Request for Proposals

Electric Department SCADA System Upgrades

For

Greenville Utilities Commission

Of the City of Greenville, North Carolina

401 South Greene Street

Greenville, North Carolina 27834

Response Due Date, March 30, 2012, 4:00 pm (EDST)

Request for Proposal
For
Electric Department SCADA System Upgrades

SECTION I

1.0   GOOD FAITH STATEMENT

All information provided by GUC in this RFP is offered in good faith. Individual items are subject to change at any time. GUC makes no certification that any item is without error. GUC is not responsible or liable for any use of the information or for any asserted claims.

2.0   PROPOSAL DEADLINE:

Proposals, subject to the conditions made a part hereof, will be received in the office of: Mr. J. Todd Rouse, P.E., Greenville Utilities Commission, 801 Mumford Road, Greenville, North Carolina 27834 until **4:00 PM (EDST) on March 30, 2012**. **Late proposals will not be considered.**

3.0   METHOD OF EVALUATION

Proposals will be evaluated by GUC personnel. Selected vendors may be requested to present formal presentations on site on a date and time mutually agreeable by both parties.

4.0   EVALUATION AND AWARD

GUC reserves the right to reject any and all proposals, to waive any and all informalities, and to disregard all nonconforming or conditional proposals or counter proposals. In evaluating proposals,GUC shall consider whether the proposals comply with the prescribed requirements, plus all alternates or options requested. GUC reserves the right to include or exclude any option or alternative(s). If interviews are necessary, interviews with selected respondents will be scheduled and conducted. If a proposal is to be awarded, it will be awarded to the lowest responsible, responsive respondent whose evaluation by GUC indicates that the award will be in GUC's best interests.

5.0   MINORITY BUSINESS PARTICIPATION PROGRAM:

GUC has adopted an Affirmative Action and Minority and Women Business Enterprise Plan (M/WBE) Program. Firms submitting a proposal are attesting that they also have taken affirmative action to ensure equality of opportunity in all aspects of employment, and to utilize M/WBE suppliers of materials and/or labor.

6.0   VENDOR INCURRED COSTS

All costs that may be incurred to prepare proposals, attend meetings, attend site inspections, provide requested follow-up information, make formal and informal presentations, and for the entire contract negotiations process if applicable, shall be the sole responsibility of each vendor. GUC is not responsible under any circumstances for reimbursement of any costs that may be

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incurred by vendors during the proposal preparation, subsequent selection or negotiation stages.

7.0 DEPOSIT

A deposit is NOT required for this proposal.

8.0 NC SALES TAX

Do **not** include NC sales taxes in proposal figure; however, Greenville Utilities Commission (GUC) does pay sales tax. Sales tax should be added to the invoice as a separate item.

9.0 FEDERAL EXCISE TAX

GUC is exempt from Federal Excise Tax and will issue a Federal Exemption Certificate upon request to the successful Proposer.

10.0 NUMERICAL ERRORS

In the case of a discrepancy between a unit price and the extension (the unit price multiplied by the number of units), the unit price governs. In the case where numerical proposals are stated both in numbers and in words, the words govern.

11.0 PROPOSAL WITHDRAWAL

A propose must notify GUC in writing of its request to withdraw a proposal within seventy-two (72) hours after the proposal opening, not including Saturdays, Sundays, or holidays. In order to justify withdrawal, the proposer must demonstrate that a substantial error exists and that the proposal was submitted in good faith.

12.0 CONFLICT OF INTEREST

In general, conflicts of interest relate to the potential for self-gain usually, but not always, of a fiscal nature. Potential for self-gain can serve to undermine the judgment or objectivity of vendors providing consultation services. A potential or actual conflict of interest exists when commitments and obligations to GUC are likely to be compromised by a vendor's other interests or commitments, especially economic, particularly if those interests or commitments are not disclosed. Not all conflicting interests are necessarily impermissible. Timely and complete disclosure of potential conflicts of interest may be a satisfactory remedy and protects the consultant from suspicion and accusations of breach of professional integrity.

Vendors are asked to disclose any situation or relationship that might be regarded as potential conflict of interest with, but not limited to, their expected duties and recommendations as defined in this RFP.

It is certified that this proposal is made in good faith and without collusion or connection with any other person responding on the same above listed items. It is also certified that this proposal is made in good faith and without collusion or connection with any GUC employee(s).

Certified check or cash for $_____n/a_____or bond for $_____n/a_____attached.

Firm Name _____   Phone (____)_____

Address _____

City _____   State_____   Zip Code_____

Fax (_____) _____   E-Mail _____

Authorized Official_____   Title_____
                                              Typed Name

_____   Date _____
                                          Signature

13.0   <u>TERMS AND CONDITIONS</u>

The attached Terms and Conditions must be considered by all vendors as part of the proposal.

TERMS AND CONDITIONS FOR THE PURCHASE OF

APPARATUS, SUPPLIES, MATERIALS, EQUIPMENT AND SERVICES

These Terms and Conditions, made and entered into on this the _____ day of _____, by and between GREENVILLE UTILITIES COMMISSION OF THE CITY OF GREENVILLE, PITT COUNTY, NORTH CAROLINA, with one of its principal offices and places of business at 401 S. Greene Street, Post Office Box 1847, Greenville, Pitt County, North Carolina 27835-1847, hereinafter referred to as "GUC" and _____, a _____ organized and existing under and by virtue of the laws of the State of _____, with one of its principal offices and places of business at _____, hereinafter referred to as "PROVIDER";

1.0 TAXES

No taxes shall be included in any proposal prices. GUC is exempt from Federal Excise Tax. GUC is not exempt from North Carolina state sales and use tax or, if applicable, Pitt County sales and use tax. Such taxes shall be shown as a separate item on the invoice.

2.0 INVOICES

It is understood and agreed that orders will be shipped at the established contract prices and quantities in effect on dates orders are placed. Invoicing at variance with this provision may subject the contract to cancellation. Applicable North Carolina sales tax shall be invoiced as a separate line item. All invoices must bear the GUC purchase order number. Mail all invoices to Greenville Utilities Commission, Finance Department, P. O. Box 1847, Greenville, NC 27835-1847.

3.0 PAYMENT TERMS

Payments for equipment, materials, or supplies will be made after the receipt and acceptance of the equipment, materials, or supplies and after submission of a proper invoice. GUC's normal payment policy is thirty (30) days. GUC will not be responsible for any goods delivered without a purchase order having been issued. Payment will be made in U. S. currency only.

4.0 QUANTITIES

Quantities specified are only estimates of GUC's requirements. GUC reserves the right to purchase more or less than the stated quantities at prices indicated in the submitted Proposal Form based on our actual needs.

5.0 AFFIRMATIVE ACTION

The Provider will take affirmative action in complying with all Federal and State requirements concerning fair employment and employment of the handicapped, and concerning the treatment of all employees, without discrimination by reason of race, color, religion, sex, national origin, or physical handicap.

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6.0   CONDITION AND PACKAGING

Unless otherwise indicated in the proposal, it is understood and agreed that any item offered or shipped shall be new and in first class condition, that all containers shall be new and suitable for storage or shipment, and that prices include standard commercial packaging.

7.0   SAMPLES

Samples of items, if required, must be furnished free of expense to GUC, and if not destroyed, will, upon request, be returned at the Provider's expense. Request for the return of samples must be made at the proposal opening, otherwise, the samples will become GUC's property. Each individual sample must be labeled with Provider's name.

8.0   SPECIFICATIONS

Any deviation from specifications must be clearly pointed out, otherwise, it will be considered that items offered are in strict compliance with specifications, and the Provider will be held responsible. Deviations must be explained in detail. **The Provider shall not construe this paragraph as inviting deviation or implying that any deviation will be acceptable.**

9.0   INFORMATION AND DESCRIPTIVE LITERATURE

Providers are to furnish all information requested. Further, as may be specified elsewhere, each Provider must submit with its proposal: cuts, sketches, descriptive literature, and/or complete specifications covering the products offered. Reference to literature submitted with a previous proposal does not satisfy this provision. Proposals which do not comply with these requirements will be subject to rejection.

10.0   AWARD OF CONTRACT

As directed by statute, qualified proposals will be evaluated and acceptance made of the lowest responsible, responsive proposal most advantageous to GUC as determined upon consideration of such factors as prices offered, the quality of the article(s) offered, the general reputation and performance capabilities of the Provider, substantial conformity with the specifications and other conditions set forth in the proposal, the suitability of the article(s) for the intended use, the related services needed, the date(s) of delivery and performance, and such other factors deemed by GUC to be pertinent or peculiar to the purchase in question.

Acceptance of the order includes acceptance of all terms, conditions, prices, delivery instructions, and specifications as shown on this set of Terms and Conditions and in this order or attached to and made a part of this order.

The conditions of this order cannot be modified except by written amendment in the form of "Amended Purchase Order," which has been approved by GUC's Purchasing Technician.

In the event of a Provider's failure to deliver or perform as specified, GUC reserves the right to cancel the order or any part thereof, without prejudice to GUC's other rights. The Provider agrees that GUC may return part of or all of any shipment at Provider's expense. GUC may charge the Provider with all reasonable expenses resulting from such failure to deliver or perform.

11.0   MEDIATION/BINDING ARBITRATION

In the event of any dispute between the Parties, the Parties agree to submit any dispute to non-binding mediation before a mutually agreeable Mediator prior to initiating litigation. If the Parties are unable to agree upon a Mediator within thirty (30) days after demand therefore, either Party may petition a Court of competent jurisdiction for the designation of a qualified Mediator for these purposes. Each Party shall bear its own costs and expenses of participating in the mediation (including, without limitation, reasonable attorneys' fees), and each Party shall bear one-half (1/2) of the costs and expenses of the Mediator. Unless otherwise agreed, the Parties will hold the mediation in Greenville, North Carolina. The matters discussed or revealed in the mediation session shall not be disclosed in any subsequent litigation.

In the event the matter is not resolved in mediation, either Party may request arbitration. The parties shall jointly select an Arbitrator, and shall be bound by the decision of the Arbitrator with respect to any dispute between the parties with respect to this Agreement. If the parties are unable to mutually agree upon an Arbitrator, the Parties shall each select an Arbitrator, and the two Arbitrators so selected shall select a third Arbitrator, and the decision of the majority of the Arbitrators shall be conclusive and binding upon the Parties. The Parties at all times agree to equally split the costs of any Arbitrator(s) selected in an effort to resolve the dispute between the Parties. Any party desiring to resolve a dispute under the terms of this Agreement shall notify the other Party in writing, and the Parties shall seek to agree upon a mutually agreed-upon Arbitrator within a period of ten (10) days from the date of such written demand. If the Parties are unable to agree within such ten (10) day period, the Parties shall each select an Arbitrator, and the two (2) Arbitrators so selected shall select a third Arbitrator within fifteen (15) days from the date of the written demand for arbitration, and a decision shall be rendered by the Arbitrator(s) so selected within five (5) days after such Arbitrator(s) is selected.

12.0   GOVERNMENT RESTRICTIONS

In the event any Governmental restrictions may be imposed which would necessitate alteration of the material, quality, workmanship, or performance of the items offered on this proposal prior to their delivery, it shall be the responsibility of the successful Provider to notify the GUC Purchasing Technician, at once, indicating in its letter the specific regulation which required such alterations. GUC reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or, in the sole discretion of GUC, to cancel the contract.

13.0   INSURANCE

    13.1   Coverage – During the term of the contract, the Provider at its sole cost and expense shall provide commercial insurance of such type and with the following coverage and limits:

        13.1.1 Workers' Compensation – The Provider shall provide and maintain Workers' Compensation Insurance, as required by the laws of North Carolina, as well as employer's liability coverage with minimum limits of $1,000,000 each accident, covering all Provider's employees who are engaged in any work under the contract. If any work is sublet, the Provider shall require the subcontractor to provide the same coverage for any of its employees engaged in any work under the contract.

13.1.2 General Liability – Commercial Liability Coverage written on an "occurrence" basis in the minimum amount of $1,000,000 per occurrence.

13.1.3 Automobile – Automobile Liability Insurance, to include coverage for all owned, hired, and non-owned vehicles used in connection with the contract with a minimum combined single limit of $1,000,000 per accident.

13.2   Requirements - Providing and maintaining adequate insurance coverage is a material obligation of the Provider. All such insurance shall meet all laws of the State of North   Carolina. Such insurance coverage shall be obtained from companies that are authorized to provide such coverage and that are authorized to do business in North Carolina by the Commissioner of Insurance. The Provider shall at all times comply with the terms of such insurance policies and all requirements of the insurer under any of such insurance policies, except as they may conflict with existing North Carolina laws or this contract. The limits of coverage under each insurance policy maintained by the Provider shall not be interpreted as limiting the Provider's liability and obligations under the contract. It is agreed that the coverage as stated shall not be canceled or changed until thirty (30) days after written notice of such termination or alteration has been sent by registered mail to GUC's Purchasing Technician.

14.0   PATENTS AND COPYRIGHTS

The Provider shall hold and save GUC, its officers, agents, and employees, harmless from liability of any kind, including costs and expenses, including reasonable attorney fees, on account of any copyrighted articles or any patented or unpatented invention, device or appliance manufactured or used in the performance of this contract.

15.0   PATENT AND COPYRIGHT INDEMNITY

The Provider will defend or settle, at its own expense, any action brought against GUC to the extent that it is based on a claim that the product(s) provided pursuant to this agreement infringe any U.S. copyright or patent; and will pay those costs, damages, and attorney fees finally awarded against GUC in any such action attributable to any such claim, but such defense, settlements, and payments are conditioned on the following: (1) that Provider shall be notified promptly in writing by GUC of any such claim; (2) that Provider shall have sole control of the defense of any action on such claim and of all negotiations for its settlement or compromise; (3) that GUC shall cooperate with Provider in a reasonable way to facilitate the settlement of defense of such claim; (4) that such claim does not arise from GUC modifications not authorized by the Provider or from the use of combination of products provided by the Provider with products provided by GUC or by others; and (5) should such product(s) become, or in the Provider's opinion likely to become, the subject of such claim of infringement, then GUC shall permit Provider, at Provider's option and expense, either to procure for GUC the right to continue using the product(s), or replace or modify the same so that it becomes non-infringing and performs in a substantially similar manner to the original product.

16.0   EXCEPTIONS

All proposals are subject to the terms and conditions outlined herein. All responses will be controlled by such terms and conditions and the submission of other terms and conditions, price catalogs, and other documents as part of a Provider's response will be waived and have no

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effect on this Request for Proposal or any other contract that may be awarded resulting from this solicitation. The submission of any other terms and conditions by a Provider may be grounds for rejection of the Provider's proposal. The Provider specifically agrees to the terms and conditions set forth in this set of Terms and Conditions by affixing its name on the signatory page contained herein.

17.0   CONFIDENTIAL INFORMATION

Except as provided by statute and rule of law, GUC will keep trade secrets which the Provider does not wish disclosed confidential. Each page shall be identified in boldface at the top and bottom as "CONFIDENTIAL" by the Provider. Cost information shall not be deemed confidential. The determination of whether a matter is confidential will be determined by North Carolina law.

18.0   ASSIGNMENT

No assignment of the Provider's obligations or the Provider's right to receive payment hereunder shall be permitted without the express written consent of GUC, provided however, upon written request approved by the GUC Purchasing Technician, solely as a convenience to the Provider, GUC may:

- Forward the Provider's payment check directly to any person or entity designated by the Provider, and

- Include any person or entity designated by Provider as a joint payee on the Provider's payment check.

- In no event shall such approval and action obligate GUC to anyone other than the Provider, and the Provider shall remain responsible for fulfillment of all contract obligations.

19.0   ACCESS TO PERSON AND RECORDS

GUC shall have reasonable access to persons and records of Provider as a result of all contracts entered into by GUC.

20.0   INSPECTION AT PROPOSALDER'S SITE

GUC reserves the right to inspect, at a reasonable time, the item, plant, or other facilities of a prospective Provider prior to contract award and during the contract term as necessary for GUC's determination that such item, plant, or other facilities conform with the specifications/requirements and are adequate and suitable for the proper and effective performance of the contract. Provider may limit GUC's access to restricted areas.

21.0   AVAILABILITY OF FUNDS

Any and all payments of compensation of this specific transaction and any continuation or any renewal or extension are dependent upon and subject to the allocation of GUC funds for the purpose set forth in this Agreement.

22.0   GOVERNING LAWS

All contracts, transactions, agreements, etc., are made under and shall be governed by and construed in accordance with the laws of the State of North Carolina.

23.0   ADMINISTRATIVE CODE

Proposals, proposals, and awards are subject to applicable provisions of the North Carolina Administrative Code.

24.0   EXECUTION

In the discretion of GUC, failure of a duly authorized official of Provider to sign the Signatory Page may render the proposal invalid.

25.0   CLARIFICATIONS/INTERPRETATIONS

Any and all questions regarding these Terms and Conditions must be addressed to the GUC Purchasing Technician.   Do not contact the user directly. **These Terms and Conditions are a complete statement of the parties' agreement and may only be modified in writing signed by Provider and the GUC Purchasing Technician.**

26.0   SITUS

The place of all contracts, transactions, agreements, their situs and forum, shall be North Carolina, where all matters, whether in contract or tort, relating to the validity, construction, interpretation, and enforcement shall be determined.

27.0   TERMINATION OF AGREEMENT

GUC or Provider may terminate this Agreement for just cause at any time. Provider will be paid for all time and expenses incurred as of the termination date. Termination for just cause by either party shall be by certified letter and shall be effective thirty (30) days after signed and acknowledged receipt of said letter. Just cause shall be based on reasonable grounds, and there must be a fair and honest cause or reason for such action. The causes for termination, include, but are not limited to: (1) Provider's persistent failure to perform in accordance with the Terms and Conditions, (2) Provider's disregard of laws and regulations related to this transaction, and/or (3) Provider's substantial violation of the provisions of the Terms and Conditions.

28.0   DELIVERY

Shipments will be made only upon releases from a purchase order issued by GUC in accordance with GUC's current needs.

Delivery of all equipment, materials, or supplies shall be made Free on Board (FOB) GUC Warehouse, 801 Mumford Road, Greenville, North Carolina 27834, unless otherwise specified. The agreed price for such equipment, materials, or supplies shall include all costs of delivery and ownership, and risks of loss shall not be transferred from Provider to GUC until express written acceptance of delivery and inspection by GUC. Delivery hours are between 8:00 AM and 4:30 PM Monday-Friday only. **GUC's purchase order number is to be shown on the**

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packing slip or any related documents. GUC reserves the right to refuse or return any delivery with no purchase order number or which is damaged. GUC will not be charged a restocking fee for any delivery which is refused or returned.

29.0   INDEMNITY PROVISION

Provider agrees to indemnity and save GREENVILLE UTILITIES COMMISSION of the City of Greenville, Pitt County, North Carolina, and the City of Greenville, North Carolina, its co-owners, joint venturers, agents, employees, and insurance carriers harmless from any and all Third Party claims, actions, costs, expenses, including reasonable attorney fees, judgments, or other damages resulting from injury to any person (including injury resulting in death), or damage (including loss or destruction) to third party tangible property arising out of the negligent performance of the terms of this Contract by Provider; including, but not limited to, Provider's employees, agents, subcontractors, and others designated by Provider to perform work or services in, about, or attendant to, the work and services under the terms of this Contract. Provider shall not be held responsible for any losses, expenses, claims, subrogations, actions, costs, judgments, or other damages, directly and proximately caused by the negligence of Greenville Utilities Commission of the City of Greenville, Pitt County, North Carolina. Insurance covering this indemnity agreement by Provider in favor of Greenville Utilities Commission of the City of Greenville, Pitt County, North Carolina, and the City of Greenville, North Carolina, shall be provided by Provider.

30.0   FORCE MAJEURE

Neither party shall be considered in default in the performance of its obligations hereunder to the extent that the performance of any such obligation is prevented or delayed by any cause, existing or future, which is beyond the reasonable control of such party. In any such event of force majeure, the parties shall advise each other of such event, and the parties shall negotiate an equitable adjustment to their respective obligations under this Agreement.

31.0   WARRANTY(IES)

The Provider hereby includes all warranties, whether expressed or implied, including, but not limited to, the Implied Warranty of Merchantability and the Implied Warranty of Fitness for a Particular Purpose.

32.0   INTEGRATED CONTRACT

These Terms and Conditions, Instructions to Proposalders, Specifications, and the selected Provider's proposal represents the entire contract between the Parties. No verbal or other written agreement(s) shall be held to vary the provisions of this Agreement.

33.0   CONTRACT PROVISIONS

Each of the provisions of these Terms and Conditions shall apply to the full extent permitted by law, and the invalidity in whole or in part of any provision shall not affect the remainder of such provision or any other provisions.

34.0   <u>NOTICES</u>

Notices to the Parties should be sent to the names and addresses specified below:

Cleve Haddock
Purchasing Department, Buyer II
Greenville Utilities Commission
P.O. Box 1847
Greenville, NC 27835-1847

Vendor Specified on Page 1 of Section II when awarded.

