and AVI files
 - 6.14.7 Support Grouping windows
 - 6.14.8 Hot Spots – for control functions and to open diagrams giving multilevel hyper linking between diagrams
- 6.15 The GDI shall have the ability to create, edit, save and view at least the following types of display objects:
 - 6.15.1 Text objects – display static text for messages, instructions and labeling

- 6.15.2 Alphanumeric objects – display numeric values, Boolean values, textual values, using:
 - dynamic text,
 - analog dials/gauges,
 - formatted numerics,
 - bar charts,
 - scrolling strip chart displays
- 6.15.3 Status objects – display Boolean values and textual values using dynamic text, or animation via bitmaps or AVI files, or dynamically toggle a display object graphic image based on a Boolean status value.
- 6.15.4 Data Log Viewer – display selected data and waveform logs from the system database
- 6.15.5 Event Log Viewer – display the selected event log records from the system database
- 6.15.6 Control – provide the ability to toggle boolean values, enable/disable status and trigger control functions
- 6.15.7 General objects – can be used to display any supported image file, or link to another diagram, web page or external application.
- 6.16 The software shall include a library of electrical symbols and diagram elements for use in custom displays.
- 6.17 Data and Event log queries
 - 6.17.1 The data log viewer and event viewer queries should be able to be configured using a wizard interface, or by specifying a complex query statement.
 - 6.17.2 Each query is desired to be able to be set to an icon or button for repeatability (i.e. last 7 days loading, all critical alarms, UPS alarms, etc.). These icons should be able to be placed in any graphic screen or table.
 - 6.17.3 Unlimited queries shall be possible. The query shall allow the user to mix, sort, filter and trend the alarm/events and electrical data in any way the user desires (by date, by device, by priority, etc.) in order to provide the user with a limited data set to review and analyze.
 - 6.17.4 It will be possible for the user to access a list/table of just the events desired for a particular device, group of devices or particular events (all sags, all trip events, etc.) by clicking on an icon on the screen.
 - 6.17.5 Time-series data provided by a data log query will be able to be charted. The chart will support interactive analysis functions including zooming, panning, and the display of statistics like minimum, maximum, and average values.
- 6.18 The GDI shall have the ability to view data including, but not limited to, the following features:

- 6.18.1 Support graphical representation of user selected data values as a function of time (data trend displays)
- 6.18.2 Support selection of device and display of data values with a range of timestamp, source device, device label or value
- 6.18.3 Support a selection and display of multiple sets of data values simultaneously using distinct colors and line styles to differentiate curves
- 6.18.4 For waveform displays, shall provide an easy method to display a histogram of harmonic distortion.
- 6.18.5 Support graphical representation of disturbance information with reference overlays – e.g. ITIC/CBEMA, SEMIF47.
- 6.19 The GDI shall have the ability to automatically generate a hierarchical graphical representation of all devices in the power monitoring network with a single mouse-click.
- 6.20 The software shall save the current view of each user as they log out of the system, and return to that view the next time that user logs in.
- 6.21 The GDI shall have an edit mode. The system shall not require any shutdown or suspension of operation, and should remain fully on-line while in edit mode.
- 6.22 The GDI shall have the ability to create templates of graphical information displays for a given type of device, without references to specific device instances. These templates shall be able to be used by the system to generate hierarchical graphical representations of the system.
- 6.23 The GDI may be capable of being translated into languages other than English. Translation capability may include all text strings displayed in the menu boxes, user dialogs, buttons, graphical diagrams, and other graphical elements.
 - 6.23.1 Language translation may be able to be performed without any compiling of binary software code, and may only require the use of standard text editing tools.
 - 6.23.2 The language translation capabilities may support languages that use double-byte character sets, including Russian and Chinese.
- 6.24 The GDI must have configurable poll rates for real-time data values.
- 6.25 The GDI shall display visual indicators when data values are not available.
 - 6.25.1 When real-time data values are not available, the user shall be able to see the source of the error through tool-tips that are presented when the mouse hovers over the affected value, or a similar method to display the object.
- 6.26 Web Enabled Capabilities
 - 6.26.1 The server should provide access to information using an interface that provides the same look and feel as the user display interface software.
 - 6.26.2 Diagrams created in the user display interface software should automatically be rendered as a page, viewable to clients over the web. No programming shall be required.

