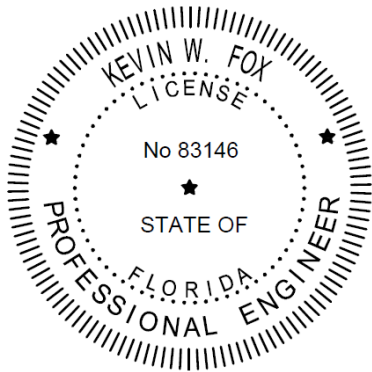




Specifications

FOR

**Central Energy Plant
Combustion Turbine Generator**



ISSUED FOR BID

**August 24, 2020
Rev 0**

Jacobs

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY

ON THE DATE ADJACENT TO THE SEAL. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

Prepared by:
777 Main Street
Fort Worth, Texas 76102
(817) 735-6000

Jacobs Project Number: WFXO2603
University of Florida Project Number: UF-623D

FLORIDA ENGINEERING CERTIFICATE AUTHORIZATION #2822

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS
SECTION 48 11 23 – COMBUSTION TURBINE GENERATOR

PART 1 - GENERAL	1
1.1 SECTION INCLUDES	1
1.2 DEFINITIONS.....	1
1.3 QUALIFICATIONS	3
1.4 DOCUMENTATION	3
1.5 QUALITY ASSURANCE.....	7
1.6 APPLICATION	7
PART 2 - PRODUCTS	9
2.1 APPROVED MANUFACTURERS	9
2.2 SCOPE OF SUPPLY – CTG PACKAGES	11
2.3 PERFORMANCE GUARANTEES	13
2.4 DESIGN REQUIREMENTS	14
PART 3 - EXECUTION	25
3.1 FACTORY TESTS AND INSPECTIONS	25
3.2 PREPARATION FOR SHIPMENT	26
3.3 INSTALLATION SUPERVISION.....	27
3.4 COMMISSIONING AND STARTUP SUPERVISION.....	27
3.5 FIELD TESTS AND ENGINEERING SUPPORT	28
3.6 TRAINING	29
 ATTACHMENTS	
1 GENERAL INFORMATION	
2 CTG PERFORMANCE TABLES	
3 REQUIRED SUBMITTALS	
4 CEP PLANT GENERAL ARRANGEMENT DRAWINGS	
5 PROCESS FLOW DIAGRAM	
6 ELECTRICAL SINGLE-LINE DIAGRAM	
7 FUEL SAMPLE ANALYSIS – NATURAL GAS	
8 CEP PLANT TAG NUMBERING REQUIREMENTS	
9 PRICING FORM	

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 48 11 23 – COMBUSTION TURBINE GENERATOR

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Specifications for one (1) Combustion Turbine Generator (“CTG”) package including controls, required auxiliaries, fuel conditioning equipment and accessories.
- B. The CTG package shall include features needed for safe, highly reliable, efficient, long-term operation. Design shall be in accordance with good engineering practice, applicable standards, and shall meet the strict demands typical of industrial power plants for safety and reliability, as well as those imposed by the University of Florida and all regulatory agencies having jurisdiction in the State of Florida.

1.2 DEFINITIONS

- A. “Owner”: University of Florida, “UF”
- B. “Engineer”: Jacobs Engineering Group, Fort Worth, TX.
- C. "Bidder": Entity responding to this Invitation to Bid.
- D. “Vendor”: Recipient of any award of any Purchase Order resulting from this Invitation to Bid.
- E. “Supplier”: Entity supplying equipment and/or materials to Vendor.
- F. “Job Site”: Official project mailing address is:

University of Florida
Facility Services
3280 Radio Road, Building 700
P.O. Box 117700
Gainesville, FL 32611-7700

- G. The equipment, materials and services furnished under this Specification shall meet or exceed the requirements of all applicable federal, state and local codes; standards and regulations; and the applicable codes, standards, and specifications of the following organizations:
 - 1. AISC - American Institute of Steel Construction
 - 2. AISI - American Iron and Steel Institute
 - 3. ANSI - American National Standards Institute
 - 4. ASME - American Society of Mechanical Engineers
 - 5. ASTM - American Society for Testing and Materials
 - 6. AWS - American Welding Society
 - 7. EPA - Environmental Protection Association

8. FDEP – Florida Department of Environmental Protection
9. FM – Factory Mutual
10. IEC – International Electrotechnical Commission
11. IEEE – Institute of Electrical and Electronic Engineers
12. IRI – Industrial Risk Insurers
13. ISA – International Society of Automation
14. NEMA - National Electrical Manufacturers Association.
15. NFPA - National Fire Protection Association
16. NIST - National Institute of Standards Technology
17. OSHA - Occupational Safety and Health Administration.
18. SAMA - Scientific Apparatus Makers Association
19. UL - Underwriters' Laboratories

H. The following specific documents shall form part of this specification:

1. ANSI B16.5 - Pipe Flanges and Flanged Fittings
2. ASME B31.1 - Power Piping
3. ASME PTC 22 - Performance Test Code on Gas Turbines
4. AWS D1.1 - Structural Welding Code
5. NESC – National Electric Safety Code
6. NFPA 37- Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
7. NFPA-70 - The National Electric Code (NEC)
8. NFPA 85 - Boiler and Combustion Systems Hazard Code (2011)

I. While a number of applicable sections of the aforementioned codes and standards have been identified in portions of this Specification, the Vendor has the ultimate responsibility for the complete identification and execution of all applicable sections of the aforementioned codes and standards.

J. Unless otherwise stated, these codes, standards or material specifications shall be the latest revisions, including all effective publications, supplements, addenda and editions in effect at the issuance date of this document.

K. These codes and standards set forth the minimum requirements. These may be exceeded by the Vendor if, in its judgment and with Owner's acceptance, superior or more economical designs or materials are available.