GREENVILLE UTILITIES COMMISSION   COMPANY NAME:

By: _____   By: _____
    Ronald D. Elks

                                   Name (Print): _____

Title: General Manager/CEO_____   Title: _____
      (Authorized Signatory)   (Authorized Signatory)

Date: _____   Date: _____

Attest: _____   Attest: _____

Name (Print): Amy Carson Quinn_____   Name (Print): _____

Title: Executive Secretary_____   Title: Corporate Secretary_____

Date: _____   Date: _____

 (OFFICIAL SEAL)   (CORP. SEAL)

This instrument has been pre-audited in the
 manner required by the Local Government
Budget and Fiscal Control Act.

By: _____
    Jeff W. McCauley

Title: Chief Financial Officer_____

Date: _____

APPROVED AS TO FORM AND LEGAL CONTENT:

By: _____
    Phillip R. Dixon

Title: Commission Attorney_____

Date: _____

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Notice of Request for Proposals
Electric Department
SCADA System Upgrades

Prepared by: Advanced Enterprise Systems Corporation
March 2012

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OVERVIEW

Greenville Utilities Commission (GUC) invites proposals from companies that specialize in the design and installation of Supervisory Control and Data Acquisition (SCADA) systems capable of monitoring and controlling electric utilities and their associated power systems. It is the goal of the GUC to update the SCADA system for their Electric Department using a commercial-off-the-shelf Human Machine interface (HMI) product along with any other necessary hardware and software products. Respondents to this RFP will be responsible for providing a turn-key solution including all necessary system design, procurement, programming, configuration, testing, training, commissioning and startup to provide Greenville Utilities a complete and operable SCADA system.

BACKGROUND

Greenville is located in Pitt County in the Coastal Plain region of eastern North Carolina. It is approximately 85 miles east of the state capital of Raleigh. In 2011, the population of Greenville was approximately 84,000 with Pitt County being 168,000.

Greenville Utilities

The Greenville Utilities Commission (GUC) was initially chartered by the North Carolina General Assembly in 1905. The latest amendment to the Charter occurred in 1992. It is organized as an independent agency of the City of Greenville and operates the City's electric, water, sewer, and gas utilities. Each of the four utilities is required to be accounted for through four individual budgets.

The Commission members are appointed by the City Council. Five members represent the City and two members represent the County. The members are appointed on three-year staggered terms with eligibility for an additional three-year appointment. The City Manager serves as the eighth and full voting member of the Board of Commissioners. GUC presently employs approximately 430 people in nine departments.

Electric Department

The Electric Department presently employs approximately 138 people in seven sections: administration, engineering, substation and controls, distribution, systems dispatch and load management, and meter.

The Electric Department serves the citizens of Greenville and approximately 75% of surrounding Pitt County, and is the second largest public power system in the state in terms of both the number of customers served and quantity of electricity purchased and distributed. GUC is a member of the North Carolina Eastern Municipal Power Agency (NCEMPA) and participates in the purchase of electricity from generation facilities jointly owned by NCEMPA and Progress Energy. Greenville is the largest of the 32 cities participating in NCEMPA.

GUC takes power delivery from Progress Energy at 230 kV from two different locations. GUC steps the voltage down to 115 kV and delivers power to various distribution substations on six transmission circuits. The delivery substations are designed with transformer differential, bus differential, breaker failure, bus overcurrent and circuit overcurrent protection. The distribution substations are designed with transformer differential protection, bus breaker protection and a main-and-transfer bus scheme.

GUC operates and maintains 33 miles of 115 kV transmission and 30 miles of 34.5 kV sub-transmission lines. GUC also operates over 1,400 miles of 12.47 kV overhead distribution lines and 950 miles of 12.47 kV underground distribution lines. In addition, the department maintains 19 distribution substation sites with combined base rating capacity of 540 MVA, two sub-transmission sites (115-34.5 kV) at a combined base rating capacity of 50 MVA, two point of delivery substations (230-115 kV) with a combined base rating capacity of 480 MVA.

GUC distributes electricity to approximately 65,000 customers with an annual peak demand of 350 MW.

ADDITIONAL DOCUMENTS

Additional documents are available to each Proposer to assist in their proposal preparation. These documents provide additional details on system layout, statistics, and other pertinent project requirements and include:

1. Section 13300 – General Provisions
2. Section 13305 – Testing
3. Section 13310 – SCADA system
4. Demonstration – Guidelines and script
5. Demonstration – Table 1 Eastern Bypass Point List
6. Demonstration – Figure 1 Eastern Bypass Substation Oneline
7. Technical Memorandum No. 3.3.1 – System Infrastructure Design
8. Technical Memorandum No. 3.3.2 – Remote Site details
9. Technical Memorandum No. 3.3.2 – Remote Site one-line drawings
10. Technical Memorandum No. 3.3.3 – Asset Management Tagging Standards

INQUIRIES

Inquiries shall be written, preferably by email. Proposers and their representatives shall not make any contact or communicate with any employees, Directors, and consultants of GUC other than Todd Rouse in regard to any aspect of this solicitation unless authorized in writing by Todd Rouse. All questions must be received no later than seven (7) calendar days in advance of the proposal due date. All questions regarding this RFP shall be directed to:

Mr. J. Todd Rouse, P.E.
rouset@guc.com, 252-551-1570

ADDENDA

GUC has a web site for disseminating information and documentation regarding this RFP at http://www.guc.com/Vendors/Default.aspx. An overview of the business process and related announcements and documents shall be posted on this website under the Vendor tab. All Proposers can access the website to obtain overview information.

Proposers have the responsibility of visiting the website frequently and keeping themselves apprised of any information relevant to the RFP requirements, timelines, addenda, meetings, and related documents. The RFP and addenda will be delivered to Proposers electronically via email.

Responses to inquiries that materially change the scope or intent of this RFP will be issued via addenda and posted to the website. Oral statements or clarifications shall be non-binding and without legal effect. It is the Proposer's sole responsibility to review and incorporate any addenda into their proposal response. Failure to include acknowledgement of all addenda may be cause for rejection of the proposal.

PROPOSAL

Proposers shall provide to GUC details as described throughout this RFP. Proposers must submit information that shows in detail how their proposed approach to upgrading the SCADA system provides the best value to GUC. Proposers are also encouraged to submit any information that indicates how their proposed system would provide GUC with features and enhancements that exceed the minimum system requirements as set forth in this RFP.

Proposers shall also complete an on-site demonstration as scripted in this RFP. A four (4) hour demonstration/presentation will be held either April 9, 10 or 11. The proposer shall schedule with Mr. J. Todd Rouse, PE prior to March 20 for the morning or afternoon of April 9, 10, or 11. Proposers shall submit seven (7) copies of their qualifications and questionnaire responses addressed to:

Mr. J. Todd Rouse, P.E.
Greenville Utilities Commission
801 Mumford Road
Greenville, NC 27834

All responses must be received by 2:00 pm Eastern Daylight Time, March 30, 2012. Proposals received after the designated time will not be considered in the selection process and will be retained unopened until after award.

All correspondence and transmittals should be clearly marked as "Greenville Utilities Commission Electric Department SCADA System Upgrade Project."

GENERAL FORMAT [Note: Tabbed Headings must match Evaluation Criteria.]
Proposals shall be structured in the same organizational format, and shall be submitted in a single, three-ring binder, no more than 3-inches thick. Proposers may include additional supplemental information on a DVD; however, the review will primarily focus on the written material within the binder. Submissions not meeting this requirement will be rejected without review. All proposals shall be written in English. All proposals shall contain concise written material and may contain illustrations. Legibility, clarity and completeness are essential. All proposals must use 8.5-inch by 11-inch portrait format, but may be supplemented using 8.5-inch by 11-inch landscape or 11-inch by 17-inch illustrations. A 12-point font shall be used. All proposals must have the following tabbed headings and be limited to the length indicated:

1. Proposal Transmittal Letter (2 pages maximum)
2. Project Approach (35 pages maximum)
3. Project Manager/Key Personnel (15 pages maximum)
4. Overall Qualification of Firm/Team (10 pages maximum)
5. Previous Experience with GUC (3 pages maximum)

6. Compensation Requirements (15 pages maximum)
7. Demonstration/Presentation Comments (10 pages maximum)
8. M/WBE Involvement (2 pages maximum)

PROPOSAL EVALUATION CRITERIA

The following information must be included in each Proposal and will form the basis of the evaluation. Generally, when scoring proposals, GUC intends to use the entire point range for most categories. Each reviewer will independently review and rate every proposal by criterion area. The point number listed is the weight of each criterion. Once the independent reviews are completed, all scoring will be aggregated into a single score for each Proposer. This will establish an initial ranking. GUC may choose to award based on these rankings, or decide to conduct further interviews with some or all of the Proposers. Greenville Utilities reserves the right to accept or reject any or all proposals and to waive informalities or irregularities in the selection process.

PROPOSAL TRANSMITTAL LETTER – 5 Points

The proposal transmittal letter shall be on company letterhead signed by a person authorized to submit and sign a proposal, clearly identifying the firm name, address, telephone number, the name of the person authorized to submit/sign the proposal, and his/her title, telephone number, and e-mail address.

PROJECT APPROACH – 25 points

The proposed project approach should include the following:
1. A statement of project understanding.
2. A management/technical approach that should describe the utilization of specific methodologies and techniques to perform the tasks outlined in the Scope of Work. Clearly explain reasons for modifications or expansions of tasks.
3. A Maintenance of Operations plan indicating the Proposers approach to transitioning from the current to the new system. While the details of the plan can be completed later as part of the work after Project Award, the plan should include sufficient detail to convey how the Proposer intends to accomplish the cutover without compromising current day-to-day operations. Such details should include any required outages that require manual monitoring and control by GUC staff, basic sequencing, dual system usage, and fault recovery during the transition process.
4. A proposed level of effort document which includes:
   a) A listing of all major tasks.
   b) A detailed inventory of all proposed project personnel by task.
   c) QA/QC effort for required documents.
   d) Summary level of effort. GUC will closely scrutinize the proposed level of effort portion of the proposal. It is crucial that Proposers submit proposals that contain ample time and effort to perform the work described under this RFP to a thorough and detailed level. If GUC believes that Proposers have not submitted adequate time and effort, Proposers will be significantly penalized in terms of points received.
5. The Proposer must list and describe all assumptions used in developing the level of effort document.
6. A detailed schedule for all tasks. The proposed schedule should meet the timeline set forth in the RFP. The schedule should highlight key milestones.

7. Include a detailed description of the quality control plan that will be utilized during this project. The plan should include specific procedures to be used in assuring that the quality of the design deliverables meets GUC's criteria and the standard of ordinary professional care. The plan should detail the products to be reviewed for this project, reviewer's identity, review timing and frequency, review documentation, dispute resolution procedure, and sign-off requirements.

PROJECT MANAGER / KEY PERSONNEL – 10 points

Provide the name and qualifications of the Project Manager (PM) assigned to this project.. Include the PM's prior similar experiences on:

1. Projects, which best illustrate his/her expertise to perform the requested services
2. Meeting schedules and budgets
3. Developing and implementing cost-effective SCADA design processes

Provide the identity and qualifications of Key Personnel (both prime and subconsultants) to work on this project, including the adequacy and appropriateness of their credentials and capabilities, expected project assignments, the extent of their project participation, and the relevance of their prior experience to this project.

Provide an organizational chart illustrating the relationship between the PM, QA/QC Coordinator, and Key Personnel. Identify subconsultants in the organizational chart by name, firm, and M/WBE designation (if applicable). Provide resumes of PM and Key Personnel only.

OVERALL QUALIFICATIONS OF FIRM / TEAM – 10 points

Provide a brief description of the overall qualifications of your firm and project team. Provide examples (not more than three) of similar projects performed by your team within the last five years. The examples should include the nature of your involvement in the project, any special environmental, political, or technical problems involved in the project, how the problems were resolved, the Consultant's experience with sustainability principles and practices, the name and phone number of the owner's representative in charge of the project, the Consultant's contracted amount for the project, the total project cost, and when the project was performed. For any projects listed include the name and phone number of the owner's representative in charge of the project.

PREVIOUS EXPERIENCE WITH GUC – 5 points

GUC will provide an evaluation on firms based on their previous performance. The evaluation will be based on 1) quality of work, 2) performance against schedule, and (3) performance against budget. A maximum of five points will be awarded to firms based on these evaluations. If a firm has no previous experience with GUC, zero points will be awarded.

COMPENSATION REQUIREMENTS – 15 points

Include within the proposal binder a separate sealed envelope that is plainly marked, "Compensation Envelope." All costs shall be shown in U.S. dollars and priced separately for items 1 through 7. The compensation proposal shall include the following to complete the proposed scope of services as identified within the RFP:

1. An itemized listing of all equipment required to complete this project as specified and/or recommended by the proposer.
2. An itemized listing of all software and modules required to complete this project as specified and/or recommended by the proposer.
3. A list of all major tasks with total man-hours and a lump sum cost (including, but not limited to, labor, overhead, profit, bonds, insurance, travel expenses, and other direct costs). This list will include, as a minimum:
    a. Mobilization
    b. Design Workshops
    c. System Design and Configuration
    d. Factory Testing
    e. Field Testing
    f. Startup, Commissioning, and Cutover
    g. Training
    h. Warranty
4. Proposed Subcontractor costs including total man-hours.
5. Ten-thousand dollars as an allowance for additional items by GUC.
6. Proposed hourly rates for staff to be used in any change order negotiations.
7. Proposed annual hardware and software support beyond the first year
8. List of exceptions to GUC's Standard Contract and Terms and Conditions

A final level of effort will be negotiated with the successful Proposer before contract award. Note that the Compensation Proposal will be used to assist with establishing a payment schedule, subject to review and adjustment by GUC's Project Manager. The selected Proposer is expected to enter into an Agreement with Greenville Utilities using GUC's standard Contract, Terms and Conditions.

ON SITE DEMONSTRATION and PRESENTATION – 30 points

Demonstration will last no longer than two (2) hours. Proposer will be granted one (1) hour for setup.

1. Communication with Entek device via RTC-1032 protocol sending GE REMS 100/101/102 addressing
2. Communication with NovaTech RTU via DNP3.0 protocol.
3. Download of database points from CSV file to HMI database.
4. Creation of single line diagram of substation.
5. Performance of alarm posting (sequence of events) from alarms generated by NovaTech RTU.

Presentation will follow the demonstration and shall not exceed two (2) hours.

1. Demonstration any applications that sets this product apart from others.
2. Provide information that will make this project successful for Greenville Utilities.

COST OF PROPOSAL PREPARATION

Greenville Utilities Commission will not pay any costs incurred in the preparation, presentation or return of Proposer's proposal, including demonstration/interview time and site visits.

WAIVER OF CLAIMS

Each Proposer, in submitting a proposal is deemed to have waived any claims for damage by reason of the selection of another proposal and/or the rejection of his proposal.

SCOPE OF WORK

This project is primarily the supply of software and necessary hardware, software development and configuration, system testing, training and commissioning. The Scope of Work does not include any installation of equipment; all physical site installation (except for placing computers and plugging in associated power and network cables to local, convenience receptacles) will be done by GUC personnel.

This is a two-phase project; Phase I is the completion of associated design elements through a series of workshops with GUC staff, and Phase II is the system implementation. Each phase is further described below:

PHASE I – DESIGN

This phase of the project will include all necessary design prep including finalizing design workshops to clarify GUC functional requirements. At a minimum, the project will include the following workshops and meetings (all held at GUC facilities):

Kickoff and standards coordination meeting:
- This meeting will include all key stakeholders and will provide the proposer an opportunity to discuss project approach, request information, and review project schedule.
- SCADA HMI Standards Workshop: GUC already has SCADA standards; the purpose of this workshop is to refine the standards specific to the Electric Department. Subject matter will cover graphic look and feel, colors, naming conventions, communication protocols, and tagging standards. Additional elements may be added to the agenda by both GUC and the Proposer. Additional requirements are included in the Technical Project Specification.
- Business to Business Requirements Workshop: This workshop will discuss interface requirements to other GUC business systems for the benefit of gaining knowledge and the progression of the system The integration is beyond the scope of this project. Additional requirements are included in the Technical Project Specification.
-
- Monthly conference call progress meetings: These meetings provide both GUC and the Proposer the opportunity to review progress, invoicing, raise issues, and collaborate on the project.
-

Factory testing and commissioning site visit
- Testing and Commissioning Submittal: This submittal provides the Proposer an opportunity to detail their factory testing, field testing, and commissioning process and documentation procedures. GUC staff will provide input on their requirements and engage in an active dialog to minimize any issues that may arise during the testing process. Additional requirements are included in the Technical Project Specification.
- Maintenance of Operations Workshop: This Workshop will be held on day one of the site visit and provides an opportunity for the Proposer to detail their plan for construction sequencing and cutover from the existing SCADA to the new SCADA. GUC staff will

provide input on restrictions and operational requirements to assist the Proposer. Additional requirements are included in the Technical Project Specification.

Upon completion of all meetings, workshops and submittals, and any necessary follow-up meetings, the Proposer will submit meeting minutes and incorporate the decisions into their associated SCADA implementation. Any significant changes to the Contract will be resolved through a Change Order process.

PHASE II – IMPLEMENTATION

This phase of the project includes all necessary fabrication, assembly, procurement, system programming and configuration, factory testing, field testing, start-up and commissioning, training, and warranty. Additional requirements are included in the Technical Project Specification.

PROJECT MANAGEMENT

Provide project management under the direction of a Project Manager (PM) who shall have overall responsibility for coordination, management, and reporting of the Proposer's activities to the GUC's PM. Project management services, at a minimum, will include the following:

1. Providing a project Work Plan that includes:
    a. Project overview
    b. List of key personnel with contact information
    c. Communications plan
    d. Project schedule
2. Provide a design schedule and cash flow projection prior to Notice to Proceed using a bar chart format so that design progress can be monitored. The overall schedule shall be in the form of a time-scaled format. Work activities shall be shown including sequences of performance and interdependencies. The level of detail shall be sufficiently fine to enable GUC to determine that the project has been adequately planned and to facilitate the determination of the real progress as the work is prosecuted.
3. Attend a project kick-off meeting with key GUC to discuss project requirements and expectations.
4. Prepare monthly progress status reports. The monthly reports shall consist of narrative status reports, schedule, and cost updates, and shall be submitted to GUC's PM within a week of the month-end accounting cutoff dates.
5. Prepare agenda and minutes for monthly conference call progress meetings scheduled with the GUC PM.
6. Coordination and management of all subconsultants.
7. Regular communication of the work in progress with GUC PM.
8. Manage Quality Control (QC) processes to address both technical quality and conformance with GUC standards.

SCHEDULE

The project schedule only addresses the RFP process through project Award. Each Proposer is required to provide a proposed project schedule for the SCADA Upgrades project in their proposal. GUC has not set a timeline for project completion but anticipates this project will complete within one calendar year after Award.

TASK	DATE
Distribute RFP to potential SCADA vendors	March 9, 2012
Schedule on-site demonstration/presentation	March 20, 2012
Receive proposals from Proposers	March 30, 2012
Conduct on-site demonstration/presentation	April 9-11, 2012
Evaluate and rank Proposers	April 12, 2012
Select Vendor	April 16, 2012
Finalize Negotiations	April 23, 2012
Contract Award and Notice to Proceed	April 30, 2012
Submit Project Plan and Schedule	April 30, 2012
Kickoff Meeting	May 8, 2012

DEMONSTRATION GUIDELINES
AND SCRIPTS

Supplied by Vendor
- Computer with HMI software
- same or separate computer with PI historical database
- cabling to connect servers
- cabling to connect to Rugged Comm switch

Supplied by GUC
- Rugged Comm switch connected to NovaTech RTU, connected to terminal server
- SEL terminal server IP to serial connected to Rugged Comm switch and Entek RTU
- Entek paging RTU for Load Control Devices – Serial communication protocol will be RTC-1032 with embedded GE REMS 100 (18bit) and GE REMS 101/102 (40 bit) protocol.
- NovaTech Orion RTU will be preprogrammed with the supplied data points. TCP/IP Communication with DNP 3.0 protocol.
- Routine in NovaTech RTU to change analog and digital values
- Alarm routine to run in the NovaTech RTU
- GE REMS 100 – point address to communicate with Entek RTU provided with RFP
- NovaTech RTU database in Microsoft Excel provided with RFP
- Eastern Bypass one-line diagram provided with RFP

Vendor will demonstrate
1. Communication with Entek device
2. Communication with NovaTech RTU via DNP 3.0
3. Download of database points from Excel spreadsheet into HMI database
4. Creating single line diagram of Eastern Bypass Substation
5. Perform alarm posting (sequence of events) from alarms generating by RTU

1. **Communication with Entek device**
   a. Demonstrate the setup of the GE REMS 100 address in the HMI system
   b. Vendor to transmit GE REMS 100 address via RTC 1032 protocol to Entek device to activate Entek load management switch

   **Entek device connected to 154 MHz transmitter which will transmit the address and activate an Entek receiver

2. **Communication with NovaTech RTU via DNP 3.0**
   a. Demonstrate communication with the NovaTech RTU using address 47 and station name EB1 (Table 1)
   b. GUC will adjust RTU points to verify updates to the HMI
   c. GUC will check LO and HI alarms on select analog points

   **The NovaTech RTU will be equipped with two identical databases. Address 47 can be preloaded from the provided spreadsheet prior to demonstration.