6.27 When viewing historical data, the software shall provide at least the following capabilities:

6.27.1 Selectable date range

6.27.2 Selectable data parameter to chart

6.27.3 Zoom, pan, and scroll the drawing to any desired magnification

6.27.4 Able to de-select parameter on chart

6.27.5 Able to modify the following:

6.27.5.1 Chart type (each selected parameter)

6.27.5.2 Chart color (each selected parameter)

6.27.5.3 Export chart in the following formats:

- Metafile
- Bitmap
- Jpeg
- GIF
- PCX

6.28 Full graphical chart editing capabilities providing at a minimum, titles, legends, axis, 3D.

6.29 Exporting data in text, XML, or HTML formats

7.0 Device Configuration Software

7.1 The device configuration software must provide the ability to interrogate and graphically display the onboard configuration of metering devices

7.2 The device configuration software shall provide the ability to fully configure the onboard configuration of metering devices, including but not limited to the following:

7.2.1 metered quantities that are logged to onboard interval data logs

7.2.2 alarm and event conditions and logging to onboard event logs

7.2.3 waveform capture logs

7.2.4 the size and behavior of all onboard logs

7.3 Ability to customize the onboard functions of metering devices using graphical configuration tools

7.4 Ability to customize the functions of the software-based virtual meter using graphical configuration tools

7.5 Ability to copy and paste ION frameworks

7.6 Ability to customize which onboard logs are downloaded to the database

7.7 Toolbox with all supported functional modules for the specific device type shall, at least, provide the following:

- 7.7.1 Quick link to specific modules
 - 7.7.2 Display the number of modules currently in use.
 - 7.7.3 Graphically represent the device configuration and linkages
 - 7.7.4 Ability to upload device templates to other devices
 - 7.7.5 The device template must be capable of being saved for future use.
 - 7.7.6 Provide standard Windows functionality. I.e. Copy/Paste.
- 7.8 Users without appropriate security login credentials shall only be capable of viewing device configuration

8.0 Network Configuration Software

- 8.1 Network Management - The Network Configuration Software shall provide a graphical interface, including but not limited to, the following abilities:
- 8.1.1 Add and remove devices in the power monitoring network
 - 8.1.2 Paste device name and address information from Microsoft Excel
 - 8.1.3 Provide an automated mechanism to name any number of devices based on a user-defined naming scheme
 - 8.1.4 Add and remove IO servers in the power monitoring network
 - 8.1.5 Edit advanced communication properties for devices including timeouts, delays,
 - 8.1.6 Display a visual indication to the user of the mandatory fields to add a new device
 - 8.1.7 Associate devices into a hierarchy using a group name
 - 8.1.8 Manually connect and disconnect serial, Ethernet, modem and Ethernet gateway sites
 - 8.1.9 Enable and disable devices and sites in the power monitoring network without interruption to other devices or sites.
 - 8.1.10 Provide a fully configurable connection schedule for any site
 - 8.1.11 Pool modem resources so that the software uses any available modem
 - 8.1.12 Support the TAPI protocol for modems
 - 8.1.13 Provide a diagnostics viewer to monitor:
 - 8.1.13.1 Communication request/response and error rates, and timeouts
 - 8.1.13.2 Log acquisition services
 - 8.1.14 Provide a view of system diagnostic events
- 8.2 Database Maintenance Tool
- 8.2.1 The Software shall include an integrated database management tool that is designed specifically to manage the databases of the power monitoring and control system.

- 8.2.2 The database maintenance tool shall require a login window and security to prevent unauthorized use of the tool
- 8.2.3 The database maintenance tool shall provide backup, archiving and trimming functionality. At a minimum, the tool shall include:
 - 8.2.3.1 Provide start and end date for operation
 - 8.2.3.2 Be capable of copying data to another database and / or trimming the data from the existing database
 - 8.2.3.3 Be capable of selecting any or all of the following type of logs for the required operation:
 - Data logs
 - Event logs
 - Waveform logs
- 8.2.4 The database maintenance tool shall provide for, but not be limited to the following functions:
 - 8.2.4.1 Provide start and end date for operation
 - 8.2.4.2 Be capable of coping data to another database and/or trimming the data from the existing database
 - 8.2.4.3 Be capable of selecting any or all of the following types of logs for the required operation;
 - Data logs
 - Events logs
 - Waveform logs
- 8.2.5 The database maintenance tool shall provide the ability to configure alarms on the database and include the ability to send an alarm if the database size exceeds a configured value via email, or other accepted method.

8.3 License Manager

- 8.3.1 The Network Configuration Software should provide a software license management tool.
- 8.3.2 The license management tool should allow users to upgrade the license key that activates the Power Monitoring Software without the re-installation or rebooting of the software.
- 8.3.3 The Power Monitoring Software may not require the use of a hardware activation key.

8.4 User Administrator Tool

- 8.4.1 The Network Configuration Software shall provide a user administration tool.

- 8.4.2 The user administrator tool shall include but not be limited the following abilities:
 - 8.4.2.1 Allow users to view the current list of user names and their level of security.
 - 8.4.2.2 Add, remove, modify users and level of security
 - 8.4.2.3 Any modification requires the supervisor password