L. The most severe requirements shall prevail in the event of conflict between requirements, specifications and applicable and governing codes. All conflicts among the Codes, specifications and/or purchase order shall be brought to the Owner's and Engineer's attention for written resolution prior to release for fabrication.

M. It is the vendor's responsibility that all equipment and materials furnished and installed be in strict conformity with all current, applicable codes and regulations of the State of Florida. Violations resulting from stipulations in the existing codes shall be corrected by the vendor at its own expense.

N. The Vendor shall be responsible for obtaining copies and paying all costs of all applicable codes and regulations.

1.3 QUALIFICATIONS

- A. Only bidders with demonstrated experience in the manufacturing, testing, and servicing of CTG units will be considered. If the bidder is a packager or independent representative, a letter shall be provided from the CTG OEM authorizing the bidder to sell and service the proposed Combustion Turbine Generator package. All bids shall include a list of references for higher education installations.
- B. All bids shall include a list of clarifications and exceptions to this specification, with special emphasis on section 2.3 Performance Guarantees and 2.4 Design Requirements. All clarifications and exceptions shall reference the relevant section(s) of this specification. Non-conformance may result in rejection of bid.

1.4 DOCUMENTATION

A. Submittal Drawings and Catalog Data

1. Refer to Attachment 3 for a tabulation of the required submittals for this work scope.
2. Failure to comply with the submittal requirements defined herein, resulting in a resubmittal and additional review, shall not be justification for schedule delays or change orders.
3. Submittals will be submitted only by Vendor. Indicate by signed stamp that Documents have been checked, that the work shown in the submittals is in accordance with Purchase Order requirements and that dimensions and relationship with work of other trades have been checked. Submittals submitted for review that have not been checked and signed by Vendor, will be returned for checking before being considered by the Engineer.
4. All documents, drawings, and data submitted shall be in the English language, with all dimensions in USCS units.
5. Include information relevant to the particular equipment or materials to be furnished where product data published by the manufacturer is part of submittal.
6. Provide documentation of compliance with manufacturer's published literature or drawings or letter signed by an officer of manufacturer in cases where compliance with UL, FM, IRI, or other similar organization standards are required.
7. Furnish submittal schedule with bid.
8. Include identifying symbols, tag names, and equipment numbers which are coordinated with the Plant Control System (PCS) standards as defined herein to allow for full integration with the installation design documents for all equipment and material submitted.
9. Submit requested submittals complete by types of equipment labeled with applicable specification section(s) included. Each submittal will be handled separately. Should any item not be acceptable, the entire submittal will be returned to Vendor for correction and resubmittal. Partial submittals will not be acceptable. The intent of this requirement is that all approved bound sets of data will be identical and will contain only acceptable information.
10. Submit a compliance sheet for each submittal indicating the submittal is in full compliance with the drawings and specifications. Indicate by drawing number or specification section number and paragraph numbers all exceptions taken and include an explanation.

11. The review of submittals does not relieve or modify Vendor's responsibility for compliance with design documents or dimensions or errors contained in the submittal or quantity count. It is clearly understood that noting of some discrepancies but identifying others does not grant Vendor permission to proceed in error. Regardless of any information contained in the submittals, design documents govern the work, and are neither waived nor suspended in any way by the review of the submittals.
12. A minimum review period of two weeks, exclusive of transmittal time, will be required in the Engineer's office for each submittal. Take this time period into consideration when scheduling work.
13. Include in submittals sufficient plans, elevations, sections, performance data, dimensions, bolt locations, ratings, sound data, weights and schematics to clearly describe the equipment and to show compliance with these specifications. Provide a cover or title sheet for the submittal containing the following:
 - a. Name of vendor originating the submittal.
 - b. Name of project for which the submittal is made.
 - c. An index of all items submitted including:
 - d. Mark of equipment on drawings.
 - e. Manufacturer.
 - f. Catalog number.
 - g. Specific section number.
 - h. Date of submittal and date of each revision.
 - i. Vendor's certification of review.
 - j. Vendor's certification of compliance.
14. Drawings and data which do not comply with specified requirements will be returned for resubmittal. One copy will be returned to Vendor marked FURNISH AS SUBMITTED, FURNISH AS CORRECTED, REVISE AND RESUBMIT or REJECTED. If it is marked FURNISH AS SUBMITTED or FURNISH AS CORRECTED, no additional submittal is required. If it is marked REVISE AND RESUBMIT or REJECTED, repeat the submittal in accordance with this section. It is intended that Vendor submit complete and accurate shop drawings and product data at the first submittal.
15. If the drawing or product data marked FURNISH AS SUBMITTED or FURNISH AS CORRECTED is altered for any reason after it has been stamped, the REVIEWED stamp shall automatically be voided.
16. Provide all work in accordance with the submittals stamped FURNISH AS SUBMITTED or FURNISH AS CORRECTED in as much as they are in agreement with design documents. Where differences occur between the submittals and design documents, design documents shall govern the work.
17. The following additional submittal requirements shall be met:
 - a. Each submitted drawing and document shall include the following Owner project identification:

UF 623-D University of Florida Central Energy Plant
 - b. The data, documents, drawings, SAMA logic diagrams, and manuals shall be submitted in digital form for each review cycle, except for the final approved/certified drawings which shall be submitted in hard copy form as part of the O&M documentation as specified below.

