

**AGREEMENT FOR  
DISTRIBUTED CONTROL SYSTEM UPGRADE/REPLACEMENT PROJECT  
BETWEEN THE  
CITY OF SANTA CLARA, CALIFORNIA,  
AND  
EMERSON PROCESS MANAGEMENT POWER & WATER SOLUTIONS, INC.**

**PREAMBLE**

This Agreement is entered into between the City of Santa Clara, California, a chartered California municipal corporation ("City") and Emerson Process Management Power & Water Solutions, Inc., a Delaware corporation ("Contractor") registered to conduct business in the State of California. City and Contractor may be referred to individually as a "Party" or collectively as the "Parties" or the "Parties to this Agreement."

**RECITALS**

- A. The City issued a Request for Proposal (RFP 18-19-16) for the provision of all equipment, materials, and labor to upgrade the Distributed Control System ("System" or "DCS") at the Donald Von Raesfeld Power Plant;
- B. Contractor has a good understanding of City's requirements through Contractor's examination of the Request for Proposal documents, software and product demonstrations, and exchange of information leading up to this Agreement;
- C. Contractor has the necessary expertise and skill to provide the System and perform design, installation and maintenance services specified herein;
- D. Based on Contractor's understanding of the City's requirements and the Contractor's knowledge and experience with other municipal organizations, Contractor warrants that the System and related services will meet the City's specifications and requirements as described in the Scope of Services; and
- E. The Parties have specified herein the terms and conditions under which such services will be provided and paid for.

The Parties agree as follows:

**AGREEMENT TERMS AND CONDITIONS**

**1. DEFINITIONS**

**"Hardware"** shall mean any hardware components to be provided by Contractor necessary for the System to function as specified including but not limited to controllers, cabinets, user interface equipment, communication network hardware, and all other related hardware.

**"Support Services"** shall mean the maintenance and support services set forth in Appendix A-7 that Contractor shall provide during any period for which the City has paid for maintenance and support services.

“**Ovation Software**” shall mean Contractor’s proprietary software. Software shall include any documentation, updates, customizations or enhancements thereto as specified herein.

“**Services**” shall mean collectively all services provided by Contractor, including installation, design, configuration, training, and Maintenance Services.

“**Software**” shall mean the aggregate of the Ovation™ Software and all other third party software installed as part of the DCS (such as anti-virus software, operating system, and all other commercial-off-the-shelf software required by the DCS and provided by Contractor).

“**System**” or “**DCS**” shall mean the Distributed Control System as a whole including all associated Services, Software, and Hardware to be delivered by Contractor under this Agreement.

## 2. AGREEMENT DOCUMENTS

The documents forming the entire Agreement between City and Contractor shall consist of these Terms and Conditions and the following Exhibits, which are hereby incorporated into this Agreement by this reference:

- Exhibit A – Scope of Services
  - Appendix A-1 – I/O Counts
  - Appendix A-2 – Steam Turbine Control Block Diagram
  - Appendix A-3 – Turbine Data
  - Appendix A-4 – OT & EWS Stations
  - Appendix A-5 – Preliminary Project Implementation Schedule
  - Appendix A-6 – Final System Acceptance Certificate
  - Appendix A-7 – SureService™ Customer Support Programs
- Exhibit B – Compensation and Payment Schedule
- Exhibit C – Insurance Requirements
- Exhibit D – Labor Compliance Addendum
- Exhibit E – Software License Agreement

This Agreement, including the Exhibits set forth above, contains all the agreements, representations and understandings of the Parties, and supersedes and replaces any previous agreements, representations and understandings, whether oral or written. In the event of any inconsistency between the provisions of any of the Exhibits and the Terms and Conditions, the Terms and Conditions shall govern and control. The provisions in the Exhibits shall prevail over conflicting terms in any Appendices to the Exhibits.

**3. TERM OF AGREEMENT**

A. Term

The term of this Agreement is from July 1, 2019 to June 30, 2025, subject to the provisions of Section 12.

B. Appropriation of Funds

City's funding of this Agreement shall be on a fiscal year basis (July 1 to June 30) and is subject to budget appropriations. Contractor acknowledges that City, a municipal corporation, is precluded by the California State Constitution and other laws from entering into obligations that financially bind future governing bodies, and that, therefore, nothing in this Agreement shall constitute an obligation of future legislative bodies of the City to appropriate funds for purposes of this Agreement. This Agreement will terminate immediately if funds necessary to continue the Agreement are not appropriated. Despite the foregoing, the City shall pay Contractor for any Services performed in accordance with this Agreement up to the date of termination.

**4. SCOPE OF SERVICES**

A. Scope of Services

Contractor shall procure, install, and maintain the System as set forth in the Scope of Services, which is attached as Exhibit A hereto and incorporated as though fully set forth herein (the "Scope of Services").

B. Additional Equipment

The cost of any additional equipment, parts, or services required for final acceptance as detailed in the Scope of Services (Exhibit A) that is not reflected in the Contractor's proposal shall be the sole responsibility of the Contractor and at no cost to the City.

C. Notification

Contractor agrees to notify City promptly of any factor, occurrence, or event coming to its attention that may affect Contractor's ability to meet the requirements of the Agreement or that is likely to occasion any material delay in completion of the project contemplated by this Agreement. Such notice shall be given in the event of any loss or reassignment of key employees, threat of strike, or major equipment failure.

D. Contractor's Proprietary Software

The terms for the use of Ovation Software delivered pursuant to the Scope of Services, including subsequent software upgrades, updates, customizations or enhancements thereto, shall be as set forth in the Software License Agreement (Exhibit E), which is attached hereto and incorporated herein. The Software License Agreement shall commence upon on July 1, 2019 and shall continue in

perpetuity unless sooner terminated in accordance with the provisions of Section 12 "Termination" or pursuant to the Software License Agreement.

E. Third Party Software

With respect to any software installed pursuant to this Agreement that is proprietary to a vendor other than Contractor, such software shall be licensed to City pursuant to the terms of the Software License Agreement or applicable third party license agreements.

F. Maintenance and Support

Maintenance and support services for both hardware and software shall be provided by the Contractor as set forth in Appendix A-7.

**5. SCHEDULE OF PERFORMANCE**

Contractor shall perform the services in accordance with the Performance Schedule set forth in Appendix A-5. Time is a material condition with respect to each and every term and provision of Appendix A-5.

Contractor shall perform all requested services in an efficient and expeditious manner. Contractor shall be as fully responsible to City for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as Contractor is for the acts and omissions of persons directly employed by it. Contractor will perform all Services in a safe manner and in accordance with all applicable federal, state, and local operation and safety regulations.

**6. DATA FACILITIES**

Contractor acknowledges that it has in its possession all applicable specifications and drawings, and all other documents to which reference is made herein and/or which are matched hereto, and all such data are adequate to enable Contractor to fairly determine its ability to perform the work called for herein at the price and in accordance with the schedule set forth herein. Contractor represents that it now has or can readily procure without assistance of City all facilities, machinery, and equipment necessary for the performance of this Agreement.

**7. STANDARDS OF SERVICES**

In connection with the performance of any services pursuant to this Agreement:

A. Number of Employees

Contractor certifies it will provide sufficient employees to complete the Services within the applicable time frames established pursuant to this Agreement.



B. Skill of Employees

Contractor certifies that employees shall have sufficient skill, knowledge, and training to perform the Services and that the Services shall be performed in a professional and workmanlike manner.

C. Security and Safety

Contractor shall require employees providing services at a City location to comply with applicable City security and safety regulations and policies that are provided to Contractor prior to the regulation or policy going into effect. .

D. Replacement of Employees

During the course of performance of Services, City may request replacement of an employee or a proposed employee, provided that there is reasonable cause. In such event, Contractor shall, within five (5) business days of receipt of such request from City, provide a substitute employee of sufficient skill, knowledge, and training to perform the applicable Services. When the City notifies Contractor that (i) such employee's level of performance is unacceptable, (ii) such employee has failed to perform as required, or (iii) such employee, in City's sole opinion, lacks the skill, knowledge or training to perform at the required level, then Contractor will be required to review the work performed by said employee, confirm the quality of work, and correct any items the Contractor deems incorrect.

**8. FREIGHT, TITLE, AND RISK OF LOSS**

All freight charges will be pre-paid by Contractor. All products and materials shall be entirely at Contractor's risk from the time they are placed in the possession of the carrier for shipment to/from City until delivery to the City, provided that Contractor will be responsible for damages to the products and materials to the extent caused by Contractor and while the products and materials are in the Contractor's care, custody and control. Contractor shall ensure that the products and materials are insured against "all risks" from the time the products and materials are placed in the possession of the carrier for shipment to/from City until delivery to the City. Contractor will pack and ship all equipment in accordance with good commercial practices.

**9. FINAL SYSTEM ACCEPTANCE**

- A. Upon final completion of the System, City and Contractor shall conduct an acceptance test. The criteria for the acceptance test shall be as set forth in the Scope of Services (Exhibit A). System acceptance will occur upon successful completion of the acceptance test (Final System Acceptance). When system acceptance occurs, the Parties will memorialize this event by promptly executing a Final System Acceptance Certificate (Appendix A-6).
- B. If the System does not meet the requirements of the acceptance test specifications, Contractor shall repair or replace the System so that the same meets the acceptance test specifications in all material respects, all at no additional expense to City. All warranties shall become effective and begin to run

upon the successful completion of the acceptance test and the date of Final System Acceptance.

## 10. CONTRACTOR REPRESENTATIONS & WARRANTIES

### A. Contractor Responsibility

Contractor understands and accepts the specifications, requirements and deliverables defined in this Agreement. Contractor warrants it:

- i. Has read and agrees with the specifications contained in the Scope of Services (Exhibit A);
- ii. Fully understands the facilities, difficulties, and restrictions attending performance of the services; and
- iii. Contractor agrees to inform City of any unforeseen conditions which will materially affect performance of the work within five (5) business days of Contractor's first notice thereof and shall not proceed until written instructions are received from City.

### B. Authority to Make Agreement

Contractor represents and warrants that Contractor has full right and authority to perform its obligations under this Agreement. City shall be entitled to use the System as provided herein.

### C. Warranty

Contractor expressly warrants for one (1) year from the date of Final System Acceptance ("Warranty Period") the System will function per the specifications set forth herein under ordinary use and operate in conformance with its specifications and documentation and with all other requirements of this Agreement. Contractor further warrants that System under normal use and service will be free from defects in material and workmanship.

Contractor shall provide warranty service to City during the Warranty Period at no additional cost and shall include all services necessary to enable Contractor to comply with the foregoing warranty. Contractor shall pass through to City any manufacturers' warranties which Contractor receives on the System and, at City's request, Contractor shall enforce such warranties on City's behalf.

Before the expiration of the Warranty Period, City must notify Contractor in writing if any Hardware, Software, or Services do not conform to the foregoing warranties. Upon receipt of such notice, Contractor will investigate the warranty claim. If this investigation confirms a valid warranty claim, Contractor shall (at its option and at no additional charge to City) correct the defect at no additional cost. The warranty for any Hardware or Software corrected or furnished in replacement and any Services reformed shall be for one year and shall run from the date of delivery of the corrected or replaced Hardware, Software, or

Service. Such action will be the full extent of Contractor's liability hereunder. All replaced Hardware thereof will become the property of Contractor

D. Warranty Against Infringement

Contractor agrees to defend and indemnify City of all direct losses, costs and damages resulting from a determination that the System as supplied to City by Contractor infringes any Canadian or United States patent rights, copyrights or trademarks provided that: City promptly notifies Contractor in writing upon City becoming aware of the existence of any such suit, action, proceeding or threat; allows Contractor sole control of the defense and/or settlement thereof; and provides such reasonable cooperation as Contractor may require. In no event shall City consent to any judgment or decree or do any other act in compromise of any such claim without Contractor's express prior written consent. In no event will Contractor be liable for the payment of any amount agreed to in settlement without its express consent. In the event that City is enjoined from use of the System due to a proceeding based upon the infringement of patent, copyright or trademark in the United States or Canada, Contractor shall, at its option, either:

- i. Modify the System, at Contractor's expense, so it becomes non-infringing; or
- ii. Replace the infringing System with equal non-infringing System, at Contractor's expense; or
- iii. Procure, at Contractor's expense, the necessary licenses for the City to continue using the System; or
- iv. Remove the affected equipment and refund the purchase price and transportation costs thereof, less a reasonable amount for depreciation.

Contractor shall have no liability in respect of any claim based upon:

- i. Use, operation or combination of the System with software, hardware, data, or other equipment not supplied by Contractor if such infringement would have been avoided but for such use, operation or combination; or
- ii. Use of the System other than in accordance with Contractor's specifications if such infringement would have been avoided but for use of the system not in accordance with Contractor's specifications; or
- iii. System that has been modified by any party other than Contractor if such infringement would have been avoided but for such modification.

**THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. EXCEPT AS OTHERWISE PROVIDED IN THIS AGREEMENT, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.**

## 11. COMPENSATION AND PAYMENT

The maximum compensation of this Agreement is Three Million Two Hundred Four Thousand Five Hundred Fifty-Two Dollars (\$3,204,552), subject to budget appropriations, which includes all payments that may be authorized under this Agreement. The terms, rate, and schedule of payment are set forth in the attached Exhibit B, entitled "Compensation and Payment Schedule." All work performed or materials provided in excess of the maximum compensation shall be at Contractor's expense. Contractor shall not be entitled to any payment above the maximum compensation under any circumstance.

## 12. TERMINATION

- A. Termination for Convenience. City shall have the right to terminate this Agreement, without cause or penalty, by giving not less than thirty (30) days' prior written notice to Contractor.
- B. Termination for Default. If Contractor fails to perform any of its material obligations under this Agreement, and Contractor has failed to cure or commence to cure such failure within twenty (20) days following written notice from the City, in addition to all other remedies provided under this Agreement, City may terminate this Agreement immediately upon written notice to Contractor.
- C. Upon termination, each Party shall assist the other in arranging an orderly transfer and close-out of services. As soon as possible following the notice of termination, but no later than ten (10) days after the notice of termination, Contractor will deliver to City all City information or material that Contractor has in its possession, and City shall pay Contractor for all undisputed Work completed prior to termination.

## 13. ASSIGNMENT AND SUBCONTRACTING

City and Contractor bind themselves, their successors and assigns to all covenants of this Agreement. This Agreement shall not be assigned or transferred without the prior written approval of City. Contractor shall not hire subcontractors without express written permission from City.

Contractor shall be as fully responsible to City for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as Contractor is for the acts and omissions of persons directly employed by it.

## 14. NO THIRD PARTY BENEFICIARY

This Agreement shall not be construed to be an agreement for the benefit of any third party or parties and no third party or parties shall have any claim or right of action under this Agreement for any cause whatsoever.

## 15. INDEPENDENT CONTRACTOR

Contractor and all person(s) employed by or contracted with Contractor to furnish labor and/or materials under this Agreement are independent contractors and do not act as

agent(s) or employee(s) of City. Contractor has full rights to manage its employees in their performance of Services under this Agreement.

## 16. CONFIDENTIALITY AND PROPRIETARY INFORMATION

### A. Confidentiality of Material

All data and information generated, collected, developed, discovered or otherwise saved in the System exclusively for the City, to the extent it contains the City's confidential or proprietary information (collectively the "Data") by the Contractor in the performance of this Agreement are confidential and must not be disclosed to any person except as authorized by City, or as required by law.

### B. Ownership of Material

City and Contractor agree that Contractor shall own the entire right, title, and interest, including patents, copyrights, and other intellectual property rights, in and to all tangible materials, inventions, works of authorship, software, information and data conceived or developed by Contractor in the performance of the project, or developed using Contractor's facilities or personnel. City and Contractor agree that City shall own the entire right, title, and interest, including all patents, copyrights, and other intellectual property rights, in and to all tangible materials, inventions, works of authorship, software, information and data solely conceived and developed by City's facilities or personnel, but shall not include intellectual property of Contractor.

### C. Software and Firmware

Notwithstanding any other provisions herein to the contrary, Contractor or applicable third party owner shall retain all exclusive rights, interest and title in its respective firmware and software. The City's use of firmware and software shall be governed exclusively by Contractor's and/or third party owner's applicable license terms.

### D. Ownership of Data

The City shall maintain ownership and control of the Data, to the extent it contains the City's proprietary information, throughout the Agreement period and in perpetuity. Contractor shall have the right to use the City's proprietary Data solely to perform Services under the Agreement with the City. Contractor may not use the City's proprietary Data, a subset of such Data, and/or a summary of such Data, or, cause or permit the City's proprietary Data, a subset and/or a summary thereof, to be used by any third party, outside the scope of the Agreement without the express written consent of the City. Contractor warrants that throughout all operational and maintenance activities the accuracy of the City's Data will be preserved.

**17. RIGHT OF CITY TO INSPECT RECORDS OF CONTRACTOR**

City, through its authorized employees, representatives or agents shall have the right during the term of this Agreement and for four (4) years from the date of final payment for goods or services provided under this Agreement, to audit the books and records of Contractor solely for the purpose of verifying invoices for charges made by Contractor for any work performed on a time and materials basis in connection with Contractor compensation under this Agreement, including termination of Contractor and records sufficient for verification of Contractor's compliance with any applicable prevailing wage requirements. Such review shall be upon two weeks advance written notice, at Contractor's facilities, and during regular business hours. Contractor agrees to maintain sufficient books and records in accordance with generally accepted accounting principles to establish the correctness of all time and materials charges submitted to City. Any expenses not so recorded shall be disallowed by City. Contractor shall bear the cost of the audit if the audit determines that there has been a substantial billing deviation in excess of ten (10) percent adverse to the City.

Contractor shall submit to City any and all reports concerning its performance under this Agreement that may be requested by City in writing. Contractor agrees to provide reasonable assistance to City in meeting City's reporting requirements to the State and other agencies with respect to Contractor's Services hereunder.

**18. HOLD HARMLESS/INDEMNIFICATION**

- A. To the extent permitted by law, Contractor agrees to protect, defend, hold harmless and indemnify City, its City Council, commissions, officers, and employees, from and against any third party claim for injury, liability, loss, cost, and/or expense or damage, including all costs and attorney's fees in providing a defense to any such claim or other action, and whether sounding in law, contract, tort, or equity, to the extent caused by Contractor's negligent acts, errors or omissions or willful misconduct connected with the Services performed by Contractor pursuant to this Agreement.
- B. Contractor's obligation to protect, defend, indemnify, and hold harmless in full City and City's employees, shall specifically extend to any and all employment-related claims of any type brought by employees, contractors, subcontractors or other agents of Contractor, against City (either alone, or jointly with Contractor), regardless of venue/jurisdiction in which the claim is brought and the manner of relief sought.
- C. To the extent Contractor is obligated to provide health insurance coverage to its employees pursuant to the Affordable Care Act ("Act") and/or any other similar federal or state law, Contractor warrants that it is meeting its obligations under the Act and will fully indemnify and hold harmless City for any penalties, fines, adverse rulings, or tax payments associated with Contractor's responsibilities under the Act.

**19. LIMITATION OF LIABILITY**

NEITHER PARTY, NOR THEIR RESPECTIVE OFFICERS, PARTNERS, AFFILIATES, SUBCONTRACTORS, VENDORS OR SUBSIDIARIES, SHALL BE LIABLE TO THE OTHER FOR CLAIMS FOR CONSEQUENTIAL, INCIDENTAL, EXEMPLARY, PUNITIVE, SPECIAL OR ANY INDIRECT DAMAGES OF ANY NATURE ARISING AT ANY TIME, OR FOR LOSS OF PROFITS OR LOSS OF USE, FROM ANY CAUSE WHATSOEVER, WHETHER ARISING IN TORT, CONTRACT, WARRANTY, STRICT LIABILITY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING ALL LIABILITY ARISING OUT OF SUCH PERSON'S OR ENTITY'S OWN NEGLIGENCE OR FAULT, CONNECTED WITH OR RESULTING FROM PERFORMANCE OR NON-PERFORMANCE UNDER THIS AGREEMENT AND/OR ANY SEPARATE AGREEMENT FOR CITY'S BENEFIT IN CONNECTION WITH ANY WORK COVERED BY THIS AGREEMENT.

NOTWITHSTANDING ANYTHING ELSE IN THIS AGREEMENT, THE TOTAL AGGREGATE LIABILITY OF CONTRACTOR, ITS AFFILIATES SUBCONTRACTORS AND VENDORS TO CITY FOR CLAIMS OR DAMAGES OF ANY NATURE ARISING AT ANY TIME, FROM ANY CAUSE WHATSOEVER, WHETHER ARISING IN TORT, CONTRACT, WARRANTY, STRICT LIABILITY, BY OPERATION OF LAW, OR OTHERWISE, CONNECTED WITH OR RESULTING FROM PERFORMANCE OR NON-PERFORMANCE OF THE WORK UNDER THIS AGREEMENT, SHALL BE LIMITED TO \$5,000,000. FOR AVOIDANCE OF DOUBT, THIS LIMITATION OF \$5,000,000 DOES NOT APPLY TO AMOUNTS OWED TO THIRD PARTIES FOR THEIR CLAIMS FOR PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. FOR THE PURPOSE OF THIS SECTION, EMPLOYEES OR AGENTS OF THE CITY SHALL BE CONSIDERED A THIRD PARTY. AMOUNTS PAYABLE TO THE CITY BY CONTRACTOR FOR PROPERTY DAMAGE CAUSED BY CONTRACTOR SHALL NOT EXCEED \$10,000,000.

**20. INSURANCE REQUIREMENTS**

During the term of this Agreement, and for any time period set forth in Exhibit C, Contractor shall provide and maintain in full force and effect, at no cost to City, insurance coverage as set forth in Exhibit C.