8.5 Modbus Device Importer Tool

- 8.5.1 The Network Configuration Software shall provide a user Modbus device importer tool.
- 8.5.2 The Modbus device importer shall provide a graphical interface for specifying Modbus register information for devices that are not natively supported by the power monitoring software.
- 8.5.3 The tool should have a quick edit function to easily duplicate and edit register information.
- 8.5.4 The tool shall support multiple register formats including, but not limited to, 16 and 32 bit signed and unsigned registers, floating point registers, and little-endian and big-endian formatted registers.
- 8.5.5 The tool shall support the ability to at least define scaling, multiplier, and offset registers for any other register.
- 8.5.6 The tool should support data entry of registers in either decimal or hexadecimal format.
- 8.5.7 The tool should support the creation of text labels for enumerated values.
- 8.5.8 The tool shall support the ability to add a named device type to the power monitoring system network database in order to create instances of the Modbus device.
- 8.5.9 The tool shall provide the ability to associate a template graphical display with the device type.
- 8.5.10 The tool should provide the ability associate Modbus registers with user-specified measurement quantities.
 - 8.5.10.1 If the user specified quantity does not pre-exist in the power monitoring system database, the power monitoring system will automatically create it.
- 8.5.11 The tool will provide a facility to validate the Modbus device profile and alert the user to validation errors such as: duplicate registers.

9.0 Reporter

- 9.1 The Power Monitoring Software shall provide a reporting tool to view historical data in pre-formatted report templates.
- 9.2 Reports shall be based on Microsoft Excel

- 9.3 Custom reports shall be able to be created using Visual Basic for Applications (VBA).
- 9.4 The reporting tool shall provide the following features:
 - 9.4.1 Report generation needs to be user configurable to be enabled on an event, on a schedule, or enabled manually.
 - 9.4.2 Ability to export to HTML, printer, or network folder
 - 9.4.3 Ability to distribute reports via email using Microsoft Outlook
 - 9.4.4 Ability to validate for duplicate or missing data
- 9.5 The reporting tool needs provide standard report templates as follows:
 - 9.5.1 Energy and Demand report that utilizes a user-defined Time-of-Use schedule with tariff rates for On-Peak and Off-Peak
 - 9.5.2 Load Profile report with a trend chart peak demand indication
 - 9.5.3 System-wide interactive Power Quality report with CBEMA evaluation
 - 9.5.4 EN50160 Compliance report
 - 9.5.5 IEC61000-4-30 report
- 9.6 Each default report shall provide the following options:
 - 9.6.1 Summary aggregation of data from the selected devices
 - 9.6.2 Individual device information
 - 9.6.3 Raw data
- 9.7 The reporting tool shall provide a graphical interface to create and manage multiple Time of Use (TOU) schedules.
 - 9.7.1 The TOU editor will provide the ability to define multiple tariffs including energy cost rates per kWh, kVARh, and kVAh, and demand charges per kW, kVAR, and kVA.
 - 9.7.2 The TOU editor will provide the ability to define off-peak and on-peak times.
 - 9.7.3 The TOU editor shall support the ability to define cost in any currency, including dollars, pounds, Euro, etc.

10.0 Communications Subsystems

- 10.1 The software must support multiple communications network topologies including but not limited to the following:
 - 10.1.1 Direct serial communications on an RS-485/RS-232 network using ModbusRTU or ION protocol.
 - 10.1.2 Ethernet/TCP connections from the software using ModbusTCP protocol through the use of an Ethernet-to-serial gateway to devices using any protocol supported by the gateway and converted to ModbusTCP.

- 10.1.3 Ethernet/TCP connections from the software using ION protocol through the use of an Ethernet-to-serial gateway to serial devices using ION protocol.
- 10.1.4 Connection to external OPC servers compliant with the OPC DA 2.x specification.

10.2 The system must have the capability to provide time-synchronization signals over an Ethernet network with at least 16ms accuracy.

11.0 Operating Environment

- 11.1 The software will be installed on a Microsoft Windows operating system.
- 11.2 The software will use a Microsoft SQL Server database.
- 11.3 The software will support the deployment of the system in a distributed IT environment utilizing a dedicated database server and a dedicated application server.
 - 11.3.1 The distributed configuration shall allow a configurable TCP port for communications between the application server and database server.

11.0 Basic Meter

- 11.1 The purpose of this section of the specification is for the purchase of meters for the Oklahoma State University Electrical Utilities.
- 11.2 The meter shall be tested to IEC 60253-11, ANSI C62.41, ANSI C37.90A, provide at least 4 kV of isolation.
- 11.3 The meter module shall be rated for an operating temperature range of at least -40°C to 85°C.
- 11.4 The meter shall be calibrated as a system and be accurate to at least +/-0.2% from 0.05 to class of the rated current over a temperature range of -40°C to 85°C according to ANSI C12.20. No annual recalibration by users shall be required to maintain these accuracy's.
- 11.5 The meter shall provide a connecting mechanism compatible with utility standard S-base sockets and be capable of being plugged into the electrical circuit without additional user wiring.
- 11.6 The meter shall be compatible with external CT's (transformer rated) in meter forms 9S, 36S, and 45S (Class 20).
- 11.7 The meter shall directly accept both single and three-phase voltage input up to and including 480 volts line to line and provide four quadrant metering.