- c. The digital form shall be in software suitable with industry standards (Excel, Word, AutoCAD, 3D AutoCAD, CADWORKS, etc.). If proprietary software is utilized, necessary viewing software shall be furnished by the Vendor.
 - d. Minimum size for hard copy drawings is 11" x 17" and must be clear and fully reproducible. Larger sizes are acceptable but must be folded to 8-1/2" x 11" for binding in the O&M manuals. Cut sheets, product data, specifications, and narratives may be 8-1/2" x 11".
 - e. All "Certified Final" reference data/drawings submitted after the order shall be provided on hard drives, USB, or other approved media, in addition to the stated hard copies. Files may be delivered via cloud-based host with secure access.
 - f. Include Vendor's certificate that products meet or exceed specified requirements.
18. Final Submittal: In addition to the number of copies of shop drawings and product data required to review submittals, maintain separate file of final reviewed copies of such material. Deliver approved submittals in hardback binder for Owner's use. Incorporate changes and revisions made throughout construction period.

B. Operation and Maintenance Manuals

- 1. Vendor shall provide six (6) hard copy sets of Operations and Maintenance Manuals for all equipment and auxiliaries provided and an electronic pdf copy on two (2) hard drives or USB. Cloud based documentation hosted by the turbine manufacturer is encouraged when live updates to the manuals are anticipated.
- 2. Organize binders to contain similar equipment such as piping, valves, transmitters, terminal boxes, sight glasses, relief valves, etc., in separate divisions. Provide a complete double index for each binder to include:
 - a. An alphabetized list of the products by name.
 - b. An alphabetized list of manufacturers whose products have been incorporated in the work, together with their addresses and the name, addresses and telephone numbers of the local sales representative or Vendor.
- 3. For each section of product, equipment or system, organize the data as follows:
 - a. Furnish a general description of the equipment or system listing the major components, intended service and other general data.
 - b. Furnish technical data including nameplate data (on a separate excel file), design parameters, normal operating bands, ratings, capacity, performance data, operating curves, etc. Clearly distinguish between information which does and does not apply.
 - c. List warnings and cautions to be observed during both installation and operations.
 - d. Fully detailed installation and operation instructions including special tools required, alignment instructions, start up and shut down sequences, emergency and casualty step-by-step procedures, and extended lay-up step-by-step procedures.
 - e. Furnish maintenance, service and repair instructions including maintenance and service schedules, materials, and methods for performing routine and annual service.

- f. Furnish a Cause and Effects matrix where the 'Cause' is in a row that reflects a process change, the 'Effect' is in the column that reflects a process action, and the 'Intersection' is marked to show the cause/effect relation.
- g. Furnish a troubleshooting guide and check list indicating common failures, test methods and procedures for determining component fault or failure.
- h. Furnish a spare parts list indicating part and order number with name, address, and telephone number of Supplier. Include current prices of replacement parts and supplies.
- i. Furnish diagrams including controls, wiring, installation or operation of the equipment or system.
- j. HMI Graphics screens (complete - listing and color screen shots)
- k. Furnish cyber security controls procedure/methodology as to how the system is protected from cyber attacks during production and how software upgrades are implemented post installation for future upgrades.
- l. Furnish list of all Set points, Interlocks, Alarms and Trip Points in MS EXCEL file format.
- m. Furnish copies of all final, approved submittal drawings and documents.
- n. Furnish all warranties and guarantees.

C. Routine Maintenance Schedule, Parts & Service

- 1. Provide a complete schedule of normally required inspection, preventative maintenance, predictive maintenance, and overhaul tasks and the outage hours required for all of the equipment supplied under this purchase order, plus replacement parts associated with each task. Provide inspection and maintenance plan required to support the minimum on-line availability specified herein. List requirements by year with a list of recommended spare parts for each through one entire cycle. Spare parts list shall consist of total/in-service quantity, recommended spare quantities, lead times and criticality factor.
- 2. Submit a line item pricing (bid alternate) for recommended spare parts for 2 years of normal operation, including expendables, beyond first year of operation.
- 3. Submit an itemized list and pricing (bid alternate) for all required tools including any special lifting fixtures to support on-site maintenance of CTG Package(s).
- 4. Submit itemized pricing (bid alternate) for Long Term Service Agreement (LTSA). Service agreement term to be no less than 5 years.
- 5. For each inspection, preventative maintenance and overhaul task, list the following:
 - a. Tools required
 - b. Materials required
 - c. Associated warnings and cautions
 - d. Initial system conditions required
 - e. Procedure (step-by-step)

D. Software

- 1. Provide a minimum of 3 licenses/copies of all proprietary software required for installation, testing, tuning, or operation of the equipment, instrumentation, and/or protective devices.
- 2. For any instrument or component which must be connected to a computer for testing, tuning, or programming and utilizes a proprietary cable, provide a minimum of two cables to the owner.

3. Provide software patches and revisions (versions) during the LTSA term.

1.5 QUALITY ASSURANCE

- A. Provide manufacturer's certification that materials meet or exceed minimum requirements as specified.
- B. The Vendor shall have in place a complete and functioning comprehensive Quality Assurance program covering the design, procurement, fabrication, packaging and delivery of the specified equipment and materials. This program shall insure that the equipment and materials furnished by the Vendor meet the requirements of this Specification as well as the Vendor's own procedures (step-by-step) and processes.
- C. It shall be the Vendor's responsibility to ensure that the Suppliers, Sub-Suppliers and Sub-Contractors meet the intent of this requirement and are able to demonstrate their compliance.
- D. Owner or its representative shall be given opportunity to witness all testing.
- E. The owner reserves the right to reject equipment and or components which require major modification or alteration to meet specifications.
- F. Non-conformances to this Specification and major equipment or component repairs that occur shall be documented and approved by the Owner in writing prior to testing and shipment.
- G. Software Quality Assurance (SQA):
 1. Establish an SQA plan that addresses software tests normally performed by programmers and tests performed to verify system operation.
 2. Perform software tests to benchmark functional evaluations, including the following:
 - a. Conformance to specification.
 - b. Language deviation.
 - c. Error handling.
 - d. Operational speed.
 - e. Maintain a software error log to record occurrence, solution, and corrected resolution.
 - f. Provide software programming as required to perform functions as specified. Provide annotations in the programming describing functions and changes such that the Owner and others in the future can understand the logic so that changes can be readily made.
 - g. Provide software licensed to the Owner in perpetuity.