**21. EXCUSE OF PERFORMANCE**

Contractor shall not be liable for delays in performance or for non-performance due to failure or interruption of computer or telecommunication systems, acts of God, war, riot, fire, terrorism, labor trouble, unavailability of materials or components through no fault of Contractor, explosion, accident, compliance with governmental requests, laws, regulations, orders or actions, or other unforeseen circumstances or causes beyond Contractor's reasonable control. In the event of such delay, the time for performance or delivery shall be extended by a period of time reasonably necessary to overcome the effect of the delay.

**22. WAIVER**

Both parties agree that waiver of any one or more of the conditions of performance under this Agreement shall not be construed as waiver(s) of any other condition of performance under this Agreement. Neither the review, acceptance nor payments for any of the System required under this Agreement shall be constructed to operate as a waiver of any rights under this Agreement or of any cause of action arising out of the performance of this Agreement.

**23. NOTICES**

All notices to the Parties shall, unless otherwise requested in writing, be sent to City addressed as follows:

City of Santa Clara  
Attention: Silicon Valley Power  
1500 Warburton Avenue  
Santa Clara, CA 95050  
and by e-mail at [gdougherty@santaclaraca.gov](mailto:gdougherty@santaclaraca.gov), [svpcontracts@santaclaraca.gov](mailto:svpcontracts@santaclaraca.gov),  
and [mpineda@santaclaraca.gov](mailto:mpineda@santaclaraca.gov)

And to Contractor addressed as follows:

Emerson Process Management Power & Water Solutions, Inc.  
200 Beta Drive  
Pittsburgh, PA 15238  
and by e-mail at [christina.spangler@emerson.com](mailto:christina.spangler@emerson.com)

The workday the e-mail was sent shall control the date notice was deemed given. An e-mail transmitted after 1:00 p.m. on a Friday shall be deemed to have been transmitted on the following business day.

**24. COMPLIANCE WITH LAWS**

Contractor shall comply with all applicable laws and regulations of the federal, state and local government, including but not limited to "The Code of the City of Santa Clara, California" ("SCCC"). In particular, Contractor's attention is called to the regulations regarding Campaign Contributions (SCCC Chapter 2.130), Lobbying (SCCC Chapter 2.155), Minimum Wage (SCCC Chapter 3.20), Business Tax Certificate (SCCC section 3.40.060), and Food and Beverage Service Worker Retention (SCCC Chapter 9.60), as such Chapters or Sections may be amended from time to time or renumbered. Additionally Contractor has read and agrees to comply with City's Ethical Standards (<http://santaclaraca.gov/home/showdocument?id=58299>).



**25. CONFLICTS OF INTEREST**

Contractor certifies that to the best of its knowledge, no City officer, employee or authorized representative has any financial interest in the business of Contractor and that no person associated with Contractor has any interest, direct or indirect, which could conflict with the faithful performance of this Agreement. Contractor is familiar with the applicable provisions of California Government Code section 87100 and following, and certifies that it does not know of any facts which would violate these code provisions. Contractor will advise City if a conflict arises.

**26. FAIR EMPLOYMENT**

Contractor shall not discriminate against any employee or applicant for employment because of race, sex, color, religion, religious creed, national origin, ancestry, age, gender, marital status, physical disability, mental disability, medical condition, genetic information, sexual orientation, gender expression, gender identity, military and veteran status, or ethnic background, in violation of federal, state or local law.

**27. NO USE OF CITY NAME OR EMBLEM**

Contractor shall not use City's name, insignia, or emblem, or distribute any information related to services under this Agreement in any magazine, trade paper, newspaper or other medium without express written consent of City.

**28. GOVERNING LAW AND VENUE**

This Agreement shall be governed and construed in accordance with the statutes and laws of the State of California. The venue of any suit filed by either Party shall be vested in the state courts of the County of Santa Clara, or if appropriate, in the United States District Court, Northern District of California, San Jose, California.

**29. SEVERABILITY CLAUSE**

In case any one or more of the provisions in this Agreement shall, for any reason, be held invalid, illegal or unenforceable in any respect, it shall not affect the validity of the other provisions, which shall remain in full force and effect.

**30. AMENDMENTS**

This Agreement may only be modified by a written amendment duly authorized and executed by the Parties to this Agreement.

**31. COUNTERPARTS**


This Agreement may be executed in counterparts, each of which shall be deemed to be an original, but both of which shall constitute one and the same instrument.

The Parties acknowledge and accept the terms and conditions of this Agreement as evidenced by the following signatures of their duly authorized representatives.

**CITY OF SANTA CLARA, CALIFORNIA**  
a chartered California municipal corporation

Approved as to Form:

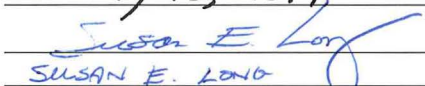
Dated: 7-22-19

  
for BRIAN DOYLE  
City Attorney

 FOR  
DEANNA J. SANTANA  
City Manager  
1500 Warburton Avenue  
Santa Clara, CA 95050  
Telephone: (408) 615-2210  
Fax: (408) 241-6771

"CITY"

**EMERSON PROCESS MANAGEMENT POWER & WATER SOLUTIONS, INC.**  
A Delaware corporation

Dated: July 15, 2019  
By (Signature):   
Name: SUSAN E. LONG  
Title: DIRECTOR, COMMERCIAL OPERATIONS  
Principal Place of Business Address: 200 Beta Drive, Pittsburgh, PA 15238  
Email Address: SUSAN.LONG@EMERSON.COM  
Telephone: 412-963-4752  
Fax: N/A

"CONTRACTOR"

**EXHIBIT A**  
**SCOPE OF SERVICES**

**1. GENERAL**

- 1.1. This Scope of Services covers the replacement of all major plant control systems and interfaces to various auxiliary systems at the Donald Von Raesfeld (“DVR”) (collectively, the “Project”). This Scope of Services defines the requirements for the design, engineering, manufacture, staging, factory test, demonstration, documentation, delivery, installation, certification, field testing and startup of the Distributed Control System (“System” or “DCS”).
- 1.2. This Project is on a turnkey basis whereby Contractor is responsible for installation and commissioning for the scope of supply covered under this Scope of Services.
- 1.3. Contractor is responsible for all system design and implementation. Contractor shall be responsible for reviewing all system and original equipment manufacturer (OEM) documentation, including all current logic and wiring diagrams, and incorporate all currently controlled and connected equipment.
- 1.4. City will not perform any design or engineering for the project and expects that Contractor has experience and capability to fully engineer the replacement System and execute the project successfully. The City will design and implement a new server room and interlocation networking with guidance from the Contractor. The City may review Contractor’s submittals and make comments but this does not remove the responsibility of the Contractor for system design.
- 1.5. The DVR plant consists of the following.
  - 1.5.1. Two (2) General Electric LM6000 PC sprint combustion turbine generators (CTG) single fuel gas with water injection to control NOx and air inlet chilling.
  - 1.5.2. Two (2) ATS Express dual pressure heat recovery steam generators (HRSG) with duct burners and selective catalytic reduction (SCR) and CO catalyst to control emissions.
  - 1.5.3. One (1) Mitsubishi Heavy Industries induction condensing steam turbine generator (STG).
  - 1.5.4. Balance of plant (BOP), a deaerating surface condenser, a mechanical draft, plume-abated cooling tower, and various associated support equipment.
- 1.6. The System shall be a fully engineered system, designed and executed as a fully functional replacement for the existing gas turbines, steam turbine, heat recovery steam generators, and balance of plant systems. Contractor shall meet or exceed all OEM control specifications, sequencing, protection, operational limits, and interlocks. The System shall provide automatic control that maintains operational process limits and time curves for warmup/cooldown requirements. Special attention must be made to both the combustion/steam turbines and generators protection systems, ensuring all

processes critical inputs are evaluated and acted upon within OEM and industry standard time specifications. Examples of critical protection are speed detection, monitoring, and over speed trip system. The System shall be open architecture with no hidden logic or sections of code inaccessible to City.

- 1.7. To the extent not inconsistent with this Agreement between the City and Contractor including this Scope of Services, the City's RFP 18-19-16 (including subsequent updates), Contractor's proposal response dated March 18, 2019, Contractor's system demonstrations materials dated April 11, 2019, and Contractor's Best and Final Offer (BAFO) response dated April 16, 2019 are hereby incorporated by reference herein, and shall supplement this Scope of Services and be subject to the terms and conditions of the Agreement.

## 2. DOCUMENTS

- 1.1. This Exhibit contains the following Appendices:
- 1.2. Appendix A-: I/O Counts
- 1.3. Appendix A-2: Steam Turbine Control Block Diagram
- 1.4. Appendix A-3: Turbine Data
- 1.5. Appendix A-4: OT & EWS Stations
- 1.6. Appendix A-5: Preliminary Project Implementation Schedule
- 1.7. Appendix A-6: Final System Acceptance Certificate
- 1.8. Appendix A-7: SureService Customer Service Support Program

## 3. CURRENT SYSTEM DESCRIPTION

### 3.1. Existing Control System

The hardware locations, as well as the scope of the interfaces between the control systems and ancillary devices, will mimic the current installation. The current control systems to be replaced are outlined as follows.

#### 3.1.1. **Combustion Turbine Generators (CTG), each turbine has its own independent control system**

3.1.1.1. Control: GE Millennium Mark VI, one (1) for each CTG.

3.1.1.2. Engineering Work Station: GE Control System Toolbox and Logicmaster PLC. Mark VI configuration tool installed on local SCADA/HMI.

3.1.1.3. SCADA/HMI: Wonderware, one (1) local and one (1) remote station for each CTG.

### **3.1.2. Steam Turbine**

- 3.1.2.1.** Control: MHI Turbine Control Panel with a Woodward 505 governor.
- 3.1.2.2.** Control (Supervisory): ABB (Harmony) DCS, one (1) Process Control Unit (PCU).
- 3.1.2.3.** Engineering Work Station: ABB Composer, common to all systems except the CTG's.
- 3.1.2.4.** SCADA/HMI: ABB Conductor NT, common to all systems except the CTG's.

### **3.1.3. HRSG's**

- 3.1.3.1.** Control: ABB (Harmony) DCS, one (1) PCU for each HRSG.
- 3.1.3.2.** Engineering Work Station: ABB Composer, common to all systems.
- 3.1.3.3.** SCADA/HMI: ABB Conductor NT, common to all systems except the CTG's.

### **3.1.4. Balance of Plant**

- 3.1.4.1.** Control: ABB (Harmony) DCS, two (2) PCU's for BOP.
- 3.1.4.2.** Engineering Work Station: ABB Composer, common to all systems.
- 3.1.4.3.** SCADA/HMI: ABB Conductor NT, common to all systems except the CTG's.

### **3.1.5. Gas Compressor**

- 3.1.5.1.** Control (Supervisory): ABB (Harmony) DCS, one (1) PCU.
- 3.1.5.2.** Engineering Work Station: ABB Composer, common to all systems.
- 3.1.5.3.** SCADA/HMI: ABB Conductor NT, common to all systems except the CTG's.

### **3.1.6. Switch Yard**

- 3.1.6.1.** Control (Supervisory): ABB (Harmony) DCS, one (1) PCU.
- 3.1.6.2.** Engineering Work Station: ABB Composer, common to all systems.

**3.1.6.3.** SCADA/HMI: ABB Conductor NT, common to all systems except the CTG's.

## **3.2. ABB (Harmony) DCS System**

**3.2.1.** The ABB (Harmony) DCS and Conductor NT SCADA/HMI system to be replaced consist of seven (7) independent process control units (PCU), each with one or two pairs of redundant control processors. With an additional six (6) processors used as foreign device interface units (FDI) to communicate with auxiliary systems. The SCADA stations are common to all control units except the CTG's and are all located in the plant control room. There are currently six (6) dual screen operator SCADA/HMI systems, one (1) OPC Data server (OSI PI Interface) and two (2) engineering work stations (EWS). The first EWS is located in the control room and the second EWS located in the I&C office.

**3.2.2.** The ABB (Harmony) DCS system consist of the following process control units. Contractor shall provide the necessary equipment (i.e. fiber optic modems, Ethernet switches) to communicate between all PCU's and all SCADA/HMI, EWS and all other work stations. The existing fiber optic, Ethernet and data highway cabling between panels (locations) shall be utilized when possible. Inter-panel fiber optic, Ethernet and data highway cabling shall be replaced.

**3.2.2.1.** PCU 1: Unit #1 HRSG Control & CTG Interface & Supervisory Control.

**3.2.2.2.** Location: Auxiliary Power Enclosure.

**3.2.2.3.** Cabinets: Four (4), one (1) Processors & Modules, three (3) I/O Terminations.

**3.2.2.4.** Processor's Control: Two (2) sets of redundant pairs.

**3.2.2.4.1.** Processor's FDI: One (1) interface with the Burner Management System (BMS) control.

**3.2.2.5.** PCU 2: Unit #2 HRSG Control & CTG Interface & Supervisory Control.

**3.2.2.5.1.** Location: Auxiliary Power Enclosure.

**3.2.2.5.2.** Cabinets: Four (4), one (1) Processors & Modules, three (3) I/O Terminations.

**3.2.2.5.3.** Processor's Control: Two (2) sets of redundant pairs.

**3.2.2.5.4.** Processor's FDI: One (1) interface with the Burner Management System (BMS) control.

**3.2.2.6.** PCU 3: BOP Control.

3.2.2.6.1. Location: Auxiliary Power Enclosure.

3.2.2.6.2. Cabinets: Two (2), one (1) Processors & Modules, one (1) I/O Terminations.

3.2.2.6.3. Processor's Control: One (1) set of redundant pairs.

**3.2.2.7.** PCU 4: Steam Turbine, Interface & Supervisory Control.

3.2.2.7.1. Location: Electrical Room.

3.2.2.7.2. Cabinets: Four (4), one (1) Processors & Modules, three (3) I/O Terminations.

3.2.2.7.3. Processor's Control: One (1) set of redundant pairs.

**3.2.2.8.** PCU 5: BOP Control

3.2.2.8.1. Location: Electrical Room

3.2.2.8.2. Cabinets: Four (4), one (1) Processors & Modules, three (3) I/O Terminations.

3.2.2.8.3. Processor's Control: Two (2) sets of redundant pairs.

3.2.2.8.4. Processor's FDI: Two (2) separate interfaces with the plant RIG and RTU.

**3.2.2.9.** PCU 6: Gas Compressor's, Interface & Supervisory Control.

3.2.2.9.1. Location: Gas Compressor Building.

3.2.2.9.2. Cabinets: Two (2), one (1) Processors & Modules, one (1) I/O Terminations.

3.2.2.9.3. Processor's Control: One (1) set of redundant pairs.

3.2.2.9.4. Processor's FDI: One (1) interface with the Gas Compressor control system.

**3.2.2.10.** PCU 7: Switchyard, Interface & Supervisory Control.

3.2.2.10.1. Location: Duane Substation Switchyard, Relay House.

3.2.2.10.2. Cabinets: Two (2), one (1) Processors & Modules, one (1) I/O Terminations.

3.2.2.10.3. Processor's Control: One (1) set of redundant pairs.

3.2.2.10.4. Processor's FDI: One (1) interface with the substation.

- 3.2.3. All cabinets are dual access (front/back) 2200 mm tall x 600 mm wide. Existing cabinets shall be utilized modifying as necessary to accommodate new system. Contractor shall provide all hardware necessary to modify the cabinets to integrate the new control system into the existing enclosures.
- 3.2.4. The existing field wiring shall be utilized. It will be the Contractor's responsibility to design the I/O termination points to accommodate the existing cable locations and lengths. No cable splicing shall be permitted. All field wiring shall be terminated at terminal blocks. All I/O modules shall be pre-wired to terminal blocks/termination units (TU), preferably with pre-manufactured cabling designed for the modules. All module points including spares shall be pre-wired to the TU's. Contractor shall verify existing voltage and amperage for all I/O points and ensure they are compatible with the new system. See Appendix A-1 for a detailed I/O count.

### 3.3. GE Millennium Control System

- 3.3.1. The GE Millennium Controller consists of a Mark VI microprocessor based digital fuel controller and a GE Fanuc 90/70 PLC sequencer. The current engine core version is S5 with enhanced sprint, water injection for NOx control and inlet air chiller system (chiller not included in this Project).
- 3.3.2. The engine core version may be upgraded to S6 or S7.
- 3.3.3. There are two (2) independent Millennium control systems, one for each gas turbine generator system. Each system has one local (panel mounted at TCP) and one remote (main control room) Wonderware InTouch SCADA/HMI station.
- 3.3.4. Located on each local SCADA/HMI station is the GE Control System Toolbox software for the Mark VI configuration, testing and calibration. The 90-70 Logicmaster PLC software is located on a single laptop.
- 3.3.5. The GE Millennium control system consists of the following. Contractor shall provide the necessary equipment (i.e. fiber optic modems, Ethernet switches) to communicate between all controllers and all SCADA/HMI, EWS and all other work stations. The existing fiber optic, Ethernet and data highway cabling between panels (locations) shall be utilized when possible. Internal panel fiber optic, Ethernet and data highway cabling shall be replaced.

CTG-1/2: Millennium Mark VI control systems, the following list is for one unit. The scope shall be for both units.

- 3.3.5.1. Location: Auxiliary Power Enclosure.



- 3.3.5.2.** Turbine Control Panel: Two (2), one (1) Processors & Modules, one (1) I/O Terminations. The TCP contains both local (Mark VI) and remote (90-70) I/O.
- 3.3.5.3.** Remote I/O: Genius Bus I/O.
  - 3.3.5.3.1. Turbine Control Panel (TCP)
  - 3.3.5.3.2. Main Turbine Terminal Box (MTTB).
  - 3.3.5.3.3. Main Generator Terminal Box (MGTB)
- 3.3.5.4.** Two (2) Woodward EM Digital Drivers, 4-20mA control. Drivers shall be replaced with the latest Woodward models.
  - 3.3.5.4.1. One (1) Driver for fuel control, valve not included in upgrade.
  - 3.3.5.4.2. One (1) Driver for water injection control, valve not included in upgrade.
- 3.3.5.5.** Modbus Master: Serial RS485 data link.
  - 3.3.5.5.1. One (1) Slave: Bently Nevada 3500, Hardwire trip, Modbus Slave, RS485 data link for SCADA/HMI.
  - 3.3.5.5.2. One (1) Slave: Digital Meter Multi-Function (DMMF), Generator Data, Modbus Slave, RS485 data link.
- 3.3.5.6.** Woodward DSM Synchronizer, not included in upgrade.
- 3.3.5.7.** Bently Nevada 3500: Integrate only, (Option to replace).
- 3.3.5.8.** Brush Prismic A30 AVR: Integrate only, not included in upgrade.
- 3.3.5.9.** Beckwith M-3425 Generator Protection (Redundant): Integrate only, not included in upgrade.
- 3.3.6.** There are three existing cabinets for each CTG to be utilized, modifying as necessary to accommodate new system. This is a typical GE design and it is expected that Contractor has experience fitting the new controls, communications and I/O into the TCP, MTTB and MGTB panels. Contractor shall provide all hardware necessary to modify the cabinets to integrate the new control system into the existing enclosures.
- 3.3.7.** The existing field wiring shall be utilized. It will be the Contractor's responsibility to design the I/O termination points to accommodate the existing cable locations and lengths. No cable splicing shall be permitted. All field wiring shall be terminated at terminal blocks. All I/O modules shall be pre-wired to terminal blocks/termination units (TU), preferably with pre-manufactured cabling designed for the modules. All module points including spares shall be pre-wired to the TU's. Contractor shall verify

existing voltage and amperage for all I/O points and ensure they are compatible with the new system. See Appendix A for a detailed I/O count.

### **3.4. Mitsubishi Heavy Industries- Turbine Control Panel**

- 3.4.1.** The Mitsubishi Heavy Industries (MHI) Turbine Control & Protection Panel (TCP) consists of the following major components:
  - 3.4.1.1.** Woodward 505 Digital Governor.
  - 3.4.1.2.** Woodward Electrical to Hydraulic Converter & Amplifier (Not included in upgrade).
  - 3.4.1.3.** Woodward ProTech 203 Overspeed Protection System.
  - 3.4.1.4.** Bently Nevada 3500, (Option to replace).
  - 3.4.1.5.** Turbine Protection Interlock Relay Panel
  - 3.4.1.6.** Auxiliary Motor Interlock Relay Panel.
  - 3.4.1.7.** Various Relays, Distributors & Isolators.
- 3.4.2.** The MHI TCP is a mixture of devices designed to form all major steam turbine control functions. This is an obsolete design and shall be completely replaced. All components shall be removed from the panel; no unused terminal boards, relays, switches or wiring shall be abandoned in place. The current panel mounted motor control HOA switches shall be retained and intergraded into the new control system. Contractor shall make recommendations for the remaining front panel mounted controls and coordinate with City. All unused panel penetrations shall be covered in a neat manner. The option to replace the panel completely or to use as a remote I/O panel is up to the Contractor. When relays are required for digital outputs, the same relays used throughout the new control system shall be used.
- 3.4.3.** All points wired to the MHI TCP that activate interposing relays and distributors that then send signals to the TCP and DCS shall be removed and go directly to the DCS. The MHI TCP may be used as a marshalling panel or have remote I/O installed. All points shall now be wired directly to the control system.
- 3.4.4.** The DCS is used as an interface and supervisory control, with approximately 75 I/O points going to the MHI TCP and 200 I/O points coming from the MHI TCP. The DCS points that are hard wired commands to the MHI TCP shall be removed, and all wiring removed, or reused. See Appendix A for a detailed I/O count.
- 3.4.5.** The Bently Nevada 3500 is also used to monitor critical steam turbine temperatures and active a turbine trip, then output temperatures to the

DCS. All temperature shall come directly into the new control system, the Bently Nevada 3500 will be reconfigured or replaced.

- 3.4.6. The steam turbine governing valve is controlled by the MHI TCP via the Woodward 505. The electric signal of 20-160 mA from the governor is transmitted to E/H converter in the amplifier (AMP) where the electrical signal is converted into the mechanical signal. (i.e. the angular displacement of the E/H converter output lever which is proportional to the electric signal).
- 3.4.7. As shown in the Steam Turbine Control Block Diagram (Appendix A-2), the DCS has direct control of the HP (HPBV) and LP (LPBV) steam bypass valves and the induction steam control valve (ICV).