3. **Download of database points from Excel spreadsheet into HMI database**
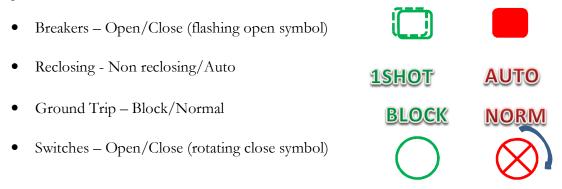   a. Download Eastern Bypass RTU database spreadsheet with address 48 and station name EB2 into master database

   **The spreadsheet will be identical to Table 1 except for the RTU address and station name

4. **Creating single line diagram of Eastern Bypass Substation**

   ** substation single-line (Figure 1) may be created prior to demo with station EB1 points from Table 1.

   a. Demonstrate the creation of the following Dynamic Status
   points for

     - Breakers – Open/Close (flashing open symbol)

     - Reclosing - Non reclosing/Auto

     - Ground Trip – Block/Normal

     - Switches – Open/Close (rotating close symbol)

   **Beginning with a blank screen – utilize points downloaded in DEMO step 3 – RTU address 48 and status name EB2.

   b. Begin creating the Eastern Bypass Substation from status points - switch 1816, CS1, T1,R, 4TB10, 4B1S,B1,r4B1L, 4F2S, F2 – include status points F2AR, F2GT – include analog points B1kW3, B1kVR3, B1PF3, B1VLTA,B,C; B1AMPA,B,C
   c. Verify points are communicating while GUC adjusts points
   d. Display complete Eastern Bypass single line diagram created prior to demonstration utilizing points with RTU address 47 and Station name EB1
   e. Create a web version of this one line diagram

5. Perform alarm posting (sequence of events) from alarms generating by RTU

** Prior to demonstration create an alarm message including

- o Master received Date/Time
- o RTU recorded Date/Time
- o Point Name
- o Point Description
- o Point Status

a. Demonstration how the alarm message is created
b. GUC will initiate alarm routine in the RTU
c. Vendor will collect the alarms into a file
d. Vendor will display alarms on the screen as they are received
e. Following completion of the alarm routine, vendor will share alarm file

SECTION 13300

ELECTRIC DEPARTMENT SCADA SYSTEM - GENERAL PROVISIONS

PART 1   GENERAL

1.01   SCOPE OF WORK

A. A single SCADA System Vendor (SSV) shall furnish all materials, equipment, labor and services, except for those services and materials specifically noted, that is required to achieve a fully integrated and operational system per the project requirements. The Scope of Work includes, but is not limited to, the following:

   1. Final design including all interfaces to existing field equipment, RTU's, power devices, Ethernet switches, Routers, and communications systems in place now and used for communicating I/O data to the existing SCADA system.

   2. Workshops as defined within this Section.

   3. Final Design associated with new equipment selection and mounting including servers, computers, monitors, communications equipment, printers, and other ancillary equipment necessary for a complete and operable SCADA system.

   4. Furnishing, fabricating, and procuring all necessary software, hardware, equipment mounting racks necessary for a complete and operable SCADA system.

   5. Performing all necessary programming and configuration associated with the new SCADA system.

   6. Furnishing various submittals as defined herein.

   7. Performing factory and field testing, startup and commissioning, and training of GUC staff as defined herein.

   8. Project management, quality assurance and other labor functions associated with the design and delivering of the SCADA system defined herein.

   9. Furnishing a one year system warranty as defined herein.

B. Items specifically excluded from the SSV's scope include the following:

   1. Installation of equipment racks, panels, instruments, UPS systems, conduit, and wire associated with the new SCADA system. Installation will be by others.

C. Project Requirements is used throughout the documents to mean the furnishing of all labor, materials, and specialty services necessary for the SSV to install a complete and operable SCADA system. Requirements are specified herein, in other Specification

Sections, detailed in the Request For Proposal (RFP), and/or defined in the Technical Memoranda associated with this project.

D. The SSV shall arrange their project schedule to accommodate the requirements of the Owner to install necessary equipment and ancillary devices furnished by the SSV or others. The exact timing of these coordination efforts will be jointly determined by the Owner and SSV; however, the SSV shall include all necessary costs to accommodate the following minimum time slots in their overall project schedule. All time allotments shall exclude any legal holidays, or days lost due to delays caused by the SSV.

    1. Workshop attendance: Workshops shall be arranged by the SSV to accommodate the Owner's schedule.

    2. Submittal reviews: The SSV will allot a minimum of two weeks review time for each submittal or resubmittal by the Owner. The review time will start upon receipt of the submittal by the Owner.

    3. Factory Testing: SSV will provide a minimum of three week notice prior to any factory testing activity that requires Owner participation.

    4. Installation of SSV supplied equipment: SSV will provide 2 weeks for the Owner to install SSV equipment at their facilities. The time will start after completion of both the factory testing and delivery of all equipment to the site. Owner will install the equipment following the commissioning sequencing outlined in the SSV's Maintenance of Operations plan.

E. All equipment shall satisfy applicable Federal, State and local codes.

F. The SSV shall use the tagging scheme associated with the existing equipment, as modified through the design workshops. The SSV shall not deviate from or modify said numbering scheme without the Owner's approval.

G. The SSV shall provide two new computer equipment racks, which shall contain all furnished servers and new communications equipment.

H. Provide all Human Machine Interface (HMI) configuration including development of control programs, database configuration, graphic screens, communication links, historical archiving, as specified herein.

1.02 RELATED WORK

A. SCADA Architecture Block Diagram is included in the Technical Memoranda.

B. Testing requirements are specified in Section 13305.

C. SCADA System hardware and software is specified in Section 13310.

1.03   SUBMITTALS

A. General submittal requirements include:

1.   Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered.

2.   Submittals shall be in electronic format using Adobe PDF format with an index and sectional dividers, with all drawings at C size (22 inch by 34 inch).Hardcopy submittals will not be allowed unless specifically requested by the Owner.

3.   The submittal drawings' title block shall include, as a minimum, the SSV's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing.

4.   Exceptions to the Specifications or Drawings shall be clearly defined by the SSV in a separate section of each submittal package. The submittal shall contain the reason for exception, the exact nature of the exception and the proposed substitution so that the Owner may make a proper evaluation. The acceptability of any device or methodology submitted as an "or equal" or "exception" to the specifications shall be at the sole discretion of the Owner.

5.   The SSV shall submit all of the submittals in accordance with this Section. Incomplete or partial submittals not complying with the submittal arrangements outlined in this Section will be returned without review.

6.   Separate submittals shall be made as follows:

a. Project Plan and Schedule Submittal

b. Hardware, Panel Drawing, Spares, and Software Submittal

c. Testing Plans

1)   Preliminary Test Procedure Submittal
2)   Final Test Procedure Submittal
3)   Test Documentation Submittal (one each for UFT, WFT, and FAT).

d. Final System Documentation

1)   Preliminary O&M Outline Plan Submittal
2)   Operations and Maintenance Manual Submittal

B. Project Plan, Deviation List, and Schedule

1. The SSV Project Plan shall be submitted and favorably reviewed before any further submittals will be accepted. The Project Plan shall, as a minimum, contain the following:

   a. Overview of the proposed SCADA in clear text format describing the SSV understanding of the project work, preliminary system architecture drawing, interfaces to other systems, schedule, startup, and coordination.

   b. Approach to work in clear text format describing how the SSV intends to execute the work. A discussion of switchover, startup, replacement of existing equipment with new, etc. shall be included as applicable.

   c. Preliminary software and hardware submittal information solely to determine compliance with the project requirements prior to the SSV development of process control programs and system layouts. Favorable review of software and hardware systems as part of this Project Plan stage shall not relieve the SSV of meeting all the functional and performance requirements of the system as defined in the project requirements.

   d. Project personnel and organization including the SSV project manager, project Owner, and lead project technicians. Include resumes of each key individual and specify in writing their commitment to this project.

   e. Preliminary coordination meeting agendas as specified herein.

   f. Preliminary testing plan.

   g. Preliminary training plan.

2. Exceptions to the Specifications or Drawings shall be clearly defined by the SSV. The acceptability of any device or methodology submitted as an "or equal' or "exception" to the specifications shall be at the sole discretion of the Owner.

3. Project schedule shall be prepared and submitted in PDF format . Schedule shall be prepared in Gantt chart format clearly showing task linkages for all tasks and identifying critical path elements. The project schedule shall illustrate all major project milestones including the following:

   a. Schedule for all subsequent project submittals. Include in the time allotment the time required for submittal preparation, Owner's review time, and a minimum of two complete review cycles.

   b. Proposed dates for all project coordination meetings.

    c. Hardware purchasing, fabrication, and assembly (following approval of related submittals).

    d. Software purchasing and configuration (following approval of related submittals).

    e. Shipment of all equipment.

    f. Installation of all equipment.

    g. Testing: Schedule for all testing including the Unwitnessed Factory Test, Witnessed Factory Test, Functional Acceptance Test, Testing schedule shall include submittal of test procedures a minimum three weeks prior to commencement of testing. Schedule shall also include submittal of completed test procedure forms for review and approval by the Owner prior to shipment, startup, or subsequent project work.

    h. Schedule for system cutover, startup, and/or going on-line for each major system. At a minimum include the schedule for each process controller and HMI server/workstation provided under this Contract.

    i. Schedule for all training including submittal and approval of O&M manuals, factory training, and site training.

C. Hardware, Panel Drawing, and Software Submittal

    a. Shop drawings shall be submitted as detailed herein. They shall be complete; giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature will not be acceptable. It is the intent for all items outlined in this paragraph to be included in a single, all inclusive submittal with the exception of the process graphics and displays.

    b. Digital Equipment Hardware

      1. Catalog cuts for [HMI servers, HMI workstation, laptops, historian servers, memory, printers, mass storage devices, modems, network interface modules, peripherals, and power supplies]. Submit system bill of materials and descriptive literature for each hardware component, which fully describes the units being provided.

      2. Complete system Input/Output (I/O) list for equipment connected to the SCADA under this Contract. The I/O list shall be submitted in both a Microsoft Excel readable electronic file format on a DVD and an 8-1/2 inch by 11-inch hard copy. The I/O list shall include I/O name (or spare), type, physical location, point

address, functional description (text that includes signal source, control function, etc.), range (Engineering units) and equivalent analog to digital "count" conversion, alarm limits (low-low, low, high, high-high, etc.), relay normal status contact configuration. The I/O list shall be sorted in order by:

a. Physical location: Panel, Rack, CPU Name, or Remote I/O Drop

b. I/O Type: AI, AO, DI, DO, PI, PO, etc.

c. Site Location name and loop Number

d. Device Tag

3. Complete system architecture diagram showing in schematic form, the interconnections between major hardware components. The system architecture shall be complete and shall depict all required cables, media type between components, raceway requirements (conduit, wireway, etc.), raceway identification, network protocol used at each network level, details on connection requirements such as cable pin-outs, port numbers, and rack slot numbers. The intent of this specification requirement is for the SSV to develop a diagram that is complete in every aspect to allow purchase of all required equipment by part number, and to allow a qualified technician to interconnect all equipment without having to refer to additional manuals or literature. Sheet size shall be 24 by 36-inch .

4. A list of all hardware electrical and environmental characteristics and requirements. All planning information, site preparation instructions, grounding and bonding procedures, cabling diagrams, plug identifications, safety precautions or guards, and equipment layouts in order to enable the Owner to proceed with the detailed site preparation for all equipment.

c. Digital System Software

1. Submit details of the HMI software application packages. Indicate all standard and optional features provided. Include copies of license agreements indicating assignment of licenses to the Owner. Any deviation of the software platforms from the preliminary software submittal included in the Process Plan shall be described in detail.

2. Submit details of SCADA communications. Submit hardware and software configuration information in sufficient detail to verify performance of the communication system as detailed herein and on the Drawings. Include details of any necessary expansion boards, special interface requirements (e.g., cables, jacks, etc.), description of drivers and impact of drivers on controller memory configuration.

d. Rack Drawings: : Drawings shall be furnished for all panels, consoles, and equipment enclosures specified in related Section of Division 13. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in or on the panel. Panel drawings shall be 11x17 minimum in size. As a minimum, the panel drawings shall include the following:

1. Interior and exterior elevation drawings to scale.

2. Cabinet assembly and layout drawings to scale. The assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. The bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify any component of the assembly by manufacturer and model number.

3. Panel control schematics and interconnection diagrams detailing the electrical connections of all equipment in rack. . Diagrams shall include power and signal connections, UPS and normal power sources, all ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering.

D. Testing Plan

1. Test Procedure Submittals: Submit the procedures proposed to be followed for each test. Procedures shall include test descriptions, forms, and checklists to be used to control and document the required tests. Include sign-off forms for each testing phase or loop (per the specifications) with sign-off areas for the SSV, Owner, and Owner. Refer to Part 3 of this section for complete testing requirements. Submit separate procedures for each specified test phase including:

   a. Unwitnessed Factory Test

   b. Witnessed Factory Test

   c. Functional Acceptance Test (FAT)

2. Test Documentation: Upon completion of each required test, document the test by submitting a copy of the signed off test procedures. Testing shall not be considered complete until the signed-off test procedures have been submitted and favorably reviewed. Submittal of other test documentation, including "highlighted" wiring diagrams with field technician notes are not acceptable substitutes for the formal test documentation.

3. Refer to Section 13305 for specific testing requirements.

E. Final System Documentation

1. The operations and maintenance manuals shall be in electronic form using Adobe PDF searchable format. Supplied files shall be index to a Table of Contents, and shall permit key-word searches. Each section shall have a uniquely identified binder tab divider, and each component within each section shall have a separate tab divider.

2. The operations and maintenance manuals shall, at a minimum, contain the following:

   a. A Table of Contents for the entire manual with the specific contents of each volume clearly listed.

   b. A list for all devices supplied including tag number, description, specification section and paragraph number, manufacturer, model number, serial number, manufacturer phone number, local supplier name, local supplier phone number, 2012 replacement cost, and any other pertinent data.

   c. Detailed service, maintenance and operation instructions for each item supplied as follows:

      1) Operation Information - this information shall include a description of how the equipment operates and a block diagram illustrating each major assembly in the equipment.

      2) Preventative-Maintenance Instructions - these instructions shall include all applicable visual examinations, hardware testing and diagnostic routines and the adjustments necessary for periodic preventive maintenance of the system.

      3) Corrective-Maintenance Instructions - these instructions shall include guides for locating malfunctions down to the card-replacement level. These guides shall include adequate details for quickly and efficiently locating the cause of an equipment malfunction and shall state the probable source(s) of trouble, the symptoms, probable cause and instructions for remedying the malfunction.

      4) Parts Information - this information shall include the identification of each replaceable or field-repairable module. All parts shall be identified on a list in a drawing; the identification shall be of a level of detail sufficient for procuring any repairable or replaceable part. Cross-references between SSV's part number and manufacturer's part numbers shall be provided.

   d. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

     e.   Complete as-built drawings, including rack drawings, wiring diagrams, and point-to-point wiring diagrams. Drawings shall depict all components, and electrical connections of the systems supplied under this Section.

     f.   Submit original software CD-ROMs or DVDs of all software provided under this Contract. Submit electronic documentation of all software provided. Submit license agreement information including serial numbers, license agreements, User Registration Numbers, etc. All software provided under this Contract shall be licensed to the Owner.

3.   The Hardware Maintenance Documentation shall describe the detailed preventive and corrective procedures required to keep the system in good operating condition. Within the complete Hardware Maintenance Documentation, all hardware maintenance manuals shall make reference to appropriate diagnostics. A maintenance manual or a set of manuals shall be furnished for all delivered hardware, including peripherals. The Hardware Maintenance Documentation shall include, as a minimum, the following information:

     a.   Operation Information - include a detailed description of how the equipment operates and a block diagram illustrating each major assembly in the equipment.

     b.   Preventative-Maintenance Instructions - These instructions shall include all applicable visual examinations, hardware testing and diagnostic routines and the adjustments necessary for periodic preventive maintenance of the System.

     c.   Corrective Maintenance Instructions - include guides for locating malfunctions down to the card-replacement level. These guides shall include adequate details for quickly and efficiently locating the cause of an equipment malfunction and shall state the probable source(s) of trouble, the symptoms, probable cause and instructions for remedying the malfunction.

     d.   Parts Information - include the identification of each replaceable or field-repairable module. All parts shall be identified on a list in a drawing; the identification shall be of a level of detail sufficient for procuring any repairable or replaceable part. Cross-references between systems SSV's part number and manufacturer's part numbers shall be provided.

4.   The Software Maintenance documentation shall provide a detailed description of the entire software system. This documentation shall be sufficient for software maintenance and modification of the entire software system. The following items shall be included with the software maintenance documentation:

     a.   System SSV's User Manuals - All applicable manufacturer software manuals for the application software.

b. Application/Custom Software Manuals - All software maintenance information not included in the system supplier's standard manuals. Each custom program developed specifically for the system shall include the following information as a minimum:

1) Table of Contents

2) Overview of the program

3) Narrative describing specifically how the program works. All calculations, references to process I/O points and operator inputs should be mentioned and cross referenced to the logic diagrams or code.

4) Flowcharts or system logic diagrams in Boolean format shall be provided to clarify the narrative description.

5) A List of Variables used by the program including the function of each. A cross reference to the Software Functional Design Documentation shall be provided where appropriate.

c. Software Listings and Databases - Submit copies of well-annotated as-built program listings of all software provided shall be furnished for all software items. Listings shall reflect the as-built condition of the logic development submitted as part of the shop drawing review process. Listings shall include, but not be limited to, the following:

1) All listings associated with the system generation and software configuration (e.g., system parameterization tables, build maps, disk maps, etc.). Submittals shall be included for HMI application software, database applications, and all other equipment where specific programs or scripts were developed for this project.

2) Listings of all data bases configured for and associated with the system.

3) Listing of all custom or modified software developed specifically for the system. Listings shall reflect any changes made after the factory acceptance test.

d. Machine Readable Documentation - The supplier shall provide two sets of as-built documentation on CD-ROMs or DVDs in machine readable format for all programs developed under this Contract. The machine readable documentation shall be 100 percent compatible with the Software Listings previous defined and include all documentation files including logic and annotation files. Any changes made during or after factory acceptance test shall be incorporated.

5. The SSV shall provide Operator's Manuals for the system operators. These manuals shall be separately bound and shall contain all information necessary for the operator to operate the system. The manuals shall be written in non-technical terms and shall be organized for quick access to each detailed description of the operator's procedure. Manuals shall contain, but not be limited to, the following information:

   a. A simple overview of the entire system indicating the function and purpose of each piece of equipment.

   b. A detailed description of the operation of the HMI including all appropriate displays.

   c. Step-by-step procedures for starting up or shutting down an individual component.

   d. Step-by-step procedures for starting up and shutting down the entire system.

   e. Operational description for operating HMI computer equipment and peripherals including printers, removable bulk storage devices, etc. Description shall include procedures for typical maintenance and troubleshooting tasks.

   f. A listing of all data base point names with their respective English language point descriptions and HMI graphic screen cross reference where the points can be found.

   g. A complete glossary of terms.

   h. Complete, step-by-step procedures for performing complete system or selected file backup and restoration.

6. The SSV's final documentation shall be new documentation written specifically for this project, but may include standard and modified standard documentation. Modifications to existing hardware manuals shall be made on the respective pages or inserted adjacent to the modified pages. All standard documentation furnished shall have all portions that apply clearly indicated. All portions that do not apply shall be lined out.

7. The manuals shall contain all illustrations, detailed drawings, wiring diagrams and instructions necessary for installing, operating and maintaining the equipment. The illustrated parts shall be numbered for identification. All information shall apply specifically to the equipment furnished and shall only include instructions that are applicable.

8. If the SSV transmits any documentation or other technical information, which he/she considers proprietary, such information shall be designated. Documentation or technical information which is designated as being proprietary will be used only for the design, construction, operation, or maintenance of the system and, to the extent permitted by law, will not be published or otherwise disclosed.

9. Retrofit Documentation - The SSV shall investigate, diagnose, repair, update and distribute all pertaining documentation of deficiencies, which become evident during the warranty period. All such documentation shall be submitted to the Owner within 30 days of solving the problem.

1.04   COORDINATION MEETINGS AND WORKSHOPS

A. The SSV shall schedule in a kickoff meeting with workshop activities and a second workshop during the factory test as described herein. The meetings and workshops shall be held at the Owner's designated location and shall include attendance by key stakeholders from the SSV and Owner's respective staffs.