1.6 APPLICATION

- A. The University of Florida is constructing a new Central Energy Plant (CEP) to furnish steam, chilled water, and electrical power to its campus distribution systems in Gainesville, Florida. The CTG described herein, to be designated "CTG-1", will be installed in a Combined Heat & Power (CHP) configuration with one new Heat Recovery Steam

Generator (HRSG) and one new extraction/condensing Steam Turbine Generator (STG), each furnished separately. The turbine exhaust will be routed to the HRSG, then exhausted through a dedicated stack. The HRSG stack will be routed through the building roof and terminate above the roof line. Target operational date for CHP service is expected no later than 2025.

- B. The CTG shall have the capability of load modulation via input from the Plant Control System (PCS) to accommodate periods of reduced steam and/or electric demand.
- C. The CTG will be mounted indoors. The vendor-furnished inlet air filter housing for the unit will be installed outside the building on top of the roof. Combustion and ventilation air will be drawn through the filter house, then through interconnecting ductwork (furnished by others) to the turbine package inside the building. Ventilation exhaust ductwork (furnished by others) will be routed back out to the exterior of the building. The combustion inlet air housing will include vendor-furnished chilled water coils to cool the air. Chilled water will be provided by owner.
- D. The machinery arrangement of the available area has been optimized around a side-exhaust (i.e. hot end drive) CTG configuration. While it is not the intent of this specification to exclude cold-end drive units, or axial exhaust units, the associated layout challenges will be taken into account as a factor in the bid evaluation. Refer to site plan drawings included in Attachment 4.
- E. Based upon the anticipated steam and power demand profiles for the CEP, the targeted range of electrical output is 32,000 – 40,000 kWe net of package auxiliaries and the targeted range of steam production from the available heat in the CTG exhaust to the HRSG is no more than 95-105 kpph at 450 psig/600°F at site conditions of 70 deg. F, 45% relative humidity, and 14.63 psia barometric pressure without the effects of inlet chilling. The design intent of the plant is to install a single CTG, not multiple smaller units.
- F. Cooling water for oil coolers and other auxiliaries will be accomplished with a closed cooling water system and will be provided by the Owner at a maximum temperature of 90 deg. F. Vendor shall specify requirements for any necessary corrosion inhibitors, filtration requirements, etc.
- G. The CTGs shall be capable of sustained operation with utility pipeline natural gas. Vendor shall specify required gas pressure to the CTG package. Copies of existing fuel analyses are included as Attachment 7.
- H. The unit shall be capable of operating in an isochronous mode to satisfy campus electric loads or synchronized to the utility grid. The unit governor response time shall be compatible with this operation. Controls and operation shall be suitable for operation in parallel with the Duke Energy utility electrical grid.
- I. Asbestos, polychlorinated biphenyls (PCBs) and lead-based paint shall not be used anywhere in the equipment supplied by Vendor, including sub-suppliers. Use of ceramic fiber shall be noted where used. Vendor shall comply with all Federal and State environmental regulations regarding the use of materials. Vendors are encouraged to use sustainable materials where possible.

- J. Instrument Air will be available from the owner at 125 psig Maximum; 80 psig Minimum pressure.
- K. Site ambient conditions and other design criteria are shown in Attachment 1.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

Qualified entities submitting bids (Bidders) shall have extensive and successful experience providing units of the size and type specified. Other Bidders may be considered with the approval of the Owner.

- A. Combustion Turbine Generator
 - 1. General Electric
 - 2. Siemens
 - 3. Engineer Approved Equal
- B. Fuel Preconditioning Package
 - 1. Relevant Solutions
 - 2. Monk Engineering
 - 3. Kingtool
 - 4. Integrated Flow Solutions
 - 5. Engineer Approved Equal
- C. Miscellaneous Equipment

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following. Any deviations must be approved by the Engineer in writing prior to purchase of items by Vendor or Supplier:

- 1. Mechanical Seals
 - a. Flowserve
 - b. John Crane
 - c. Engineer Approved Equal
- 2. Control Valves, Regulators
 - a. Fisher
 - b. Masoneilan
 - c. PECC
 - d. Spence
- 3. Pressure Transmitters (Gage and Differential)
 - a. Rosemount
 - b. Foxboro
 - c. Siemens

4. Temperature Transmitters (Sensors, transmitters & thermowells as applicable)
 - a. Rosemount
 - b. Foxboro
 - c. Ultra-Electronics (formerly Weed Instrument)
 - d. Siemens
5. Flowmeters
 - a. Foxboro
 - b. Rosemount
 - c. Toshiba
 - d. Siemens
6. Pressure Gauges
 - a. Ashcroft
 - b. Ametek/US Gauge
 - c. Engineer Approved Equal
7. Level/Sight Glasses
 - a. Armored:
 - 1) Penberthy
 - 2) Jerguson
 - 3) Engineer Approved Equal
 - b. Magnetic:
 - 1) Clark Reliance
 - 2) Jerguson
 - 3) MagTech
8. Provide instruments and control valve actuators with “HART” protocol, where available. Connect HART communication signals as a homerun, not in a multidrop configuration. HART hand-held interface connections shall be fixed to the terminal block on smart transmitters and actuators. HART communications shall include the following device parameters:
 - a. Digital process variable (primary and secondary)
 - b. Status and Diagnostic information
 - c. Device identification
 - d. Calibration of instruments
9. Instrument Fittings
 - a. Parker
 - b. Swagelok
 - c. Hy- Lok

10. Variable Frequency Drives

- a. ABB
- b. Cutler-Hammer
- c. GE
- d. Yaskawa
- e. Siemens

2.2 SCOPE OF SUPPLY – CTG PACKAGES

Components and systems within CTG Vendor's Scope shall be complete, including control valves, piping, equipment, instrumentation, controls, alarms, wiring, insulation, cladding and other items required for a complete, functional, highly reliable and highly-automated installation in accordance with good engineering practices and the rigorous demands of industrial power plant service. To the extent practical, equipment shall be delivered in modular form; pre-piped, pre-wired, pre-terminated and pre-tested. The general limits of the CTG package supply are summarized in Attachment 5, Process Flow Diagram.