- 11.8 The meter shall be auto ranging supporting voltages from 120 volts to 480 volts without user configuration.
- 11.9 Each meter shall have as standard an RS-485 data port using Modbus (RTU) protocol to allow multipoint communication. The RS-485 communication shall provide communications links up to 10,000 feet in length.
- 11.10 The meter shall provide visible indicators of serial communications, including but not limited to, transmit, receive, and status.
- 11.11 The information and capabilities provided by the meter shall include, but not limited to, the following: The values shall be read directly from the meter display without the need for multipliers,
- Real Energy Delivered (kWh)
 - Real Energy Received (kWh)
 - Reactive Energy Delivered (KVARh)
 - Reactive Energy Received (kVARh)
 - Apparent Energy (kVAh)
 - Real Power (kW)
 - Reactive Power (kVAR)
 - Apparent Power (kVA)
 - Power Factor
 - Current per Phase
 - Voltage per phase
 - Real Power Demand
 - Reactive Power Demand
 - Apparent Power Demand
 - Frequency
 - Meter diagnostics (including wiring errors)
 - Voltage and Current magnitudes and angles
- 11.12 The meter shall log real and reactive energy and pulse inputs on a 15 minute interval basis in non-volatile memory for a minimum of 82 days.
- 11.13 The meter shall have an infrared communications port that is compatible with ANSI C12 probes.
- 11.14 The meter shall have at least two inputs capable of receiving pulses from transducers or other meters.
- 11.15 The meter shall provide at least two KY pulse outputs.
- 11.16 The meter shall have a poly-carbonate cover.
- 11.17 The meter shall be provided with PC based configuration software. Configuration software shall support meter configuration through the meter's ANSI C12.18 infrared port and through the meter's RS-485 Modbus interface.

12.0 Power Quality Advanced Instrument

12.1 General Provisions

- a. All setup parameters required by the PMS shall be stored in nonvolatile memory and retained in the event of a control power interruption.
- b. The PMS Instrument may be applied in 4-wire wye, 3-wire wye, 3-wire delta, direct delta, and single phase systems.
- c. The PMS Instrument shall be fully supported by PMS Software.
- d. Only vendors with at least 20 years of experience with technology applied to advanced, networkable, digital, multifunction, multimeters will be accepted.

12.2 Support

- The power monitoring supplier shall have a factory field support representative within 75 miles of OSU Stillwater, and the ability to guarantee a response time within 4 hours on site.

12.3 Standards Compliance

12.3.1.1 The PMS Instrument shall comply to the following safety/construction standards:

- ANSI C12.20-1998: American National Standard for Electricity Meters 0.2 and 0.5 Accuracy classes.
- IEC 62052-11: Electricity metering equipment (AC) – general requirements, tests and test conditions
- IEC 62503-22-2003: Electricity metering equipment (AC) particular requirements – part 22: static meters for active energy, classes 0.2S and 0.5S
- IEC 62053-23: Electricity metering equipment (AC) Particular requirements-Part 23: static meters for reactive energy, classes 1 and 2
- ISO MTR1-96: Engineering specifications for Polyphase Solid-State Electricity Meters for use on the ISO Grid.

12.3.1.2 The PMS Instrument shall comply to the following electromagnetic immunity standards:

- IEEE C.37-90.1-1989: IEEE Standard Surge Withstand Capability (SWC) tests for Protective Relays and Relay Systems (ANSI). All inputs tested, except for the network communications port.
- IEC1000-4-2 (EN61000-4-2/IEC801-2): Electrostatic Discharge (B).
- IEC1000-4-3 (EN61000-4-3/IEC801-3): Radiated EM Field Immunity (A).
- IEC1000-4-4 (EN61000-4-4/IEC801-4): Electric Fast Transient (B).
- IEC1000-4-5 (EN61000-4-5/IEC801-5): Surge Immunity (B).
- IEC1000-4-6 (EN61000-4-6/IEC801-6): Conducted Immunity.
- IEC61000-4-12 (EN61000-4-12/IEC801-12) Immunity to damped oscillatory waves
- ANSI C62.41: Surge Immunity

12.3.1.3 The PMS Instrument shall comply to the following electromagnetic emission standards:

- FCC Part 15 Subpart B, Class B: Class B Digital Device, Radiated Emissions
- ICES-003, Industry Canada, Interference Causing Equipment Standard (ICES) Class B Digital Device, Radiated/Conducted Emissions (Class B)
- EN 55022 (CISPR 22): Radiated/Conducted Emissions (Class B)

12.4 Form Factor

- The PMS Instrument shall be available in ANSI socket form factors 9S/36S/39S/76S and 35S.
- The PMS Instrument shall be available in FT-21 switchboard style (also known as drawout case) for 9S, 35S and 36S.

12.5 Current/Voltage Inputs

- The PMS Instrument shall provide 3 voltage and 3 current inputs for all forms except 39S and 76S which provide an additional neutral current input.
- The PMS Instrument shall be able to withstand a minimum of 250A for 1 second (Class 2 meter), non-recurring or 500A for 1 second, non-recurring (Class 20 meter)
- The PMS instrument shall be able to withstand a minimum of 2500 VAC RMS for 1 minute.
- The PMS instrument shall support nominal current ratings of 1A, 2A, 5A, 10A (Class 2 meter) and 5A, 10A and 20A (Class 20 meter).