1. A project kickoff and standards coordination meeting shall be held within one week after submitting the Project Plan and Schedule Submittal. The kickoff meeting will cover several topics related to project management and system development. The SSV shall prepare and distribute an agenda for this meeting a minimum of two days before the scheduled meeting date. The meeting will be held at the Owner's facilities and will last up to one (1) business day.

   a. The purpose of the meeting shall be to discuss the SSV's Project Plan and Schedule Submittal, to summarize the SSV's understanding of the project; discuss any proposed substitutions or alternatives; schedule testing and delivery deadline dates; provide a forum to coordinate hardware and software related issues; and request any additional information required from the Owner.

   b. The second part of the workshop will address standards. Standards will build on existing GUC standards and will focus on items specific to the power industry and the SSV's standard offering with respect to navigation, screen layouts, color schemes, graphic objects, alarm management, historical database design, licensing, and security among other details. The SSV will prepare a draft document and distribute prior to the workshop. During the workshop, both the SSV and Owner will refine the standard.

   c. The third part of the meeting will address I/O and database naming. The naming scheme will build on the existing GUC asset tagging scheme and the current naming scheme deployed throughout the electrical system. The SSV will identify areas of conflict between the existing standard and current conditions, and then make recommendations for improvements to the standard.

The SSV will submit to the Owner two weeks prior to the Workshop their findings and recommendations. At the workshop both the SSV and Owner will discuss and reach consensus on the updates to the standard.

    d. The fourth part of the meeting will address business systems to business systems integration. The business to business integration improvements are beyond the scope of this project; however, the design shall include necessary flexibility to support and accommodate the interface requirements of these anticipated near-term improvements. To the extent possible the Owner will convey the anticipated or expected requirements of systems currently being planned. The intent is to create a comprehensive enterprise management server interface that exposes real-time and historical data with necessary aggregating functionality. Currently there are planned integrations of GIS, Outage Management, Asset Management, and a Load Management, Customer Information System, and Load Management Customer Reporting.

2. A Maintenance of Operations Plan Workshop will be held on day one of the factory test. . The SSV will develop a plan to sequence construction and perform a cutover to the new SCADA system. The plan will seek to minimize any disruptions to ongoing operations, and will include contingency plans to allow for recovery to the previous system upon any significant faults or failures encountered during the cutover process. Two weeks prior to the workshop the SSV will submit to the Owner a draft plan for review. At the workshop both the SSV and Owner will review and discuss the plan in detail. After the workshop, the SSV will update the plan based on the decisions made in the workshop, and submit the plan for approval by the Owner.

1.05   REFERENCE STANDARDS

A. Publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition in effect at the time of bid opening shall apply.

B. The Institute of Electrical and Electronics Engineers (IEEE)

    1.   IEEE C37.1 Standard for SCADA and Automation System

C. National Electrical Manufacturers Association (NEMA)

D. National Fire Protection Agency (NFPA)

    1.   NFPA 70, National Electrical Code (NEC).

E. North American Electric Reliability Corporation (NERC), Critical Infrastructure Protection (CIP)

1.06   QUALITY ASSURANCE

A. The SSV shall be one of the following or equal as approved by the Owner.

    1. Survalent Technology, Mississauga, Ontario, Canada

    2. Novatech, Lenexa, Kansas, USA

    3. GE Intelligent Platforms, Alpharetta, Georgia, USA

    4. Open Systems International, Medina, Minnesota, USA

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery, storage, and handling shall be in accordance with section 01600.

B. Shipping Precautions

    1. After completion of shop assembly, factory test and approval of all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty (5 mil) polyethylene envelopes or secured sheeting to provide protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.

    2. Manufacturers special instructions for proper field handling, storage and installation required for proper protection shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in resealable plastic bags or other acceptable means of protection.

    3. If any apparatus is damaged, such damage shall be repaired by the SSV at his/her own cost and expense without delay to the project schedule. Any equipment damaged by water, as determined by the Owner, shall be thoroughly dried out and put through such tests as directed by the Owner. This shall be at the cost and expense of the SSV, or the equipment shall be replaced by the SSV at no additional cost to the Owner.

1.08 NOMENCLATURE AND IDENTIFICATION

A. Panel Nameplates

    1. All panels shall be supplied with suitable nameplates that identify the panel and individual devices as required. Equipment shall be tagged before shipping to the site.

2. Nameplates shall be a 3/32-inch thick, black and white, laminated Bakelite or Lamicoid with engraved inscriptions. The letters shall be white against a black background. Edges of the nameplates shall be beveled and smooth. Nameplates with chipped or rough edges will not be acceptable.

3. Orient nameplates to facilitate reading the device identifier from a cursory inspection. Do not mount nameplates behind or under equipment.

1.09   WARRANTY AND MAINTENANCE

A. SSV will provide a one year warranty of all hardware and software products furnished on this project. The cost of warranty and maintenance will be included in the contract price.

B. Provide software updates throughout the 1-year warranty period. Provide latest official released version for all software provided under this Contract. Owner shall have the latest software releases at the end of the 1-year warranty period.

C. The SSV shall provide the capability of delivering extended warranty and maintenance support, as well as after-hours support. The SSV shall specify the length of the warranty , availability and cost of extended support, and type of customer support provided (dedicated department or handled by programming staff or distributor, telephone hours, Email & Web support, FTP download area, Knowledge Base, bulletin board service, field service, etc.)

D. Twenty-four (24) hour, seven (7) day a week support shall be available from the SSV.

E. Software Improvements & "Bug" Fixes

1. The SSV shall provide software patch management in accordance with NERC CIP standards. All SSV software patches will be tested against all software applications provided in this proposal, on a comparable hardware platform, and the results of those test made available to the Owner within 30 days of patch release. The SSV shall have a location on their web site where users can download software improvements, add-ons, components and so forth. The SSV shall provide a mechanism to install software improvements and bug fixes without the need for uninstalling or reinstalling the software application – only the changed components need to be replaced or upgraded. The SSV shall also provide an easy mechanism for upgrading and installing software improvements and for allowing a user to quickly ascertain what improvements have been installed.

1.10   PROJECT/SITE REQUIREMENTS

A.   Temperature:

1.   Equipment located in indoor locations shall be suitable for 40 to 104 deg F ambient minimum.

2.   Storage temperatures shall range from 0 to 120 deg F ambient minimum.

3.   Additional cooling or heating shall be furnished if required by the equipment as specified herein.

B.   Relative Humidity. Air conditioned area equipment shall be suitable for 20 to 95 percent relative, non-condensing humidity. All other equipment shall be suitable for 0 to 100 percent relative, condensing humidity.

C.   Power Supply: 120 volts AC sources of electrical power supply shall be from unregulated industrial panel boards (either utility or standby generator).

PART 2   PRODUCTS

2.01   GENERAL

A.   All electronic equipment shall be of the manufacturer's latest design. Solid state components shall be conservatively rated for their purpose, to provide reliable performance over the ambient atmosphere fluctuations previously noted.

B.   Substitutions on functions or type of equipment specified will not be acceptable unless specifically noted. In order to insure compatibility between all equipment, it shall be the responsibility of the SSV to coordinate all interface requirements with mechanical and electrical systems and furnish any signal isolation devices that might be required.

C.   All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single manufacturer, and shall consist of equipment models, which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.

D.   Electrical

1.   Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above shall be provided between

power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

PART 3   EXECUTION

3.01   GENERAL INSTALLATION

A.   Equipment shall be installed in accordance with the manufacturer's instructions.

B.   The SSV shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the SSV shall be required to ship his/her material in sections sized to permit passing through restricted areas in the building. The SSV shall also investigate, and make any field modifications to the allocated space for each cabinet, enclosure and panel to assure proper space and access (front, rear, side).

C.   Lifting rings from cabinets/assemblies shall be removable. Hole plugs shall be provided for the holes of the same color and material as the cabinet.

D.   The SSV shall provide on-site service to oversee the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Owner's approval. The SSV shall certify that field wiring associated with his/her equipment is installed in accordance with their requirements and best industry practice.

3.02   TESTING

A.   Refer to Section 13305.

3.03   TRAINING

A.   The cost of training programs to be conducted with Owner employees shall be included in the Contract price. The training and instruction shall be directly related to the system being supplied. The SSV is responsible for training associated with the control panels, hardware, and software.

B.   The following training classes are required:

1.   HMI software configuration including database development, displays, reports logging, alarming, and analog trending.

2.   HMI hardware and networks including operating system administration requirements, new users, security levels, virus protection, backups, archives, and routine maintenance.

3.   Communication system configuration including system configuration, system architecture, and equipment familiarization.

C. The supplier shall provide detailed manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project.

D. The supplier shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, such materials shall be delivered to Owner.

E. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of the system.

F. All training schedules shall be coordinated with, and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.

G. Each training class shall be a minimum of 8 hours in duration. Separate classes shall be conducted for the Owner's maintenance and operating personnel. Maintenance classes shall stress troubleshooting, repair, calibration, and other technical aspects of the HMI system. Operator classes shall stress operational theory and use of the HMI display screens. Each of the training classes listed above for operators shall be conducted twice during separate weeks to allow for scheduling of Owner personnel. Training time shall be determined by the size and complexity of the project.

H. The training classes shall be scheduled a minimum of 2 weeks in advance of when they are to be given. Proposed training material, including a detailed outline of each lesson, shall be submitted to the Owner at least 30 days in advance of when the lesson is to be given. The Owner shall review the submitted data for suitability and provide comments that shall be incorporated into the course.

I. Initial Training: The SSV shall provide the cost of sending two people to two HMI programming courses. HMI courses shall include a beginner and an intermediate class with a total duration of 8 days minimum and shall be standard courses offered by the HMI manufacturer and taught by an instructor certified by the manufacturer. Cost will mean all reasonable expenses associated with traveling coach class, staying in a three star or better hotel, renting a car from a national car rental agency, and a $75 per day per diem to cover meals, incidentals, parking, and mileage.

J. On-site Training: On-site (field) training shall be conducted at the plant site and shall provide detailed hands-on instruction to plant personnel covering; system debugging, troubleshooting, maintenance procedures, calibration procedures and system operation. The training shall run at times chosen by the Owner. The training shall be conducted over a period of three months as follows:

1. Five days immediately after successful completion of the Functional Acceptance Test.

2. One day covering preventive and corrective maintenance and trouble-shooting, to be conducted three months after successful completion of the Functional Acceptance Test.

3. Two weeks immediately after Functional Acceptance Test. A total of three eight-hour sessions shall be scheduled covering general operational theory and applications.

K. Additional Training: After completion of all training specified above, the SSV shall provide additional training on subjects selected by the Owner. This training shall be conducted by the individual most familiar with the configuration of this project. Training time shall be based on two eight-hour sessions.

1. Network Monitoring system – 2 day training for 4 people minimum

2. Plant Historical System training – 2 day training for 4 people minimum

END OF SECTION

SECTION 13305

ELECTRIC DEPARTMENT SCADA SYSTEM – TESTING

PART 1   GENERAL

1.01   SCOPE OF WORK

  A.   Refer to Section 13300.

  B.   This section covers the testing requirements for all devices and systems furnished as detailed in the Request for Proposal (RFP), in the Technical Memoranda, and as described in the related Sections of this Technical Specification.

1.02   RELATED WORK

  A.   Refer to Section 13300.

1.03   SUBMITTALS

  A. Refer to Section 13300.

1.04   COORDINATION MEETINGS

  A.   Refer to Section 13300.

1.05   REFERENCE STANDARDS

  A.   Refer to Section 13300.

1.06   QUALITY ASSURANCE

  A.   Refer to Section 13300.

1.07   DELIVERY, STORAGE AND HANDLING

  A.   Refer to Section 13300.

1.08   NOMENCLATURE AND IDENTIFICATION.

  A.   Refer to Section 13300.

1.09   WARRANTY AND MAINTENANCE

  A.   Refer to Section 13300

1.10   PROJECT/SITE REQUIREMENTS

  A.   Refer to Section 13300.

PART 2   PRODUCTS

NOT USED

PART 3   EXECUTION

3.01   GENERAL INSTALLATION

   A.   See execution requirements in Section 13300.

3.02   TESTING

   A.   General

      1.   As part of the requirement of this specification section it is the responsibility of the SCADA System Vendor (SSV) to provide a complete operational SCADA system. Confirmation of an operational SCADA system is dependent upon results derived from test procedures as specified in this Section. As part of this Contract the SSV shall provide factory testing prior to shipment of the equipment and also testing of the equipment once installed in the field.

      2.   Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and upon the system's or subsystem's producing the correct result (effect), the specific test requirement will have been satisfied.

      3.   All tests shall be conducted in accordance with prior Owner approved procedures, forms and checklist all as submitted by the SSV under Part 1 of this Specification. Each test to be performed shall be described and a space provided after it for signoff by the appropriate parties after its satisfactory completion. Include "punchlist" forms with the test procedure to document issues that arise during the testing. Punchlist forms shall include a resolution section that allows a description of the fix and signoff areas for SSV and Owner.

      4.   Copies of the sign off test procedures, forms and checklists will constitute the required test documentation. The test result forms shall be submitted to the Owner for approval at the completion of each test.

      5.   Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment and data, the SSV will provide suitable means of simulation subject to Owner's approval. Define these simulations techniques in the test procedures.

      6.   The SSV shall coordinate all required testing with all affected Subcontractors, and the Owner.

7. The SSV shall furnish the services of field service Engineers, all special calibration and test equipment and labor to perform the field tests.

8. The Owner reserves the right to test or retest all specified functions, whether or not explicitly stated on the Test Procedures, as required to determine compliance with the functional requirements of the overall system. Such testing required to demonstrate compliance with the specified requirements shall be performed at no additional cost to the Owner. The Owner's decision shall be final regarding the acceptability and completeness of all testing.

9. No equipment shall be shipped until the Owner has received all test results and approved the system is ready for shipment.

B. Factory Testing: Prior to shipment of the equipment the following tests are required:

   1. Unwitnessed Factory Test (UFT).

      a. The entire system except for field devices shall be interconnected and tested to ensure the system will operate as specified. All signals points not interconnected at this time shall be simulated to ensure proper operation of all alarms, monitoring devices/functions and control devices/functions.

      b. All racks and assemblies shall be inspected and tested to verify that they are in conformance with the project requirements. During the tests all digital system hardware and software shall be operated for at least five days continuously without a failure to verify the system is capable of continuous operation.

      c. Tests to be performed shall include but not be limited to the following. Each of these tests shall be specifically addressed in the Test Procedure submittal.

         1. 100% database address verification of all signals on every graphic.

         2. Demonstrate functionality of the process controls in conformance with the use cases. Simulate operating conditions to verify the performance of the monitoring and control functions.

         3. Demonstrate graphical user interfaces (hardware and software).

         4. Demonstrate the data communication network and protocol for each type of communications channel.

         5. Demonstrate all system software functions specified including clock synchronization.

6. Test system recovery from failure scenarios including cold boot, warm boot, communication loss, power failure, process failure, redundancy backup systems, RAID array operability, historical archiving, etc.

d. All control panels provided or modified under the requirements of the related technical specification sections shall be included in these tests.

e. Submit UFT results for review by the Owner

2. Witnessed Factory Acceptance Test (WFT).

a. Implicit in the scheduling of the Witnessed Factory Acceptance Test is the assumption that the SSV has completed the WFT test procedures as defined in the UFT, successfully completed the UFT and submitted the results to the Owner.

b. All system tests performed and specified for the unwitnessed factory test shall be repeated in the presence of the Owner.

c. The SSV shall notify the Owner in writing that the system is ready for the Witnessed Factory Acceptance Test and allow the Owner to schedule a test date within three weeks of receipt of the "Ready to Test" letter. At the time of notification, the SSV shall submit WFT Test Procedure incorporating any revisions to the detailed test procedure previously approved by the Owner in the project system plan.

d. The purpose of the test shall be to verify the functionality, performance and stability of the hardware and software. The system shall operate continually for 100 hours without failure before the test shall be judged successful. Successful completion of this test, as determined by the Owner, shall be the basis for approval of the system to be shipped to the site.

e. Tests performed during the Witnessed Factory Acceptance Test shall be designed to demonstrate that hardware and software fulfill all the project requirements. The test conditions shall resemble, as closely as possible, the actual installed conditions.

f. The Owner shall have unrestricted access to the system for a period of time equal to at least 20 percent of the test duration.

g. All deficiencies identified during these tests shall be corrected and retested prior to completing of the Factory Test as determined by the Owner.

h. Punchlist items and resolutions noted during the test shall be documented on the Punchlist/Resolution form.

    i.   The following documentation shall be available for reference at the test site during the WFT:

        1. All Drawings, Technical Specifications, RFP, Technical Memoranda, addenda and change orders.
        2. Master record copy of the test procedure to be used for formal signoff of the test.
        3. List of the equipment to be tested including make, model and serial number.
        4. Hardware submittal
        5. Software documentation submittal.
        6. Submit WFT results for review by the Owner

C.   Field Testing - Following installation of the process SCADA system components and prior to plant start up the following tests are required:

1.   Functional Acceptance Test (FAT).

    a.   General: Prior to beginning any site specific elements of the Functional Acceptance Test, all new equipment shall be checked for proper installation, calibrated and adjusted on a site by site, and display by display basis to ensure that it is in conformance with project requirements. A witnessed FAT shall be performed on the complete system to demonstrate that it is operating and in compliance with these Specifications. All preliminary testing, inspection, and calibration shall be complete as defined in the Operational Readiness Test.

    b.   Tests shall be implemented using Owner-approved forms and checklists. These form shall include the following information and checkoff items with spaces for sign off by Owner and SSV:

        1. Project Name, Test Date, SSV Name, and Lead SSV Technician Name
        2. Site Name
        3. Tag Number or other identifying name for each component.
        4. Checkoffs/signoffs for each component.

           a. Identification
           b. Scale, Range, and Setpoint as applicable
           c. Checkoffs/signoffs

        5. SSV shall maintain a binder with all signoff sheets for each site. SSV will submit copies of signoff sheets when requested by Owner, and will submit the completed binder with all signoff sheets at the conclusion of all Step One and Step Two testing.

c. Tests shall be the same as specified under Factory Tests except that the entire installed system shall be tested and all functions demonstrated using live field data to the greatest extent possible.

d. Updated versions of the documentation specified to be provided for during the Factory Tests shall be made available to the Owner at the job site during the tests. In addition, one copy of all O & M Manuals shall be available for reference at the job site during testing.

e. Testing shall be done in a three-step process to minimize the overall impact on system conversion for the Owner. The SSV will be responsible for on-site testing associated with all items in Step One and Step Two.

1. Step one (1) testing will include a complete end-to-end test of all signals for at least two sites of each site type (e.g., generator, substation, recloser) to confirm compliance with the Project Requirements. Testing will include verifying proper signal status developed by the field device successfully transmits via the appropriate protocol, displays, and records, and generates all necessary alarms, status updates, and color changes throughout the system. Testing will also include validating that all required features of each protocol are successfully implemented. Owner staff will actively participate in the testing to operate equipment not furnished under this agreement, as necessary. Once the SSV demonstrates the functionality of the new system for the limited number of each site type, testing shall transition to step two.

2. Step two (2) testing will require the SSV to simulate the inputs from all remaining sites of each site type without having to manually activate signals at the remote site. Simulation signals will be introduced from each site to confirm the basic protocol setup has been implemented correctly. Owner will participate and witness this testing. The SSV agrees that the signoff for testing done under this method is conditional, and the Owner reserves the right to require further testing and action by the SSV during the warranty period if errors or defects are discovered by the Owner with the detailed testing outlined in Step Three. Once all sites have been tested under Step One and Step Two, and significant punchlist items resolved, the system will be declared substantially complete.

3. Step three (3) testing will be conducted by the Owner over the course of the first year of operation (within the Warranty Period). Owner staff will perform end-to-end testing on all remaining sites to confirm proper operations of the entire SCADA system. This testing will be done using Owner staff at a time that is convenient to their ongoing operations. SSV will not be required to participate in the testing, however, if significant errors or issues are discovered, SSV will respond within 24 hours, as warranted.

f. Following initial startup, the entire SCADA system shall operate for a continuous 48 hours without failure before any Step One or Step Two testing begins. As sites are added to the communications, the Owner reserves the right to require the SSV to make configuration changes to address new anomalies associated with system loading.

g. Punchlist items and resolutions noted during the test shall be documented on the Punchlist/Resolution form. In the event of rejection of any part or function test procedure, the SSV shall perform repairs, replacement, and/or retest within ten (10) days.