A. Furnished by Vendor (CTG Package Scope)

1. Freight, FOB Job Site.
2. Combustion turbine package mounted in outdoor rated, sound attenuated, ventilated enclosure.
3. Electric generator.
4. Computer-based turbine-generator control system.
5. Steel base frame with full size, continuous drip pan.
6. Base plates, shims, alignment/leveling equipment, and any other special foundation imbeds required to set and align equipment.
7. Electric/hydraulic or electric-only turbine starting system including variable frequency drive as required for starter motor.
8. Lube oil systems, pumps and coolers for turbine and generator.
9. Fuel system capable of burning utility pipeline natural gas.
10. Fuel gas preconditioning equipment necessary to meet CTG vendor's fuel specifications
11. Compressor water wash system for offline and online washing, with pumps, tanks, valves, piping, and appurtenances.
12. Interconnecting piping, tubing, and/or flexible hose connections as required between vendor-furnished auxiliary skids and main package.
13. Inlet air filter housing and filter media with ladders, platforms and safety rails (as needed) for maintenance.
14. One set of clean new combustion and ventilation air filters for startup and commissioning of the CTGs, and a complete second set of clean new filters upon turnover of the units to Owner.
15. Chilled water heat exchanger for cooling inlet combustion air.
16. Ventilation fans for generator and turbine compartments.
17. Sound attenuators and necessary filters for supply and exhaust ducts for ventilation of generator and turbine compartments.
18. Sound attenuators for combustion air and exhaust systems, as required to meet overall noise limits specified herein.

19. Anti-icing system, to prevent ice formation at compressor inlet down to the minimum ambient temperature conditions specified in Attachment 1. Vendor shall specify method used for ice prevention and associated utility requirements; inlet heating coils requiring an external source of heat shall not be utilized.
20. Insulation and cladding for heat retention, noise reduction and personnel protection (140 degrees F maximum surface temperature, or as required by applicable codes and standards).
21. Heat trace for all piping and equipment necessary to support operation of the CTG in minimum ambient conditions specified in Attachment 1.
22. Instruments and equipment required for interface with distribution switchgear such as resistance temperature detectors, potential and current transformers, neutral ground resistor and associated current transformer.
23. Safety rails as required in accordance with OSHA standards.
24. Borescope inspection ports.
25. Vibration monitoring, condition monitoring, and data management systems.
26. Real-time event recorder with first-out identification and reporting to the operator.
27. Turbine performance monitoring system.
28. Painting per Vendor's standard.
29. Safety guards on exposed rotating parts, in accordance with OSHA standards.
30. Complete automatic CO2 fire protection system including fire, heat and gas leakage detectors, manual disable switches on outside of enclosure, CO2 bottles or storage unit, automatic dampers, etc., per NFPA requirements. Package fire alarm control system shall be interfaceable with the plant fire alarm control panel.
31. Required lifting/moving equipment and tools to remove and replace turbine engine, generator (if required), and gear equipment (if required) within 24 hours.
32. DC emergency power distribution system internal to package for controls, emergency lights and pre/post lube oil pumps (if applicable) for a coast down and cool down period sufficient to prevent equipment damage after a full load trip.
33. AC power/lighting system for inside of enclosure.
34. On-site support during offloading, setting, startup, commissioning, and performance testing.
35. Operations and maintenance personnel training at the job site, including travel and local living expenses as specified herein.

B. Furnished by Others

1. Heat Recovery Steam Generator
2. Selective Catalytic Reduction (SCR) and CO systems
3. Offloading, storage, erection and installation of the equipment at the job site.
4. Foundations, anchor bolts and grouting.
5. Piping, valves, fittings and supports outside the Vendor's scope of supply.
6. Expansion joint between CTG exhaust and HRSG inlet flange
7. Chilled water for inlet air chilling and closed-loop cooling water supplies.
8. Instrument and service air supply to the unit
9. Duct transitions external to unit between building exterior walls/roof and CTG package for compartment ventilation and intake air structure connections (note: CTG vendor shall furnish design criteria for said ductwork – materials of construction, pressure drop limitations, coating & insulation requirements, etc.).
10. DC power for DC emergency power distribution system (to be provided by the Plant DC system).
11. AC Power Supply from station service to package AC power/lighting system.

12. Conducting on-site equipment performance test (Vendor shall provide oversight and support as specified herein).
13. Wiring of Vendor-furnished controls to Plant Control System (PCS).
14. Classroom facilities for on-site training.
15. Building permits and environmental permits.

2.3 PERFORMANCE GUARANTEES

The following performance values shall be provided at guarantee base conditions as well as the other conditions indicated in Attachment 2 and shall be verified during the on-site Performance Test.