12.6 Power Supply

- a. The PMS instrument shall be powered by one of the following methods:
 - Polyphase power supply, drawing from the voltage inputs. For form factors 9S, 36S, 39S, or 76S the supply voltage in 120-277 V L-N RMS +/-15% (47 to 63 Hz). For form factor 35S, the supply voltage is 120-480 V L-N RMS +/-15% (47 to 63 Hz).
 - Auxiliary 1-phase power supply, receiving power from an independent supply, separate from the voltage sensing terminals on the meter base. Supply voltage is 120-277 VAC L-N RMS +/-20% (47 to 63 Hz), or 168-330 VDC +/-20%.

12.7 Measured Values

- a. The PMS Instrument shall provide at minimum the following voltage values:
 - Voltage L–L Per-Phase
 - Voltage L-L 3-Phase Avg
 - Voltage L–N Per-Phase
 - Voltage 3-Phase Avg
 - Voltage % unbalanced
- b. The PMS Instrument shall provide at minimum the following current values:
 - Current Per-Phase
 - Current, Neutral (measured)
 - Current 3-Phase Avg.
 - Current % Unbalanced
- c. The PMS Instrument shall provide at minimum the following power values:
 - Real Power (Per-Phase, 3-Phase Total)
 - Reactive Power (Per-Phase, 3-Phase Total)
 - Apparent Power (Per-Phase, 3-Phase Total)
 - Power Factor – True (Per-Phase, 3-Phase Total)
 - Power Factor – Displacement (Per-Phase, 3-Phase Total)
- d. The PMS Instrument shall provide at minimum the following energy values:
 - Accumulated Energy (Real kWh, Reactive kVARh, Apparent kVAh) (Signed/Absolute)
 - Incremental Energy (Real kWh, Reactive kVARh, Apparent kVAh) (Signed/Absolute)
 - Conditional Energy (Real kWh, Reactive kVARh, Apparent kVAh) (Signed/Absolute)
 - Reactive Energy by Quadrant

- e. The PMS Instrument can provide a minimum/maximum value for any measured parameter.
- f. The PMS Instrument shall be capable of deriving values for any combination of measured or calculated parameter, using the following arithmetic, trigonometric, and logic functions (or equivalent PLC capabilities):
 - Arithmetic functions: division, multiplication, addition, subtraction, power, absolute value, square root, average, max, min, RMS, sum, sum of-squares, unary minus, integer ceiling, integer floor, modulus, exponent, PI.
 - Trigonometric functions: COS, SIN, TAN, ARCCOS, ARCSIN, ARCTAN, LN, LOG10
 - Logic functions: =, =>, <=, <>, <, >, AND, OR, NOT, IF
 - Thermocouple linearization functions: Type J, Type K, Type R, Type RTD, Type T
 - Temperature conversion functions: C to F, F to C

12.8 Demand

- a. The PMS Instrument shall be able to provide min/max demand, present demand interval, running average demand, and predicted demand on multiple demand channels.
- b. The PMS Instrument shall be able to perform multiple accepted demand calculation methods including block, rolling block, and thermal demand with user-programmable demand period lengths.

12.9 Accuracy

- a. The PMS Instrument shall meet ANSI C12.20.0.2 class.
- b. The PMS Instrument shall meet IEC62053-22: Electricity metering equipment (AC) –particular requirements part 22: static meters for reactive energy, accuracy class 0.2S.
- c. The PMS Instrument shall meet IEC 62053-23: Electricity metering equipment (AC)-Particular requirements-part 23: static meters for reactive energy, accuracy Class 1.
- d. The PMS Instrument shall provide 4-quadrant metering

13.0 Sampling

- a. The PMS Instrument shall sample at least 256 samples/cycle.

- b. The PMS Instrument is desired to be able to perform high speed sag/swell detection of voltage disturbances on a cycle-by-cycle basis, providing the duration of the disturbance, the minimum, maximum, and average value of the voltage for each phase during the disturbance. Disturbances less than one cycle in duration can be detected.

13.1 Logging

- a. The PMS Instrument shall have at least 10MB of user programmable onboard data logging.
- b. The PMS will store all critical internal and revenue data upon sudden power loss.
- c. The PMS Instrument shall have non-volatile memory.
- d. The PMS Instrument shall have a time-stamped event log with the following features:
 - Supports at least 500 events.
 - The number of records in the log is programmable.
 - Each event is recorded with the date and time of the event, the cause and effect of the event, and the priority of the event.
 - All events relating to set point activity, relay operation and self-diagnostics are recorded in the event log.
 - Time stamps have a resolution of 1 millisecond.
 - Time stamps can be synchronized to within 100 ms between devices on the same serial communications medium.
 - Minimum event recording response time is $\frac{1}{2}$ cycle for high speed events and 1 second for other events.
 - The priority of setpoint events is programmable.
- e. The PMS Instrument is desired to be able to log any parameter in the meter including min/max and waveforms.