2. Final Acceptance Test

a. After completion of all Step One and Step Two tests, telemetry checks, the SSV shall be responsible for operation of the entire system for a period of 30 consecutive days, under conditions of full system operation, without a single non-field repairable malfunction.

b. During this test, Owner and SSV personnel shall be present as required. The SSV is expected to provide personnel for this test who have an intimate knowledge of the hardware and software of the system. Coordinate staffing requirements during the 30-day test to coincide with normal shift operations as much as possible. Off-shift emergencies shall be fully supported by SSV staff. Provide SSV staff with cell phones to ensure that support staff is available by phone and/or on-site within 4 hours of a request by operations staff.

c. While this test is proceeding, the Owner shall have full use of the system. Only Owner shall be allowed to operate equipment associated with live processes. Electric system operations shall remain the responsibility of Owner and the decision of the Owner's operators regarding operations shall be final. Only operating personnel shall be allowed to operate equipment associated with live processes.

d. Any malfunction during the tests shall be analyzed and corrections made by the SSV. The Owner will determine whether any such malfunctions are sufficiently serious to warrant a repeat of this test.

e. Any malfunction, during this 30 consecutive day test period, which cannot be corrected within 24 hours of occurrence by the SSV's personnel, or more than two similar failures of any duration, will be considered as a non-field-repairable malfunction.

f. Upon completion of repairs, by the SSV, the test shall be repeated as specified herein.

g.   In the event of rejection of any part or function, the SSV shall perform repairs or replacement within 10 days.

h.   All database, process logic, and graphical interface system errors shall be functioning as required per the project requirements prior to the start of each test period. The 30 day test will not be considered successful until all data base points and logic functions are tested and verified to be correct.

i.   The total availability of the system shall be greater than 99.5 percent during this test period. Availability shall be defined as:

AVAILABILITY = (TOTAL TIME – DOWN TIME) / TOTAL TIME

j.   Down times due to power outages or other factors outside the normal protection devices or backup power supplies provided, shall not contribute to the availability test times above.

k.   Upon successful completion of the 30 day operation test and subsequent review and approval of complete system final documentation, the system shall be considered substantially complete.

2.   Certification of Installation: Following successful completion of the 30-day test, the SSV shall issue a Certification of Installation. Certification shall be on SSV corporate letterhead, and signed by an officer of the firm. Certification shall state that the process SCADA system has been completed in conformance with project requirements. Certification shall be submitted to the Owner as specified herein.

END OF SECTION

SECTION 13310

SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM

PART 1   GENERAL

1.01   SCOPE OF WORK

A.   Equipment, materials, and services shall be supplied in accordance with the general requirements defined in Section 13300.

B.   The Supervisory Control and Data Acquisition System (SCADA) shall be manufactured and supported by a single entity regularly engaged in the manufacture, supply, configuration, customization, and maintenance of large scale automation and control systems for the electric power industry.

C.   The SSV shall furnish cabling and cable accessories, including tools necessary for connecting the System and peripherals, Operator Workstations, communications network, communications systems, and input/output devices.

D.   The SSV shall furnish startup, training, and system check-out services.

E.   Omission of a specific item obviously necessary for the proper functioning of the equipment shall not relieve the SSV of the responsibility of furnishing and installing the item at no additional cost to the Owner.

F.   All equipment and installations shall satisfy applicable Federal, State, and local codes.

G.   Each server, workstation, laptop, and programmable device furnished under this agreement shall be backed up after completion of the FAT. These backups shall be turned over to the Owner.

H.   All software packages provided shall be licensed under the Owner's name and address. The SSV shall coordinate with the Owner for correct name and address.

1.02   RELATED WORK

A.   Refer to section 13300

1.03   SUBMITTALS

A.   Refer to Section 13300.

1.04   COORDINATION MEETINGS

A.   Refer to Section 13300.

1.05 REFERENCE STANDARDS

A. Refer to Section 13300.

1.06 QUALITY ASSURANCE

A. Refer to Section 13300.

1.07 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 13300.

1.08 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300.

1.09 WARRANTY AND MAINTENANCE

A. Refer to Section 13300.

B. Spare Parts

1. Spare parts equal to at least one set of manufacturer's recommended spares shall be supplied.

2. The SSV shall perform an availability analysis based upon expected repair turnaround times and shall supply any additional spare required to provide 99.9% system availability. A copy of this analysis shall be provided to the Owner prior to system shipment. Assumptions used in developing the analysis will be verified during system acceptance testing.

3. All spare parts shall be packaged so as to prevent damage during long storage. All packages shall be legibly and properly identified with indelible markings on the exterior as to contents.

4. Complete ordering information including manufacturer, part number, part name, and equipment for which the part is to be used shall be provided.

1.10 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300.

PART 2   PRODUCTS

2.01   GENERAL

A.   Refer to Section 13300.

B.   Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.

C.   The System shall be designed and constructed to withstand the demands of real time process management and control.

D.   All equipment furnished shall be designed and constructed so that in the event of power interruption, or temperatures outside the operational range, the Systems specified hereunder shall go through an orderly shutdown with no loss of memory, and resume normal operation without manually resetting when power is restored.

E.   All devices on the communications network shall be transparently accessible from all workstations attached to the network by direct connection, bridge network.

F.   The new SCADA system shall perform the same or similar monitoring and control functions as the current system. Monitoring and control functions are generally defined in the project requirements; however, the SSV will investigate the existing system and confirm with the Owner all necessary requirements.

G.   All software licenses required to achieve the functionality described in the Specifications shall be provided.

2.02   COMPUTER SYSTEM HARDWARE

A.   All servers and related hardware shall be as specified herein or the minimum recommended and approved by the manufacturer of all software packages required to run on them, whichever is greater.

B.   The servers and peripheral equipment shall be installed in environmentally controlled air-conditioned areas as shown on the Drawings. ~~They shall be designed to meet the environmental requirements defined in 13300.~~

C.   Equipment furnished shall be designed and constructed so that in the event of power interruption, or temperatures outside the operational range, the Systems specified hereunder shall go through an orderly shutdown with no loss of memory, and resume normal operation without manual resetting when power is restored.

D.   The specifications herein are provided as a guide to the SSV. The SSV shall adhere to the minimum requirements below, and shall provide the latest hardware and software, to that which is specified, that satisfies the Project Requirements and provides for the most optimal installation of the SSV's SCADA system.

E.   Hardware

1.   Servers - Provide four servers mounted in the equipment racks. <u>Two (2) servers for real-time database, one (1) server to historical database, and one (1) for terminal services and diagnostics.</u> The following provides minimum technical requirements for the servers; however, the SSV shall provide equipment that is best optimized for their SCADA software. If additional hardware features or performance enhancements are necessary to meet the System functional requirements, additional items will be provided to the Owner at no additional cost.

   a.   Processor: Intel® Xeon® E5640 2.66Ghz, 12M Cache, Turbo, HT, 1066MHz (minimum of 2 provided)
   b.   Memory: 64GB Memory (8x8GB), 1333MHz Dual Rank LV RDIMMs 2 Processors, Optimized
   c.   Operating System: To meet SSV's requirements
   d.   Hard Drives: 1TB 7.2K RPM Near-Line SAS 6Gbps 3.5in Hot-plug Hard Drive (minimum of 2 required)
   e.   Hard Drive Configuration: RAID 1, 2HDDs
   f.   Disk bays (total/hot-swap) - 4/4 (2.5" form factor)
   g.   Internal Controller: PERC S300 3Gb/s SAS/SATA Internal Software RAID adaptor for Hot Plug Configuration
   h.   Power Supply: 750 Watt Redundant Power Supply
   i.   Power Cords: As required to meet Owner's standard
   j.   Network Adapter: Gigabit ET Quad Port NIC, PCIe-4
   k.   Internal Optical Drive: DVD+/-RW, SATA, Internal
   l.   Form factor – Rack mounted
   m.   Hot-swap components - Power supply, fans, hard disk drives
   n.   Server Accessories: Keyboard and Optical Mouse, USB, Black, English, with 17 LCD Monitor
   o.   Systems management – Software to meet Owner standard, Integrated Service Processor, Diagnostic LEDs, drop-down light path diagnostics panel, Automatic Server Restart System Documentation: Electronic System Documentation
   p.   Hardware Support Services: 3 Year On-site Service

2.   Workstations – Provide four computer workstations, all located in the control room. The following provides minimum technical requirements for the workstations; however, the SSV shall provide equipment that is best optimized for their SCADA software. If additional hardware features or performance enhancements are necessary to meet the System functional requirements, additional items will be provided to the Owner at no additional cost.

   a.   Processor: Intel® Core™ i7 2600 Processor (3.4GHz, 8M)
   b.   Memory: 16GB DDR3,Non-ECC,1333MHz Dual Channel SDRAM
   c.   Operating System: To meet SSV's requirements
   d.   Hard Drive: 500GB 3.5 6.0Gb/s SATA with 16MB DataBurst Cache™

    e.   Video: Integrated Video, Intel® HD Graphics 2000 (1DP & 1 VGA)
    f.   Internal Optical Drive: DVD+/-RW, SATA, Internal
    g.   Power Supply: 350 Watt Power Supply
    h.   Monitor, Keyboard, Mouse: None required
    i.   Form Factor: Heat Sink, Performance/Mainstream, Small Form Factor
    j.   System Documentation: Electronic System Documentation
    k.   Hardware Support Services: 3 Year On-site Service

3.   KVM Switches – Provide a KVM switch in each equipment rack. KVM switches will allow operations staff to quickly and easily switch the workstations to any available monitor in the control room. KVM switches shall meet the following minimum requirements:

    a.   Computer Connections: 8 minimum
    b.   Port Selection: Hotkey, Pushbutton, OSD
    c.   Connector Ports
        1)   Console Keyboard: 1 x USB Type A Female
        2)   Console Video: 1 x HDB-15 Female
        3)   Console Mouse: 1 x USB Type A Female
        4)   Console Speaker: 1 x Mini Stereo Jack Female
        5)   Console Microphone: 1 x Mini Stereo Jack Female
        6)   KVM Keyboard: 8 x USB Type A Female
        7)   KVM Video: 8 x HDB-15 Female
        8)   KVM Mouse: 8 x USB Type A Female
        9)   KVM Speaker: 8 x Mini Stereo Jack Female
        10) KVM Microphone: 8 x Mini Stereo Jack Female
    d.   LED's: Online (8), Selected (8), Power (1)
    e.   Video: To meet SSV requirements
    f.   Mounting: Rack mount

4.   GPS/IRIG B Time Code Generator/Reader - Provide 2 GPS rack mounted time clocks, one in each server rack, to provide time synchronization across all SCADA computers.

    a.   The unit shall be a GPS synchronized IRIG B time code generator designed to provide a precise IRIG B serial time code, both modulated and demodulated, output as well as a 1PPS time pulse. The unit shall automatically acquire all in-view satellites upon power up and lock an internal IRIG B time code generator to the GPS time reference.
    b.   If the GPS lock is lost, the unit will automatically switch to an internal clock and continue generating the output IRIG B signal. No discernible change in the IRIG B output will occur due to this transition.
    c.   The unit shall permit synchronization to an external 1 PPS such as a time mark signal or from another timing device. When applied, the unit internal clock will be reset to the closest second.
    d.   The unit shall be capable of operating as a stand-alone unit to generate an IRIG B signal. The time-of-year may be set by the user via front panel switches. A

        back lit LCD readout shall display the days, hours, minutes and seconds as well as status.

e. In the event of a power failure the unit shall continue to advance by automatically switching to a battery backed-up internal clock. The IRIG output will resume, without resetting, upon reapplication of power.

f. The unit shall have a minimum of five buffered IRIG B outputs and one demodulated IRIG B output as well as status and synchronized clock signal outputs.

g. The unit shall include a serial RS-232 port to provide for remote user programming and time and position output.

h. The unit shall operate powered by 100 to 240 VAC 50/60 Hz.

2.03   COMMUNICATION NETWORKS

A. Communications network is provided by the Owner with the exception of network switches for new equipment. SSV to provide cabling and/or patch cords to connect computers and ancillary devices to the local patch panel identified by the Owner.

B. Network Switch

1. The network switch shall be a RuggedCom RuggedBackbone ™ model RX1500 with appropriate options, no others accepted. The exact part number shall be coordinated with the Owner.

2. The network switch shall be a modular device allowing for the hot swapping of components including power supplies and communication interface modules.

3. The network switch shall be configured with redundant power supplies, and support communications on up to 24 different ports. The specifics on communications modules shall be determined by the SSV to meet the requirements of their supplied system.

4. The network switch shall be rack mounted.

5. The network switch shall be supplied with the ROX ™ II software.

6. Key features of the network switch shall include:
   a. Multi-level passwords
   b. SSH/SSL encryption
   c. Enable/disable ports, MAC based port security
   d. Port based network access control (802.1x)
   e. VLAN (802.1Q) to segregate and secure network traffic
   f. Centralized password management
   g. SNMPv3 encrypted authentication and access security
   h. Immunity to EMI and high voltage electrical transients
   i. -40°C to +85°C operating temperature (no fans)
   j. Failsafe Output Relay: For critical failure or error alarming

      k.   Field replaceable line modules
      l.   Up to 36-ports 100FX or 10/100TX, up to 8-ports Gigabit Ethernet
      m.   Fully compliant EIA/TIA RS485, RS422, RS232 serial ports (software selectable) with raw socket mode support for conversion of any serial protocol
      n.   Web-based, SSH, CLI management interfaces
      o.   SNMP v1/v2/v3
      p.   5 Year Warranty

2.04   CONTROL PANELS AND EQUIPMENT RACKS

    A.   The computer equipment rack shall be a PowerEdge model 4220 manufactured by Dell. No others accepted. SSV to coordinate the installation requirements with the Owner's IT department prior to equipment purchase and fabrication.

    B.   The computer equipment rack shall be an enclosed unit, supplied with necessary fans equipment mounting rails, and power cords.

    C.   The computer equipment rack shall house the servers, KVM switches, GPS clock, network switches, and other devices as shown in the Technical Memoranda or as determined by the SSV to support the installation of their system.

    D.   The SSV will supply two computer equipment racks, and the exact arrangement of equipment within the enclosure shall be approved by the Owner.

    E.   The computer equipment rack will include a cable management system, and shall comply with the EIA-310-E standard for rack mounting of electronics.

2.05   SCADA HMI SOFTWARE REQUIREMENTS

    A.   GENERAL

       1.   This Section describes a Human Machine Interface (HMI)/Supervisory Control & Data Acquisition (SCADA) Software System, herein after referred to as the System, used for process control, monitoring, visualization, alarming, trending, analysis and reporting.

       2.   The System shall collect real-time information from both local and remote devices (e.g. PLCs, RTUs, pole mounted equipment, etc.), making it available for system functionality as well as that provided through the Data Historian.

       3.   The System will support a distributed Client-Server architecture that can seamlessly exchange point/alarm & history information with each other and scale to support over 100 clients per SCADA.

       4.   The System will be able to support from a redundant SCADA server environment applications running on Client Technologies like Thick, Terminal Services, Web and Mobile Tablet.

5. The System will support multiple levels of Alarm priorities and multiple Alarm Area definitions to categorize and divide the alarms into logical & functional groupings for efficient Alarm Management.

6. The System will log Setpoint and Operational writes from the SCADA graphics to comply with NERC security requirements.

7. The System database will support at least 8 different I/O drivers that can be connected to the points for information from a wide range of hardware.

8. The System graphic elements like data links and animations will individually support switching between real-time and historical mode, with support to display on-the-fly Averages, Highs, Lows, Totalized values from Historian.

9. The System shall include as an integral part of the product an Electric Power Industry development module which industry specific equipment objects and faceplates for reducing application development time and error proofing.

10. The System will support advanced Point Management capabilities for configuration and maintenance such as: categorizing points by areas, alarm priorities, I/O drivers, and filtering access of these points by name, description, driver and data type.

11. Monitor analog values such as Volts, Amps, Watts and VARs at each substation. Convert these values to a digital format. Transmit changed values back to the Master Station. Convert these values into engineering units. Display these values on single line diagrams and provide alarm limit checking. Provide historical storage at user definable interval and retention periods.

12. The SCADA system shall be capable of providing health monitoring of the host server, Ethernet switch, and terminal servers by means of SNMP, and the health monitoring points integrated into the SCADA database and accessible by the operator screens.

13. The System shall accumulate kilowatt-hour pulses from pulse initiators at each substation. The System shall have the ability to freeze counts by RTU on a user definable interval, transmit the counts back to the master or central location, and convert the counts into interval and hourly deltas.

14. The System shall utilize a Select Before Operate (SBO) procedure that is fully compliant with IEEE Standard C37.1-1994, section 7.4.1 "Operations security features."

    a. The System shall require secure handshaking with the RTU before any controls are executed. In such cases, control of a point requires the following exchange of messages:

1) Master to RTU - control point selection
2) RTU to Master - point address checkback
3) Master to RTU - control execution
4) RTU to Master - execute acknowledge

b. If the scan task does not receive proper acknowledgement of either the select request or the execute command, a checkback failure alarm should be raised. If the acknowledgements are correct, but the expected status change does not occur within the point's control response timeout, a control failure alarm should be raised. An optional multiple status change validation feature should be available to handle cases where a control causes multiple status changes to occur.

B. CONFIGURATION

1. The System shall provide a mechanism for accepting configuration input either directly from the keyboard, via a mouse, or as appropriate, indirectly through ASCII files that are created by an external text editor, spreadsheet or relational database program.

2. Source code modifications, re-assembly or recompilation shall not be required for implementing user-level system changes.

C. ON-LINE OPERATION

1. All configuration changes shall be capable of being made on-line, while the System is operating. Data definitions, operator displays, etc. shall be capable of being modified, added or deleted without having to interrupt the data acquisition.

D. DOCUMENTATION

1. The System shall provide complete user documentation, including examples of how to operate the various modules within the System. The documentation shall be in electronic format with the ability to search for topics by keyword or search for specific text.

E. ON-LINE HELP

1. Program Help

a. An on-line "help" facility shall provide useful, context-sensitive information on the operation of the package. This help facility shall be capable of being invoked on-line through a point-and-click operation. The "help" facility must also support the ability to perform full text word search, add custom comments, bookmark topics, copy and pasting into another application, printing, and use of system fonts and colors.

2. Custom Help

    a. The System should be capable of incorporating a user-built standard help file (*.hlp or equivalent for proposed operating system) into the graphic displays without any scripting or code.

    b. The System should provide the tools to the developer to convert standard documents and procedures written in any popular word processing program into a compiled help file with a table of contents, index and search capabilities.

F. DATA HANDLING CAPABILITIES

1. No programming, compiling or linking shall be required to configure the System. The database points shall be configurable on-line. That is, new function and database point assignments can be added while the System is performing data acquisition and control operations.

2. The process database containing the current value of the data, or point list, shall be memory-resident and of a design that is appropriate for real-time monitoring and control functions. Its design shall be optimized for speed, memory usage, data integrity and system security. Floating-point arithmetic shall be used in all calculations. This database shall be stored as a standard.

3. The actual application of monitoring and control functions will be dictated by the definition of the contents of this memory-resident database. Configuration of this database shall be done by a user familiar with automation or instrumentation terms.

G. DATA INTEGRITY

1. The System shall provide pre-emptive multitasking to ensure that common operating system actions do not interfere with I/O communications, processing of data, alarming, and the integrity of the real-time and historical data. These common operating system actions include moving a window with a mouse, opening a file, accessing the hard disk, or printing a graphic display.

H. DATABASE POINT CONFIGURATION AND MANAGEMENT

1. Various input/output hardware assignments, as well as processing functions, shall be assigned to named points or "function blocks". Multiple points can be tied together to perform more complex functions. During the configuration process, the program shall be capable of checking the point structures for correct linkages, appropriate names, and so on. The scan-processing program shall also be capable of detecting and handling configuration errors at run-time. Any errors encountered shall generate messages to the user.

2. The user shall be able to perform point configuration (adding, modifying, deleting, viewing) in several ways, as follows:

a.   Directly from the graphics editor as graphics are developed.

b.   Via the importation of a CSV text file developed in another program as input for point creation. The database builder program shall also be able to export the current point listing for modification by the external program.

c.   Similar to Point Configuration from an interactive spreadsheet-style database builder program, the System should also allow for Point Management through a fill-in-the-blank menu methodology. The database builder program shall provide for the following editing functions:

   1)   Cut/Copy/Paste points
   2)   Duplicate points
   3)   Generate multiple points from a given pattern
   4)   Sort points based on name, Alarm Priorities, Alarm Areas, Data Types
   5)   Query points based on Point name wild characters, Scan Time, Alarm Priorities, Description, Alarm Areas
   6)   Display points in user-configurable formats

3.   Database verification. The package must also allow for database configuration verification. This task will allow for verification of configuration errors on a local database or a database on another node. Errors shall be reported in a dialog box and a user shall be able to make the corrections from this dialog box.

4.   Point Database Editing. The database has to allow for editing from a graphic editor, from within the building of a graphic operator screen, or from within a VBA script. The database editing shall be able to be accessed locally or across the network. A node can edit a database on another node while online.

5.   Tag Management

a.   The System shall allow operators to inhibit control of devices by means of a secure, multi-level tagging feature. This feature shall allow operators to apply up to eight tags to each point, each tag being stored with a date/time stamp and optional operator-entered description.

b.   Each point shall be able to be provided with a visual attribute showing that the point has one or more tags on each display where that point is shown. If a point is tagged, the display shall show the symbol that corresponds to the highest-level tag on the point.

c.   It shall be possible to specify that the tag dialog remembers the last choice of action, tag type, tag number and tag description.

d.   The System shall provide the capability to configure a custom set of tag types that are mapped to the following four basic types of tags: Inhibit ON and OFF

controls, Inhibit ON control only, Inhibit OFF control only, Information only (no control inhibit).

e. The System shall permit no means of bypassing the control inhibit caused by a tag. This applies to any and every application supplied by the SSV or written by the Owner using the SSV's API.

f. A group tag function shall be provided that allows an operator to define a tag, select multiple points and apply the same tag to all selected points.