A. Capacity and Fuel Consumption

1. “Guaranteed Power” which is defined as the 100 percent power output of the CTG, as measured at the generator breaker, expressed in kilowatts, net of package-driven pumps, exciters and other auxiliaries, based on site specific factors, at guarantee ambient conditions and specified fuels.
2. “Guaranteed Fuel Consumption”, which is defined as the fuel consumption of the CTG expressed in BTU/hr, lower heating value basis, at the 100 percent guaranteed power output level and guarantee ambient conditions, based on site specific factors and specified fuel.
3. Part-load performance data shall also be provided for the load conditions indicated in Attachment 2.
4. Performance shall be based on inlet air pressure drop including filters, silencers and ductwork, inlet air chilling coils, and mist eliminators. Curves to allow correction of CTG performance for varying inlet pressure drop shall be provided for a range of 0” to 8” water gauge.
5. Performance shall be based on exhaust pressure drops consisting of combined HRSG/SCR stack and ductwork pressure drops. For bidding purposes, assume total HRSG / stack pressure drop to be 12 in. of water. Curves to allow correction of CTG Performance for varying back pressure shall be provided for a range of 3” – 18” of water gauge.

B. CTG Emissions

1. “Guaranteed Exhaust Emissions” from 75-100 percent guaranteed power output for the following pollutants, expressed in 1) ppmv at 15 percent oxygen, and 2) total pounds per hour, for the specified fuel (taken at turbine exhaust):
 - a. NO_x
 - b. CO

NO_x emissions shall not exceed 25 ppmv and CO emissions shall not exceed 25ppmv, taken at the turbine exhaust, when burning natural gas fuel, corrected to 15 percent oxygen at 100 percent load. NO_x emissions shall be controlled utilizing dry low NO_x technology. Steam and/or water injection shall not be utilized to meet emissions guarantees.

2. Anticipated CTG exhaust emissions shall be provided for the following additional pollutants:
 - a. UHC
 - b. VOC
 - c. PM 2.5/PM-10
 - d. Opacity
 - e. SO₂
3. Part-load performance data shall also be provided for the load conditions in Attachment 2.

C. Noise Limitations

1. Noise levels for equipment furnished under this Scope of Work shall be guaranteed not to exceed 85 dBA (maximum) at 3 feet distance and 5 feet above grade under free field conditions over a reflecting plane measured at points spaced six feet apart around the equipment.
2. The specified noise limits shall apply to all normal modes of operation.

2.4 DESIGN REQUIREMENTS

The intent of this specification is to utilize Vendor's standard package design where possible. However, the specific design features discussed herein shall be included as a minimum.

A. Turbine Package

1. CTG shall be designed for continuous operation at base load (100 percent), and shall also be capable of load-following operation between 15 percent and 100 percent load.
2. Combustion emissions control shall be via Dry Low NO_x technology and shall not require water or steam injection.
3. Turbine enclosure ventilation fans shall have a 100 percent backup installed.
4. Turbine performance mapping system shall allow continuous, real-time thermodynamic modeling of CTG for purposes of optimizing performance. Parameters to be monitored include:
 - a. Compressor Inlet Dry Bulb and Wet Bulb Temperatures
 - b. Compressor Inlet Pressure
 - c. Compressor Discharge Pressure
 - d. Compressor Discharge Temperature
 - e. Combustor discharge (turbine inlet) temperature
 - f. Power Turbine Inlet Temperatures (where applicable)
 - g. Exhaust Temperature
 - h. Fuel Flow & Pressure
 - i. Combustion Air Inlet Flow
 - j. Air Inlet Pressure Drop
 - k. Exhaust Back Pressure

5. Inlet Air Filters

- a. Inlet air filters shall be designed for 5 micron removal at 99 percent basis efficiency. Filter holders shall be stainless steel or aluminum.
- b. Filtration system shall consist of a minimum of two stages of filtration, pre- and final-filtration, in order to extend the useful life of the final filtration elements.
- c. Inlet air filter housing shall include mist/moisture eliminators to prevent moisture infiltration.
- d. Separate differential pressure instruments and transmitters shall be provided across each individual section/stage of filtration on the inlet air housing, as well as across the inlet air chilling coils, to allow monitoring of the cleanliness of each filter bank section. For units with dual intake arrangements, this instrumentation shall be provided in both filter banks.

6. Inlet Chilling Coils

- a. The inlet air chilling coils shall be designed to cool the incoming combustion air to 50°F over the full range of specified ambient conditions. Bidder shall specify chilled water design requirements for inlet chilling coils (water flow, temperatures, etc.). The inlet air chilling coils shall be designed for location in the vendor-provided inlet filter housing to be located on the roof of the building.
- b. Chilled water at 42 deg. F will be supplied by Owner to a single flanged connection on the package. Chilled water shall be returned to the Owner at a single flanged connection on the package.
- c. The inlet coils shall be designed for maximum waterside temperature rise (nominally 18°F but no less than a minimum of 15°F) with minimal air-side pressure drop. Waterside pressure drop shall be 10 psi or less across flanged connection points. Coils shall be sized for a minimum tube velocity of 3 feet per second and a maximum tube velocity not exceeding 8 feet per second. Minimum tube wall thickness shall be 0.035 inches. Tubes shall be copper with aluminum fins, with a maximum of six rows.
- d. Separate thermowells, temperature elements, and temperature transmitters shall be provided downstream of each chilling coil module to measure supply air temperature to the CTG.
- e. Insulation and vapor sealing of vendor-furnished intake ductwork after cooling coils shall be provided to prevent sweating and exterior metal corrosion due to atmospheric condensation. Ductwork walls shall contain insulation between inner and outer walls, stainless steel perforated plate on interior walls and ceiling, and corrosion resistant coating on floor of duct.
- f. A stainless steel condensate drip pan and drain connections shall be furnished and designed so as to prevent splashing or carry-over of condensate to surrounding roof structure.