13.2 Alarming

- a. The PMS Instrument shall have setpoint driven alarming capability
- b. The PMS Instrument should be able to generate an email on an alarm condition.

- c. The PMS Instrument shall have millisecond timestamp resolution on alarm entries.
- d. The PMS Instrument should be able to readjust alarm setpoints based on the alarm quantity (Alarm Setpoint Learning)
- e. The PMS Instrument shall support consecutive high-speed alarm conditions which trigger on a cycle-by-cycle basis with no “dead” time between events (i.e.no need for a rearming delay time between events).
- f. The PMS Instrument is desired to be able to operate relays on alarm conditions.
- g. The PMS Instrument shall be able to initiate datalog captures on alarm conditions.
- h. The PMS Instrument shall be able to control any number of digital output relays in an AND or an OR configuration, using pulse mode or latch mode operation, for control and alarm purposes.
- i. The PMS Instrument shall be able to combine any logical combination of any number of available setpoint conditions to control any internal or external function or event.

13.3 Communications

- a. The PMS Instrument is desired to be capable of the following communications methods simultaneously and independently:
 - Ethernet over Fiber or copper media.
 - Serial RS-232
 - Serial RS-485
 - 56K Modem
 - IEC61107 compliant optical communication port
- b. The PMS Instrument shall simultaneously support multiple data packets and any one of the following communications protocols on any one port:
 - ION
 - Ethergate
 - Modemgate
 - DNP 3.0

- Modbus
 - a. Modbus RTU
 - b. Modbus TCP
 - c. Modbus Mastering of serial RS485 slaves
 - SMTP
 - MV-90 compatibility
 - XML compatibility
- c. The PMS Instrument shall support GPS time synchronization to an accuracy of +/-1ms from an IRIG-B time source.
- d. The PMS Instruments that are equipped with an Ethernet port are internet enabled and supports the following functions:
- Automatically e-mail alarm notifications or scheduled system status updates. E-mail messages sent by the PMS instruments can be received like any ordinary e-mail message. Data logs can also be sent on an event driven or scheduled basis.
 - Built in web pages in the PMS instruments enables access to real-time values and basic power quality information using a standard web browser. Basic configuration of the PMS instruments can also be performed through the browser.
 - Integration with custom reporting, spreadsheet, database and other applications with XML compatible data.

13.4 I/O Options

- a. The PMS instrument shall be capable of having both integrated digital I/O and a separate I/O expander module to allow extended I/O capabilities. The integrated digital I/O shall contain 4 Form C Digital Outputs, 3 Form A Digital Inputs. The I/O expander module can contain any of the following groups of I/O:
- 8 digital inputs and 4 digital outputs (4 Form A, 4 Form C)
 - 8 digital inputs and 4 digital outputs (4 Form C) and 4 analog outputs (0 to 20mA, scalable to 4 to 20mA)
 - 8 digital inputs and 4 digital outputs (4 Form C) and 4 analog outputs (-1mA to 1mA)

- 8 digital inputs and 4 digital outputs (4 Form C) and 4 analog outputs (Two -1mA to 1mA and two -0mA to 20mA)
- b. The PMS instrument shall have digital outputs that support pulse output relay operation for kWh total, kWh imported, kWh exported, kVARh total, kVARh imported, kVARh exported, and kVAh values.

13.5 Display

- a. The PMS Instrument shall support direct display of all parameters on the front panel.
- b. The PMS Instrument shall have a user programmable custom display that is capable of displaying up to 4 quantities on a single screen.
- c. The PMS Instrument is desired to be able to display advanced graphical representations of metering information including at minimum spectral components, phase or diagrams, and trending charts.
- d. The PMS Instrument is desired to be able to display the following front panel screens:
 - Numeric: Display 1, 2, 3, or 4 parameters at a time.
 - Nameplate: Display information about meter owner, meter and power system details.
 - Histogram: Display harmonics content in histogram format, including THD (total, even, odd); current harmonics histogram screens display K Factor and Crest Factor.
 - Phasor: Display phase information in phasor diagram format, including phase, voltage and current magnitudes.

13.6 Field Programmability

- a. The PMS instrument is field programmable as follows:
 - Basic parameters: Voltage input scale, voltage mode (Wye, Delta, single phase), current input scale, auxiliary input and output scales, and communications setup parameters are programmable from the front panel.
 - All basic parameters described above, plus additional setpoint/relay and data log setup parameters may be programmed via the communications port using a portable or remotely located computer terminal.
 - Custom configuration of all operating parameters is possible through a graphical, flexible programming language.

- The configuration of the device will be done using programmable modules. The modules can be linked together in an arbitrary manner to create arbitrary functionality. Some example module types include min, max, setpoint, digital input, and digital output.
- Programming through a computer can be secured by user ID and password.
- Programming through the front panel is secured by password.
- Programmability shall be sectioned such that when the meter is sealed, the meter shall still be configurable to an extent that does not affect the accumulation of revenue metering related data.