#### **4. GENERAL DESCRIPTION OF THE NEW CONTROL SYSTEM**

##### **4.1. General**

- 4.1.1. The System shall have direct interface suitable for existing turbine devices and instruments. The new system shall have the modules required for turbine control, including speed measurement and valve interface.
- 4.1.2. The System shall have a common integrated hardware platform across BOP, HRSG, CTG, and STG controls. With a common engineering tool across BOP, HRSG, CTG, and STG controls.
- 4.1.3. The System shall be provided with a minimum of 25% usable spare computation capability, memory, logic block capacity, and display block capacity in the most heavily loaded control processor, with point dead bands set to no greater than 0.5% of span.
  - 4.1.3.1. System shall have redundancy at CPU, network, and HMI level.
  - 4.1.3.2. No external devices or signal conditioners are permitted.
  - 4.1.3.3. Sequence of Events (SOE) modules are required for all critical digital IO, at minimum all current DCS SOE points will be configured for high speed sequence of events recording and reporting.
  - 4.1.3.4. Start permissive and trip displays for easy troubleshooting.
  - 4.1.3.5. All Interlocks, Permissive, Runbacks, Holds shall have a detailed graphics display listing the status of each input or condition to the function.
  - 4.1.3.6. All system multi point interlocks and trip functions shall have a detailed status listing, including a First Out for trip functions.

- 4.1.3.7. Overrides (enable/disable) for interlocks with override status and alarm functions. Critical system protection shall not have overrides. City and Contractor to determine points.
- 4.1.4. Steam and Gas Turbine Specific Functions
  - 4.1.4.1. Unit operation maintenance summary with equivalent Hours and starts counters calculations.
  - 4.1.4.2. Automatic turbine trip reports. System shall have high speed data recording capable of recording selected critical values, digital and analog, at 10ms (or less) resolution for use in post-disturbance analysis. The automatic trip reports shall go back for at least 1 minute before the event and 1 minute after. The logs shall be automatically archived onto the Historian hard drive.
  - 4.1.4.3. Update time for variable geometry and other critical control loops shall be 10ms or less.
  - 4.1.4.4. Speed detection and over speed trip functions shall be 10ms or less.
  - 4.1.4.5. Over speed test functions from HMI screen.
  - 4.1.4.6. Valve and variable geometry calibration from HMI screen.
  - 4.1.4.7. Manual bias of water injection for improved NOx control.
- 4.1.5. In addition, controller shall have communications modules for interfacing with industry standard protocols used with devices like protection relays, CEMS, RTUs, Fire & Gas systems, vibration monitor, DCS etc.

## **4.2. Redundancy and Fault Tolerance**

- 4.2.1. Redundancy shall be provided for, but not limited to, the following.
  - 4.2.1.1. Processors
  - 4.2.1.2. Power supply – Incoming
  - 4.2.1.3. Power supply – System
  - 4.2.1.4. Communications (internal, data highway, HMI communications)
- 4.2.2. All processing equipment shall be fully redundant (primary and backup). Redundant backup equipment shall be dedicated to the backup of specific equipment on a one-to-one (1+1) basis (active/active resilience level). Floating backup, where one set of equipment can backup two or more pieces of equipment, is not considered reliable and is not permitted.
- 4.2.3. Upon detection of a fatal failure in the primary equipment, the backup equipment shall assume operation in a bumpless fashion. This condition

shall be alarmed. Transfer of control back to the primary equipment will require deliberate manual reset.

- 4.2.4. For normal operations, the backup equipment shall have parallel access to the system and continuously update while in the backup state. The intent is to maintain the status of the backup equipment current so that transfer of information from the failing primary controller is not required.
- 4.2.5. The ability shall exist to download to the primary processor to facilitate the testing of new code prior to the backup processor being updated.
- 4.2.6. When peer-to-peer communication between controllers is employed, there shall be no interruption in communication upon transfer of either the primary processor to its backup, transfer of a backup processor to its primary, or during data highway faults.

### 4.3. Operator Stations

- 4.3.1. Total operation and monitoring of the plant shall be through the SCADA/HMI Operator Terminals (OTs). The following functions shall be possible from any OT:
  - 4.3.1.1. Selection of automatic, cascade and manual operation and the adjustment of set points, bias settings, and limits.
  - 4.3.1.2. Motor start/stop and valve open/close control.
  - 4.3.1.3. The ability to enable, disable, and acknowledge alarms.
  - 4.3.1.4. Monitor all analog and discrete points in the system.
  - 4.3.1.5. Access details for every displayed analog and discrete point in the system. Ability to access logic diagrams from point selection.
  - 4.3.1.6. Create trending displays and observe trended information.
  - 4.3.1.7. Calibrate and tune the system from a password protected environment.
  - 4.3.1.8. Operate interactive graphics displays from a password protected environment.
- 4.3.2. The Control Room shall have a total of sixteen (16) operator display screens. This should be accomplished by four quad screen OT stations. One OT station will have two standard displays (30") and two large format (55" HDMI Input) displays, all other display screens shall be 30" LCD monitors.
- 4.3.3. The Auxiliary Power Enclosure (APE) CTG OT local stations. The new system shall incorporate a single desktop dual monitor operator OT station and a single desktop dual monitor EWS station with both CTG 1&2

integrated, instead of the independent TCP panel mounted stations. The TCP panel mounted screens shall be removed and have a blanking plate installed. Alternatively two (2) dual monitor combination OT and EWS stations may be utilized. The remote APE stations shall be locked to view only mode by password protected security by default. See Appendix A-4 for a general OT and EWS layout.

#### **4.4. Engineering Work Stations**

- 4.4.1.** There shall be at minimum three (3) dual monitor Engineering Work Stations (EWS), one at each of the following locations.
  - 4.4.1.1.** Server Room (new next to Main Control Room).
  - 4.4.1.2.** I&C Office.
  - 4.4.1.3.** Auxiliary Power Enclosure (as described above).
- 4.4.2.** Each EWS will have the ability to develop, edit and monitor all processors (Logic), processor/interface modules (FDI), and SCADA/HMI stations. The I&C office EWS shall ability to remotely connect to and configure the Domain controllers, Historian and the OPC data servers.

#### **4.5. OPC Servers**

- 4.5.1.** There shall be redundant OPC servers for the plant PI system. The OPC servers shall be independent of the SCADA/HMI system. The OPC server shall have separate Ethernet connections for the control system and the plant PI interface.

#### **4.6. Historian**

- 4.6.1.** The System shall include redundant historians for gathering, analyzing, and reporting plant information. The historian shall be specifically designed to support plant operations. The historian shall be an integral component of the control system; third party add-on historians or data management systems are not acceptable.
- 4.6.2.** The data historian shall reside on the control system network and provide mass storage into which process values, alarms, sequence-of-events, calculated values, and operator actions shall be archived. The historian shall utilize a dead band compression technique to store information without impacting the fidelity of retrieved data. Trend data will be readily available to plant personnel via defined trend displays, menu driven functions, and ad hoc queries; any point in the system can be trended simply by assigning that point to a new or existing trend display. Personnel shall be able to define and save trends for groups of variables in which they are interested in situations where, for example, there are operational abnormalities meriting investigation.

#### **4.7. Domain Controllers**

- 4.7.1.** Domain controllers shall be utilized to facilitate central operator logon credentials. There shall be redundant domain controllers; optionally a system to facilitate central operator logon credentials.

### **5. EQUIPMENT SPECIFICATIONS**

The OTs shall be completely self-contained and independent. The OTs will utilize PCs, minimum 30" LCD monitors, QWERTY type keyboards and laser mouse pointing devices. A total of five (5) quad monitor OTs will be provided and three (3) dual monitor EWS stations. Four (4) OT stations will be located in the control room and one (1) will be located in the Auxiliary Power Enclosure (APE). The APE OT station will share two (2) monitors with one (1) of the EWS stations.

Video screen displays, including interactive graphics, shall be fully displayed and operative on the video screen in two seconds or less. All displayed data shall have been actually measured at the input terminations within two seconds or less.

Any operator-initiated control action, whether requested by the keyboard or mouse shall be executed within one second or less. Confirmation that an operator action has been executed shall be displayed on the video screen within two seconds or less. Execution and confirmation to an operator action shall not be slower due to high system activity, such as an alarm avalanche during a process upset.

Operator workstations shall be provided with a means of controlling access to the system by means of a password. The functions that are accessible without invoking security shall, in general, include auto/manual selection, set point and bias adjustment (within limits) and control drive positioning.

The City has standardized on Dell for computers and monitors. The Dell computers specified herein provide minimum system requirements.

#### **5.1. Control Room and Auxiliary Power Enclosure Operator Stations**

- 5.1.1.** Contractor shall coordinate with the City in the design, procurement and installation of new control stations for the main control room and the addition of a station in the auxiliary power enclosure. The new stations shall incorporate monitor support (2 high), cable management, networking devices and computer placement.
- 5.1.2.** There shall be three (3) distinct sections in the main control room. The new station in the auxiliary power enclosure shall be a combined OT and EWS station.

#### **5.2. Computers, Servers and Monitors**

- 5.2.1.** The operator stations and engineering work stations shall be Dell Precision Workstations, with a minimum of 32 GB of RAM, redundant solid state hard drives (minimum 256 GB), Raid 1, two or more NIC's and redundant power

supplies. All stations will have Windows 10 or greater operating system and come with Microsoft Office Professional.

**5.2.1.1.** The four (4) OT's in the Control Room are to be rack mounted Dell Precision Workstations with IP KVM system.

**5.2.1.2.** The Server Room EWS shall also be a rack mounted Dell Precision Workstation with IP KVM.

**5.2.1.3.** The Auxiliary Power Enclosure OT and EWS stations shall be tower Dell Optiplex Workstations.

**5.2.1.4.** The I&C Office EWS station shall be tower Dell Optiplex Workstation.

**5.2.2.** All server shall be Dell PowerEdge Servers, redundant power supplies, hot pluggable redundant hard drives. Separate hard drives for backups and data storage.

**5.2.3.** All display screens shall be Dell UltraSharp 30" monitors, with the exception of the two large format (55" HDMI Input) displays.

### **5.3. IP Based KVM Switching System**

**5.3.1.** All control room OT's and EWS shall utilize IP based KVM system. The KVM system shall use separate redundant networking equipment and switches from the main control system network. The system shall have the capacity to integrate the City's other control system computers and monitors. See Appendix A-4 system diagram. Although the system diagram shows local work stations for the OT's, this is for visualization only.

### **5.4. Printers**

Dedicated printers shall be provided for the following services:

**5.4.1.** One (1) color laser-jet type, engineering workstation printer capable of printing on 11"x17" paper, to be located near the EWS.

**5.4.2.** One (1) color laser-jet type, operator terminal printer capable of printing on 8.5"x11" paper, to be located in the Control Room.

**5.4.3.** All printers shall have Ethernet connectivity built in.

**5.4.4.** All printers shall be provided with sufficient noise silencing to be compatible with control room operations.

### **5.5. Network**

**5.5.1.** Contractor shall provide new network switches that are integrated with the overall security program. The control network shall be an isolated network with a DMZ zone for external connections. It is expected that Contractor



will provide a comprehensive security system. See System Security section.

- 5.5.2. All control system network connections between workstations, processors, and I/O modules shall be redundant. Routing for redundant networks will include separate cables and routes (when possible) for redundant pairs.
- 5.5.3. All network equipment will be located locally to the control system equipment, and internal to the control system cabinets and server room located next to the control room.

#### **5.6. Processors**

- 5.6.1. The process controllers shall be provided with fault tolerant redundancy. The control system processors shall be complete with a redundant data highway communication interface, and mounted in ventilated enclosures.
- 5.6.2. Processor capability shall be such that operation is not impacted during any condition with loop execution time set to 250ms or less for all loops.

#### **5.7. System Power Supply and Distribution**

- 5.7.1. The power provided for the control system shall be two 120 VAC UPS feeds. All required power supply modules for processor and I/O power shall be furnished with the system. Contractor shall distribute this power, as required, within the cabinets, with appropriate regulation, circuit protection and wiring.
- 5.7.2. Power supplies shall be provided in 1+1 redundancy configuration. The failure of any supply shall be alarmed. Both of the redundant supplies shall be diode shared, or another suitable redundant method, such that failure of any supply shall not cause a power interruption to any portion of the system. Power supplies shall be capable of being removed and/or replaced on line.
- 5.7.3. Power supply loading shall be below 75% at time of system shipment (including anticipated spare I/O loading). Loading calculations shall be furnished for review.
- 5.7.4. Engineering and operator workstations and computer monitors shall be provided with 120 VAC UPS power.
- 5.7.5. All I/O power shall be monitored and alarmed when failed. The current ABB system has one (1) discrete input dedicated per input module to indicate input power is available. When this input is false, a module power monitor alarm is generated.
- 5.7.6. Any cabinet containing "processors" or isolated I/O in a separate location shall be provided with a high cabinet temperature alarm. An analog temperature sensor will be used for this purpose. The control system will continually monitor and record this temperature.

## **6. SYSTEM SECURITY**

- 6.1.** The System shall provide enhanced protection for secure, reliable and efficient plant operation without disruption.
- 6.2.** At a minimum, the integrated security suite shall include the components and/or functions detailed below. The security suite must include the appropriate infrastructure hardware and network equipment to host the suite in its own security DMZ while connecting to multiple process networks.
  - 6.2.1.** The System shall employ user accounts with password protected access. The System shall have a centralized operator logon credentials and password management.
  - 6.2.2.** Antivirus – Centrally monitors and manages antivirus status and activity, delivers validated monthly antivirus signature updates and notifies or reports detected infections by date and antivirus signature version status. Control System OEM validated solutions are preferred and must be approved by City.
  - 6.2.3.** Patch Management – Security patch management to facilitate deployment of patches, assess vulnerabilities and streamline documentation. Control system OEM validated solutions are preferred and must be approved by owner.
  - 6.2.4.** System Backup and Recovery – Image based backup solution that supports universal restore capability to execute scheduled, event triggered or manual backup schemes. Aids recovery from a disaster. Restore workstations and servers. Control system OEM validated solutions are preferred and must be approved by City.

## **7. TECHNICAL REQUIREMENTS**

### **7.1. System Configuration**

- 7.1.1.** The System shall be configured, calibrated, tuned and modified using workstations with appropriate security to prevent unauthorized changes. It shall not be necessary to use a host computer, or other peripheral device, to configure the System.
- 7.1.2.** The control functions will reside in dedicated redundant microprocessor-based devices that shall be as functionally independent of each other as practical. Peer-to-peer communication via the data highway between all control devices shall be provided.
- 7.1.3.** Functional diagrams shall be per ANSI/ISA-5.1-1984 (R1992), ANSI/ISA-5.2-1976 (R1992), or City approved equal. Contractor shall supply all the system engineering and hardware needed to constitute a fully integrated, complete, and operable startup, shutdown, and on-line control system whether or not specifically detailed.

- 7.1.4. During transient conditions causing deviations of process variables, the System shall not permit deviations that exceed the specifications set by the manufacturer of the process equipment being controlled. In no event shall the performance of the System become the limiting factor on unit responsiveness. The System shall be capable of producing smooth load changes without overshoot unless these changes are not achievable because of plant equipment limitations.
- 7.1.5. The System and components shall be designed to react with a predictable and safe response in the event of a voltage dip or spike.
- 7.1.6. Configuration and interlocks shall be provided to ensure that systems are placed in operation and automatic mode in a safe sequence. Unsafe combinations of automatic and manual modes shall be prohibited.
- 7.1.7. Wherever control limits, blocks, lock-ups or other overrides are imposed, the affected controllers shall track the occurrence and will discontinue integration (anti-reset windup provided). When the override is removed, the controls shall be balanced to the existing process and shall immediately resume normal control without causing improper movement of the control drive.

## 7.2. Graphics

- 7.2.1. Process graphic displays, trend displays, faceplate displays, and permissive displays that show the status of system interlocks shall be included. Faceplates shall also be included as pop-up windows on the process graphic displays. All current process graphics will be reproduced – approximately 110 main graphics screens, not counting alarms summary, face plate, and system status screens.
  - 7.2.1.1. DCS                    68 main display screens
  - 7.2.1.2. GT-1                   18 main display screens
  - 7.2.1.3. GT-2                   18 main display screens
  - 7.2.1.4. New                    7 New screens
- 7.2.2. The City will provide new startup and overview screen layouts to facilitate the integrated system startup and monitoring. Contractor shall provide suggestions and examples.
- 7.2.3. In addition to the process graphic displays, it is expected that system status (loop, I/O, processors, power status, etc.), alarm summary, disabled/inhibited alarms, trends, interlock, permissive and general information screens and pop-ups will be developed.
- 7.2.4. All displays (including loop tuning, trends, and graphics) shall be available at the operator station and engineering work station. All video screens will be capable of displaying color interactive graphics.

### **7.3. Trending**

- 7.3.1.** The operator stations and the engineering workstation shall be capable of displaying trends of any combination of values in the system.
- 7.3.2.** Trending capabilities shall include the following features:
  - 7.3.2.1.** The ability to pan and zoom.
  - 7.3.2.2.** Both time and variable amplitude grids and a display of the digital value of the trended variables.
  - 7.3.2.3.** Current time display in hours, minutes, and seconds to the most recent trend update.
  - 7.3.2.4.** Cursor time display in days, hours, minutes, and seconds when displaying historical data during scrolling.
- 7.3.3.** Up to eight (8) trends per page with operator capability to mask or change trend plots to focus on specific trends.

### **7.4. Alarm Reporting and Logging**

- 7.4.1.** Alarms shall be generated in the event of any difficulty (problem) with any part of the control system including, but not limited to, all parts of the data highways, file servers, work stations, processors, power supplies, and input or output cards (even if the system recovered from the difficulty).
- 7.4.2.** Process alarms shall be assignable for every variable in the database. Any one of three levels of alarm severity shall be assignable to every variable, or the alarm can be suppressed. The system shall have filters that can filter alarms by priority or by function group. A suppressed and/or disabled alarm graphics display page and a report function shall be incorporated.
- 7.4.3.** Indicated alarms shall have at a minimum three levels of presentation, with Priority 1 being the highest priority and lower priority level increasing in number. All system alarms shall automatically be the lowest priority alarms. Each of the priority alarm levels shall show up as a different color on the LCD display. All alarms shall be reported on the alarm printer.
- 7.4.4.** Three alarm categories shall be available: unacknowledged alarms, alarm history, and alarm list (only those alarms still in alarm).
- 7.4.5.** The displays shall allow a single keystroke for acknowledgment of the most recent alarm and silencing the horn. The alarm summary screen shall allow for page acknowledgement of all active alarms.

## **7.5. Alarm Generation**

- 7.5.1.** High and low process alarms shall be available to be assigned to each analog input and calculated process variable without the need for additional equipment or without affecting system throughput.
- 7.5.2.** Alarm setpoints shall be stated in the engineering units of the process variable to which it is assigned.
- 7.5.3.** An individually set and selected hysteresis dead-band shall be provided for each process alarm. The process variable must return past the alarm setting by the value of the dead-band before the alarm is returned to normal.
- 7.5.4.** The most current alarm shall appear at the top of the alarm display screen. When the alarm screen is activated the actual alarms shall display automatically.

## **7.6. Logs**

- 7.6.1.** The system shall provide status logs, sequence logs, engineering logs, and operations logs. The logs must capture all changes to the system, including development changes.

## **7.7. Action on Loss of Power**

- 7.7.1.** The system design shall recognize that full or partial loss of power can occur. Loss of power, or its restoration, shall not cause spurious motion of any control drive. The system shall allow the user to configure outputs to fail in place, fully open, fully closed, or in some intermediate position.

## **7.8. System Diagnostics**

- 7.8.1.** System diagnostics shall be provided as an integral part of the control system. Automatic recognition and location of instrumentation and control (I&C) faults shall be available at the engineering and operators workstations. Fault alarms shall be for each device fault. The system shall locate and graphically display the fault location down to the I/O point level.
- 7.8.2.** In addition to system fault detection, system hardware components status shall be available to indication performance parameters including cycle times, operating states, space occupied, and buffer memory.

## **7.9. Data Highway**

- 7.9.1.** The data highway will utilize redundant Ethernet networks, via 100 megabit/second (fast) Ethernet, at a minimum, utilizing commercial off the shelf (COTS) component. Each data highway shall be functionally redundant to the extent that any single point of failure shall not cause partial or total control system failure. Redundant cabling shall utilize separate cables, routed in separate conduits (when available).

- 7.9.2. Highway speed and access time will be such that any operator action will be executed in 1.0 second or less under upset as well as steady state conditions. Contractor shall confirm the guaranteed response time under all operating conditions including an alarm burst of 1000 process variable alarms occurring within 2 seconds.
- 7.9.3. The failure of any station on the highway to respond shall not inhibit communication between all remaining stations. Back-up controllers, where provided, shall assume all communication functions, including peer-to-peer. This condition shall be alarmed. If data from the failed station is used for control or alarm in another station, appropriate protective action shall be incorporated into the system logic to avoid incorrect control action.
- 7.9.4. Diagnostics shall continuously monitor the status of the data highway. Failure of the data highway path to communicate with any station on the highway shall be alarmed.

## **8. INPUT AND OUTPUT MODULES**

All currently installed active and spare I/O will be accommodated (see Appendix A-1). Contractor shall provide 5% to 10% installed spare of each unique type of I/O. Spare calculations shall be rounded up to the next highest whole point count. Spare I/O shall be calculated by location (PCU, panel grouping). For example, the current ABB DCS is distributed into 7 PCU's, the spare calculation shall be per PCU per I/O type. Large I/O count locations may be reduced to 5% spare points. While a panel with only one 16-point analog input card shall have 2 spare points, 1.6 points rounded up to 2 points. In some cases, the ability (physical space, system capacity) to add a new I/O card shall be considered satisfactory spare capacity. Each case of less than 10% spare capacity must be identified by the Contractor and approved by the City.