7. Inlet Anti-Icing System

- a. Vendor shall furnish necessary equipment, materials, and controls for prevention of ice formation or carry-over along the combustion and compressor inlet paths over the full range of ambient conditions specified herein.
- b. Methodology and design of anti-icing system shall be specified by Vendor; however, inlet coils requiring a separate heating source and loop shall not be utilized (compressor bleed air system preferred). A description of the proposed anti-icing system along with associated utility requirements shall be included with Vendor's proposal.
- c. All piping, valves, equipment, and controls for the anti-icing system should be completely self-contained and within the Vendor's scope of supply and shall not require an external source of heat.

8. Lube Oil System(s)

- a. Lubricating oil systems shall be provided for both the turbine and the generator. Design of each lube oil system shall be per manufacturer's standard, but shall include the following features as a minimum:
 - 1) Main oil pump(s).
 - 2) Pumps, filters and strainers (excluding Turbine-driven pumps) shall be fail safe (i.e. pre-installed backups, ready for automatic or manual switchover or gravity fed rundown tanks). In addition to the main engine driven lube oil pump(s), the lube oil system shall include AC pre/post and DC backup driven lube oil pumps or gravity fed rundown tanks to provide safe turbine shutdown in the event of a pump failure. Where utilized, DC backup system shall have monitoring capability with status indication and alarm to the Plant Control System (PCS) indicating readiness.
 - 3) Duplex water-cooled oil coolers (shell and tube type) with transfer valve with the capability of transfer to standby cooler during normal operation. Oil coolers should be sized with a 1/8" corrosion allowance, 3/4" minimum tube sizes and be code stamped. Heat exchangers shall be equipped with removable heads for cleaning cooling water side.
 - 4) Integral lube oil tank.
 - 5) Electric lube oil tank heater.
 - 6) Duplex lube oil filters with transfer valve and ability to shift to the standby filter during normal operation.
 - 7) Demister system suitable for maintaining vent area free from oil collection.
 - 8) Drip pan.
- b. Vendor shall furnish lubrication oil, in required types and quantities, sufficient for:
 - 1) Completion of initial lube oil flushing.
 - 2) Additional required for initial operation.

- c. Vendor shall furnish necessary materials, containment, controls, and safety procedures (step-by-step) to address specific toxicity characteristics for any synthetic lubricants that are utilized in their systems.
9. Safety ladders, hand rails, gratings, steps, external structural or support members shall be hot dipped galvanized.

B. Fuel System

1. A fuel system capable of operating on utility pipeline natural gas shall be provided. The fuel system shall include all necessary components (control valves, instrumentation, etc.) to control and monitor fuel flow and pressure to the CTG package. The unit control system shall automatically control and modulate fuel flow during start-up, shut down, and normal operation. All instrumentation and valves must be accessible and maintainable for maintenance and operation activities.
2. The fuel gas supply systems shall be equipped with duplex filters capable of being swapped to the standby filter during unit operation.
3. Vendor shall provide a complete skid-mounted fuel gas conditioning package to treat the incoming pipeline-quality fuel gas such that it meets Vendor's requirements for pressure, temperature, cleanliness and moisture content. Package shall include, but not necessarily be limited to, the following:
 - a. Two 100%-capacity fuel gas filter separators. It is anticipated that operation of a single filter separator at a time will be sufficient for this application; however, if additional pre-treatment equipment (e.g. knockout drum, etc.) is required or recommended by Vendor to achieve the specified fuel gas quality on a continuous basis, this equipment shall be clearly identified in the proposal.
 - b. One 100%-capacity electrically-powered fuel gas preheater, if required to meet fuel gas superheat requirements. Include skid-mounted local SCR power controller.
 - c. Block valves for complete isolation of each individual vessel.
 - d. Common structural steel skid for mounting of piping, valves, instrumentation, and vessels.
 - e. All internals, nozzle connections, and accessories.
 - f. Full-flow-capacity relief valves for protection of each pressure vessel, designed per ASME Section VIII requirements.
 - g. Automated liquid drain valves and/or traps from each vessel chamber, piped to a common drain header.
 - h. Double-wall, vented waste drain tank for collection of all liquids, including pump-out connection with quick-disconnect fitting as well as manual drain. Tank shall be designed in accordance with Underwriters Laboratories' UL-142 specifications and so labeled. Vent size shall be sufficient to prevent over pressurization of waste drain tank in the event of fully-open discharge of gas from all connected drain lines.
 - i. Continuously welded support legs for vessels.
 - j. Vent piping and valves to provide required venting for start-up and normal operation.

- k. Instrumentation and controls as required to allow for complete control and monitoring of the preconditioning package by the PCS, wired to terminal boxes on the common structural steel skid-mounted package. Instrumentation shall include the following as a minimum, each provided with local indication:
 - 1) Liquid level site gauges and transmitters for each filter-separator vessel chamber.
 - 2) Liquid level site gauge and transmitter for waste drain tank.
 - 3) Differential pressure transmitters across each vessel.
 - 4) Gas preheater inlet, outlet, and vessel temperature transmitters.
- l. All special tools required for routine operation and maintenance of the fuel gas conditioning assembly shall be provided. Tools shall be new and of first-class quality. Tools shall be shipped to the job site in containers clearly marked with the use for which they are intended.
- m. Surface preparation and painting per manufacturer's standard.
- n. Adequately sized and positioned lifting lugs for all furnished equipment.
- o. Vessel testing per ASME Section VIII requirements.
- p. Sets of spare filter elements as necessary for start-up and commissioning based on past experience of similarly sized units.
- q. All pressure vessels shall be designed, manufactured and tested in accordance with ASME Section VIII. Furnish ASME stamp and label in accordance with ASME code for required maximum working pressure.
- r. All external piping associated with the preconditioning package shall be designed, manufactured and tested in accordance with ASME/ANSI B31.1, Power Piping.