6. Data Processing

a. The System shall provide support for multiple status changes that result from control commands. For each control point, it shall be possible to specify a list of up to 30 status points that may change as a result of a command. If not all the expected transitions occur within the control point response time-out, the System shall generate an alarm for the control point as well as an additional alarm for each associated point that did not undergo the expected transitions

b. The System shall scan every analog input in the RTUs at predefined scanning intervals. Any failure to complete a scan shall be marked with a data quality flag. Also the System shall scan each analog input every second and compare that input to the previously reported input. When the difference between these values exceeds its reporting band, the analog value shall be reported (report-by-exception).

c. The System shall be capable of checking the analog values for at least three sets of limits: warning, emergency and reasonability. Each of these three sets of limits shall be provided with an upper limit, a lower limit and a deadband.

d. To allow the removal of noise readings around the zero mark of the engineering scale, a range of engineering values inside the point value range shall be specified which shall clamp the input value to zero. For example, if the zero clamp deadband is 3.0, any input value which is converted to between +3.0 and -3.0 engineering units will be clamped to zero.

e. The System shall provide a rate-of-change for analog input values by computing the difference between the new and previous value and dividing this by the difference between the current time and the time the point was last updated. The rate-of-change shall be checked against the limits for rate-of-change.

f. The System shall be able to process accumulators received from the RTUs. The System shall send a command to freeze the accumulators either to all RTUs or to selected RTUs. However this freeze command shall not reset the accumulators in the individual RTUs. Upon receiving the accumulator readings at the master station, the System shall automatically calculate the difference

from the last reading. The System shall retrieve the hourly accumulators every hour from the RTUs and shall convert them to engineering units. The System shall also be able to retrieve accumulators at user-definable intervals from 15 to 30 minute intervals

I.   DATABASE POINT FUNCTIONS

1.   Analog Input

a.   This reads an analog value (time, temperature, speed, pressure, level, etc.) either directly from an A/D converter or from a register within an I/O device such as a programmable controller, and automatically scales the raw data to engineering units (seconds, revolutions/minute, pounds/sq. in., degrees, etc.) An Analog Input point must also support write outs.

2.   Analog Output

a.   This writes an analog value (set point, output, speed, etc.) either directly to a D/A converter or to a register within an I/O device, such as a programmable controller.

3.   Boolean Logic

a.   This point-type takes up to eight (8) inputs, typically logical or digital values, and performs Boolean arithmetic on them. The result can then be passed to or used by other points or applications within the System. The operators must include:

1)   OR
2)   AND
3)   EQUAL
4)   NOT EQUAL
5)   NOT
6)   XOR
7)   NAND
8)   Parentheses

4.   Calculation

a.   This point-type takes up to 8 variables or constants and performs an arithmetic calculation on them. The result can then be passed to or used by other points or applications within the System. The operators must include:

1)   Add, Subtract, Multiply, Divide
2)   Parentheses
3)   Absolute value
4)   Square root

      5) Exponentiation
      6) Natural log
      7) Base-10 log
      8) Relational operations (greater than, less than)
      9) Change floating point values to integers

5. Digital Input

    a. This senses the logical on/off state of a switch, relay, pushbutton, etc. either directly from the I/O hardware or from a bit within the memory of an I/O device, such as a programmable controller. The value shall be displayed in a user-selected format (0/1, open/close, false/true, etc.) A Digital Input point must also support write outs.

6. Digital Output

    a. This sets a logical on/off state in an output relay either directly in the I/O hardware or in a bit within the memory of an I/O device, such as a programmable controller. The value shall be accepted in a user-selected format (0/1, open/close, false/true, etc.) The Digital Output point must also provide output-reverse handling and the ability to specify an initial cold-start position.

7. Multi-state Digital Input

    a. This point combines up to three (3) digital values and outputs a value of 0-7 based upon the status of the values in sequence (000 = 0, 001 = 1, 010 = 2, 011 = 3, 100 = 4, 101 = 5, 110 = 6, 111 = 7).

8. Event Action

    a. This point-type monitors the value or alarm conditions of an I/O point and, based upon TRUE/FALSE conditions, performs one of two operations. These operations include starting or stopping the processing of another point or opening or closing a digital point.

9. Program

    a. This function provides the user with a procedural language for sequencing, monitoring, and controlling typical process operations. The programming function shall execute within the database's scan cycle and is separate from the HMI scripting language. Program functions shall include:

      1) If/Then go to another step
      2) Wait until a process condition occurs
      3) If time-out go to another step
      4) Go to another step
      5) Set a point to a value or the value of another point

6) Open/Close a digital point
7) Set Auto/Manual status of a point
8) Set On Scan/Off Scan status of a point
9) Add/Subtract a value to/from a point
10) Print a message
11) Call other program blocks as subroutines
12) Run other program blocks in parallel
13) Stop other program blocks
14) Pause or delay a number of seconds
15) Play a .WAV sound file
16) Run an executable program

b. The current step being processed shall be capable of being displayed on the operator's CRT. In addition, a debug mode shall be provided to facilitate program checkout.

10. Real-time Trend

a. This point shall take as its input an analog or calculated value. Averaging of accumulated input values will be provided to extend the amount of time represented by the trend block. The data within the point can be graphically depicted on operator displays.

11. Text

a. This function reads or writes text of up to eighty (80) characters from or to a device.

12. Timer

a. This point performs a counting operation. It counts in either the up or down direction, from a pre-set value to a target value. Upon reaching the target or time-out condition, a contact may be closed. This point also supports conditional next block processing. It shall time up to one (1) year. The timer may be started, stopped, reset or resumed based on a sensed condition or operator command.

13. Accumulator

a. The accumulator function will totalize a value based on a digital input transition from low to high (zero to one). The accumulator will include the ability for resetting the total. The accumulator function shall be capable of totalizing counts up to 999,999,999.

b. This point-type maintains a floating point total for values passed to it from other database points.

14. Dead time

   a. This will delay a signal by a selectable time period from 1-255 seconds to compensate for transportation delay.

15. Ramp

   a. The output of this point is a linear increase/ decrease to a selected target value over a selected time period. This function will support up to three (3) individual ramps to targets with user-defined hold times between the ramping action.

16. Pareto

   a. This point-type will accept up to eight (8) inputs and will sort these inputs and their associated descriptors in one of the following ways: ascending, descending, none.

17. Batch Support

   a. The System will provide blocks for state-driven, sequenced, interlocked, batch control operations. The software development company meeting this specification shall be able to offer a fully integrated Batch package for future considerations. The functions shall include:

      1) Device Control. For coordination of opening and closing digital devices based upon user-defined conditions.
      2) Program. For running short programs for batch operations or to increase the degree of automation in an application.
      3) Custom features. The ability to add optional function blocks that will co-exist with the standard function blocks and have all the same configuration access as the standards block. The optional blocks are to be built by a toolkit offered by the software development company.

18. Point Attributes

   a. Each point will have point name of up to 30 characters. The name shall be alphanumeric. All other application programs will use this point name as their sole reference to the data element assigned.

   b. For points assigned to actual hardware points, they shall also contain fields for:

      1) Hardware device name
      2) Hardware address
      3) Hardware specific parameters
      4) Signal conditioning requirements (parameters for scaling inputs)

     c.   Simulation points can also be created that receive their values from the operator's keyboard, other internal calculations, or other programs.

     d.   All points shall have a description field.

     e.   Each point associated with a hardware address or capable of causing an alarm condition shall have a means of displaying a descriptive message on the alarm printer. The descriptor shall be at least 40 characters in length.

     f.   Any output or control block shall be able to log a "time stamp" when an operator changes a value.

19. Double Precision data and calculations

     a.   All the Analog point types shall support reading and storing double precision data types (as supported by the I/O driver).

J.   I/O DEVICE COMMUNICATIONS

1.   The System must support communication with a variety of external input/output (I/O) devices. The devices that can be interfaced to the System must include:

     a.   Programmable logic controllers (PLCs -- interfaced via serial communications or PLC vendor-supplied interface cards)

     b.   Remote Terminal Units (RTU)

     c.   IED's

     d.   Load management devices

     e.   Analog-to-digital converters

     f.   Remote I/O

     g.   OPC Servers

     h.   Specific protocols include:
         1)   DNP
         2)   Modbus
         3)   ICCP
         4)   SMNP
         5)   OPC
         6)   GE REMS 100, 101, 102 embedded into RTC1032 protocol

2. The System shall be capable of supporting a minimum of eight (8) different types of device communications drivers. The SSV will provide a system that can communicate to all devices connected to existing SCADA system.

3. The software subsystem for the proposed protocols shall implement all features of the RTUs and IEDs that are required by the Owner. As a minimum, the following functions shall be included:

   a. Rapid polling of RTUs for exceptions
   b. Select Before Operate control execution
   c. Variable control durations for momentary controls
   d. Detect and report multiple changes of state between poll cycles , if the RTU does not buffer changes but instead reports a "multiple change detect" bit
   e. Automatic interleaving of multiple priority messages, e.g. automatic "fast scan" after a control and "error scan" after a communication error
   f. Scheduled accumulator freezes and polls
   g. Scheduled integrity (general interrogation) polls
   h. Time synchronization of the RTUs
   i. Sequence of events data uploading and processing

4. When a user-definable error retry count expires for an RTU, the System shall declare the RTU failed by means of a status point and an accompanying alarm. Should communications errors be detected, the System shall automatically indicate that the data (on graphic displays, in historical files, etc.) is no longer valid. The invalid data should be replaced with any used defined characters or have the ability to alter the color, or font to let the operator know the data may be invalid. In the latter case the System shall display the last known value. The System shall automatically attempt to re-establish communications, and, if successful, shall then replace the characters with valid data. These capabilities shall be built-in to the software and shall not require any user programming or other actions to implement.

5. The user shall be able to define alternate communication ports (or IP addresses) that can be used to reach the RTUs. On a series of communication errors with an RTU, the System shall switch ports after a user-definable port retry count expires. A separate port status point for each RTU shall be maintained to indicate which port is currently being used to poll each RTU. If the communication line is looped, it shall be possible to determine between which two RTUs a break exists by examining the values of the port status points.

6. For each RTU, the System shall maintain communication statistics in the form of analog points that may be viewed on displays, printed in reports, or stored in historical data files. Such statistics shall include percentage of successful communication, number of timeouts and number of security errors.

7. OPC Server Connection

a.   In addition to I/O drivers, the process database shall be able to send and receive data with an OPC (OLE for Process Control) server. Any database block should be able to receive or send OPC data by supplying an OPC address.

b.   The System shall be capable of serving OPC information to any OPC complaint database.

c.   The System must support connectivity to Remote OPC Servers through Microsoft DCOM (Distributed COM).

K.   NETWORKING AND DISTRIBUTED OPERATION

1.   Configurations shall be available that provide complete functionality, others that provide read/write access to the data (but do not perform I/O communications themselves), and still other information nodes that provide read-only access to all data on the network.

2.   Data shall be available to all computers and individuals on the network that have been provided access. Real-time data shall be available directly across the network from the computer that acquired it from the process hardware. Configurations that require each computer to contain copies of database points it needs to access are not acceptable.

3.   The System shall be configured such that the failure of any one computer will not affect the operation of others on the network. It is recognized that data contained in a failed machine will be unavailable to other machines requesting it. However, the System shall offer the provision for re-starting or re-configuring other stations to take over.

4.   The System shall also have the capability to establish "trusted" connections between all the nodes on the SCADA network, thus preventing any non-recognized and rogue computer connections.

5.   Network Security

a.   The System shall offer encrypted networking to a level of 256 bits or better. In addition, it will be possible to explicitly specify remote nodes that will have access to a server node as opposed to leaving a system open to communication from any remote node.

6.   Error Detection, Recovery, and Diagnostics

a.   The System must provide on-line diagnostics that display the current status and operation of the local area network and its nodes. The diagnostic display must include the LAN adapter status for the machine showing the display, as well as the current number of messages, errors and retries.

b. An additional display will show the current session status (established, pending, off-line) of all stations on the network. A session monitor program that automatically monitors and recovers communications shall be supplied with the System.

c. Should network communications errors be detected the System shall automatically indicate that the data (on graphic displays, in historical files, etc.) is no longer valid and shall replace the invalid data with any user defined characters or the ability to alter the color or font of the text. The System shall automatically attempt to re-establish communications, and, if successful, shall then replace the characters with valid data. This capability shall be built-in to the software and shall not require any user programming or other user-dependent actions to implement. It shall be customizable by the user whether the last known "good" value remains on the screen, with, or without different colors to indicate an error condition, or to have the user-defined characters discussed above used instead.

7. Data Handling without duplication of data

a. Points shall not be duplicated among stations in order to provide access. Each data value shall be available to all authorized computers and users on the network. However, the data value shall reside only in the computer that is physically connected to the process equipment. Broadcasts of database points for duplication among machines are not acceptable. Application programs, such as graphic displays, that need data in another station, must request that data over the LAN rather than access a copy in their local database.

b. Database points shall be stored in files for each computer physically connected to process equipment. They shall be loaded into main memory during the startup sequence for that machine.

8. OPC and .NET technology Support

9. The System must support OLE automation of 3rd party applications, allowing, for example, an Excel spread sheet to be created and fully controlled from the SCADA/HMI application.

a. The System must support OPC data to be directly accessed by the graphics application.

b. The System must allow .NET technology developed controls to be inserted into the application securely and with complete exposure to properties as designed by the controls. These controls should share the same space as regular graphic objects and support being accessed from the VBA environment.

10. Open Database Connectivity (ODBC) and OLE Database Support

a. Support of accessing data to and from the process database and historical archive to another database using Structured Query Language (SQL) as a standard language.

b. Support of accessing data to and from the process database and historical archive to another database using OLE DB drivers

L. MICROSOFT TERMINAL SERVICES SUPPORT

1. This paragraph will only apply if the SSV relies on terminal services to implement their SCADA software solution.

2. In addition to the client/server networking, the System shall support the use of Microsoft Terminal Server. The user shall be able to have multiple configurations (view-only, view, and configure) without the need to purchase or install separate configurations. A configuration management tool will be provided to map remote users with appropriate SCADA/HMI applications to launch.

3. Terminal Services Server

a. The Terminal Services Server will be available in two forms, running alongside the SCADA/HMI or running as a separate box from the SCADA/HMI. If alongside the SCADA/HMI, the Server will support up to 3 remote clients. This will be limited to ensure proper operation of the SCADA/HMI.

b. If operating separate from the SCADA/HMI, the server shall be capable of up to 25 users.

c. CITRIX Support - The Microsoft Terminal Services Server will support operation in an enhanced CITRIX environment.

M. GRAPHIC CAPABILITIES

1. The graphics package must provide a means of creating and displaying color object-oriented graphic displays that will be used by the operator to monitor and control the process. Real-time values being read from the field devices shall be capable of being displayed in a variety of user-configurable formats.

2. There shall be no limit (other than physical disk size) to the number of displays that can be developed and accessed on-line.

3. The graphic screens need to be based on objects and not individual pixels. The object graphics will consist of an image and image attributes, such as size, color, and position that will define the properties of the object. The user will use tools menus and dialog boxes to change object properties. An object is defined as anything that can be created with drawing tools from within the package, an image

imported into the package, or .NET technology control. All properties, events, and methods of the object – including 3rd party controls – shall be exposed to the System and available for the developer.

4. The graphics environment should provide for a secure way of hosting external controls, thus preventing inefficient controls from effecting the main SCADA application.

5. The System must support changing individual graphic files ("pictures") at any time with no additional configuration, or requiring the System to be stopped, or restarted.

6. Graphic Creation

   a. The System shall provide an interactive object-oriented editor or workspace that allows creation of graphic displays using a pointing device (for example, a mouse).

   b. A facility shall be provided for the user to configure a Quick Access Toolbar, for faster access to frequently used Graphics development functions.

   c. A facility shall be provided that quickly toggles, via a mouse click or hot-key, between the graphic building and graphic runtime modes to speed display animation verification during the development process.

   d. The software shall be designed with the ability to make changes to the graphics while the System is running. Shutting down the System shall not be required to make changes. If the graphics files are stored on a network file server then all machines will see the effect of any changes the next time the graphic is displayed.

7. Properties Window

   a. A properties window, exposing all properties for an object must live on the workspace. The properties window must support edit functions for any object selected. All properties are available in both the graphic workspace and the scripting engine.

8. Object Duplication

   a. Object properties shall be passed when an object is copied. Copying should be able to occur from the tree browser or workspace. All properties shall be passed on to the duplicated object and the name properties must automatically get changed. Example: When an object with the following properties Name: OVAL; Foreground Color: RED 024 gets duplicated the new objects properties are Name: OVAL1; Foreground Color: RED 024.

b. If an object is copied all of its scripts are copied with it. If the script refers to a property of the object (or any item grouped within the object), the new copy will correctly refer to its own copy of the object.

9. Object Drill Down

a. The System will allow the developer to "drill down" into any sub or grouped objects within any other object and change any property, script, or animation without the need to ungroup or otherwise modify the main object.

10. Tile & Cascade

a. Graphic screens that are opened in configuration mode must support tiling and cascading. Tiling shall have horizontal and vertical support and no overlapping when the graphic screens are viewed in this manner. The only limit on the number of graphic screens opened at one time is by the amount or Ram in the PC. Cascading is defined as a method to staggered pictures so they can be selected from their title bar.

11. Graphic Sizing

a. Size will be based on logical units; not pixels and any logical unit may be used. Graphic screen design at one resolution shall be able to run at a different resolution. A full screen option as well as the ability to add sizing borders to any graphic screen shall be supported. Also graphic screens shall have an option to enable the screen to always be on top and a title bar enabled / disabled option.

12. .NET Technology Support

a. The graphic screens shall have the ability to have third party .NET technology objects dropped in. They should support being placed with other graphic elements in the same graphic and be stored as the same graphic file.

13. Electric Power Industry Development Module

a. The Development Module shall include standard power industry objects. When the objects are dropped on a graphic display they should automatically trigger a popup form to connect the instance of the object to points in the database.

b. The types of equipment objects shall include all major electric power equipment, such as:

   1) Circuit breakers
   2) Controllable and non-controllable telemetered switches.
   3) Voltage transformers
   4) Power transformers

     5) Analog indications
     6) Digital indications
     7) Portable grounds
     8) Grounds
     9) Replace picture keys
     10) Notes key
     11) Rack in plug symbols
     12) In cable symbols
     13) Link symbols
     14) Local service transformers
     15) Local service contactors
     16) Injection plant
     17) DC convertor

c. Faceplates which account for the specific I/O, Alarm and Point out functionality.

d. The System shall support Intelligent Electronic Device (IED) control panel templates that graphically represent IED's within the database. The template will allow dynamic elements and database values to be superimposed over a graphic representation of the IED faceplate. The template shall support multiple pages of IED information.

e. The user shall be able to copy and paste a template instance on the operator display, and reassign the template to a new IED, with all database values automatically updated to the new IED. When edit changes are made to the template, all instances of the template on the operator display will be updated.

f. The user shall be able to create custom templates using the same editing tools available for editing the operator display. The user shall be able to import and export templates for sharing with other system users.

14. Relational Database Support

a. The graphics application will provide the ability to insert tables, queries, views and procedures from any ODBC or OLE-DB database (Access, SQL Server, Oracle, dBase, etc.) into a picture. The System will include list boxes, combo boxes, grids, and data controls to interact with and query the database. All of these controls should have the ability to be linked together so that, for example, the user can select a batch number from a list box and the grid control automatically updates, with no scripting required of any kind.

b. The data control should have a "wizard" to automatically create SQL queries without the user knowing SQL. However, the user should have the ability to view and modify the SQL created by the wizard.

c.   The data control must support asynchronous data transfer to/from the database so large queries can be executed without adversely impacting performance.

d.   The data control must support reading and writing to a database using the built-in procedures of the database. In addition, if connecting to a procedure the control should indicate the number and type of variables that the procedure requires.

15. Global Colors

a.   The System must allow for a global or universal color table selections. This table is based on exact match, or range compression or a value. The colors in the tables will appear on any graphic screen when the value for the data source of the object matches the table. Changes to color tables shall be independent of the graphic screens and not require the user to compile or pass the graphic screen through the graphic configuration program or mode for changes to take place. Changes to global color tables shall be supported in runtime mode.

16. Graphic Toolbox

a.   The System must provide configurable toolboxes that the graphics developer can customize as to what tools it contains and their position in the toolboxes.

b.   The Toolboxes shall be a Window where its shape, size and location can easily be changed with the mouse.

c.   Toolboxes shall contain a method, like the ToolTips within Microsoft Word, to describe the function of each tool when the mouse cursor is positioned on a particular tool.

d.   Once configured, the state of the toolboxes shall be automatically saved when the drawing session is completed. It shall be returned to that same condition when the next drawing session is started.

e.   Users shall have the ability to define their own buttons.