### **8.1. Analog Inputs**

- 8.1.1. The minimum accuracy of the analog to digital conversion shall be 0.1% of span with a bit resolution of 12 bits plus sign.
- 8.1.2. Common mode rejection of the analog inputs shall be 90 dB at 60 Hz or greater. Normal mode rejection of the analog inputs shall be 35 dB at 60 Hz or greater.
- 8.1.3. All inputs shall fully meet the transient surge protection requirements of ANSI/IEEE C37.90, including the requirement that no false or spurious actions will occur.

### **8.2. Thermocouples**

- 8.2.1. The accuracy of the analog to digital conversion shall be 0.1% of span or better. Analog to digital conversion shall be at least 12 bits plus sign.
- 8.2.2. Cold junction compensation will be incorporated at the first point of termination, if external terminal blocks are used.

### **8.3. Resistance Temperature Detectors (RTDs)**

- 8.3.1. The accuracy of the analog to digital conversion shall be 0.1% of span or better. Analog to digital conversion shall be at least 12 bits plus sign.

### **8.4. Discrete Inputs**

- 8.4.1. Discrete inputs shall meet the surge withstand requirements of IEEE-472, including the requirement that no false or spurious action will occur.
- 8.4.2. In the input cabinets, visual status indication, such as an LED, shall be provided for each discrete input.
- 8.4.3. Means shall be provided to eliminate the spurious effect of contact bounce. Contractor shall state the means employed to accomplish this while still maintaining a 1-millisecond resolution.

### **8.5. Discrete Outputs**

- 8.5.1. A visual status indication, such as an LED, shall be provided for each discrete output. All outputs shall be individually fused, or utilize relay contacts with a separate, fused, power supply. The loss of one channel, due to short or ground, will not cause the loss of the entire card or system power supply.
- 8.5.2. Discrete outputs shall meet the surge requirements of IEEE-472.
- 8.5.3. Fail-safe features required on discrete outputs include a configurable option to fail open or fail closed on a loss of communication with the control processor. Internal circuit protection for output modules shall be provided such that a fault on one output does not cause other outputs to fail.

### **8.6. Analog Outputs**

- 8.6.1. All analog outputs shall be short-circuit and open-circuit protected and may be grounded or ungrounded.

## **9. DOCUMENTATION**

Operations, maintenance manuals, engineering drawings, diagrams and configuration data.

### **9.1. Operations Manual**

- 9.1.1. Contractor shall provide a detailed operation manual or series of manuals by system. Operation manuals shall include the following as a minimum:
  - 9.1.1.1. Startup, shutdown and normal operation steps and sequences.
  - 9.1.1.2. Setpoints, alarms, permissive, interlocks and shutdowns (trips).
  - 9.1.1.3. Control algorithms and sequences.

- 9.1.2. In general, all control system functions shall be explained. Basic logic diagrams shall be used to explain complex control algorithms. All alarms, permissives, setpoints, conditions and resulting action shall be clearly defined by the use of charts, tables and descriptions.
- 9.1.3. The operations manual does not need to include basic theory of operations or software general procedures. It is assumed that the operations personnel are qualified in HRSG, BOP, CTG, STG and general plant operations. What is required is a site specific control system description used to operate and trouble shoot plant operations. Control system logic will not substitute for basic logic diagrams. Actual logic includes software functions that are not required to explain operation functionality. There may be two documents produced, i.e. Operations Manual and Control System Specification, as long as all operational sequences, limits, time delays, curves, and alarms, interlocks, permissives conditions and setpoints are detailed.
- 9.1.4. The Operations Manual and Control System Specification shall be submitted as part of the "System Factory Test and Demonstration" documentation. This will be utilized by the City as part of the factory acceptance testing.

## **9.2. Electrical System Schematics and Drawings**

- 9.2.1. An electrical system schematic(s) shall be provided to aid in the wiring of the system as well as troubleshooting of the system once installed. Detailed drawings of all internal panel connections shall be provided. Detailed external connection drawings (I/O) with final device connections, tag numbers, descriptions and cable numbers. All panel to panel connections will show detailed terminations shown, i.e., new steam turbine controller connections to the Generator Control & Protection Relay Panel. Final point terminations to other panels shall be identified and have the relevant vendor drawing numbers identified.
- 9.2.2. Contractor shall provide as an option complete detailed loop drawings showing all intermediate connections, i.e., junction boxes and panels.

## **9.3. Configuration Data**

- 9.3.1. Configuration (programming) data sheets shall be completely filled and supplied with the hardware when it is shipped. All site specific hardware configurations (i.e. jumpers, dip switches, shunts) shall be included in the documentation. The City understands that these may change slightly during the commissioning of the system and that Contractor will supply updated data sheets after the commissioning.

## **9.4. Owner Drawings**

- 9.4.1. Contractor shall work with the City to carefully mark up all points where the System interfaces with the City's electrical and hydraulic drawings and show where any changes have been made to the present system.



- 9.4.2. Contractor shall take existing paper drawings and provide updated CAD drawings based on revisions and information provided by City.

## **9.5. Installation Manuals**

- 9.5.1. Contractor shall provide three (3) sets of installation and operation manuals. These manuals are to be included with the hardware shipment to the City. These manuals are to be supplied with marked locations where the final drawings are to be inserted after final commissioning. Each manual shall be a hinged, D-Ring type binder with numbered index tabs. Each of these manuals shall include (or include locations as noted above) at least the following data:

- 9.5.1.1. An easy to follow contents of enclosures
- 9.5.1.2. A material listing of all supplied items with manufacturers part numbers
- 9.5.1.3. A system description of operation
- 9.5.1.4. Operations and maintenance manuals of all vendors' products used for the project
- 9.5.1.5. Mechanical demolition drawings
- 9.5.1.6. Mechanical assembly drawings
- 9.5.1.7. Electrical system schematic
- 9.5.1.8. Control configuration (programming) data

## **9.6. Network Drawings**

- 9.6.1. Contractor shall provide a control system network drawing that shows all required cables and the appropriate cabinet terminations. Overall system connectivity drawings shall be provided for all ethernet, data highway, remote I/O or any other type of network, showing location to location and detailed point connections.
- 9.6.2. A combination of drawings and configuration sheets shall be provided including all relevant data, i.e., IP addresses, computer names, switches, security devices, etc.

## **9.7. Drawing format**

- 9.7.1. Drawings are to be supplied on paper, electronic printable copies (e.g., PDFs) as well as the native editable format (e.g., AutoCAD native \*.dwg file). Acrobat PDF files are not acceptable as an editable format.

## **10. FURNISHED BY THE CITY**

**10.1.** The following will be provided by the City:

- 10.1.1.** All conduit and wiring between field devices and control panel mounted equipment and control system terminations for the currently installed system.
- 10.1.2.** Electric power, both line AC and UPS. Input power to the control systems will be 120 VAC UPS.
- 10.1.3.** Heating and air conditioning of the room housing the control equipment.
- 10.1.4.** Any additional fiber optic cable runs required for the DCS network or serial link.

## **11. FURNISHED BY CONTRACTOR**

**11.1.** Contractor shall provide the following:

- 11.1.1.** All control system hardware and software as required to meet this Scope of Services.
- 11.1.2.** Demolition of existing control cabinet equipment that will no longer be used. Equipment will be stored on site.
- 11.1.3.** All control system interconnecting cables, pre-assembled or bulk, as well as any required connectors, etc.
- 11.1.4.** All equipment and tools required for installation and repair.
- 11.1.5.** Hardware design and configuration.
- 11.1.6.** Staging, testing, and demonstration of the entire system.
- 11.1.7.** As-built documentation, including loop drawings (field device to the control system terminal), revised electrical drawings, and control system layout drawings. All drawings to be provided in vector (native file) and raster (PDF, etc.) format.
- 11.1.8.** The installation, testing, and commissioning of all equipment, including power connections and the termination of field devices.
- 11.1.9.** Three hard copies and one soft (CD) copy of all documentation and instruction manuals.
- 11.1.10.** Project management and expediting services required for achieving the requirements of this specification.
- 11.1.11.** Startup spare parts required to support commissioning.

## **12. APPLICABLE CODES AND REFERENCES**

- 12.1.** Pertinent sections of the latest issue of the following codes and standards are provided as references.
  - 12.1.1.** ASME – American Society of Mechanical Engineering
  - 12.1.2.** IEEE – Institute of Electrical and Electronic Engineers
  - 12.1.3.** ISA – Instrumentation, Systems, and Automation (ISA) Standards and Practices
  - 12.1.4.** ANSI/NEMA ICS6 – Enclosures for Industrial Controls and Systems
  - 12.1.5.** ANSI/IEEE C37.90 – Guide for Surge Withstand Capability (SWC) Tests.
  - 12.1.6.** SP51.1 – Instrumentation Terminology
  - 12.1.7.** SP5.1 – Instrumentation Symbols and Identification
  - 12.1.8.** ITS 90 Conversion Tables for Thermocouples.
  - 12.1.9.** NEMA – National Electrical Manufacturers Association
  - 12.1.10.** ANSI/ISA18.2-2016, EEMUA 191-3<sup>rd</sup> edition, and IEC 62682-2014
  - 12.1.11.** NFPA 70 – 2017 National Electric Code

## **13. ENVIRONMENTAL**

- 13.1.** The System shall meet the following environmental conditions:
  - 13.1.1.** Ambient temperature: 32°F – 122°F (0°C – 50°C)
  - 13.1.2.** Temperatures greater than 50°C shall require an air conditioning system
  - 13.1.3.** Humidity: 5% to 95%, non-condensing

## **14. EXECUTION**

### **14.1. Project Management and Engineering**

- 14.1.1.** Contractor shall assign a Project Manager (PM) to lead the tasks for the Project. The PM shall be the primary person communicating with the City and keeping City fully apprised on the status and progress of the Project. The PM shall be responsible for project schedule updates, creation and preparation of progress reports, adherence to project scheduling, and general project coordination. The Project Manager shall develop a project implementation plan in coordination with the City. Contractor shall execute the agreed upon implementation plain in accordance with the City's requirements and expectations.

- 14.1.2. The requirements and expectation shall be reviewed during project kick-off meeting to ensure all parties have a common understanding.
- 14.1.3. In addition to the designated Project Manager, Contractor shall assign a technical lead and other necessary personnel to support the project.
- 14.1.4. Contractor shall be responsible for directing the technical implementation of the Project and ensuring consistency and uniformity across the design and implementation phases by following the design agreed upon with the City.

#### **14.2. Schedule**

- 14.2.1. The scheduled outage for installation at site is November 2, 2019 and finish no later than December 15, 2019 (to be verified at kick-off and again prior to system shipment to site).
- 14.2.2. Scheduled dates for kick-off, logic review, software freeze, Factory Acceptance Test (FAT), site mobilization, installation, commissioning, and testing will be finalized with the City, working back from the expected installation dates.

#### **14.3. Commissioning Spares**

- 14.3.1. Contractor shall provide the required spares necessary for commissioning of the System.

#### **14.4. Factory Acceptance Test (FAT) and Demonstration**

- 14.4.1. Contractor shall conduct a complete functional closed loop test of all the inputs, configuration, and control outputs of the automatic control portions of the system.
- 14.4.2. Inputs that are employed for data acquisition only (and not control) need not be 100% simulated. Contractor shall simulate a sufficient number of these inputs to exercise all of the multiplexing equipment.
- 14.4.3. The entire system, in its intended configuration, shall be staged at the principal manufacturing facility. All communication links shall be tested during the FAT with the support of the City.
- 14.4.4. Qualified technicians whose normal job function is to conduct such a test shall conduct the in-house test. Qualified engineer who has primary responsibility for the control system design will personally observe the test. The City's intent is that the test not be conducted in a local sales office or regional service center where sufficient experienced and trained personnel and test equipment would not be expected to be available, on a full-time basis, during the conduction of the test.
- 14.4.5. The entire control system configuration and all of the system logic shall be exercised and verified.

- 14.4.6.** Contractor shall provide sufficient time, test equipment, and trained personnel for the City to inspect and evaluate the total system. At least ten (10) full days shall be reserved for this demonstration. Contractor shall provide additional time, as required, at no additional cost.
- 14.4.7.** In addition to a functional test, system performance shall be demonstrated. Among the items to be verified with respect to the specification are:
  - 14.4.7.1.** Response to a keyboard request.
  - 14.4.7.2.** Time to completely display an Engineer configured control display.
  - 14.4.7.3.** Action on loss of power and on power-up.
  - 14.4.7.4.** Fail over of control equipment.
  - 14.4.7.5.** Demonstration of the replacement of redundant equipment on-line.
  - 14.4.7.6.** Failure of either, or both, data highway paths.
  - 14.4.7.7.** Data highway loading test (see below)
  - 14.4.7.8.** Printout of all specified logs.
- 14.4.8.** High Loading Test: Data highway speed and access time shall be demonstrated during extreme loading as in alarm burst of 1000 process variable alarms occurring within 2 seconds while data historian is polling all data at a 1 second archival rate.
- 14.4.9.** At least four (4) weeks prior to the demonstration, Contractor shall submit a written test agenda and advise the City of the schedule.
- 14.4.10.** Contractor shall submit a functional FAT test procedure with loop checking documents capable of witness initials, final signature, and comment section. Contractor shall also submit the Operations Manual and Control System Specification (see Operations Manual in the Documentation section). This will be utilized by the City as part of the factory acceptance test.
- 14.4.11.** The FAT procedure shall include a variance document for changes or corrections.
- 14.4.12.** It is expected that Contractor will make minor adjustments and corrections that may be discovered during the demonstration. However, if serious defects in design and performance are discovered, the demonstration shall be discontinued and the entire test shall be repeated at the Contractor's expense after the necessary corrections are made.
- 14.4.13.** The equipment shall not be shipped until a successful demonstration has been completed.

- 14.4.14. Within two weeks after shipment of the system, Contractor shall transmit one complete set of prints and one reproducible set of the “as shipped” system, for use during installation and checkout.

#### **14.5. Installation and Commissioning**

- 14.5.1. An installation procedure document shall be submitted to the City for review prior to installation. The procedure shall include power isolation and a safe de-energization approach. The procedure shall also include power-up testing when terminations are complete. Procedure documents shall include loop testing forms that include individual loop data, cells for measured values of 0%, 25%, 50%, 75% and 100%, witness initials and final signature and comment section.
- 14.5.2. All loops will be verified for proper configuration and operation from the field device through the control system. All alarms and switches shall be verified and recorded during loop checks.
- 14.5.3. All testing documents and procedures shall be submitted for review a minimum of two weeks prior to the commencement of any task. A change procedure shall be provided by the Contractor that documents the process and people capable of changes.
- 14.5.4. Contractor shall provide a field engineer with the capacity to fully oversee and control the system installation and testing.
- 14.5.5. Upon completion of the installation and the commissioning of the system, Contractor shall provide revised drawings that incorporate field startup corrections.

#### **14.6. Initial Startup**

- 14.6.1. Contractor shall be responsible for overseeing the initial startup, including providing experienced personnel with the capacity to perform the initial startup while maintaining system process conditions within the OEM specifications. It is expected that out of tolerance conditions that could damage equipment will be prevented. Contractor will be responsible to meet these conditions:
  - 14.6.1.1. That the initial parameters and tuning values are derived from previous experience with GE LM6000 Gas Turbines, MHI Steam Turbines, dual pressure HRSG's and the remaining BOP equipment.
  - 14.6.1.2. That all OEM control specifications, sequencing, protection, operational limits and interlocks have been tested and proven during commissioning.
  - 14.6.1.3. That the operational process limits and time curves for warmup/cooldown requirements are met.

**14.6.1.4.** That there is on site support provided for at least five ten-hour days of final tuning and testing after the initial startup.

## **15. TRAINING**

**15.1.** Training shall consist of the following.

- 15.1.1.** One (1) week of on-site training for up to ten (10) operators.
- 15.1.2.** Fifteen weeks of training at the factory for up to three (3) individuals to include:
  - 15.1.2.1.** System configuration and administration.
  - 15.1.2.2.** Logic programming.
  - 15.1.2.3.** Graphics building and editing.
  - 15.1.2.4.** Serial link configuration.
  - 15.1.2.5.** Security system configuration and updating.
  - 15.1.2.6.** System backup and recovery.
- 15.1.3.** Training shall be available for up to 12 months after complete system shipment.

## **16. FINAL SYSTEM ACCEPTANCE**

**16.1.** The Final System Acceptance shall begin upon completion of the commissioning period after all errors have been corrected. The acceptance criteria shall include the following:

- 16.1.1.** All new equipment has been installed by Contractor and verified by manufacturer's representative.
- 16.1.2.** All necessary adjustments have been fully implemented.
- 16.1.3.** The turbine control dynamics have been fully tuned to the turbine and its load.
- 16.1.4.** All failsafe conditions verified.
- 16.1.5.** All modes of operation tested, tuned and verified (speed loop, Megawatt loop, etc.).
- 16.1.6.** All other supplied items are operating correctly.
- 16.1.7.** Operators have been trained for proper operation.
- 16.1.8.** Maintenance is fully informed on troubleshooting.

16.1.9. All documentation has been turned over and accepted by City.

16.1.10. Resolution of all corrective action items.

## **17. MAINTENANCE AND SUPPORT**

### **17.1. Warranty**

17.1.1. For a period of one year following Final System Acceptance ("Warranty Period"), Contractor shall warrant that the System will perform and operate in accordance with the functional requirements and specifications set forth in this Agreement. All inclusive costs, (parts, labor, repairs, Contractor travel time, Contractor expenses, etc.) covered by the warranty and incurred during the Warranty Period shall be provided without additional cost to the City.

### **17.2. Maintenance and Support Services After Warranty Period**

17.2.1. Contractor shall provide maintenance and support services for a period of no less than five (5) years after Final System Acceptance at City's cost.

17.2.2. Appendix A-7, SureService™ Customer Support Program, describes the various support programs offered by Contractor. Contractor shall provide such support for as long as the City pays the applicable fees.

### **17.3. Service Availability**

17.3.1. Service support network shall be available 24/7 for system support if City purchases the SureService™ support.

17.3.2. Contractor shall provide online access to manuals, technical notes, software updates, and user groups.

17.3.3. Contractor shall provide on-site services within seventy-two (72) hours of initial request for support, if phone support is deemed fruitless.

### **17.4. Additional Products and Services**

17.4.1. Contractor shall provide additional products and services as may be required by the City at the rates set forth in Exhibit B.

## **18. PRODUCT OBSOLESCENCE**

18.1. Contractor must maintain and manage product obsolescence for the System.

18.2. All control systems shall be backward compatible.



**APPENDIX A-1  
I/O COUNTS**

| <b>Abbreviation</b> | <b>Description</b>                         |
|---------------------|--|
| DCS                 | Distributed Control System                 |
| DMS                 | DC Motor Starter                           |
| EXC                 | Excitation Cubicle                         |
| GBC                 | Generator Circuit Breaker Cubicle          |
| GCRP                | Generator Control & Protection Relay Panel |
| Local               | Local Device                               |
| MCC                 | Motor Control Center                       |
| TCP                 | Turbine Control & Protection Panel         |
| TGB                 | Turbine Local Gauge Board                  |
| AMP                 | E/H Converter & Amplifier                  |

**2. DCS ALL**

|   | <b>Total<br/>(Modules)</b> | <b>Capacity<br/>(Module)</b> | <b>Capacity<br/>(Points)</b> | <b>Used<br/>(Points)</b> | <b>AI<br/>Type<br/>(Total)</b> |
|---|----------------------------|------------------------------|------------------------------|--------------------------|--------------------------------|
| <b>ABB DCS</b>  |                            |                              |                              |                          |                                |
| <b>Location: All</b>  |                            |                              |                              |                          |                                |
| Analog Input Modules -<br>Universal mA, VDC, RTD, T/C<br>(16 Point) | 35                         | 16                           | 560                          | 400                      |                                |
| mA (4-20)   |                            |                              |                              |                          | 198                            |
| T/C (Type K)  |                            |                              |                              |                          | 47                             |
| T/C (Type E)  |                            |                              |                              |                          | 128                            |
| RTD   |                            |                              |                              |                          | 27                             |
| Analog Input Modules - mA,<br>VDC (14 Point)                        | 26                         | 15                           | 390                          | 257                      |                                |
| Analog Output Modules (14<br>Point)                                 | 13                         | 14                           | 182                          | 95                       |                                |
| Digital Input Modules (14 Point)                                    | 67                         | 14                           | 938                          | 665                      |                                |
| Digital Input Modules High<br>Speed, Time-Synch, SOE (14<br>Point)  | 12                         | 14                           | 168                          | 113                      |                                |
| Digital Output Modules (16<br>Point)                                | 38                         | 16                           | 608                          | 291                      |                                |
| Pulse Input Module (Speed<br>P/U)                                   | 2                          | 8                            | 16                           | 3                        |                                |
|   |                            |                              |                              |                          |                                |