13.7 Power Quality

- a. Without the use of separate software it is desirable for the PMS Instrument to be able to evaluate power quality statistically in accordance with IEC61000-4-30 Class A.
- b. Without using separate software, the PMS Instrument shall monitor the value of any statistical indicator of power quality (present, predicted, average or otherwise manipulated value) with an absolute or relative setpoint. When such setpoint is exceeded, issue an alert via e-mail or pager, or enable control via a local interface to mitigation equipment or control systems through relays and analog or digital outputs.
- c. The PMS Instrument shall support the following power quality functions:
 - Harmonics and inter-harmonics analysis to IEC61000-4-7
 - Flicker analysis to IEC61000-4-15

13.8 Transients

- a. The PMS Instrument shall provide sub-cycle transient detection at least 256 samples/cycle
- b. The PMS Instrument should be able to perform 65 microsecond transient captures (at 60Hz) or 78 microsecond transient captures at 50Hz.

13.9 Waveform Capture

- a. The PMS Instrument should be able to perform 256 samples/cycle waveform capture recording.
- b. The PMS Instrument shall have nine programmable oscillographic waveform recorders. Each waveform recorder has the following features:

- Able to record a digitized representation of any phase voltage or current signal with no dead time between such recordings, and the ability to trigger multiple such recordings in continuous succession, and at different resolutions simultaneously.
 - Enabled and triggered manually or through internal operating conditions, including periodic timer or setpoint activity.
 - High speed triggering is supported.
 - The number of records (depth) of each data recorder, and the overflow conditions (stop-when-full or circular) is programmable.
- c. The PMS Instrument is desired to be able to record continuously to capture long duration waveforms. The duration of the waveform capture is desired to be limited by memory alone.

14.0 Advanced Features

- a. The PMS Instrument firmware shall be field upgradeable by OSU personnel.
- b. The PMS Instrument shall have multi-level security which supports customized access for up to 16 users.
- c. The PMS Instrument shall have revenue security capabilities including but not limited to the following:
- Password protected, no hardware lock, or
 - Password protected and hardware locked, or
 - The following data is protected from alteration when locked:
 - a. kWh and kVARh (import, export, net and total)
 - b. kVAh (total)
 - c. kW, kVAR, kVA demand (thermal and sliding window)
 - d. kWh, kVARh, kVAh pulse outputs
- d. The PMS Instrument shall have provisions for conformal coating of its internal circuitry for installations exposed to high degrees of humidity. (Tropicalization treatment)
- e. The PMS Instrument shall have provisions for creating periodic or non-periodic schedules for up to two (2) years. These schedules may be used to perform the following functions:
- Time of Use (TOU)

- Demand Control
 - Load Scheduling
 - Logging
 - Periodic Resetting
 - Alarm Gating
- f. The PMS Instrument shall have multiple tariffs and Time-of-Use (TOU) functionality to store and monitor up to 20 years of seasonal rate schedules. The TOU feature allows four seasons, four day types (each one capable of at least eight switch times, with a resolution of one minute). The TOU feature supports four rate tariffs, and at least twelve holidays per year, and allows periodic self read capability.
- g. The PMS Instrument must be able to determine (with a level of confidence) whether a disturbance event occurred upstream or downstream of the meter. (Disturbance Direction Detection).
- h. The PMS Instrument shall be a PowerLogic ION8600 manufactured by Schneider Electric or approved equal.
- i. The meter module shall be rated for a minimum operating temperature range of -40°C to 85°C.

15.0 Ethernet Gateways

Ethernet Gateways (EGX) – Stand-Alone Devices

The EGX shall feature one RS-485 serial port and a second port configurable for RS-232 or RS-485 (support for 2-wire or 4-wire)

A single EGX, assigned a single IP address, shall provide high speed Ethernet support for up to 192 devices.

The EGX shall feature, at a minimum, the following protocols: Ethernet -- MODBUS/TCP HTTP, FTP. Serial -- MODBUS, JBUS.

The EGX shall have an input voltage of 24 Vdc and a maximum burden of 8 Watts.

The EGX shall operate in ambient temperature of -30 to 80° C, an ambient storage temperature of - 40 to 85° C and will operate in relative humidity of 5 to 95% non-condensing.

The EGX is required to be a stand-alone product that offers various mounting configurations and includes, at a minimum, the following: DIN- rail mounting, Wall/Panel Mounting, Flat Surface or Desk Top.

The EGX should at the least be UL, CUL, CE, NOM and FCC Class A compliant.

The EGX must be compatible with Ethernet TCP/IP networks and allows users to access power monitoring information from any location on a local area network (LAN) or a wide area network (WAN).

The EGX shall utilize Modbus/TCP protocol as its high-speed backbone network protocol.