17. Graphic Objects

a.   At a minimum, the following object drawing tools shall be supported:

1)   Rectangle/Square
2)   Rounded Rectangle/Rounded Square
3)   Oval/Circle
4)   Straight Line
5)   Polylines (two or more connected line segments)
6)   Polygons
7)   Arcs (curved line segments)

        8)   Chords (a curved line connecting a line segment)
        9)   Pie Shapes (wedges of a circle)
       10) Text
       11) Pipes
       12) Connection Points
       13) Vertical and Horizontal connection lines

18. Graphic Development Operations

    a.   Operations that may be performed on objects or groups of objects must include the following:

        1)   Select/Select All
        2)   Deselect/Deselect All
        3)   Change Color
        4)   Move
        5)   Nudge (move a single pixel at a time)
        6)   Cut
        7)   Copy
        8)   Paste
        9)   Clear
       10) Duplicate
       11) Group/Ungroup (objects within a group shall be selectable without ungrouping)
       12) Align (left, right, top, bottom, vertical center, horizontal center)
       13) Space Vertically/Space Horizontally
       14) Grid
       15) Snap-to-Grid
       16) Reshape
       17) Zoom In/Zoom Out (50%, 100%, 150%, 200%)
       18) Send to Back/Bring to Front
       19) Choice of line and fill styles
       20) Reshape (add/delete/move points)
       21) Flip horizontally/Flip vertically (mirror image)
       22) Search and Replace point names (including the use of wildcards)
       23) Undo (the number of levels shall be user-configurable up to 50)
       24) Cursor position (optionally on the display for exact object placement)
       25) Rotation (center of rotation selectable from any part of the screen)
       26) Space objects evenly (vertical & horizontal)
       27) Make objects same size (height, width and both)
       28) Layers (for building and viewing, up to 30 layers supported)
       29) Connect
       30) Add Line Segment
       31) Break Line
       32) Extend to Meet
       33) Truncate at Meet

19. Graphic Animation

a. Each display shall have the ability to dynamically update elements in the picture. Defining the method for dynamic update shall be determined by a point and click operation.

b. A pre-defined list of dynamic link elements that shall include the following:

1) Data Link - Displays alphanumeric values (numeric values may be displayed in whole number, decimal or scientific notation)
2) Historian Data Link - Displays last stored value from the historical database with a time stamp.
3) Time Link - Displays current time
4) Date Link - Displays current date
5) System Information Link - Displays diagnostic information
6) Alarm Summary Link - Displays current alarm information
7) Pushbutton Link - Executes a Command Language script
8) OLE objects - Display a third party OLE object
9) Multiple-pen chart link
    a. Any number of pens
    b. Displays run time and historical data on same chart
    c. Allow the user to insert data (i.e., lab data) into a chart
    d. Configurable time span
    e. Configurable trend direction (left to right and right to left)
    f. Configurable Zoom
    g. Scrolling Grid
    h. Ability to invert Hi and Low limits
    i. Minimum of 5 line styles for pens
    j. Minimum of 3 pre-built line makers and a customizable lime marker.
10) Enhanced Charts
    a. Allow users to Stack charts on the fly, based on number of pens configured
    b. Allow users to Duplicate and Auto Generate Charts on the fly, using currently viewed chart as a template
    c. Allows users to toggle between Linear and Logarithmic scale in development and runtime modes
    d. Configurable time span
    e. Configurable Zoom
    f. Scrolling Grid
    g. Ability to invert Hi and Low limits
    h. Minimum of 10 line styles for pens
    i. Minimum of 5 plotting styles (Line, Bar, Points)

20. Dynamic Properties for Objects

a. Dynamic properties that may be assigned to an object or group of objects must include the following:

1) Color changes:
   a. Foreground Color
   b. Edge Color
   c. Background Color
   d. Gradient Fill Color

2) Fill Percentage:
   a. Horizontal (Left/Right)
   b. Vertical (Up/Down)
   c. Position/ animation:
   d. Horizontal (X)
   e. Vertical (Y)
   f. Rotate
   g. Scale

3) Script Language:
   a. Commands on down (mouse button or key)
   b. Commands on up (mouse button or key)
   c. Commands on mouse click
   d. Commands on mouse double click
   e. Commands on mouse move
   f. Commands on edit

4) Fill Style:
   a. Solid
   b. Hollow
   c. Horizontal
   d. Vertical
   e. Downward Diagonal
   f. Upper Diagonal
   g. Cross Hatch
   h. Diagonal Cross Hatch
   i. True Gradient Fill

5) Edge Style:
   a. Solid
   b. Hollow
   c. Dash
   d. Dot
   e. Dash Dot
   f. Null

b. Objects may be assigned more than one (1) dynamic property. In addition, objects within groups may have individual dynamic properties in addition to those dynamic properties assigned to the overall group.

c.   For properties other than "Commands", configuration shall be by "point and click" operations; scripting or programming shall not be required.

d.   When building object dynamics properties must support configuration from a dialog box, pop-up menu and user customizable dialog boxes or forms.

e.   Positioning property changes must support a method to get screen coordinates and automatically fill in the required coordinates for positioning.

f.   The user customizable dialog boxes or forms shall be customizable through VBA. The System must supply the following pre built forms:

1)   Fill
2)   Rotate
3)   Position
4)   Scale
5)   Visibility
6)   Edge Color
7)   Foreground Color
8)   Background Color
9)   Data Entry
10) Open Picture
11) Close Picture
12) Replace Picture
13) Open Digital Point
14) Close Digital Point
15) Toggle Digital Point
16) Toggle Digital Point
17) Acknowledge Alarm

21. Graphic Refresh Rate

a.   The refresh rate shall be user-definable on a per object basis with the fastest rate being fifty (50) milliseconds; although it is recognized that achieving this performance is dependent upon the overall system configuration.

22. Sources of Data for Object Animation

a.   The animation of the graphics and objects with dynamic properties shall be able to be linked to any of these types of data:

1)   Data acquired by the System and stored in its memory resident database
2)   Data acquired by another networked system and stored in its memory resident database
3)   OPC Data Source
4)   Variables declared in the command language scripts
5)   Local and networked relational databases using SQL/ODBC

b. The System shall provide a wild card supported filter for assigning a data source.

c. The System must provide an expression builder that is accessible from the graphic workspace. The builder will allow an expression to be assigned to the data source. Supported functions of the builder are:

   1) Addition + , Subtraction - , Multiplication * , Division /
   2) Left & Right Parenthesis ()
   3) Equal To =
   4) Not Equal To <>
   5) Greater Than >
   6) Less Than >
   7) Greater Than or Equal To >=
   8) Less Than or Equal To…<=

23. Reusing Graphic Objects

   a. A method shall be provided for allowing graphics objects or groups of objects to be re-used easily. It shall allow the developer to insert native language prompts that request appropriate point or other animation information whenever the object or grouped object is reused in another graphic display. These objects, either single or grouped, shall be intelligent, wizard-like objects, so that it is possible, for example, to have a single prompt request and substitute:

      1) A single point name into multiple dynamic properties within the object
      2) Multiple attributes (current value, high alarm limit, point name, etc.) from a single point into multiple dynamic properties within the object
      3) Text into the object
      4) Parameters within command language sequences

   b. A method shall be provided to update all these wizards used in the application if the Master Wizard from the library is updated.

   c. The System will allow conversion of previously created graphic objects to the newer dynamically linked objects through a converter.

   d. The System must allow for bitmaps created by other packages to be imported into the graphics, Bitmaps must support a transparent mode and Metafiles must import as objects not just bitmaps. At a minimum the System must support .bmp, .msp, .jpg, wmf, pcx, ico, cur, psd, epr, and wpg.

   e. The System must allow the user to add to import and use DWG/DXF files as a basis of any graphical display.

     f.   On import of a DWG/DXF file, the colors, text styles and symbols that are contained in the DWG/DXF file should be imported into the libraries, where they may be customized or just used as is.

24. Point Aliasing and Group support

     a.   The System must support a means of creating single picture that can use any one of a number of different data sources. The System shall allow the user to create a picture by inserting point substitution strings in any link in a picture. A separate point group file will then be used to cross-reference the substitution strings with the data source. When the graphic is opened, the user can either specify the point group file to use, or the operator can be prompted.

     b.   The point substitution strings shall be insertable into any data link, variable, or animation in a picture and can be combined to create concatenable strings. (e.g., String1 + NODE + String2).

     c.   The point substitution strings shall also be fully supported in the scripting environment.

     d.   A point group editor shall be provided to assist in the creating of point group files. The editor shall be able to browse any picture and automatically create a list of all unique point substitution strings in a picture.

25. Item Selection and Data Entry

     a.   Items on a display shall be available to have their values changed by the operator, as appropriate. Selecting an item for data entry shall be done with the use of a pointing device or keyboard. The selected item will be highlighted by a box surrounding it.

     b.   Each data entry type shall be configurable to require confirmation if so desired.

26. Operator Action Tracking

     a.   The System shall print a descriptive message with a time stamp and user ID on the alarm printer or to an alarm file (if so configured) whenever an operator or technician performs any activity on the System, except for changing displays. Sample items to log include, but are not limited to, the following:

         1)   Alarm acknowledgment
         2)   Data entry into a point
         3)   Reloading a database file
         4)   Saving a database file
         5)   Changing a database file
         6)   Placing a point on or off scan
         7)   Restarting the System

        8)   Logging on or logging off the System

        9)   Launching any program

27. Command/Scripting Language

    a.   The SSV will supply a scripting language that is either Microsoft's Visual Basic for Applications (VBA) or an equivalent. The scripting language shall be a native tool associated with the SCADA software. Scripts can be simple or complex and allow users to automate operator tasks, and create automations solutions. Scripts shall be capable of running in either the configure environment ("draw" or "edit") or the run environment ("view"). The scripting language must expose all properties, methods, and events of graphic objects.

    b.   Scripting language requirements:

        1)   Animation of objects in pictures.
        2)   Automatic generation of pictures or objects.
        3)   Read from, write to, and create database blocks.
        4)   Automatically run other applications.
        5)   Incorporate custom security features.
        6)   Create custom prompts and messages for operators.
        7)   Access ODBC or ADO data sources.
        8)   Incorporate and communicate with third party and custom Active X controls.
        9)   Trap bad or misbehaving Active X controls to prevent crashes.
        10)   Write custom wizards for frequently performed tasks and offer as Toolbars
        11)   Allow use of global scripts and global variables.
        12)   Scripts become part of the graphic screen.
        13)   The VBE must allow import and export capability.
        14)   The shall be a link from the graphic editor to the VBE.
        15)   VBA or the VBE is lunched from within the System, without any commands.

    c.   All Properties, methods, and event of Graphic object created within the graphic editor or Third party Active X controls used in the graphic screen shall be exposed to VBA.

28. Global Scripts and Variables

    a.   The ability to have scripts and variables available across all graphic screens. These global scripts and variables must get loaded when the System is started.

    b.   Historical Playback, Overlay Analysis and On-the-Fly Data Mode Change Capability

c. The SSV shall provide a "historical playback, overlay analysis and on-the-fly data mode change" capability that allows a user to perform root cause analysis on-the-fly.

d. The Historical Playback shall allow for the real-time SCADA graphics to be switched into Historical mode and playback the graphics based on user defined time references. At a minimum, this shall include:

1) Defining Historical time references on graphic data links
2) Defining Historical time references on graphic animations
3) Allow user to define time references for the Graphic on the fly
4) Allow users to control time references to multiple graphics for playback through a single click
5) Allow users to pass time from Alarm displays to playback the graphics from the alarm time references.

e. The Overlay Analysis capability shall allow a single SCADA graphic to be open multiple times with different time references, allowing users to overlay entire graphics for time analysis. At a minimum it should include:

1) Synchronizing all graphics to a common time reference
2) Allowing individual graphic the choice to participate in common time synchronization

f. The On-the-Fly Data Mode change capability shall allow for users to view information on the SCADA graphics in various modes like Real-time, Historical, Average over time, Max/High over time, Min/Low over time, Totalizer over time. At a minimum it should include:

1) Ability to monitor displays with information in a free mix of above stated modes
2) Allow users to switch between modes on-the-fly individually on graphic elements
3) Allow users to synchronize the data modes with the common time synchronization.

29. Web SCADA Clients

a. The System should support rendering graphics already developed on the regular operator displays to the web through Internet Explorer and/or Mozilla Firefox browser. The System should not require any additional development or conversion to render the graphics on the web, nor, should it pose any limitation on functionality through the web client unless configured through security.

b. The System should support rendering graphics already developed on the regular operator displays on mobile tablets through thin/web client technologies. In addition, the System should also support rendering the same

graphics on iPADs through iOS apps. This rendering should not require any additional development or conversion, nor should it pose any limitation on functionality through the tablets unless configured through security.

N. ALARM AND MESSAGE HANDLING

1. The System shall be capable of detecting alarm conditions based on the states and values of the various sensed variables. The alarm conditions shall be detected even if the variables causing alarms are not currently on the display. Alarms can be filtered based upon location, priority and other user-selectable criteria. When a new alarm is detected, all client machines will immediately see the new alarm. If the alarm is acknowledged on one machine then all machines will see that it was acknowledged.

2. Alarms will be used to report potentially harmful process conditions requiring a response. Typically when a process value exceeds the pre-defined limits. An example would be a tank's level that is too high is an alarm condition to which an operator must respond. Messages are to report non-critical information that does not reacquire a response. Alarm limits can be entered by the user at configuration time or from the operator's display during run-time. Alarm limits are expressed in engineering units.

3. Alarm Types

   a. Analog input or alarm variables shall have the following alarm types:
      1) High High High
      2) High High
      3) High
      4) Low
      5) Low Low
      6) Low Low Low
      7) Time rate-of-change
      8) Alarm Disable with text field for operator entry
      9) Deadband

   b. Digital input variables shall have the following alarm types:
      1) None
      2) Change of state
      3) Open
      4) Close
      5) Deviation from Set point
      6) Alarm Disable with text field for operator entry

4. Alarm Priorities and Filters

   a. The System shall support at least seven (7) alarm priorities for each alarm type. A filtering mechanism shall be provided so that the operator can adjust the

System alarm priority. The priority should indicate the importance of a block's alarms. The priority of the most critical blocks would be CRITICAL. This would distinguish the highest priority alarms from less-critical ones.

b. Special alarm messages (such as I/O failure) shall be non-maskable and shall always print.

c. System errors will be viewed by a pop up message viewer. The viewer should allow users the following configuration:
   1) Show all entries or just new ones.
   2) Maximize on next new entry.
   3) Clear, and exit.
   4) Disable the viewer from popping up.

5. Alarm Areas

a. In order to logically divide a process into smaller units, the System shall allow for unlimited, named individual alarm areas to be defined. These alarm areas shall be definable on an individual point level. All alarm areas shall be accessible by each point and the System must support multiple alarm areas per point.

b. Alarm areas are used to determine which destinations receive each alarm. The method of alarm distribution over a network shall be session-based in order to guarantee alarm distribution and reception. Broadcasting of alarms on the network shall not be permitted.

c. Each alarm block shall be able to support an area where you can associate a graphic screen for the alarm.

6. Alarm Counters

a. The System shall provide "counters" to display the number, type, and priority of alarms in any alarm area. The System shall also provide Alarm Occurrence Counters to determine transitions in alarms between Acknowledgements. The use shall be able to use these counters in mathematical and Boolean expressions to display, for example, the number of high priority unacknowledged alarms in a user-specified number of alarm areas. The alarm counters must also be accessible as directly addressable I/O points in the point database.

b. The alarm counters in any alarm area shall include:

   1) Total number of acknowledged alarms
   2) Total number of unacknowledged alarms
   3) Running total of alarms
   4) Number of acknowledged High, Medium, & Low priority alarms
   5) Number of unacknowledged High, Medium, & Low priority alarms

6) Number of disabled High, Medium, & Low priority alarms

c. The System shall also be able to display a summary of all of the above alarm counters for all areas on a given node.

7. Alarm Destinations

a. The System shall provide a means for placing an alarm message in one or more of the following locations:

1) Alarm summary display
2) Alarm printer
3) Alarm message file on disk
4) Alarm history window and file (first-in, first-out scrolling window on the display)

b. Alarm messages shall be independently user-configurable as to what information is provided and its sequence within the message. The following shall be available choices:

1) Time of the alarm
2) Name of the point causing the alarm
3) Alarm condition code
4) Engineering units value when the alarm occurred
5) Descriptor text assigned to the point
6) Engineering units of the point
7) Directly to a relational database

c. The user shall be able to specify the length of the alarm queue for each destination.

8. Time Stamping

a. A time stamp shall be included with every alarm or message. The time stamp must indicate both when the alarm occurred in the field and when the alarm was received at the SCADA system subject to the capabilities of the specific communications protocol. This time stamp will indicate the time and date that the alarm or message was generated. Time stamping shall be supported from the local computer time, OPC server time, or process hardware's clock.

9. Alarm Notification and Acknowledgment

a. When a new alarm condition is detected, an alarm message will be generated.

b. If the alarm condition code text for the block is on the current display, then the text will flash until the alarm is acknowledged. Alarm acknowledgment will be

performed from the operator's keyboard or with the mouse and shall require no more than one keystroke or mouse click.

c.   The System shall be capable of "freezing" the highest alarm status value on the display until acknowledgment is made. Once acknowledgment is made, the System will display the current alarm status text.

d.   The System shall provide built-in capabilities to support the following:

1)   Remote acknowledgment. This shall allow, for example, a button to be depressed by the operator, which closes a digital point and acknowledges one or more alarm conditions, as configured by the user.

2)   Alarm suspension. This shall allow the user to specify digital points, that when closed, cause alarms not to be generated for one or more alarm conditions. This is useful, for example, during the start-up phase of a project to avoid nuisance alarms.

3)   Re-alarm time. This shall allow the System to re-generate an alarm after a user-configurable amount of time, should the alarm condition still exist.

4)   Delay time. This shall allow the user to specify a period of time for which an alarm condition must remain before an alarm is generated. This is useful, for example, if certain actions may cause a temporary, but acceptable, fluctuation beyond alarm limits and the generation of alarms is not desired.

5)   Launching a script on an alarm action. The System shall provide the ability to launch custom scripts when an alarm occurs or clears.

e.   Close contact on alarm. This shall allow the user to specify digital points that become closed when certain alarm conditions occur. These contacts can then be used to take actions, such as sounding a horn or initiating a sequence of instructions. Also, the user can specify the conditions under which these digital points are re-opened, including the following:
1)   When the alarm is acknowledged
2)   When the alarm is cleared
3)   When the alarm is acknowledged and cleared
4)   Never (it shall be re-opened by a different function)

f.   For analog values, re-alarm time, delay time, and close contact on alarm capabilities shall be supported, not just on a point by point basis, but for the following individual alarm types within a point:
1)   High High High
2)   High High
3)   High
4)   Low

5)   Low Low
6)   Low Low Low
7)   Rate of change
8)   Deviation from target value

g.   When an alarm is acknowledged from any node on the network, the acknowledgment shall be made directly at the node from which the alarm was generated, and a message indicating that it has been acknowledged shall then be distributed to all alarm destinations.

h.   Messages shall be able to be designated as "events-only". These will be distributed to alarm destinations, but shall not require acknowledgment.

10. Alarm Summary Display

a.   The System must offer an alarm summary display as a pre-defined, customizable, graphic. . This alarm summary display must show a list of the pending alarms in the System. As new alarms are detected, entries are made to the list. As the alarm conditions clear, the entries are removed from the list.

b.   In addition to being able to configure the placement of the information (point name, current value, descriptor, time of alarm, and alarm status), the user shall be able to specify the color codes to be used to indicate the various alarm conditions either by the Alarm status or the Alarm priority. The user shall also have the ability to reverse the row color upon acknowledgement of the alarm.

c.   Alarms can be acknowledged from the alarm summary display either individually (by clicking on an alarm acknowledgment field) or for all alarms in the queue.

d.   The alarm summary display must provide sorting and filtering capabilities. The user shall be able to filter on acknowledge status, node name, alarm area(s), alarm status and alarm priority. The user shall be able to sort on time, point, alarm area, alarm priority and alarm status. The user shall be able to display field or fields about the alarm block in a column format and do complex filtering.

e.   The alarm summary object must also be to fire a VBA "event" to indicate the presence of new alarms or that the list has changed. It should also have the capability to fire an event on alarm escalation of any alarm in the list.

11. Operator Notes

a.   The System shall support a system of "post-it" notes that allows operators to add and remove note icons on any display. Clicking on a note icon shall cause a pop-up window to appear to show free-form notes on any topic. The notes can be entered and modified in this window.

b.   The System shall also support notes that are specific to database points. Such notes shall be accessible from a pushbutton in the point dialog box that appears when the point is selected. When a point has some notes, the pushbutton icon in the dialog box shall be highlighted.

c.   Point-specific notes shall also be accessible from the alarms display. When a point-related alarm is selected, a pushbutton in the tool bar should highlight if there are notes for the selected point. Clicking on this pushbutton shall bring up the point's notes.