3. PCU-1: UNIT #1 HRSG

| PCU-1: Unit #1 HRSG<br>(Auxiliary Power Enclosure)                  | PCU<br>Total<br>(Modules) | Capacity<br>(Module) | Capacity<br>(Points) | Used<br>(Points) | AI<br>Type<br>(Total) |
|---|---------------------------|----------------------|----------------------|------------------|-----------------------|
| Cabinets - Processors &<br>Modules                                  | 1                         |                      |                      |                  |                       |
| Cabinets - Terminations   | 3                         |                      |                      |                  |                       |
| Processor's (Redundant Pairs)                                       | 2                         |                      |                      |                  |                       |
| Processor's (FDI)   | 1                         |                      |                      |                  |                       |
| Analog Input Modules -<br>Universal mA, VDC, RTD, T/C<br>(16 Point) | 9                         | 16                   | 144                  | 120              |                       |
| mA (4-20)   |                           |                      |                      |                  | 45                    |
| T/C (Type K)  |                           |                      |                      |                  | 20                    |
| T/C (Type E)  |                           |                      |                      |                  | 51                    |
| RTD   |                           |                      |                      |                  | 4                     |
| Analog Input Modules - mA,<br>VDC (14 Point)                        | 8                         | 15                   | 120                  | 84               |                       |
| Analog Output Modules (14<br>Point)                                 | 3                         | 14                   | 42                   | 23               |                       |
| Digital Input Modules (14 Point)                                    | 12                        | 14                   | 168                  | 115              |                       |
| Digital Input Modules High<br>Speed, Time-Synch, SOE (14<br>Point)  | 1                         | 14                   | 14                   | 5                |                       |
| Digital Output Modules (16<br>Point)                                | 8                         | 16                   | 128                  | 40               |                       |
| Pulse Input Module (Speed<br>P/U)                                   | 0                         | 8                    | 0                    | 0                |                       |
|   |                           |                      |                      |                  |                       |

4. PCU-2: UNIT #2 HRSG

| PCU-2: Unit #2 HRSG<br>(Auxiliary Power Enclosure)                  | PCU<br>Total<br>(Modules) | Capacity<br>(Module) | Capacity<br>(Points) | Used<br>(Points) | AI<br>Type<br>(Total) |
|---|---------------------------|----------------------|----------------------|------------------|-----------------------|
|   |                           |                      |                      |                  |                       |
| Cabinets - Processors &<br>Modules                                  | 1                         |                      |                      |                  |                       |
| Cabinets - Terminations   | 3                         |                      |                      |                  |                       |
|   |                           |                      |                      |                  |                       |
| Processor's (Redundant Pairs)                                       | 2                         |                      |                      |                  |                       |
| Processor's (FDI)   | 1                         |                      |                      |                  |                       |
|   |                           |                      |                      |                  |                       |
| Analog Input Modules -<br>Universal mA, VDC, RTD, T/C<br>(16 Point) | 9                         | 16                   | 144                  | 119              |                       |
| mA (4-20)   |                           |                      |                      |                  | 44                    |
| T/C (Type K)  |                           |                      |                      |                  | 20                    |
| T/C (Type E)  |                           |                      |                      |                  | 51                    |
| RTD   |                           |                      |                      |                  | 4                     |
| Analog Input Modules - mA,<br>VDC (14 Point)                        | 8                         | 15                   | 120                  | 84               |                       |
| Analog Output Modules (14<br>Point)                                 | 3                         | 14                   | 42                   | 23               |                       |
| Digital Input Modules (14 Point)                                    | 12                        | 14                   | 168                  | 115              |                       |
| Digital Input Modules High<br>Speed, Time-Synch, SOE (14<br>Point)  | 1                         | 14                   | 14                   | 5                |                       |
| Digital Output Modules (16<br>Point)                                | 8                         | 16                   | 128                  | 40               |                       |
| Pulse Input Module (Speed<br>P/U)                                   | 0                         | 8                    | 0                    | 0                |                       |
|   |                           |                      |                      |                  |                       |

5. PCU-3: BOP

|   | PCU<br>Total<br>(Modules) | Capacity<br>(Module) | Capacity<br>(Points) | Used<br>(Points) | AI<br>Type<br>(Total) |
|---|---------------------------|----------------------|----------------------|------------------|-----------------------|
| <b>PCU-3: BOP</b>   |                           |                      |                      |                  |                       |
| <b>Location: Auxiliary Power Enclosure</b>                    |                           |                      |                      |                  |                       |
| Cabinets - Processors & Modules                               | 1                         |                      |                      |                  |                       |
| Cabinets - Terminations                                       | 1                         |                      |                      |                  |                       |
| Processor's (Redundant Pairs)                                 | 1                         |                      |                      |                  |                       |
| Analog Input Modules - Universal mA, VDC, RTD, T/C (16 Point) | 2                         | 16                   | 32                   | 12               |                       |
| mA (4-20)   |                           |                      |                      |                  | 11                    |
| T/C (Type K)  |                           |                      |                      |                  | 0                     |
| T/C (Type E)  |                           |                      |                      |                  | 1                     |
| RTD   |                           |                      |                      |                  | 0                     |
| Analog Input Modules - mA, VDC (14 Point)                     | 2                         | 15                   | 30                   | 4                |                       |
| Analog Output Modules (14 Point)                              | 2                         | 14                   | 28                   | 10               |                       |
| Digital Input Modules (14 Point)                              | 7                         | 14                   | 98                   | 53               |                       |
| Digital Input Modules High Speed, Time-Synch, SOE (14 Point)  | 1                         | 14                   | 14                   | 3                |                       |
| Digital Output Modules (16 Point)                             | 3                         | 16                   | 48                   | 13               |                       |
| Pulse Input Module (Speed P/U)                                | 0                         | 8                    | 0                    | 0                |                       |
|   |                           |                      |                      |                  |                       |

**6. PCU-4: STEAM TURBINE**

|   | <b>PCU<br/>Total<br/>(Modules)</b> | <b>Capacity<br/>(Module)</b> | <b>Capacity<br/>(Points)</b> | <b>Used<br/>(Points)</b> | <b>AI<br/>Type<br/>(Total)</b> |
|---|------------------------------------|------------------------------|------------------------------|--------------------------|--------------------------------|
| <b>PCU-4: Steam Turbine</b>                                   |                                    |                              |                              |                          |                                |
| <b>Location: Electrical Room</b>                              |                                    |                              |                              |                          |                                |
| Cabinets - Processors & Modules                               | 1                                  |                              |                              |                          |                                |
| Cabinets - Terminations                                       | 3                                  |                              |                              |                          |                                |
| Processor's (Redundant Pairs)                                 | 1                                  |                              |                              |                          |                                |
| Analog Input Modules - Universal mA, VDC, RTD, T/C (16 Point) | 6                                  | 16                           | 96                           | 71                       |                                |
| mA (4-20)   |                                    |                              |                              |                          | 51                             |
| T/C (Type K)  |                                    |                              |                              |                          | 7                              |
| T/C (Type E)  |                                    |                              |                              |                          | 0                              |
| RTD   |                                    |                              |                              |                          | 13                             |
| Analog Input Modules - mA, VDC (14 Point)                     | 1                                  | 15                           | 15                           | 9                        |                                |
| Analog Output Modules (14 Point)                              | 1                                  | 14                           | 14                           | 4                        |                                |
| Digital Input Modules (14 Point)                              | 11                                 | 14                           | 154                          | 121                      |                                |
| Digital Input Modules High Speed, Time-Synch, SOE (14 Point)  | 3                                  | 14                           | 42                           | 31                       |                                |
| Digital Output Modules (16 Point)                             | 7                                  | 16                           | 112                          | 81                       |                                |
| Pulse Input Module (Speed P/U)                                | 1                                  | 8                            | 8                            | 1                        |                                |
|   |                                    |                              |                              |                          |                                |

7. PCU-5: BOP

|   | PCU<br>Total<br>(Modules) | Capacity<br>(Module) | Capacity<br>(Points) | Used<br>(Points) | AI<br>Type<br>(Total) |
|---|---------------------------|----------------------|----------------------|------------------|-----------------------|
| <b>PCU-5: BOP</b>   |                           |                      |                      |                  |                       |
| <b>Location: Electrical Room</b>                              |                           |                      |                      |                  |                       |
| Cabinets - Processors & Modules                               | 1                         |                      |                      |                  |                       |
| Cabinets - Terminations                                       | 3                         |                      |                      |                  |                       |
| Processor's (Redundant Pairs)                                 | 2                         |                      |                      |                  |                       |
| Processor's (FDI)   | 2                         |                      |                      |                  |                       |
| Analog Input Modules - Universal mA, VDC, RTD, T/C (16 Point) | 6                         | 16                   | 96                   | 63               |                       |
| mA (4-20)   |                           |                      |                      |                  | 33                    |
| T/C (Type K)  |                           |                      |                      |                  | 0                     |
| T/C (Type E)  |                           |                      |                      |                  | 24                    |
| RTD   |                           |                      |                      |                  | 6                     |
| Analog Input Modules - mA, VDC (14 Point)                     | 6                         | 15                   | 90                   | 72               |                       |
| Analog Output Modules (14 Point)                              | 4                         | 14                   | 56                   | 35               |                       |
| Digital Input Modules (14 Point)                              | 20                        | 14                   | 280                  | 216              |                       |
| Digital Input Modules High Speed, Time-Synch, SOE (14 Point)  | 1                         | 14                   | 14                   | 11               |                       |
| Digital Output Modules (16 Point)                             | 9                         | 16                   | 144                  | 84               |                       |
| Pulse Input Module (Speed P/U)                                | 0                         | 8                    | 0                    | 0                |                       |
|   |                           |                      |                      |                  |                       |

**8. PCU-6: GAS COMPRESSOR**

|   | <b>PCU<br/>Total<br/>(Modules)</b> | <b>Capacity<br/>(Module)</b> | <b>Capacity<br/>(Points)</b> | <b>Used<br/>(Points)</b> | <b>AI<br/>Type<br/>(Total)</b> |
|---|------------------------------------|------------------------------|------------------------------|--------------------------|--------------------------------|
| <b>PCU-6: Gas Compressor</b>  |                                    |                              |                              |                          |                                |
| <b>Location: Gas Compressor<br/>Building</b>                        |                                    |                              |                              |                          |                                |
| Cabinets - Processors &<br>Modules                                  | 1                                  |                              |                              |                          |                                |
| Cabinets - Terminations   | 1                                  |                              |                              |                          |                                |
| Processor's (Redundant Pairs)                                       | 1                                  |                              |                              |                          |                                |
| Processor's (FDI)   | 1                                  |                              |                              |                          |                                |
| Analog Input Modules -<br>Universal mA, VDC, RTD, T/C<br>(16 Point) | 2                                  | 16                           | 32                           | 7                        |                                |
| mA (4-20)   |                                    |                              |                              |                          | 6                              |
| T/C (Type K)  |                                    |                              |                              |                          | 0                              |
| T/C (Type E)  |                                    |                              |                              |                          | 1                              |
| RTD   |                                    |                              |                              |                          | 0                              |
| Analog Input Modules - mA,<br>VDC (14 Point)                        | 1                                  | 15                           | 15                           | 4                        |                                |
| Analog Output Modules (14<br>Point)                                 | 0                                  | 14                           | 0                            | 0                        |                                |
| Digital Input Modules (14 Point)                                    | 3                                  | 14                           | 42                           | 33                       |                                |
| Digital Input Modules High<br>Speed, Time-Synch, SOE (14<br>Point)  | 1                                  | 14                           | 14                           | 14                       |                                |
| Digital Output Modules (16<br>Point)                                | 3                                  | 16                           | 48                           | 33                       |                                |
| Pulse Input Module (Speed<br>P/U)                                   | 0                                  | 8                            | 0                            | 0                        |                                |
|   |                                    |                              |                              |                          |                                |

9. PCU-7: SWITCHYARD

|   | PCU<br>Total<br>(Modules) | Capacity<br>(Module) | Capacity<br>(Points) | Used<br>(Points) | AI<br>Type<br>(Total) |
|---|---------------------------|----------------------|----------------------|------------------|-----------------------|
| <b>PCU-7: Switchyard</b>  |                           |                      |                      |                  |                       |
| <b>Location: Duane Substation<br/>Switchyard, Relay House</b>       |                           |                      |                      |                  |                       |
| Cabinets - Processors &<br>Modules                                  | 1                         |                      |                      |                  |                       |
| Cabinets - Terminations   | 1                         |                      |                      |                  |                       |
| Processor's (Redundant Pairs)                                       | 1                         |                      |                      |                  |                       |
| Processor's (FDI)   | 1                         |                      |                      |                  |                       |
| Analog Input Modules -<br>Universal mA, VDC, RTD, T/C<br>(16 Point) | 1                         | 16                   | 16                   | 8                |                       |
| mA (4-20)   |                           |                      |                      |                  | 8                     |
| T/C (Type K)  |                           |                      |                      |                  | 0                     |
| T/C (Type E)  |                           |                      |                      |                  | 0                     |
| RTD   |                           |                      |                      |                  | 0                     |
| Analog Input Modules - mA,<br>VDC (14 Point)                        | 0                         | 15                   | 0                    | 0                |                       |
| Analog Output Modules (14<br>Point)                                 | 0                         | 14                   | 0                    | 0                |                       |
| Digital Input Modules (14 Point)                                    | 2                         | 14                   | 28                   | 12               |                       |
| Digital Input Modules High<br>Speed, Time-Synch, SOE (14<br>Point)  | 4                         | 14                   | 56                   | 44               |                       |
| Digital Output Modules (16<br>Point)                                | 0                         | 16                   | 0                    | 0                |                       |
| Pulse Input Module (Speed<br>P/U)                                   | 1                         | 8                    | 8                    | 2                |                       |
|   |                           |                      |                      |                  |                       |



**10. GE MARK VI (UNIT #1 & 2)**

|  | <b>Module<br/>s<br/>(Total)</b> | <b>Module<br/>(Points)</b> | <b>Points<br/>(Total)</b> | <b>Points<br/>(Used)</b> | <b>Points<br/>(Spare)</b> |
|--|---------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|
| <b>GE Mark VI (Unit #1)</b>                        |                                 |                            |                           |                          |                           |
| <b>Processor: All</b>                              |                                 |                            |                           |                          |                           |
| Turbine Control Board                              | 1                               |                            |                           |                          |                           |
| Analog Inputs                                      |                                 | 4                          | 4                         | 0                        | 4                         |
| Trip Output (Relay)                                |                                 | 3                          | 3                         | 2                        | 1                         |
| Pulse Inputs (Speed P/U)                           |                                 | 4                          | 4                         | 4                        | 0                         |
| <b>Servo Control Boards (2 Channels per board)</b> |                                 |                            |                           |                          |                           |
| Driver Outputs (1 dual output per Channel)         | 2                               | 2                          | 4                         | 4                        | 0                         |
| Excitation Output (1 per channel)                  |                                 |                            | 4                         | 4                        | 0                         |
| LVDT Inputs (2 dual input per channel)             |                                 |                            | 16                        | 16                       | 0                         |
| <b>Discrete I/O</b>                                |                                 |                            |                           |                          |                           |
| Analog Input                                       | 4                               | --                         | 72                        | 34                       | 38                        |
| Analog Output                                      | 3                               | --                         | 16                        | 11                       | 5                         |
| Thermocouple Inputs                                | 1                               | --                         | 24                        | 11                       | 13                        |
| RTD Input  | 14                              | --                         | 68                        | 54                       | 14                        |
| Discrete Input                                     | 10                              | --                         | 176                       | 110                      | 66                        |
| Discrete Output                                    | 1                               | --                         | 16                        | 2                        | 14                        |
| Digital Outputs (Relay)                            | 7                               | --                         | 116                       | 65                       | 51                        |
| <b>GE Mark VI (Unit #2)</b>                        |                                 |                            |                           |                          |                           |
| <b>Processor: All</b>                              |                                 |                            |                           |                          |                           |
| Turbine Control Board                              | 1                               |                            |                           |                          |                           |
| Analog Inputs                                      |                                 | 4                          | 4                         | 0                        | 4                         |
| Trip Output (Relay)                                |                                 | 3                          | 3                         | 2                        | 1                         |
| Pulse Inputs (Speed P/U)                           |                                 | 4                          | 4                         | 4                        | 0                         |
| <b>Servo Control Boards (2 Channels per board)</b> |                                 |                            |                           |                          |                           |
| Driver Outputs (1 dual output per Channel)         | 2                               | 2                          | 4                         | 4                        | 0                         |
| Excitation Output (1 per channel)                  |                                 |                            | 4                         | 4                        | 0                         |
| LVDT Inputs (2 dual input per channel)             |                                 |                            | 16                        | 16                       | 0                         |
| <b>Discrete I/O</b>                                |                                 |                            |                           |                          |                           |
| Analog Input                                       | 4                               | --                         | 72                        | 34                       | 38                        |
| Analog Output                                      | 3                               | --                         | 16                        | 11                       | 5                         |
| Thermocouple Inputs                                | 1                               | --                         | 24                        | 11                       | 13                        |
| RTD Input  | 14                              | --                         | 68                        | 54                       | 14                        |
| Discrete Input                                     | 10                              | --                         | 176                       | 110                      | 66                        |
| Discrete Output                                    | 1                               | --                         | 16                        | 2                        | 14                        |
| Digital Outputs (Relay)                            | 7                               | --                         | 116                       | 65                       | 51                        |

**11. GE MARK VI (UNIT #1) - FUEL CONTROL (MARK VI)**

|   | Modules<br>(Total) | Module<br>(Points) | Points<br>(Total) | Points<br>(Used) | Points<br>(Spare) |
|---|--------------------|--------------------|-------------------|------------------|-------------------|
| <b>GE Mark VI (Unit #1)</b>   |                    |                    |                   |                  |                   |
| <b>Processor: Fuel Control (Mark VI)</b>                            |                    |                    |                   |                  |                   |
| Turbine Control Board   | 1                  |                    |                   |                  |                   |
| Analog Inputs   |                    | 4                  | 4                 | 0                | 4                 |
| Trip Output (Relay)   |                    | 3                  | 3                 | 2                | 1                 |
| Pulse Inputs (Speed P/U)  |                    | 4                  | 4                 | 4                | 0                 |
| Analog Inputs & Outputs   | 2                  |                    |                   |                  |                   |
| Analog Inputs   |                    | 20                 | 40                | 21               | 19                |
| Analog Outputs  |                    | 4                  | 8                 | 3                | 5                 |
| Thermocouple Inputs (Type K used)                                   | 1                  | 24                 | 24                | 11               | 13                |
| RTD Inputs  | 1                  | 16                 | 16                | 8                | 8                 |
| Digital Inputs & Relay Outputs                                      | 2                  |                    |                   |                  |                   |
| Digital Inputs  |                    | 48                 | 48 (Note #1)      | 12               | 36                |
| Digital Outputs (Relay)   |                    | 24                 | 36 (Note #2)      | 19               | 17                |
| Note #1: No input termination units for second VCRC board.          |                    |                    |                   |                  |                   |
| Note #2: One of two output termination units for second VCRC board. |                    |                    |                   |                  |                   |
| Servo Control Boards (2 Channels per board)                         | 2                  | 2                  | 4                 | 4                | 0                 |
| Driver Outputs (1 dual output per Channel)                          |                    |                    | 8                 | 8                | 0                 |
| Excitation Output (1 per channel)                                   |                    |                    | 4                 | 4                | 0                 |
| LVDT Inputs (2 dual input per channel)                              |                    |                    | 16                | 16               | 0                 |

**12. GE MARK VI (UNIT #1) - SEQUENCER (90-70)**

|                                     | <b>Modules<br/>(Total)</b> | <b>Module<br/>(Points)</b> | <b>Points<br/>(Total)</b> | <b>Points<br/>(Used)</b> | <b>Points<br/>(Spare)</b> |
|-------------------------------------|----------------------------|----------------------------|---------------------------|--------------------------|---------------------------|
| <b>GE Mark VI (Unit #1)</b>         |                            |                            |                           |                          |                           |
| <b>Processor: Sequencer (90-70)</b> |                            |                            |                           |                          |                           |
| Remote Networks                     | 3                          |                            |                           |                          |                           |
| BIU's Total                         | 6                          |                            |                           |                          |                           |
| BIU's Network #1 (MTTB)             | 2                          |                            |                           |                          |                           |
| BIU's Network #2 (MGTB)             | 1                          |                            |                           |                          |                           |
| BIU's Network #3 (TCP)              | 3                          |                            |                           |                          |                           |
| Modules Network #1 (MTTB)           |                            |                            |                           |                          |                           |
| Analog Input                        | 1                          | 16                         | 16                        | 6                        | 10                        |
| RTD Input                           | 8                          | 4                          | 32                        | 29                       | 3                         |
| Discrete Input                      | 3                          | 16                         | 48                        | 28                       | 20                        |
| Modules BIU's Network #2 (MGTB)     |                            |                            |                           |                          |                           |
| RTD Input                           | 4                          | 4                          | 16                        | 15                       | 1                         |
| Discrete Input                      | 1                          | 16                         | 16                        | 14                       | 2                         |
| Modules BIU's Network #3 (TCP)      |                            |                            |                           |                          |                           |
| Analog Input                        | 1                          | 16                         | 16                        | 7                        | 9                         |
| Analog Output                       | 1                          | 8                          | 8                         | 8                        | 0                         |
| RTD Input                           | 1                          | 4                          | 4                         | 2                        | 2                         |
| Discrete Input                      | 4                          | 16                         | 64                        | 56                       | 8                         |
| Discrete Output                     | 1                          | 16                         | 16                        | 2                        | 14                        |
| Digital Outputs (Relay)             | 5                          | 16                         | 80                        | 46                       | 34                        |