The EGX must allow direct Ethernet connection to monitoring and protective RS-485 field devices. Power monitoring software running on a PC with a Modbus/TCP driver shall be able to access monitoring, metering, and protective data via the LAN. The PC is required to be connected to the Ethernet LAN via a Network Interface Card (NIC)

The gateway shall provide a twisted pair connection to connect to the Ethernet backbone. The Ethernet twisted-pair port shall have: An RJ45 connector, Supports 10/100BaseT connection (10 or 100Mbit auto-negotiate), Support for both unshielded twisted-pair (UTP) as well as shielded twisted-pair (STP) wiring LED's to indicate Ethernet activity.

The EGX shall have a serial RS-485 port that is used to connect serial field devices to the LAN. This RS-485 serial port shall have the following specification: Supports up to 32 serial devices without a repeater. Supports Modbus, Jbus, or mixed mode daisy chain devices. Supports either 2-wire or 4-wire daisy chain devices. Support for baud rates of 1200 to 38400.

The EGX shall have a minimum of one port that can be configured for either RS-485 or RS-232.

The EGX shall allow a Modbus master on one of its serial ports to request data from devices on the second serial port.

The EGX must be configurable by either: Local RS-232 connection and a Hyper Terminal® interface or local or remote Ethernet connection and a standard web browser.

SNMP (Simple Network Management Protocol) shall be supported by the EGX according to the industry standard MIB2.

SNTP (Simple Network Time Protocol) shall be supported to allow date and time to be synchronized to within 1 second between devices.

Setup of the ECC needs to be accomplished via the on-board Ethernet port and a web browser. It shall also be possible via the Ethernet port to upgrade the firmware of the ECC in the field to accommodate new system features.

It shall also be possible via the Ethernet port to upgrade the firmware of the EGX in the field to accommodate new system features.

All communications cabling shall be Category 5 rated for 100baseT, or Fiber Optics rated for 100 base FX.

The EGX shall provide a web based interface for device configuration and diagnostics.

Evaluation Criteria

- **Cost:** Price for complete project, including but not limited to all software, hardware, training, specialized equipment, annual maintenance fees, or technical support.
- **Software:** Cost of the software is to be scalable in size by using a per device licensing fee as we all an unlimited license fee. At the time that the per license fees equal the unlimited device costs, these fees will be credited toward the unlimited device license package. The Software Price Sheet must be completely filled out.
- **Experience/Scope:** The power monitoring supplier must have existing systems installed of similar size and scope including major universities.
- **Company durability:** The supplier shall have been in the power monitoring business for at least twenty years.
- **One stop shopping:** The successful vendor must provide a complete turn-key system designed and proven to be compatible in all respects without any third party components, specialized services, software, or special programming. The completed system including all setup, training, software, and hardware and design technologies shall be the product of one manufacturer and its subsidiaries.
- **Compliance:** Meets the criteria of this specification



OKLAHOMA STATE UNIVERSITY

STILLWATER, OKLAHOMA

CONTINUATION SHEET
To Accompany Requisition No.

W036575-PTB

For: Oklahoma State University

ITEM	QUANTITY	UNIT	DETAILED DESCRIPTION - DOUBLE SPACE BETWEEN ITEMS	UNIT PRICE	AMOUNT
COMPLETE THE FOLLOWING IF APPLICABLE TO BID/RFP/RFQ:					
1.	7	EA	Cost of Base System License for Oklahoma State University - Stillwater, Oklahoma		\$ _____
2.	1	Lot	Cost of Client Software (per seat or site license)		\$ _____
3.	1	Lot	Total Training of User/Computer Personnel. Bid hours for completion and cost per hour _____ hours @ \$ _____/hr		\$ _____
4.	1	Lot	Total Installation/Implementation. Bid hours for completion and cost per hour. _____ hours @ \$ _____/hr		\$ _____
5.	1	Lot	<u>Optional</u> : Hardware required to operate system which is not currently installed at OSU		\$ _____
6.	1	Lot	<u>Optional</u> : System 1 Database (third party). Software required to operate system which is not currently installed at OSU.		\$ _____
7.	1	Lot	<u>Optional</u> : Bid cost per hour for any additional services required i.e. Custom programming, modifications, etc.		\$ _____/hr
8.			Annual Software License / Maintenance Note: If year 1 is included in base bid amount, indicate "no charge" for year 1		\$ _____
			Year 1		\$ _____
			Year 2		\$ _____
			Year 3		\$ _____
			Year 4		\$ _____
			Year 5		\$ _____



OKLAHOMA STATE UNIVERSITY

STILLWATER, OKLAHOMA

CONTINUATION SHEET
To Accompany Requisition No.

W036575-PTB

	QUANTITY	UNIT	DETAILED DESCRIPTION – DOUBLE SPACE BETWEEN ITEMS	UNIT PRICE	AMOUNT
1	3	EA	Basic Meters (Section 11) per the attached Specifications Brand:_____ Model:_____	\$_____	\$_____
2	2	EA	Ethernet Gateways (Section 15) per the attached Specifications Brand:_____ Model:_____	\$_____	\$_____
3	4	EA	Advanced Meters (Sections 12-14) per the attached Specifications Brand:_____ Model:_____	\$_____	\$_____
TOTAL:					\$_____
Note: Unit pricing shall include all shipping and installation charges.					