P.   ARCHIVING AND REPORTING

1.   The System must provide a facility for automatically collecting, storing and recalling data. Recalled data will be made available to a trend display program, a report generation program and to user-written programs.

2.   Data File Handling

a.   Data will be stored in a compressed format. Compression will be performed through a user-supplied dead band. Entries containing time, name, value and status will be made in the file whenever the real-time value exceeds the previously stored value by the dead band limit. A dead band value of zero will cause an entry in the file each time the real-time value is examined.

b.   Files shall be organized according to time and will contain values for multiple, named variables. The file can be placed on the hard disk or other media, and can be placed on a file server if LAN server software in installed.

c.   A mechanism for on-line maintenance and automatic purging of files must also be provided.

d.   The System must support third party applications for ODBC queries.

3.   Archive Configuration

a.   The data to be collected by the archiving program will be identified through an interactive, menu-based configurator. The user will enter the point name, collection rate, and data compression dead band value. Collection Rates shall be adjustable from 1 second to 30 minutes.

b.   The task will allow the collection of groups of points to be turned on and off automatically based on an alarm on discrete value in any networked database with no scripting required.

4.   Displaying Archived Data

a.   The operator shall be able to recall archived data from the disk to be displayed in graphic format along with Real-time data, OPC data, alarm counters and any data programmatically added to the chart.

b.   The display of archived data shall be user-configurable. It shall be possible to configure objects in graphic displays that, when selected, fetch pre-defined historical trend data from disk and display it to the operator. The System must allow for users to edit a pen's attributes during runtime.

c.   The display shall support unlimited variables to be displayed on the same time/value axis simultaneously. For each entry in the display list, the operator will be able to assign a given point name and marker to a particular line color selected from palettes of unlimited colors. The operator may also enter display engineering units ranges to cause scaling of the display. Support shall be provided for multiple, different y-axis engineering units to be displayed, as appropriate.

d.   The trend object will allow for bi-directional trending and scrolling. A user can select right to left or left to right.

e.   A movable, vertical line will act as a time cursor on the display. This cursor can be moved by dragging it with the mouse. The date, time, and values of the trends corresponding to that time will be displayed in the bottom portion of the screen.

f.   The grid of the trend object shall be scrollable.

g.   The trend may be shifted forward or backward in time ("panning") by clicking on left/right buttons. New data will be fetched from the historical file as appropriate. Two sets of buttons shall be provided that cause shifting by different amounts of time. The amount of time shifting caused by these buttons shall be user-configurable.

h.   The ability to display historical (pre collected) data with current (real time) data on the same chart shall be supported.

i.   A transparent option for the trend shall be selectable.

j.   The user shall be able to "zoom" in on any section of the trend display by "cutting" that section with a mouse. The software will automatically re-scale both the y-axis and time axis and will fetch the appropriate data for the time period selected.

k.   The trend object shall have a refresh rate selectable in .1 second increments from a minimum of .10 seconds to a maximum of 1800 seconds.

l.

Q.   DATA HISTORIAN

1. General Requirements

   a. The Data Historian shall be a PI system with associated software modules to meet the technical requirements listed herein, as manufactured by OSIsoft. No other products accepted.

   b. The Data Historian shall provide a minimum sustained performance rate of 150,000 read/write values per second at the largest point configuration.

   c. The Data Historian shall be developed as a high-speed, time-based process Data Historian that does not require the use of 3rd party relational databases for operation or installation when logging time-series process data.

   d. The Data Historian shall provide 1 microsecond time stamp resolution.

   e. The Data Historian shall be able to store 32 bit floating point numbers, including time stamps and quality.

   f. The Data Historian shall provide automatic time-based indexing between different points without adversely impacting storage performance. The Data Historian shall store each sample consuming only 6 bytes per sample.

   g. The Data Historian shall be built with 64-bit code. The Data Historian shall operate on both 32-bit (x86) systems and 64-bit (x64) systems. The Data Historian shall automatically detect and install 32-bit or 64-bit Data Historian based on the System architecture.

2. Administration And Configuration

   a. Administrative functions (e.g., point configuration, archive maintenance, etc.) shall be configurable using native tools or via a 100% browser based interface (Internet Explorer) without the need for any 3rd party ActiveX controls on the client computer.

   b. A non web-based administration tool shall also be available so that a web site is not required for system configuration.

   c. The user shall be able to browse and add points from any of the data sources (e.g. OPC)

   d. All configuration changes shall be "on-line" without the need to stop and re-start the data historian

   e. System shall provide for the automatic creation of archive files and the ability to automatically overwrite the oldest archive for unattended operation

    f.   The System shall provide a method for backing up all on-line/active archives on-line without the need to stop the archive system.

3.   Security

    a.   The historian shall support Active Directory service providing single-log on capability and a central repository for information.

    b.   Role-based security shall restrict user access to different administration and system functions. At a minimum these shall include:

        1)   Security administrators
        2)   Point maintenance
        3)   Archive file maintenance
        4)   Data collector maintenance
        5)   Data readers
        6)   Audited writes
        7)   Unaudited writes

    c.   Point-based security shall be configurable on a point-by-point basis and shall include the following:

        1)   Readers
        2)   Writers
        3)   Administrators

    d.   Security system shall support both local and domain-based security

4.   Audit Trail

    a.   The Data Historian shall come with an automatic audit trail mechanism that stores all configuration changes, user connections, security violations and performance metrics.

    b.   The audit trail shall not be modifiable – a user may insert custom messages, but once stored an audit message cannot be modified or deleted regardless of the user's security privileges.

5.   Point And Data Collection

    a.   The System shall provide a graphical interface to browse and add points from any supported data source. Added points shall automatically determine the data type, description, point name from the data source

    b.   All configuration changes shall be performed on-line with no restart required.

c.   The System shall use IRIG-B time code from the local GPS clock for time stamping data whenever possible.

d.   System shall support both polled and exception-based data collection.

e.   System shall provide both a collection rate and a collection-offset configuration.

f.   Collection rates shall be configurable using intuitive seconds, minutes, hours drop down select lists.

g.   System shall support 1 millisecond time stamp resolution.

h.   System shall support the following native data types:

    1)   Single integer (2bytes)
    2)   Double integer (4bytes)
    3)   Single Float (4 bytes)
    4)   Double Float (8 bytes)
    5)   Scaled floats (scaling a float across 2 bytes)
    6)   Fixed length string (of any length)
    7)   Variable length string (of any length)
    8)   Binary Large Objects (BLOBs of any size)

i.   System shall provide dead banding compression algorithm (+/- limits around the process value)

    1)   The dead banding compression system shall be performed on the remote data collection PCs so that values that do not exceed the dead band are not reported to the server and do not consume network bandwidth.

    2)   The dead banding shall have a "time out" feature so that a value is stored at a regular interval regardless if it has not exceeded the dead band for polled points.

    3)   The dead banding shall be configurable as a % of the engineering limits.

j.   System shall provide a rate of change compression algorithm (+/- limits around the real-time slope of the process)

    1)   The rate of change algorithm shall have a "time out" feature so that a value is stored at a regular interval regardless if the slope deviation has not been exceeded.

    2)   The rate of change compression limits shall be configurable as a % of the engineering limits.

k. System shall ensure that data spikes are properly represented in trend and client tools. E.g., if a value has been stead state for several periods and suddenly spikes to a high value trends shall properly display this as a spike/step change and not a ramp.

l. System shall provide for recording time stamps from either a collector PC or from the OPC/PLC point.

m. Data collectors shall have an automatic store and forward mechanism to ensure that data is not lost when disconnected to the data historian.

  1) The store and forward mechanism shall not require the user to pre-allocate a buffer file, or set a maximum buffer file size. Instead, the System shall provide for utilizing available disk space up to a user configurable limit.

  2) The store and forward mechanism shall automatically detect when the historian is available and forward data from the buffer files while simultaneously collecting all incoming data.

n. Data collectors shall not require a hardware key or other licensing on the collection PC.

o. Once installed, data collectors shall automatically register and configure themselves with the data historian service without the need for any additional configuration on the historian.

p. A user shall be able to store comments with any collected data.

q. Unsolicited Point Compression Timeout - This feature allows the user to configure a timeout interval along with collector compression such that a current value for the point is generated at the specified timeout interval.

6. Calculation Engine

a. Architecture and Data Collection

  1) The System shall provide a calculation engine for the automatic calculation and analysis of both incoming and archived data and then storing the results of the calculation in the data historian as a point value.

  2) The calculation engine shall be configurable so that it can be installed on a PC, or several PCs that are remote from the data historian.

  3) The calculation engine shall have a store and forward mechanism to ensure that calculated results are not lost if the connection to the data historian is down.

4) The calculation engine shall have a recovery logic system so that any updates to trigger points (calculation inputs) cause the calculation to re-fire. The calculation points shall be configurable to execute both as polled or unsolicited/trigger-based points.

5) Unsolicited points execute their calculation whenever an assigned trigger point receives a new value, time stamp or change in quality.

6) Calculations shall support an unlimited number of trigger points.

b. Calculation Functions - The System shall support the following calculation functions:

1) Browse and select any historian point as an input to the calculation
2) Current/last stored value of any point
3) Previous values of a point
4) Next value of a point
5) Interpolated values of a point
6) Current/previous/next time stamp
7) Current/previous/next quality
8) Historical time-weighted average
9) Historical time-weighted minimum
10) Historical maximum
11) Historical time-weighted standard deviation
12) Historical time-weighted total
13) Historical count of samples
14) Historical raw average
15) Historical raw standard deviation
16) Historical raw total
17) Time of minimum sample
18) Time of maximum sample
19) Total time that a sample was good

c. The System shall support filtered calculations so that the above calculations are automatically filtered/limited based upon another point's value. E.g., Calculate the minimum amps (point 1) over the previous day, but exclude any samples in which for the same time period the line voltage (point 2) was 0. Or, return the average for point 1, while the batch id (point 2) = 'ABC'

7. Calculation Configurations

a. The System shall support filtered calculations so that the above calculations are automatically filtered /limited based upon another point's value.

b. Calculations shall support full visual basic scripting within the calculation.

    c.   Calculations shall be configurable using the same administration tools (web and non-web) including all visual basic scripting and functions.

    d.   The System shall have tools to assess the time that a calculation takes to execute, as well as a means of disabling calculations that exceed a configurable maximum execution time.

    e.   The calculation engine shall have a manual recalculation engine so that calculations can be applied to legacy data and values stored alongside the legacy data as if the calculation engine had been executing in real time when the legacy data was archived.

8.   Client Tools

    a.   Microsoft Excel

        1)   The data historian shall come with a Microsoft Excel tool bar so that users can readily extract data and develop reports using Excel.

        2)   The Excel add-in shall provide for the ability to import or modify points

        3)   The Excel add-in shall provide for the ability to import stored data.

        4)   The Excel add-in shall provide for the ability to import and view comments for any stored data

        5)   The Excel add-in shall not require the user to know the SQL query language.

        6)   The Excel interface shall provide for automatic recalculation if any cell is changed – e.g., a point name, time periods, selected calculations and so forth.

    b.   OLE DB

        1)   The data historian shall come with an OLE DB interface so that data can be extracted and viewed by client applications such as SQL Server and Crystal Reports.

        2)   The OLE DB interface shall provide access to all server time-weighted calculations as described in the Microsoft Excel section above.

        3)   The OLE DB Provider shall have write access disabled. You cannot insert, update, or delete data in archives using the provider.

        4)   The OLE DB interface shall provide SET statements and other functions so that time-weighted calculations and reports can be easily extracted.

5) e.g. The user shall be able to get the hourly average of a point or several points, regardless of how frequently they were collected by entering a statement such as shown below:

6) SET Interval milliseconds = 1Hour, Start Time = Yesterday, End Time = Today, Calculation Mode = Average Select Timestamp, Value from Raw Data where Point name = Point1 or Point name = Point2 SET statements shall include functions as shown below:

7) SET statements shall include functions as shown below:

    a. Today, Yesterday, Now, Beginning of month, etc.

    b. Interval = hours, minutes, seconds (for evenly spaced reports)

8) The OLE DB interface shall provide access to all system configuration, audit messages, and data

9) The data historian shall come with an OPC HDA interface so that data can be extracted and viewed by OPC HDA client applications.

  c. system

    1) The data historian shall have native connectivity to that manufacturers system product.

    2) The HMI interface shall provide the user with a drop down list to specify different time zones the data shall be represented (since the historian stores data as UTC it can be represented in any relative time zone)

    3) The HMI interface shall provide the ability to select if charts shall reflect time changes due to daylight savings time.

9. Web Interface

  a. The data historian shall have a 100% web-based client interface to browse, chart and display data.

R. EVENT SCHEDULING

1. The System shall support an event scheduler with event-based events, and time-based events. Any valid scripts or the like can be included in the scheduler. The scheduler shall be able to run as a background "service" to allow scripts to run regardless if an operator is logged in, or if the graphic application running.

2. Event-Based Events

a. Event based items are to be used by any data source available to the System to trigger events. The System shall be able to trigger an event on the following conditions:
1) When the data source resolves to a non-zero value (On True).
2) When the data source resolves to a zero value (On False).
3) At the specified interval when the data source evaluates to a non-zero value (While True).
4) At the specified interval when the data source evaluates to zero (While False).
5) When the data source changes (On Change).
6) On any Boolean condition based on any number of data on any networked machine.

3. Time-Based Events

a. Time-based events are events that occur at a scheduled time and are not tied to a data source. The System must allow for scheduling of the following time-based events:

1) One shot. Events that run once at the specified data and time.
2) Continuous. Events that run continuously at the specified date and time.
3) Daily. Events that run on the scheduled day of the week at a particular time.
4) Monthly. Events that run on the scheduled day or the month at a particular time. "End of month" will be supported with no scripting to automatically take into account months with different lengths.

S. SECURITY MANAGEMENT

1. The System shall provide a user-based security system. The security system must allow for the creation of users with certain rights and/or privileges. These rights must include the ability to run any combination or all of the applications in the data acquisition system. The ability to allow or disallow user's access to change values, such as set points and machine-setups, on an individual point basis shall be supported.

2. The ability to prevent non-authorized users from modifying the value or set point of a point shall be part of the database design and shall not require any scripting.

3. Groups of users, such as Operators or Supervisors, can be created and granted rights. All users assigned to a group obtain the rights of the group, although they are still tracked by the System by their individual ID. Individual members of a group may also be assigned additional rights.

4. The security system will support either centralized or distributed security file management.

5. The System shall support using the operating system's security in lieu of, or in addition to the package's own security system. If using the operating system security, the System shall authenticate a user on any security domain without requiring the System to be re-started.

6. When user-based security is enabled, an audit trail will be generated in the System, which will point every operator action with user identification (ID).

7. Systems that use a numeric level-based security methodology shall not be acceptable.

8. Security Areas

   a. The System must support up to 254 separate security areas. Security areas shall be assignable on a per point basis. Each point can be assigned all of the available security areas, none of the available security areas, or up to three (3) individual security areas. Only users with clearance for those security areas shall have the ability to change parameters.

   b. Security area names may be up to twenty (20) characters in length.

9. Security Manager

   a. The following functions shall be supported within the security manager application:

      1) Enable/Disable user-based security
      2) Define users, passwords and login names
      3) Define groups to which users may belong
      4) Define security path(s)
      5) Define user and/or group rights/privileges
      6) Define security area names
      7) Define system auto-start user

10. Securing the Operating System GUI Environment

    a. The ability to "lock" an operator or other user into the runtime graphics environment shall be provided. Specifically, disabling any combination of the following shall be supported, as configured by the user:

       1) Starting other applications.
       2) Switching to other applications that may be running.
       3) Exiting from the System.
       4) Restarting the computer using <Ctrl><Alt><Delete> or equivalent keystrokes for non-Windows operating systems.
       5) Opening unauthorized graphic screens.

6) Closing the current graphic screens.
7) Using the system menu.
8) Switching to the configuration environment.
9) Accessing the system tree.

11. Limiting Login Time

   a. The System shall allow for a login timeout setting for each user account. This setting will logout an operator when the time interval expires.

12. Automatic and Manual Logging In and Out

   a. The System shall support manual login and logout as well as automatic login. In addition security information shall be customizable through scripting.

13. Additional Requirements

   a. The System shall have the ability to temporarily disable a user account without deleting it.

   b. The System shall have the ability to deny remote access for a user account.

   c. User account passwords shall be a minimum 128-bit encrypted and neither stored nor transmitted in plaintext. The System shall allow for selection of password length greater than twelve (12) characters, and have password complexity settings for inclusion of alpha, numeric, and mixed case character requirements in the password. The System shall allow the password frequency of change to be set to 1, 30, 90, 180, or 365 days. It shall also allow setting the password to never expire.

   d. The System shall allow a settable number of failed login attempts by an account, and a blocked timeout period of time to block the user login if the number of failed login attempts is exceeded.

   e. Account activity logging shall be configurable for login success and failures.

   f. The logging mechanisms shall be configurable for the remote Syslog protocol.

14. User Rights

   a. Each user account shall be assigned a set of user rights that determines the actions that the user may take. This shall provide individual control over various operating and editing functions. These user rights shall include the ability to: acknowledge, block, unblock, and silence alarms; edit database, maps, reports, analog limits, and notes; manual set, control, and tag/un-tag points.

    b.   The proposed system shall be able to handle an unlimited number of user accounts with their corresponding user rights and privileges.

T.   REDUNDANCY

1.   The System must support SCADA server failover and LAN redundancy. Both redundancy options are independent of each other. The System may be configured for SCADA server failover, LAN redundancy or both.

2.   SCADA server Failover

    a.   The System shall have a failover option that allows a client to switch to a backup server in case the primary server is lost. The primary and the backup SCADA server will support the following tasks:

        1)   Database Synchronization – The System shall have the capability to run a SCADA synchronization task that will replicate the database from the Primary to the Backup SCADA server. Every aspect of the database point, from alarm limits to alarm area configuration and from adding and deleting points to changing egu limits in the point, all will be synchronized and replicated from primary to secondary.

        2)   Real time Data synchronization – Any data which has been configured for animation or program execution purposes and which does not get updated from the process data, will also be synchronized from the Primary to Backup.

        3)   Alarm Synchronization – The alarm queues and alarm acknowledgment information shall be synchronized between the primary and backup SCADA. The backup SCADA shall, in a normal operation, only read alarms from the primary and will only have the capability to report its health status. In a failover situation, where the backup becomes the primary server, that server will start generating alarms.

        4)   Alarm ODBC failover – The Alarm ODBC task which stores alarms to a relational database shall also have the failover capability from Primary to Backup.

    b.   The SCADA synchronization task shall have the capability to execute on a dedicated LAN with an additional option of failover of that task to another set of LAN connections. The System shall also provide a SCADA synchronization monitor which will provide a running trail of all transactions executed between the primary and backup SCADA server. Both primary and backup server will be collecting information from the process hardware. When the connection from the client node to the primary server is lost, the System must allow for the client to automatically switch over to the backup. After a fail over has occurred

the backup node will become that primary node and once the original primary node is fixed or replaced it will be the backup node.

3. LAN Redundancy

    a. The System must support 2 physical network connections between a client node and a server node. Both network paths will be for the same process data and when the connection from one network path is lost the System will automatically fail over to the other path.

U. SOFTWARE TOOLS

1. The System shall be built on and use industry standard development tools.

2. Data Access - The System shall provide an open architecture that allows interaction with other programs. It must provide a mechanism for other programs to access individual data elements and fields (such as the high alarm limit of an analog input) within data elements in real time. File transfer mechanisms are not acceptable; the access shall be direct to the memory-resident database. The following shall be supported:

    a. ODBC

        1) The System shall support Open Database Connectivity (ODBC) for sharing data from its database to any other ODBC compliant database through SQL queries, via an ODBC dynamic-link library (DLL) driver. At a minimum the database shall support communication to Microsoft Access, SQL Server, and Oracle.

    b. OLE for Process Control (OPC).

        1) The System should be an OPC-DA Client to access local and remote OPC DA Servers. The System should be an OPC DA Server to make data available to other OPC DA Clients. The System should be an OPC A&E Server to share alarm and event information with other OPC A&E Clients. The System should be an OPC A&E Client, to view alarms and Events from other OPC A&E Servers.

V. SERVICES

1. Training

    a. An interactive on-line tutorial shall be provided as part of the software to teach the basic operations of the System, including graphics and point development. The tutorial shall demonstrate the configuration operations using interactive on-screen instructions.

PART 3 EXECUTION

3.01   GENERAL INSTALLATION

A.   Refer to Section 13300.

B.   The SSV shall be responsible for ensuring that field wiring for power and signal circuits is correct and wired in accordance with best industry practice. Also, the SSV shall be responsible for validating the installation of system grounding to ensure a satisfactory functioning installation.

END OF SECTION