**13. GE MARK VI (UNIT #2) - FUEL CONTROL (MARK VI)**

|   | <b>Modules<br/>(Total)</b> | <b>Module<br/>(Points)</b> | <b>Points<br/>(Total)</b> | <b>Points<br/>(Used)</b> | <b>Points<br/>(Spare)</b> |
|---|----------------------------|----------------------------|---------------------------|--------------------------|---------------------------|
| <b>GE Mark VI (Unit #2)</b>   |                            |                            |                           |                          |                           |
| <b>Processor: Fuel Control (Mark VI)</b>                            |                            |                            |                           |                          |                           |
| Turbine Control Board   | 1                          |                            |                           |                          |                           |
| Analog Inputs   |                            | 4                          | 4                         | 0                        | 4                         |
| Trip Output (Relay)   |                            | 3                          | 3                         | 2                        | 1                         |
| Pulse Inputs (Speed P/U)  |                            | 4                          | 4                         | 4                        | 0                         |
| Analog Inputs & Outputs   | 2                          |                            |                           |                          |                           |
| Analog Inputs   |                            | 20                         | 40                        | 21                       | 19                        |
| Analog Outputs  |                            | 4                          | 8                         | 3                        | 5                         |
| Thermocouple Inputs (Type K used)                                   | 1                          | 24                         | 24                        | 11                       | 13                        |
| RTD Inputs  | 1                          | 16                         | 16                        | 8                        | 8                         |
| Digital Inputs & Relay Outputs                                      | 2                          |                            |                           |                          |                           |
| Digital Inputs  |                            | 48                         | 48 (Note #1)              | 12                       | 36                        |
| Digital Outputs (Relay)   |                            | 24                         | 36 (Note #2)              | 19                       | 17                        |
| Note #1: No input termination units for second VCRC board.          |                            |                            |                           |                          |                           |
| Note #2: One of two output termination units for second VCRC board. |                            |                            |                           |                          |                           |
| Servo Control Boards (2 Channels per board)                         | 2                          | 2                          | 4                         | 4                        | 0                         |
| Driver Outputs (1 dual output per Channel)                          |                            |                            | 8                         | 8                        | 0                         |
| Excitation Output (1 per channel)                                   |                            |                            | 4                         | 4                        | 0                         |
| LVDT Inputs (2 dual input per channel)                              |                            |                            | 16                        | 16                       | 0                         |

14. GE MARK VI (UNIT #2) - SEQUENCER (90-70)

|                                     | Modules<br>(Total) | Module<br>(Points) | Points<br>(Total) | Points<br>(Used) | Points<br>(Spare) |
|-------------------------------------|--------------------|--------------------|-------------------|------------------|-------------------|
| <b>GE Mark VI (Unit #2)</b>         |                    |                    |                   |                  |                   |
| <b>Processor: Sequencer (90-70)</b> |                    |                    |                   |                  |                   |
| Remote Networks                     | 3                  |                    |                   |                  |                   |
| BIU's Total                         | 6                  |                    |                   |                  |                   |
| BIU's Network #1 (MTTB)             | 2                  |                    |                   |                  |                   |
| BIU's Network #2 (MGTB)             | 1                  |                    |                   |                  |                   |
| BIU's Network #3 (TCP)              | 3                  |                    |                   |                  |                   |
| Modules Network #1 (MTTB)           |                    |                    |                   |                  |                   |
| Analog Input                        | 1                  | 16                 | 16                | 6                | 10                |
| RTD Input                           | 8                  | 4                  | 32                | 29               | 3                 |
| Discrete Input                      | 3                  | 16                 | 48                | 28               | 20                |
| Modules BIU's Network #2 (MGTB)     |                    |                    |                   |                  |                   |
| RTD Input                           | 4                  | 4                  | 16                | 15               | 1                 |
| Discrete Input                      | 1                  | 16                 | 16                | 14               | 2                 |
| Modules BIU's Network #3 (TCP)      |                    |                    |                   |                  |                   |
| Analog Input                        | 1                  | 16                 | 16                | 7                | 9                 |
| Analog Output                       | 1                  | 8                  | 8                 | 8                | 0                 |
| RTD Input                           | 1                  | 4                  | 4                 | 2                | 2                 |
| Discrete Input                      | 4                  | 16                 | 64                | 56               | 8                 |
| Discrete Output                     | 1                  | 16                 | 16                | 2                | 14                |
| Digital Outputs (Relay)             | 5                  | 16                 | 80                | 46               | 34                |

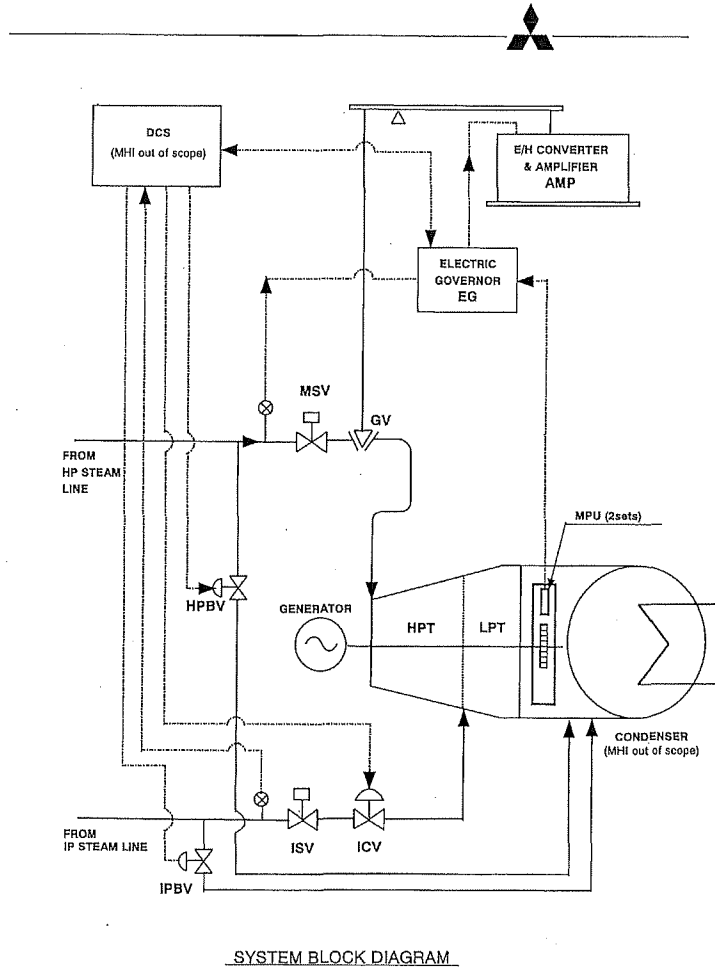
### 15. MITSUBISHI TURBINE CONTROL PANEL – NON DCS INTERFACE

| Interface (MHI TCP) | Count | Type     | From  | To    |
|---------------------|-------|----------|-------|-------|
| GBC to GCRP         | 4     | Digital  | GBC   | GCRP  |
| Local to GCRP       | 2     | Digital  | Local | GCRP  |
| GCRP to GBC         | 10    | Digital  | GCRP  | GBC   |
| Local to TCP        | 14    | Digital  | Local | TCP   |
| GCRP to TCP         | 4     | Digital  | GCRP  | TCP   |
| GBC to TCP          | 1     | Digital  | GBC   | TCP   |
| Local or TGB to TCP | 2     | 4-20mA   | Local | TCP   |
| Local or TGB to TCP | 15    | RTD      | Local | TCP   |
| Local or TGB to TCP | 6     | Type K   | Local | TCP   |
| Local to TCP        | 13    | Vib      | Local | TCP   |
| Local to TCP        | 2     | Pulse    | Local | TCP   |
| Local to TCP        | 3     | Pulse    | Local | TCP   |
| Local to TCP        | 2     | Pulse    | Local | TCP   |
| GCRP to TCP         | 1     | 4-20mA   | GCRP  | TCP   |
| Local to TGB        | 1     | Type K   | Local | TGB   |
| TCP to GCRP         | 3     | Digital  | TCP   | GCRP  |
| TCP to Local        | 11    | Digital  | TCP   | Local |
| TCP to Local        | 1     |          | TCP   | Local |
| MCC to TCP          | 13    | Digital  | MCC   | TCP   |
| TCP to MCC          | 21    | Digital  | TCP   | MCC   |
| Local to DMS        | 1     | Digital  | Local | DMS   |
| TCP to DMS          | 4     | Digital  | TCP   | DMS   |
| DMS to TCP          | 1     | Digital  | DMS   | TCP   |
| TCP to AMP          | 1     | 20-160mA | TCP   | AMP   |

**16. MITSUBISHI TURBINE CONTROL PANEL – DCS INTERFACE**

| Interface (DCS) | Count | Type    | From  | To        |
|-----------------|-------|---------|-------|-----------|
| TCP to DCS      | 31    | Digital | TCP   | DCS       |
| TCP to DCS/SOE  | 30    | Digital | TCP   | DCS (SOE) |
| EXC to DCS      | 19    | Digital | EXC   | DCS       |
| MCC to DCS      | 16    | Digital | MCC   | DCS       |
| GCRP to DCS     | 13    | Digital | GCRP  | DCS       |
| Local to DCS    | 5     | Digital | Local | DCS       |
| DMS to DCS      | 5     | Digital | DMS   | DCS       |
| GCRP to DCS     | 4     | Digital | GCRP  | DCS       |
| TCP to DCS      | 39    | 4-20mA  | TCP   | DCS       |
| Local to DCS    | 13    | RTD     | Local | DCS       |
| Local to DCS    | 9     | 4-20mA  | Local | DCS       |
| Local to DCS    | 6     | Type K  | Local | DCS       |
| GCRP to DCS     | 12    | 4-20mA  | GCRP  | DCS       |
| GCRP to DCS     | 1     | Pulse   | GCRP  | DCS       |
| DCS to TCP      | 57    | Digital | DCS   | TCP       |
| DCS to GCRP     | 15    | Digital | DCS   | GCRP      |
| DCS to DMS      | 3     | Digital | DCS   | DMS       |
| DCS to Local    | 1     | 4-20mA  | DCS   | Local     |

## APPENDIX A-2 STEAM TURBINE CONTROL BLOCK DIAGRAM



MITSUBISHI HEAVY INDUSTRIES, LTD.

1-3-4



**APPENDIX A-3  
TURBINE DATA**

**1. STEAM TURBINE DATA**

| <b>Steam Turbine-Generator Unit</b>    |                             |
|--|-----------------------------|
| Turbine OEM name:                      | Mitsubishi Heavy Industries |
| Turbine Serial Number:                 | D-934                       |
| MHI Work Order Number:                 | 33034/66934                 |
| Turbine Rating (kW):                   | 53600                       |
| Steam Pressure (psig):                 | 1250                        |
| Steam Temperature (°F):                | 950                         |
| Exhaust Pressure (in. of Hg absolute): | 4.0                         |
| Induction Steam Pressure (psig)        | 9.5                         |
| Rated Speed (rpm):                     | 3600                        |
| High-Speed Point (rpm):                | 3780                        |
| Tripping Speed (rpm):                  | 3960                        |

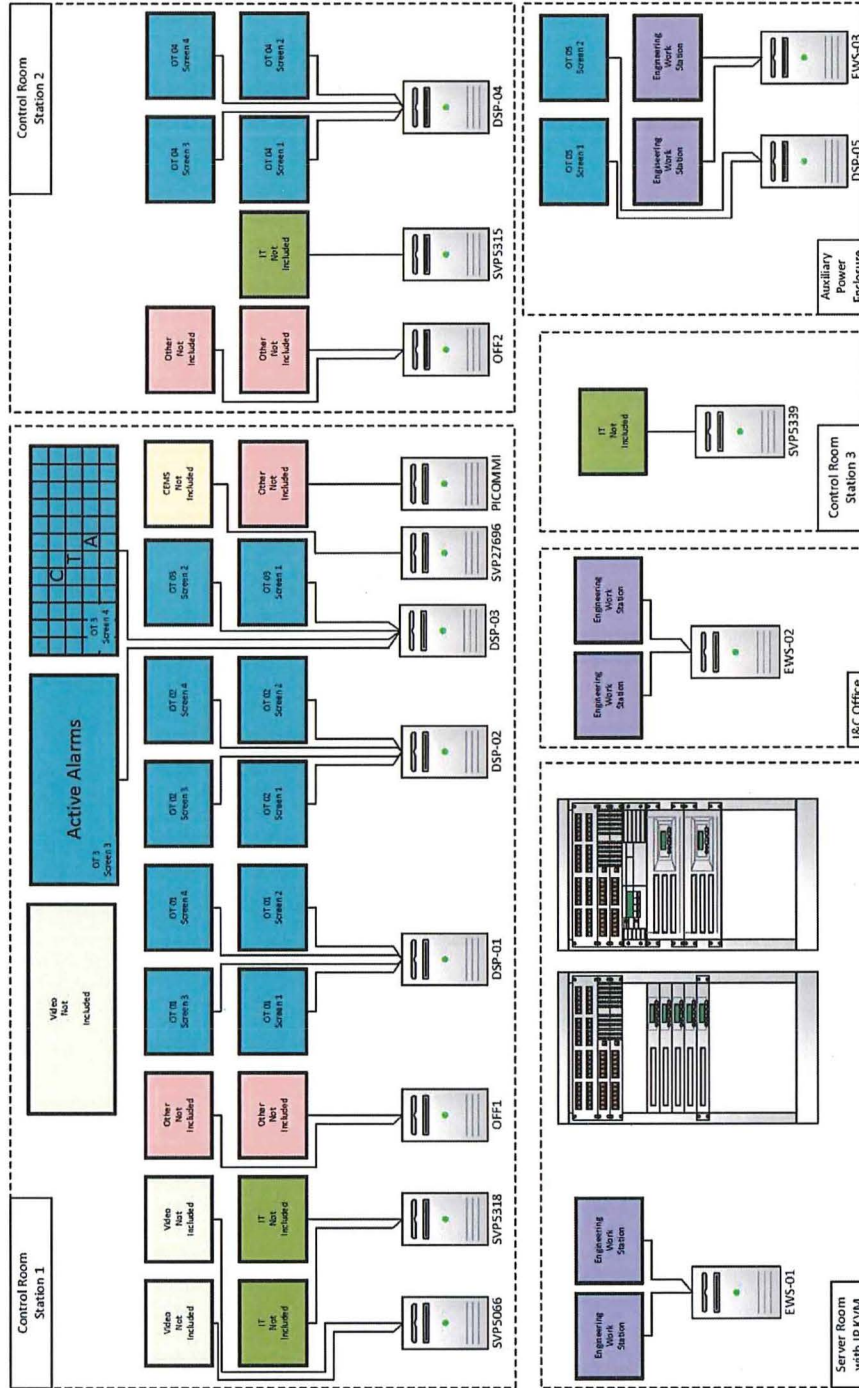
**2. GAS TURBINE UNIT #1 DATA**

| <b>Gas Turbine-Generator Unit #1</b> |              |
|--------------------------------------|--------------|
| Turbine OEM name:                    | GE LM6000 PC |
| Work Order Number:                   | 100039-1     |
| Serial number:                       | 55061        |
| Turbine Number:                      | 191-498      |
| Turbine Rating (kW):                 | 50389        |
| Rated Speed (rpm):                   | 3600         |
| High-Speed Point (rpm): NSD/N25      | 3780         |
| Tripping Speed (rpm): NSD/N25        | 4300         |
| Control Software Version:            | GE S5        |
| Toolbox Version:                     | 11.02.09C    |

### 3. GAS TURBINE UNIT #2 DATA

| <b>Gas Turbine-Generator Unit #2</b> |              |
|--------------------------------------|--------------|
| Turbine OEM name:                    | GE LM6000 PC |
| Work Order Number:                   | 100039-1     |
| Serial number:                       | 55371        |
| Turbine Number:                      | 191-502      |
| Turbine Rating (kW):                 | 50389        |
| Rated Speed (rpm):                   | 3600         |
| High-Speed Point (rpm): NSD/N25      | 3780, 10,700 |
| Tripping Speed (rpm): NSD/N25        | 4300, 10,800 |
| Control Software Version:            | GE S5        |
| Toolbox Version:                     | 11.02.09C    |

## APPENDIX A-4 OT & EWS STATIONS



**APPENDIX A-5  
PRELIMINARY PROJECT SCHEDULE**

The project schedule will proceed in accordance with this Preliminary Project Schedule set forth on the following page, except as may be modified into a Final Project Implementation Schedule that is approved by the City. The Final Project Implementation Schedule, as mutually agreed upon, will become the governing project schedule incorporated into the Agreement.

| <b>Task Name</b>                                | <b>Start</b>       | <b>Finish</b>       | <b>Resource Names</b> |
|---|--------------------|---------------------|-----------------------|
| Submit Hardware / Shop Drawings (ST / GT / BOP) | Mon 7/1/19         | Mon 7/1/19          | Contractor            |
| Approve Hardware Drawings                       | Mon 7/1/19         | Fri 7/12/19         | City                  |
| Hardware Release                                | Fri 7/12/19        | Fri 7/12/19         | Contractor            |
| Hardware Manufacture Complete                   | Mon 7/1/19         | Thu 9/19/19         | Contractor            |
| Design Freeze (BOP)                             | Mon 8/12/19        | Mon 8/12/19         | City                  |
| Design Freeze (ST & GT)                         | Mon 9/16/19        | Mon 9/16/19         | City                  |
| Configure Data Links                            | Mon 7/1/19         | Fri 8/23/19         | Contractor            |
| Software FAT - Pittsburgh                       | Mon 9/30/19        | Fri 10/4/19         | City / Contractor     |
| Software FAT - Integrated - Pittsburgh          | Mon 10/7/19        | Fri 10/11/19        | City / Contractor     |
| Deliver system to site (Software)               | Thu 10/31/19       | Thu 10/31/19        | Contractor            |
| <b>Outage</b>                                   | <b>Sat 11/2/19</b> | <b>Mon 12/16/19</b> |                       |

**APPENDIX A-6**

**FINAL SYSTEM ACCEPTANCE CERTIFICATE**

After the City is satisfied with all test results and resolutions, as specified herein, the City will initiate execution of the Final System Acceptance Certificate.

Customer Name: **City of Santa Clara ("City")**

Project Name: **Distributed Control System Upgrade / Replacement Project**

This Final System Acceptance Certificate memorializes the occurrence of System Acceptance.

Contractor and the City acknowledge that:

1. Contractor has completed all Deliverables promised under this Agreement.
2. The System is accepted, and all punch list items generated during testing have been completed.
3. By acknowledging the Final Acceptance of the System, the City agrees to pay any remaining and approved outstanding invoices to Contractor, including previously withheld retainage.

**City of Santa  
("City")**

**Emerson Process Management Power &  
Water Solutions, Inc.  
("Contractor")**

By: \_\_\_\_\_ By: \_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Title: \_\_\_\_\_ Title: \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

APPENDIX A-7  
SURESERVICE™ CUSTOMER SUPPORT PROGRAMS

Data Sheet

## SureService™ Customer Support Programs

### Support Modules

- Telephone Support
- Remote System Diagnostics
- Internet Information Access
- Scheduled On-Site Service
- Emergency On-Site Service
- Component Coverage
- Classic System Component Support
- Training Programs
- Software Updates
- Ovation Guardian Support
- Ovation Security Center Support
- Cybersecurity Assessment
- Software Archiving
- Online Tutoring
- Application Enrichment
- Optimization Services
- Simulation Update Services
- Scheduled Alarm Management Services



### Introduction

SureService™ customer support programs by Emerson enable utilities to customize the right maintenance package for the unique needs of the power generation and water/wastewater treatment industries.

### SureService Support

Emerson is committed to the quality of SureService. Our customer service is designed to enable customers to reach their maintenance objectives. Emerson works with the customers to ensure top-quality support and customer satisfaction. SureService

contracts can control and reduce plant maintenance costs by selecting various support applications individually or bundling them together to take advantage of maximum savings into one fixed contract price.

### Superior Engineering Support

Emerson's SureService team is comprised of highly qualified engineers and support personnel. They are selected for their impressive experience in field installation, startup, excitation control systems and upgrades of Emerson's process control systems.

Each member of the SureService team follows approved support guidelines including



customer consultation to discuss any potential impact of recommended system adjustments before any adjustments are made to the customer's control system.

SureService engineers bring a wealth of industry experience having implemented control systems for a wide range of processes including power generation and water/wastewater operations. Trained in the latest process control technologies, SureService engineers use their knowledge and experience to achieve complete customer satisfaction. By integrating a variety of specialties from multiple areas, Emerson offers a wealth of process control system and excitation control system expertise in:

- Electric utility industry
- Boiler control and tuning
- Gas turbine operation and tuning
- Design, implementation, startup and upgrades of process control systems
- Instrument system design and modification
- System integration and communication interfaces
- Programming in Windows® environments
- Project management, project engineering, integration, implementation, installation and startup of process control systems
- Creation and modification of control strategies, software databases and interface graphics
- Excitation control system testing and calibration

In addition to industry and control system knowledge, many members of the SureService support team have been recognized by customers for their dedication to excellent service.

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## SureService Telephone Support

Our SureService customer response center stands ready twenty-four hours a day, seven days a week to immediately diagnose and resolve any Ovation™ or excitation control system problems. Armed with powerful troubleshooting skills and a thorough knowledge of control systems, the SureService support team works with the customers to gather relevant information to correctly identify the problem and diagnose the situation.

Our facility in Pittsburgh features fully functional excitation control systems that are used for troubleshooting and determining solutions without interfering with plant operations. After isolating the problem, the SureService team suggests corrective actions and works with the customer to resolve any situation.

## Remote System Diagnostics

Remote system diagnostics leverages the remote network connectivity capabilities available with today's technology. Using remote system diagnostic tools, the SureService team can connect directly to a customer's control system. Once connected, the SureService support team can review and remotely troubleshoot the system, performing controller loading and online file and highway error analyses.

The combination of experience, training and background of our operations staff make remote system diagnostics the best assurance





for identifying and resolving problems quickly. Remote system diagnostics allows the SureService team to solve problems faster and easier than through SureService telephone support alone. If requested by the customer, the SureService support engineer can even perform corrections online.

Moreover, the support engineer may also recommend specific areas where preventative actions or assessments can further improve plant efficiency and processes. In this case, additional SureService support applications may be recommended.

## Internet Information Access

Designed specifically for technical plant operations staff, the SureService Ovation Users' web site offers a level of information available only to SureService contract holders. The site provides instant access to software release notes and the latest technical manuals and user documentation. Regular broadcast emails alert subscribers to the availability of new software releases, new or revised documentation, new web site features and more.

The Ovation Users' web site also provides continuous, updated information regarding the status of components returned to us for repair. Online parts ordering and a spare parts price list are available on the site as well. In addition, customers can submit requests for software improvements conveniently and report problems online.

## Scheduled On-site Service

Recurring equipment failures, multiple calls to the support center and degrading process efficiency can all signal the need to

tune and adjust a system component or perform routine maintenance. By utilizing our control systems and skilled engineers, scheduled on-site visits ensure that critical clean up, backup, testing and calibration of excitation control systems, and maintenance services are performed regularly without diverting manpower from critical tasks.

Scheduled on-site service provides additional staff and support when needed, keeping control systems running at peak performance by scheduling service visits on a regular basis or as-needed. Scheduled on-site service includes simple control system changes, PID and algorithm adjustments, excitation control system testing, calibration, cleanup and inspection services, which can significantly improve plant performance.

Additionally, regular routine system and excitation control system maintenance can decrease parts failures and improve the overall process. Maintenance and preventative activities include (but are not limited to):

- Back up DPU/controller application software to the hard drive and tape.
- Perform Ovation database reconciliation and verification.
- Back up the software server to tape.
- Perform file clean-up on the software server and other workstations.
- Implement minor control and graphics changes at the direction of the customer.
- Excitation control system power supply checks: CPU, firing card supplies, base adjuster, etc.
- Calibration check of PTs, CTs and transducers
- Limiting features check (VHL, MXL and MEL).



- Protection features check (forcing, VHP, OXP and MEP).
- Ensure all relevant alarms are generated by the regulator.
- Download and analyze alarm history.
- Check configuration files for consistency.

## Emergency On-site Service

When telephone support and remote system diagnostics cannot solve or diagnose the problem, immediate on-site assistance may be necessary. In this case, the SureService customer response center dispatches a field service engineer to the plant's site.

The immediate availability of a SureService engineer quickly returns plant operations to normal, reducing or eliminating downtime and unplanned outages to significantly improve plant performance and profitability.

All emergency on-site service subscribers receive priority response, ensuring fast, efficient on-site support. Emerson's team of field service engineers encompasses a wealth of experience and training in every stage of a control system, including field installation, startup and upgrading of complex process control systems.

Trained to assess and evaluate the situation quickly and thoroughly, the field engineer communicates with the SureService team, ensuring access to technical expertise and support resources until the problem has been resolved.

## Component Coverage

The SureService team stands ready to eliminate costly interruptions to plant operations by returning failed components

to normal. A staff of highly trained technicians and inspectors follow strict methodologies to ensure that critical parts are replaced or repaired quickly, thereby minimizing downtime and maximizing the efficiency of plant operations.

For a single fixed fee, component coverage includes the repair of all Emerson-supplied components that have an assigned Emerson part number during the contract term. When possible, component coverage subscribers don't wait for repair of malfunctioning parts. As soon as Emerson receives a defective part, a replacement part is located within the exchange inventory and shipped.

SureService component coverage subscribers can also arrange for a replacement part to be shipped in advance. All exchange parts are thoroughly tested and include the latest improvements and upgrades. Throughout the process, the SureService team works quickly to ensure minimal disruptions to normal plant operations.

When a part is not available in the exchange inventory, or if a customer requests repair rather than replacement, the component coverage team follows a strict methodology that ensures that the malfunctioning part goes through detailed inspection, repair and testing procedures to return it to proper working order.

## Classic System Component Support

Classic system component support extends spare parts, parts exchange and repair service to control systems that have reached a "retired" status. The off-the-shelf technology that makes open control

systems appealing also makes maintaining a steady level of product support unpredictable. Key spare parts can disappear from the market at any time. With the classic system component support application, Emerson will supply customers with component coverage after the control systems have reached the retired status for as long as the market on the necessary spare parts remains open and repair of those parts is possible.

With classic system component support, customers submit a blanket purchase order as part of their SureService package. The purchase order will include a "not-to-exceed-dollar amount" and will be used on an as-needed basis throughout the contract term for repairs of components that are still available on the market.

Benefits of this service include:

- Extends component coverage to cover retired status
- Provides additional level of confidence in open systems
- Offers an avenue to lengthen the life of the plant's control system
- Provides the opportunity for packaged discounts

## Training Programs

Emerson's training programs are designed for the ongoing education and development of the operators, engineers and technicians that support plant operations. When training is built into a SureService contract, plant staff can attend training courses as needed.

Many of our SureService support engineers have training and education backgrounds. This provides them with the ability to communicate clearly and target opportunities for operators to improve their skills to better

support the control system and the excitation control system.

Including training programs in a SureService contract encourages plant support staff to develop new skills to communicate with the SureService team during support calls or on-site visits. Whenever possible, the SureService support engineers recommend specific training courses or custom training programs to improve plant operations.

Ovation training programs include:

- Standard course offerings
- On-site and customized training programs
- Training at customer sites
- Custom-developed course content
- On-line instructor-led classes through Emerson's virtual classroom

These comprehensive training programs address the configuration, programming, administration and operation of our product lines under Ovation platforms. Operators, technicians and engineers gain an individual perspective on the understanding and operation of an Ovation system.

Ovation excitation systems training programs are conducted at our training facility in Pittsburgh, Pennsylvania and are targeted for control and electrical engineers, technicians, system engineers and technicians who have the primary responsibility for the excitation controller operation and maintenance.

## Software Updates

Emerson's software updates<sup>1</sup> service ensures continual robust functionality of the Ovation control system without significantly changing the software level. In the world of always-evolving technology, software

updates contain the results of continuing efforts in software improvement.

Customers desire the newest Ovation software updates and third-party patches as they become available; however, complicated installation procedures may cause users to avoid needed updates. Customers may also be concerned about the potential impact of the update on the existing software. Emerson's engineers will ensure that no existing application software is directly or negatively impacted by each update.

Ovation software updates can be obtained from a SureService representative. Validated third-party patches can be downloaded from the SureService section of the Users' Group website. Customers who subscribe to the SureService scheduled on-site service application can also request that one of our experienced field service engineers perform the Ovation software update or install the third-party patches via a scheduled visit. SureService customers will have access to any relevant update documentation for general knowledge and record-keeping purposes.

Ovation and Microsoft security patches are distributed at the end of each month through three unique channels:

- Ovation Users' website
- Box website for Ovation Security Center (OSC), and Power & Water Cybersecurity Suite (PWCS) customers
- CD delivery

### Ovation Users' Website

The Ovation Users' website provides a 3-month span of all the security patch downloads that Emerson can legally distribute, such as Microsoft operating system

patches. After the 3-month span, all accumulative patches can be requested through SureService software update support via CD delivery.

Links to vendor websites with approved patches that Emerson cannot legally distribute, such as Adobe® Reader and Java™ patches, are also provided on the Ovation Users' site.

### OSC and PWCS Box Website

OSC and PWCS customers who have purchased patch management support and are subscribed to the SureService OSC and PWCS support services can download all security patches, including those for Adobe® and Java™ Runtime Environment (JRE) from the Ovation Users' Box website:

- <https://ovationusers.account.box.com>

OSC and PWCS patch/update files are obtained from Emerson's dedicated Box.com subscription website. The subscription website requires the user to use a unique login assigned in the SureService agreement.

Downloaded security patches are transferred to the patch management application and deployed to all Ovation workstations as scheduled by the OSC or PWCS.

Due to the nature of file sharing employed in this distribution mechanism, it is possible that the Ovation Users' Box websites may be blocked by corporate firewalls. This restriction can be removed by whitelisting these websites in the corporate firewalls to provide authorized personnel access for file retrieval.

### CD Delivery

Upon request, CDs containing an accumulation of all security patches can be sent to the customer's site.



## Benefits

- Latest available validated patches available for operating systems, Oracle, Adobe Reader, Java and Internet Explorer
- Provides Ovation system software updates
- Avoids potential impacts by the known and corrected system bugs
- Provides immediate access to pertinent update documentation and media information

## Software Updates with Antivirus Program

For systems that include Emerson-validated antivirus software for virus protection, anti-spam and content filtering on Windows-based platforms, customers can subscribe to the SureService software updates with antivirus program to receive the latest tested and approved protective software to guard against viruses, cyber-attacks and other unwanted intrusions.

## Benefits

- Includes all the features of the SureService software update program
- Receives antivirus signature updates
- Includes antivirus license

## Ovation Guardian™ Support

The SureService Ovation Guardian support application displays Ovation system-specific data, as well as technical support information, including the status of the current SureService contract and the state of any technical support calls. Additionally, Guardian collects information related to

OEM and commercial off-the-shelf technologies, digital field devices and other Emerson alliance partner products associated with the Ovation system.

The result is a comprehensive collection of system-specific information, accessible from a secure web site connection that will enhance the ability to manage the Ovation distributed control system more effectively and efficiently.

Guardian support users can also download Ovation and Microsoft security patches through the Ovation Users' web site and/or from the OSC, PWCS Box website.

## Ovation Security Center Support

The Ovation Security Center (OSC) support application, which is applicable for the OSC 3.0 and forward, is designed to keep the software, contents or license elements promptly updated and the hardware components quickly repaired in case of mechanical failures. In general, the SureService support includes:

- Software updates for maintenance releases and improvements
- Content updates for the vulnerability database, latest security patches and updated security policies or rule settings
- License renewals where applicable
- Hardware repair during the term of a valid SureService contract that includes OSC support

## Cybersecurity Assessment

The cybersecurity assessment service can assist in identifying threats and

vulnerabilities that could impact the reliability and availability of critical control systems, process data and network operations.

The assessment is specifically designed to aid in identifying the current state of the plant's security posture, by providing a better understanding of the strength of defenses against cyber-attacks.

## Software Archiving

Software archiving is a remote file storage system that adds an extra edge of protection to plant's operation. With software archiving, Emerson transfers electronically the software and data files to an off-site location to be dated, archived and stored, mitigating unexpected events that can cause financial loss through hardware breakdowns, software crashes and other lost revenues, incurring in high costs.

On a periodic basis, Emerson saves critical software and files running at the plant's workstations and database servers. These include data files such as system databases, control sheets and graphics programs. Other configuration files for routers, switches, historian, log reports, connectivity software or others can be optionally archived when they are manually copied to the proper directory. Software and files saved are transferred via the Internet to the archival system at Emerson's archival center to be dated, archived and stored.

All files remain stored for four periods before being replaced by the newest archival. A period can be defined as weekly, biweekly, monthly or quarterly.

At the end of each cycle, the last archived file will be transferred to an optical media.

This optical media will be stored at an off-site for additional protection.

If problems occur, the archived software can be selected to be used for the reload. This software requires minimal re-testing and re-alignment to return the system to normal operations in minimal time, reducing both downtime and engineering time.

## Benefits

- Meets NERC CIP-009-1 R4 backup and restore guidelines
- Recovers complete control system application software in a timely manner
- Quickly returns plant to normal operations with the latest saved control parameters
- Minimizes further loss of revenue due to unexpected disaster to the control system

## Online Tutoring

Online tutoring provides the next step toward maintaining and increasing the skill level of plant personnel on system operations. By remotely accessing the system and operating environment, an instructor provides instruction for performing programming, diagnostics, maintenance, operations and other functions. The instructor also provides tips and insight to increase operator skill level for better plant control.

As the plant's staff changes with new hires and retired professionals, many new operators must learn system operation through on-the-job training, often not acquiring the full knowledge that operators once carried. Even experienced personnel

might lose certain techniques that are not used frequently.

## Application Enrichment

With application enrichment, Emerson's process specialists can remotely modify existing software and implement any changes as necessary to maintain a route for constant system improvements and additions.

Application enrichment allows control technology to effectively adapt to changing requirements. Emerson's engineers provide support with updated knowledge and skills to avoid a complex, re-learning process during implementation of changes necessary to keep the control system running efficiently.

After acceptance, modifications are downloaded and made immediately effective. After the implementation and working together with the customer, the operation of the system is monitored to ensure full software acceptance and compliance. Before the expiration of the current SureService contract, the up-to-date service days will be compared against the contracted days. Any unused days can be converted to other services within the same year.

### Benefits

- Uses the most effective resource and avoids the re-learning process
- Expands the application software with operating experiences
- Reflects process changes in software without unnecessary delays
- Explores the system's full capabilities

## Optimization Services

SureService support includes an application specific to optimization technology and EDS. As part of this support service, the customer will receive:

- SureService telephone support
- Scheduled on-site service
- Software updates
- Software archival
- Tuning service

### Proactive Support

Emerson's highest level of SureService support for optimization assists in maximizing the return on the technology investment. This is accomplished by analyzing the optimization solution through weekly reviews to ensure optimal system operation. A monthly report is generated that details runtime statistics, system availability and affected economic factors.

### Optimization Telephone Support

Optimization telephone support, executed through the SureService customer response center, puts Emerson optimization specialists in direct communication with the plant's personnel. The optimization team is ready 24 x 7 to quickly identify and resolve any optimization related issues, as well as provide answers to optimization questions.

### Scheduled On-site Service

With scheduled on-site service, optimization engineers travel to the site to evaluate system operation, maintenance services and file and logic backups. Emerson's optimization field engineering team can implement changes or perform accumulated maintenance tasks during



normal plant operations or planned outages without diverting essential staff manpower from their critical tasks.

Additional services that can be performed during on-site visits include:

- Resolving pre-identified issues
- Backing up software
- Inspecting network communications
- Cleaning-up files
- Implementing minor updates
- Performing other necessary maintenance functions
- Providing recommendations on optimization solutions to accommodate seasonal or operational variation in emission requirements

### Software Updates

Following the initial release of a major software level, software updates or "patches" are developed to modify, enhance or fix minor issues associated with the initial release. The software update application downloads the latest updates to the optimization software, ensuring optimum system functionality without significantly changing the operational aspects. As soon as the updates to the customer's software level become available, a remote software upload via virtual private network (VPN) can be requested (this may require the installation of a VPN connection), or the update can be installed during an on-site service visit. Emerson's service team will fully explain the new features and functions contained in the software release, as well as any system configuration changes that may be required with onsite staff.

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### Software Archiving

Through software archiving, critical software and files are electronically transferred on a periodic basis to the SureService customer support center in Pittsburgh, PA. The software is then dated, archived and securely stored as a secondary mechanism to the local activity. All files remain stored at a dedicated workstation for four weeks and then transferred to storage or optical media. For additional protection, the media can be sent to a secure off-site facility for long-term storage.

### Tuning Service

Emerson's service team uses experienced engineering support to adjust optimization solution objectives to accommodate equipment updates, unusual operating modes, seasonal adjustments or operational variation in optimization goals. Emerson engineers can perform these fine-tuning functions during a scheduled on-site service visit or remotely via VPN.

### Simulation Update Services

Emerson offers simulation update services as part of the SureService customer support program to help customers' simulation solutions keep pace with control system technology advancements and plant operations. The SureService simulation update service program provides yearly support that starts with a site survey to assess current conditions and then follows with scheduled maintenance aimed at keeping simulator processes operating at peak performance. An investment in the SureService simulation update program will extend the



life of the simulator system, while keeping it aligned with the customer's plant DCS.

## Scheduled Alarm Management Services

Scheduled alarm management services provide knowledgeable manpower that assists the plant's workforce in keeping the alarm system and processes operating at optimum levels and thus allowing them to focus on other tasks.

Periodic alarm system assessments may reveal alarm configuration changes that can improve the control system and plant reliability.

## Benefits

- Enhances alarm system performance through periodic, scheduled reviews
- Improves operator awareness of priority alarms
- Augments plant staff so they can focus on other responsibilities
- Increases plant efficiency by customizing alarm management tasks to help determine event priorities
- Provides immediate access to alarm management specialists for:
  - Assessing alarm configurations
  - Implementing configuration changes
  - Answering general alarm system questions
  - Providing training to staff

<sup>†</sup> Ovation software updates for Ovation 3.6 systems and higher include feature pack updates

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**EXHIBIT B  
COMPENSATION AND PAYMENT SCHEDULE**

**1. MAXIMUM COMPENSATION**

The maximum amount payable for all materials and services provided under this Agreement shall not exceed **Three Million Two Hundred Four Thousand Five Hundred Fifty-Two Dollars (\$3,204,552)** during the term of the Agreement. Any additional services or materials requested by the City that would exceed the preceding maximum amount will be addressed in an Amendment to the Agreement. No additional services will be performed unless both Parties execute an Amendment outlining the services requested and the compensation agreed for such services.

**Table B-1: Maximum Compensation**

| Description                                  | Total              |
|--|--------------------|
| System Implementation (see Section 2 below)  | \$2,557,000        |
| Support for five years (see Section 3 below) | \$147,552          |
| Contingency                                  | \$500,000          |
| <b>Maximum Compensation</b>                  | <b>\$3,204,552</b> |

**2. SYSTEM IMPLEMENTATION**

**2.1. Firm Fixed Price**

Contractor shall provide all equipment, materials, and labor to upgrade the Distributed Control System as specified in Exhibit A on a firm fixed cost basis as set forth in Table B-2 below. Any additional products or services will be presented to the City for approval prior to commencement of the work.

**Table B-2: System Implementation - Price Breakdown**

| <b>System Implementation</b>  |                    |
|---|--------------------|
| Hardware  | \$682,214          |
| Software Application (including Windows Server 2016, Windows 10, Ovation, and OPH with Crystal Reports for report building) | \$476,116          |
| Project Management  | \$65,000           |
| Installation  | \$541,365          |
| System Commissioning / Validation / Final System Acceptance   | \$694,130          |
| Documentation   | \$3,400            |
| Training (15 weeks factory training; one week on-site)  | \$32,775           |
| Shipping (FOB Destination)  | Included           |
| Expanded Ovation Spare Parts  | Included           |
| V-System Server with 1 Virtual Controller (Training System)   | Included           |
| Use of LM6000 Simulator (via remote login)  | Included           |
| Ovation playback machine  | Included           |
| <b>Subtotal</b>   | <b>\$2,495,000</b> |
| <b>Sales Tax</b>  |                    |
| Estimated Sales Tax   | \$62,000           |
| <b>TOTAL SYSTEM IMPLEMENTATION</b>  | <b>\$2,557,000</b> |

## 2.2. Payment Schedule

**Table B-3: System Implementation Payment Schedule**

| <b>Milestone/Deliverable</b>  | <b>Estimated Completion Date</b> | <b>Payment</b>     |
|---|----------------------------------|--------------------|
| Project Management / Kick-off Meeting / Submittal of Hardware Drawings                              | 7/1/19                           | \$748,500          |
| Submittal of Initial Functional Control Drawings  | 7/29/19                          | \$499,000          |
| Completion of Factory Acceptance Test   | 10/11/19                         | \$249,500          |
| Completion of System Installation and Commissioning   | 11/26/19                         | \$499,000          |
| Final System Acceptance*  | 12/31/19                         | \$499,000          |
| <b>Subtotal</b>   |                                  | <b>\$2,495,000</b> |
| Estimated Sales Tax (to be paid in accordance with applicable milestone for which sales tax is due) |                                  | \$62,000           |
| <b>TOTAL PAYMENTS</b>   |                                  | <b>\$2,557,000</b> |

\*The signed Final Acceptance Certificate (Appendix A-6) triggers final payment and start of warranty period.

- 2.2.1. Progress payments shall be made to Contractor by City following acceptance of designated milestones as shown in Table B-3.
- 2.2.2. All payments are based upon City's acceptance of Contractor's performance as evidenced by successful completion of all of the deliverables as set forth for each milestone. City shall have no obligation to pay unless Contractor has successfully completed and City has approved the milestone for which payment is due.
- 2.2.3. Payment for any part or parts of the System provided hereunder, or inspection or testing thereof by City, shall not constitute acceptance or relieve Contractor of its obligations under this Agreement. City may inspect the components of the System when delivered and reject upon notification to Contractor any and all the System, which does not conform to the specifications or other requirements of this Agreement. Components of the System, which are rejected shall be promptly corrected, repaired, or replaced by Contractor. If City receives components of the System with defects or nonconformities not reasonably apparent on inspection, then City reserves the right to require prompt correction, repair, or replacement by Contractor in accordance with Contractor's warranty obligations.

### 3. ONGOING SUPPORT AND MAINTENANCE SERVICES

Ongoing support and maintenance services after Final System Acceptance shall be in accordance with the pricing set forth herein.

#### 3.1. SureService™ Customer Support Programs

Contractor provides various support programs as described in Appendix A-7. The City has elected to purchase the service programs listed below. The City reserves the right to delete or add service programs as required to support the System.

Contractor shall invoice the City annually for all applicable support and maintenance costs. In the event of early termination of the Agreement, Contractor shall refund the City on a pro-rated basis any fees paid in advance that have not been expended as of the date of termination.

**Table B-4: Selected SureService™ Customer Support Program**

| Description  | Annual Total     |
|--|------------------|
| Year 1 SureService™ (SureService Telephone Support, Internet Information Access, Remote System Diagnostics, and Software Updates with Antivirus Program) | \$0              |
| Year 2 SureService™ (SureService Telephone Support, Internet Information Access, Remote System Diagnostics, and Software Updates with Antivirus Program) | \$34,233         |
| Year 3 SureService™ (SureService Telephone Support, Internet Information Access, Remote System Diagnostics, and Software Updates with Antivirus Program) | \$35,946         |
| Year 4 SureService™ (SureService Telephone Support, Internet Information Access, Remote System Diagnostics, and Software Updates with Antivirus Program) | \$37,743         |
| Year 5 SureService™ (SureService Telephone Support, Internet Information Access, Remote System Diagnostics, and Software Updates with Antivirus Program) | \$39,630         |
| <b>5-Year Total</b>  | <b>\$147,552</b> |

#### 3.2. Additional Services

Unless otherwise included under the SureService™ Customer Support Program for which the City has paid the applicable fees, service rates and spare parts shall be as follows:

**Table B-5: Rates**

|   |
|---|
| <b>Weekdays</b><br>First 8 hours that day @ 1,750 per day; Additional hours that day @ \$328/hour       |
| <b>Saturdays</b><br>All hours that day @ \$328/hour   |
| <b>Sundays &amp; Holidays</b><br>All hours that day @ \$438/hour  |
| <b>Spare parts</b> - 50% off list price through final system acceptance; 15% off list price thereafter. |

#### 4. SYSTEM ENHANCEMENTS AND UPGRADES

Upon request of the City, Contractor shall provide services and resources required to implement upgrades, improvements, and enhancements to the System as required by the City. Additional products and services shall be separately negotiated to be paid on a lump sum or time and material basis as authorized by the City. No additional products or services will be provided unless both Parties execute an Amendment to this Agreement.

The City has identified the following system features / enhancements that may be implemented at a later time.

| Description   | Unit Price |
|---|------------|
| Ovation Machinery Health Monitor (OMHM) to replace the Bently Nevada 3500 on the Steam Turbine  | \$45,782   |
| Workbench with Tie-back Simulation  | \$185,000  |
| AVR and PSS replacement for 2 CTG's and 1 STG. Includes applicable testing and certification by 3rd party - Ovation Excitation System | \$498,000  |
| Network Intrusion Detection (NID)   | \$188,000  |
| Vulnerability Assessment  | \$39,000   |

#### 5. INVOICING

Compensation and payments shall be made to Contractor by City based on Net Thirty (30) days payment terms.

The City will make payments when due in the form of a check, cashier's check, or wire transfer drawn on a U.S. financial institution.

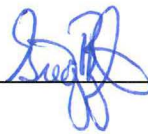
#### 6. LIQUIDATED DAMAGES

**IF CONTRACTOR DOES NOT COMPLETE ITS WORK BY DECEMBER 15, 2019, OR SUCH OTHER DATE AS MUTUALLY AGREED UPON, PLUS ANY EXTENSIONS GRANTED BY CITY IN WRITING, DAMAGES WILL BE SUSTAINED BY CITY AND IT IS AND WILL BE IMPRACTICAL AND EXTREMELY DIFFICULT TO ASCERTAIN THE ACTUAL DAMAGES WHICH CITY WILL SUSTAIN IN THE EVENT OF AND BY REASON OF SUCH DELAY. IT IS THEREFORE AGREED THAT, FOR DELAYS THAT ARE SOLELY CAUSED BY CONTRACTOR, THE CONTRACTOR SHALL PAY TO CITY THE SUMS SET FORTH BELOW FOR DELAYS IN FINISHING ITS WORK BEYOND THE TIMES OF COMPLETION SPECIFIED; AND THE CONTRACTOR AGREES TO PAY THESE LIQUIDATED DAMAGES, AND FURTHER AGREES THAT CITY MAY DEDUCT THE AMOUNT THEREOF FROM ANY MONEYS DUE OR THAT MAY BECOME DUE THE CONTRACTOR UNDER THE AGREEMENT. ANY SUCH LIQUIDATED DAMAGES PAYABLE BY CONTRACTOR SHALL NOT EXCEED, IN THE AGGREGATE, TEN PERCENT (10%) OF THE CONTRACT PRICE AND SHALL BE THE CITY'S SOLE AND EXCLUSIVE REMEDY FOR ANY SUCH DELAY.**

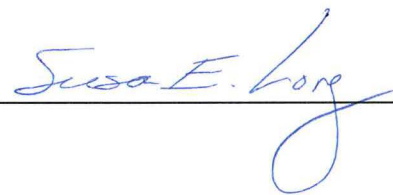
LIQUIDATED DAMAGES IN THE AMOUNT OF \$25,000 FOR EACH CALENDAR DAY OF DELAY CAUSED BY CONTRACTOR WILL BE IMPOSED ON CONTRACTOR.

BY PLACING THEIR INITIALS BELOW, CITY AND CONTRACTOR ACKNOWLEDGE THAT THE AMOUNT SET FORTH ABOVE HAS BEEN AGREED UPON AS THE PARTIES' REASONABLE ESTIMATE OF CITY'S DAMAGES.

"CITY"

By:  \_\_\_\_\_

"CONTRACTOR"

By:  \_\_\_\_\_

**EXHIBIT C**  
**INSURANCE REQUIREMENTS**

Without limiting the Contractor's indemnification of the City, and prior to commencing any of the Services required under this Agreement, the Contractor shall provide and maintain in full force and effect, at its sole cost and expense, the following insurance policies with the indicated coverages, provisions and endorsements. If the Contractor meets all of the requirements of this section through self-insurance, Contractor shall provide a written statement to that effect to be incorporated into this contract and shall provide proof of Contractor's ability to meet said requirements by providing a letter of credit to the City or audited annual financial statements that demonstrate its ability to meet the requirements.

**A. COMMERCIAL GENERAL LIABILITY INSURANCE**

1. Commercial General Liability Insurance policy which provides coverage as set forth below at least as broad as Insurance Services Office form CG 00 01. Policy limits shall be the following:

\$2,000,000 Each occurrence  
\$2,000,000 General aggregate  
\$2,000,000 Products/Completed Operations aggregate  
\$2,000,000 Personal Injury

2. Exact structure and layering of the coverage shall be left to the discretion of Contractor.

**B. BUSINESS AUTOMOBILE LIABILITY INSURANCE**

Business automobile liability insurance policy which provides coverage with policy limits of one million dollars (\$1,000,000) each accident. Liability coverage shall apply to all owned, non-owned and hired autos.

**C. WORKERS' COMPENSATION**

1. Workers' Compensation Insurance Policy as required by statute and employer's liability with limits of one million dollars (\$1,000,000) policy limit Bodily Injury by disease, one million dollars (\$1,000,000) each accident/Bodily Injury and one million dollars (\$1,000,000) each employee Bodily Injury by disease.
2. The indemnification and hold harmless obligations of Contractor included in this Agreement shall not be limited in any way by any limitation on the amount of damage, compensation or benefit payable by or for Contractor or any subcontractor under any Workers' Compensation Act(s), Disability Benefits Act(s) or other employee benefits act(s).
3. This Workers' Compensation coverage must include a Waiver of Subrogation, via blanket endorsement, in favor of the City of Santa Clara, its City Council, commissions, officers and employees to the extent of Contractor's negligent acts, errors or omissions or willful misconduct.

#### D. COMPLIANCE WITH REQUIREMENTS

All of the following clauses and/or endorsements, or similar provisions, must be part of each commercial general liability policy, and each umbrella or excess policy.

1. Additional Insureds. City of Santa Clara, its City Council, commissions, officers, and employees are hereby included as additional insureds to the extent of Contractor's negligent acts, errors or omissions or willful misconduct and subject to Article 19 in respect to Contractor's work for City, via blanket endorsement.
2. Primary and non-contributing. Each insurance policy provided by Contractor shall contain language or be endorsed via blanket endorsement to contain wording making it primary insurance to the extent of Contractor's negligent acts errors or omissions or willful misconduct as respects to, and not requiring contribution from, any other insurance which the Indemnities may possess, including any self-insurance or self-insured retention they may have. Any other insurance Indemnities may possess shall be considered excess insurance only and shall not be called upon to contribute with Contractor's insurance, to the extent of Contractor's negligent acts, errors or omissions or willful misconduct.
3. General Aggregate. The general aggregate limits shall apply separately to Contractor's work under this Agreement;
4. Cancellation.
  - a. Contractor shall provide written notice to City at least ten (10) days prior to the effective date of such modification or cancellation of its insurance policies. In the event of non-renewal, written notice shall be given at least ten (10) days of the effective date of non-renewal.
  - b. In the event of non-renewal, written notice shall be given at least thirty (30) days prior to the effective date of non-renewal.
5. Other Endorsements. Other blanket endorsements may be required for policies other than the commercial general liability policy if specified in the description of required insurance set forth in Sections A through D of this Exhibit C, above.

#### E. ADDITIONAL INSURANCE RELATED PROVISIONS

Contractor and City agree as follows:

1. Contractor agrees to ensure that subcontractors, and any other party involved with the Services who is brought onto or involved in the performance of the Services by Contractor, on the City's site provide the same insurance coverage required of Contractor, except as with respect to limits. Contractor agrees to monitor and review all such coverage and assumes all responsibility for ensuring that such coverage is provided in conformity with the requirements of this Agreement. Contractor agrees that upon request by City, all agreements with, and insurance certificates provided by such subcontractors and others engaged in the project on Contractor's behalf will be submitted to City for review.

2. Contractor agrees to be responsible for ensuring that no contract used by any party involved in performing any portion of Contractor's Work under this Agreement reserves the right to charge City or Contractor for the cost of additional insurance coverage required by this Agreement. Any such provisions are to be deleted with reference to City. It is not the intent of City to reimburse any third party for the cost of complying with these requirements. There shall be no recourse against City for payment of premiums or other amounts with respect thereto.
3. The City reserves the right to withhold payments from the Contractor in the event of material noncompliance with the insurance requirements set forth in this Agreement that Contractor fails to remedy upon receiving written notice.
4. Contractor may satisfy the insurance coverages required under this Agreement by a combination of primary and umbrella or excess insurance or self-insurance.

F. EVIDENCE OF COVERAGE

Prior to commencement of any Services under this Agreement, Contractor, and each and every subcontractor (of every tier) performing work on behalf of Contractor on City's site shall, at its sole cost and expense, provide and maintain the insurance coverage with the endorsements indicated in this Agreement.

G. EVIDENCE OF COMPLIANCE

Contractor or its insurance broker shall provide the required proof of insurance compliance, consisting of blanket endorsement forms and the ACORD form 25-S certificate of insurance (or its equivalent), evidencing all required coverage shall be delivered to City, or its representative as set forth below, at or prior to execution of this Agreement. Unless otherwise required by the terms of this Agreement, all certificates, endorsements, coverage verifications and other items required to be delivered to City pursuant to this Agreement shall be provided by e-mail to: [ctsantaclara@ebix.com](mailto:ctsantaclara@ebix.com).

Or by mail to:

EBIX Inc.  
City of Santa Clara – Silicon Valley Power  
P.O. Box 100085 – S2  
Duluth, GA 30096  
Telephone number: 951-766-2280  
Fax number: 770-325-0409

H. QUALIFYING INSURERS

All of the insurance companies providing insurance for Contractor shall have, and provide written proof of, an A. M. Best rating of at least A minus 6 (A- VI).



**EXHIBIT D  
LABOR COMPLIANCE ADDENDUM**

Contractor is subject to the applicable requirements of California Labor Code section 1720 et seq., to the extent applicable to Contractor's personnel, requiring the payment of prevailing wages, the training of apprentices, and compliance with other applicable requirements.

**I. Prevailing Wage Requirements**

1. Contractor shall be obligated to pay not less than the General Prevailing Wage Rate, which can be found at [www.dir.ca.gov](http://www.dir.ca.gov) and are on file with the City Clerk's office, which shall be available to any interested party upon request. Contractor is also required to have a copy of the applicable wage determination posted and/or available at each job site.
2. Specifically, contractors are reminded of the need for compliance with Labor Code Section 1774-1775 (the payment of prevailing wages and documentation of such), Section 1776 (the keeping and submission of accurate certified payrolls) and 1777.5 in the employment of apprentices on public works projects. Further, overtime must be paid for work in excess of 8 hours per day or 40 hours per week pursuant to Labor Code Section 1811-1813.
3. Special prevailing wage rates generally apply to work performed on weekends, holidays and for certain shift work. Depending on the location of the project and the amount of travel incurred by workers on the project, certain travel and subsistence payments may also be required. Contractors and subcontractors are on notice that information about such special rates, holidays, premium pay, shift work and travel and subsistence requirements can be found at [www.dir.ca.gov](http://www.dir.ca.gov).
4. Only bona fide apprentices actively enrolled in a California Division of Apprenticeship Standards approved program may be employed on the project as an apprentice and receive the applicable apprenticeship prevailing wage rates. Apprentices who are not properly supervised and employed in the appropriate ratio shall be paid the full journeyman wages for the classification of work performed.
5. As a condition to receiving progress payments, final payment and payment of retention on any and all projects on which the payment of prevailing wages is required, Contractor agrees to present to City, along with its request for payment, all applicable and necessary certified payrolls (for itself and all applicable subcontractors) for the time period covering such payment request. The term "certified payroll" shall include all required documentation to comply with the mandates set forth in Labor Code Section 1720 *et seq.*, as well as any additional documentation requested by the City or its designee including, but not limited to: certified payroll, fringe benefit statements and backup documentation such as monthly benefit statements, employee timecards, copies of wage statements and cancelled checks, proof of training contributions (CAC2 if applicable), and apprenticeship forms such as DAS-140 and DAS-142.

6. In addition to submitting the certified payrolls and related documentation to City, Contractor and all subcontractors shall be required to submit certified payroll and related documents electronically to the California Department of Industrial Relations. Failure to submit payrolls to the DIR when mandated by the project parameters shall also result in the withholding of progress, retention and/or final payment.
7. No contractor or subcontractor may be listed on a bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].
8. No contractor or subcontractor may be awarded a contract for public work on a public works project, unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5. Contractors MUST be a registered "public works contractor" with the DIR AT THE TIME OF BID. Where the prime contract is less than \$15,000 for maintenance work or less than \$25,000 for construction alternation, demolition or repair work, registration is not required.
9. All contractors/subcontractors and related construction services subject to prevailing wage, including but not limited to: trucking, surveying and inspection work must be registered with the Department of Industrial Relations as a "public works contractor". Those you fail to register and maintain their status as a public works contractor shall not be permitted to perform work on the project.
10. Should any contractor or subcontractors not be a registered public works contractor and perform work on the project, Contractor agrees to fully indemnify the City for any fines assessed by the California Department of Industrial Relations against the City for such violation, including all staff costs and attorney's fee relating to such fine.
11. This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

J. Audit Rights

All records or documents required to be kept pursuant to this Agreement to verify compliance with this Addendum shall be made available for audit at no cost to City, at any time during regular business hours, upon written request by the City Attorney, City Auditor, City Manager, or a designated representative of any of these officers. Copies of such records or documents shall be provided to City for audit at City Hall when it is practical to do so. Otherwise, unless an alternative is mutually agreed upon, the records or documents shall be made available at Contractor's address indicated for receipt of notices in this Agreement.

K. Enforcement

1. City shall withhold any portion of a payment; including the entire payment amount, until certified payroll forms and related documentation are properly submitted, reviewed and found to be in full compliance. In the event that certified payroll forms do not comply with the requirements of Labor Code Section 1720 et

seq., City may continue to hold sufficient funds to cover estimated wages and penalties under the Agreement.

2. Based on State funding sources, this project may be subject to special labor compliance requirements of Proposition 84.
3. The City is not obligated to make any payment due to Contractor until Contractor has performed all of its obligations under these provisions. This provision means that City can withhold all or part of a payment to Contractor until all required documentation is submitted. Any payment by the City despite Contractor's failure to fully perform its obligations under these provisions shall not be deemed to be a waiver of any other term or condition contained in this Agreement or a waiver of the right to withhold payment for any subsequent breach of this Addendum.

City or the California Department of Industrial Relations may impose penalties upon contractors and subcontractors for failure to comply with prevailing wage requirements. These penalties are up to \$200 per day per worker for each wage violation identified; \$100 per day per worker for failure to provide the required paperwork and documentation requested within a 10-day window; and \$25 per day per worker for any overtime violation.

**EXHIBIT E**  
**EMERSON PROCESS MANAGEMENT, POWER & WATER SOLUTIONS SOFTWARE**  
**LICENSE AGREEMENT**

License TO USE: The term LICENSEE includes an authorized user who accepts and agrees to be bound by the terms of this Agreement. Emerson Process Management, Power & Water Solutions, ("EMERSON"), grants LICENSEE a nonexclusive, nontransferable license to utilize one copy of all fully paid up licensed Software provided to LICENSEE (unless multiple copies or concurrent or simultaneous use rights are elsewhere authorized) for the intended purpose and LICENSEE's internal use in the equipment in which it is initially installed. "Software" as used herein shall mean any software program, firmware, or flash ROM licensed by EMERSON including, but not limited to, the EMERSON operating system software, application software, machine readable media on which the Software is contained, documentation, and/or written materials accompanying the Software. IF LICENSEE TRANSFERS POSSESSION OF ANY COPY OR MODIFICATION OF THE SOFTWARE OR RELATED MATERIALS TO ANOTHER PARTY, EXCEPT AS EXPRESSLY PROVIDED FOR IN THIS LICENSE, THIS LICENSE IS AUTOMATICALLY TERMINATED. The license fee for the EMERSON Software is included in the contract price. If concurrent or simultaneous usage licenses are furnished, LICENSEE may not at any one time exceed the maximum number of licenses purchased under this Agreement. LICENSEE shall not alone or with assistance of others reverse compile, reverse engineer or in any other manner attempt to decipher in whole or in part the logic or coherence of any Software licensed hereunder. Except as specifically provided herein, no license, express or implied, is granted under any intellectual property directly or indirectly owned by EMERSON. Furthermore, no license (except the license specifically granted herein) or any license in third party software furnished under this Agreement, shall be implied in law, implied in equity, or exist under the doctrine of patent exhaustion. LICENSEE may make one backup copy of such Software for evaluation, installation and maintenance of the equipment in which the Software is installed. LICENSEE must reproduce and include the copyright notice on any copy or modification of the Software. LICENSEE recognizes that third party software furnished by EMERSON may be subject to a separate license agreement and/or registration requirements and limitations on copying and use and LICENSEE agrees to be bound by the terms of any third party license agreement(s) accompanying such software.

TITLE: All title and ownership of the Software and any derivative works including, without limitation, the copyright to such Software, shall remain exclusively with EMERSON or its licensors. LICENSEE'S right to use the same is at all times subject to the terms and conditions of this Agreement. EMERSON may, from time to time, revise or update the Software and/or related materials and, in so doing, incurs no obligation to furnish such revisions or updates to LICENSEE.

TERMINATION: LICENSEE may terminate this license at any time by destroying the Software and the related materials together with all copies and modifications in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if LICENSEE fails to comply with any term or condition of this Agreement. LICENSEE agrees upon such termination to destroy the Software and the related materials together with all copies and modifications in any form.

WARRANTY: a) Software provided directly to End User: Unless otherwise agreed in writing by the parties, EMERSON warrants that the Software provided hereunder will be free from errors

which materially affect its utility. The warranty period shall expire 12 months from the date of completion of installation or 18 months from the date of delivery, whichever occurs first. Unless stated otherwise herein, third party software shall be warranted and remedied on a pass through basis in the same manner and for the same period and extent provided by the original software manufacturer. This Software warranty does not apply to any application software or set of instructions composed by LICENSEE; provided however, that this warranty will extend to any application software composed by EMERSON in accordance with LICENSEE's instructions, but only to the extent of such instructions. b) Software provided through Intermediate Parties: Unless otherwise agreed in writing by the parties, EMERSON warrants that the Software provided hereunder will be free from errors which materially affect its utility. The warranty period shall expire 12 months from the date of completion of installation or 18 months from the date of delivery to the Intermediate Party, whichever occurs first. Unless stated otherwise herein, third party software shall be warranted and remedied on a pass through basis in the same manner and for the same period and extent provided by the original software manufacturer. This Software warranty does not apply to any application software or set of instructions composed by LICENSEE; provided however, that this warranty will extend to any application software composed by EMERSON in accordance with LICENSEE's instructions, but only to the extent of such instructions.

YEAR 2000 WARRANTY: EMERSON warrants that the Software provided hereunder will be Year 2000 Compliant. "Year 2000 Compliant" shall mean the Software will be capable of managing and manipulating data involving dates, including single century formulas and multi-century formulas, and not generate incorrect values or invalid results involving such dates. LICENSEE acknowledges that this Year 2000 warranty shall not apply: i) to any software that is not date sensitive; ii) to any software not furnished under this Agreement; iii) to software provided by LICENSEE or others which may interface or operate in conjunction with EMERSON furnished Software/equipment, regardless of whether such other software/equipment is itself Year 2000 compliant; and iv) to the EMERSON furnished Software in the event any software/equipment not furnished by EMERSON under this Agreement prevents the EMERSON furnished Software from performing any function specified in the above definition of "Year 2000 Compliant". Remedies: In the case of a nonconformity in this warranty and if EMERSON is notified in writing of such nonconformity during the applicable warranty period, it shall be remedied, upon return to EMERSON, by correction in the medium originally supplied, or provision of a procedure to correct material errors. If such remedies are impracticable, EMERSON may refund the purchase price for the nonconforming Software. Any warranty specified herein is conditioned upon: a) proper handling, installation and maintenance; b) not having been subjected to accident, alteration, abuse or misuse; and c) LICENSEE providing necessary access and assistance for EMERSON to fulfill its warranty obligations.

LIMITATIONS OF REMEDIES: The warranties set forth above are exclusive and in lieu of all other warranties whether statutory, express or implied (including all warranties of merchantability and fitness for purpose and all warranties arising from course of dealing or usage of trade). The remedies set forth, for the time and in the manner provided above, shall be LICENSEE's exclusive remedies for failure of EMERSON to meet its warranty obligations, whether based in contract, in tort (including negligence or strict liability), or otherwise. IN NO EVENT WILL EMERSON BE LIABLE TO LICENSEE FOR ANY DAMAGES ARISING OUT OF ANY CAUSES WHATSOEVER (WHETHER SUCH CAUSES BE BASED IN CONTRACT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT, PATENT INFRINGEMENT, OR OTHERWISE), INCLUDING ANY damage to or loss of property or equipment; loss of profits or revenue; loss of use of LICENSEE's property, equipment or power system; increased costs of any kind, including but not limited to cost of operation and maintenance, capital cost, fuel cost and cost of purchased or replacement power; or claims of customers of licensee, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES

ARISING OUT OF THE USE OR INABILITY TO USE SUCH SOFTWARE EVEN IF EMERSON HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR OF ANY CLAIM BY ANY OTHER PARTY.

**GOVERNING LAW:** This Agreement shall be governed by the laws of the Commonwealth of Pennsylvania, U.S.A., excluding both its rules or laws regarding choice or conflict of laws and the United Nations Convention on Contracts for the International Sale of Goods.

**EXPORT RESTRICTIONS:** Licensee shall comply fully with all laws, regulations, decrees and orders of the United States of America that restrict or prohibit the exportation (or reexportation) of technical data and/or the direct product of it to other countries, including, without limitation, the U.S. Export Administration Regulations.

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