C. Electric Generator

- 1. The electric generator shall be provided as an integral part of the turbine-generator set. Vendor is responsible for the delivery, performance, control, and technical field support of the generator.
- 2. Generator shall be 12,470 volts, 3 Phase, 0.85 power factor, 60 Hz, Totally Enclosed Water-to-Air Cooled (TEWAC), with Vendor-selected capacity based on machine output.
- 3. The generator shall be capable of operating in standalone, paralleling, synchronous, isochronous and droop mode.
- 4. The generator shall be rated for continuous (100 percent duty) operation, class F insulation, B-rated temperature rise, and meet the following requirements:
 - a. TEWAC enclosure rated for outdoor installation
 - b. Automatic voltage regulation, +/- 0.5 percent
 - c. Voltage adjustment of +/- 5 percent of rated voltage
 - d. Load regulation of +/-1 percent
 - e. Full load efficiency of 97 percent or better
 - f. Core losses not to exceed 100 KW
 - g. Subtransient reactance of 0.25 or less
 - h. Short circuit ratio of 0.43 +/- 5 percent
 - i. Six RTDs in stator winding for monitoring and protection by the Turbine Control Panel. RTDs shall be redundant element type at each location or have redundant RTDs at each location.

- j. Bearing RTDs for monitoring and protection by Turbine Control Panel.
 - k. The generator shall be provided with a 2/3 winding pitch.
5. The unit grounding system will be a high resistance system.
- a. System components shall limit line-to-ground fault to 200 amperes at 8000 Volts line-to-ground.
6. The high resistance ground unit shall be mounted in a metal enclosure suitable for installation in an area accessible to personnel. The neutral termination cabinet shall include a 200:5 C400 CT for connection to Owner's Schweitzer Engineering Laboratories (SEL) 700G protective relay device as well as the protective relay provided by the manufacturer.
7. Furnish a metal cubicle enclosing the generator neutral side terminals, with C400 current transformers with a minimum meter accuracy class of 0.3 at a burden of B-0.9 and a thermal overload rating of 1.5. Phase CT ratios shall be selected based on the generator maximum output current with a minimum rating of 1200:5. Wire the current transformer secondary connections to shorting type terminal blocks in an isolated terminal box on the rotating equipment baseplate. All CT leads shall be brought out to the shorting terminal block. Refer to Attachment 6 for the required number of CT's.
8. Owner will supply wye ground-wye ground potential signals to the unit control panel for synchronization and control.
9. Furnish a metal cubicle enclosing the generator lineside terminals, lightning arresters and surge capacitors. The cubicle shall have adequate provisions for cable terminations to be furnished and installed by the Owner.
10. Both line and neutral terminations will be cable in conduit. The load side termination cabinet should be adequately sized to accommodate Class 1 terminations (3 x 750 KCMIL conductors per phase minimum).
- D. Generator control and protection
- 1. Terminate current transformer leads at shorting type terminal blocks.
 - 2. Provide FT-1 type test blocks for current and voltage inputs to the generator protective devices.
 - 3. Wiring connections for current transformers within panels shall be #12 AWG red SIS type conductors and terminations shall utilize uninsulated ring tongue lugs.
 - 4. Control power terminations should be terminated at pullout type fuse blocks.
 - 5. Provide primary generator protective relay and lockout relay installed in the generator control panel. Protective relay shall be SEL 300G or approved equal, refer to Attachment 6 for details.
- E. Miscellaneous Electrical Equipment
- 1. Motors rated $\frac{3}{4}$ hp or greater shall be rated 460V, 3-phase, with TEFC enclosure and be non-overloading at the rated condition without using any portion of the service factor.
 - 2. Provide all three phase motors with at least 1.15 service factor at 40 degrees C, continuous duty.

3. Motors rated ½ hp or less shall be rated 115V, 1-phase, with TEFC enclosure and be non-overloading at the rated condition without using any portion of the service factor.
4. Select motors for low starting current, designed for continuous duty to provide the running torque and pull in torque required to send the load. Maximum kVA starting code letter shall be Code G.
5. Motors shall meet or exceed NEMA Premium™ efficiency ratings.
6. Motors shall have copper windings and Class F or higher insulation but rated based on Class B temperature rise.
7. Motors controlled via variable frequency drives (VFD) shall be inverter duty rated with an insulation system that meets NEMA MG1 Part 31 and are suitable for operation with pulse width modulated variable speed drives.
8. Space heaters: Maintain windings a minimum of 5 to 10 degrees C above dew point during de-energized conditions. Space heaters shall be rated 240V AC and operated at 120V AC.
9. Motors shall be equipped with grease-lubricated, anti-friction ball or roller bearings with InproSeal bearing isolators on fan and drive end shaft extensions for IP56 protection. Bearings shall have an AFBMA L10 life of 100,000 hours or more. All bearings shall be constructed so as to prevent lubricant leakage into the motor under normal or excess lubrication. Permanently-lubricated bearings will not be acceptable. All ball or roller bearings shall be equipped with Alemite or Zerk grease and relief fittings. Grease points shall be readily accessible during normal equipment operation. Lubrication instructions shall be furnished with each motor.
10. Motor frame and end brackets shall be cast iron with non-sparking exterior fan and cast iron guard. Lifting eyes shall be provided. Include brass drain and breather to ensure drainage from lowest point of motor.
11. Motors shall have cast iron conduit terminal boxes of adequate size to support proper termination of supply conductors selected in accordance with the NEC. Minimum size shall be two sizes larger than required by the National Electrical Code (NFPA 70), latest edition.
12. Direction of rotation shall be permanently marked on motor where motor is suitable for only one direction of rotation.
13. Motors shall have steel sole plates. Maximum allowable no load vibration shall be 0.10 inches per second. Vibration measurement points, capable of routine vibration data collection, shall be identified for all three axes of vibration. If permanent mounted vibration equipment is installed, local vibration monitoring points shall be provided.
14. Select motors for quiet operation. Motor sound power level when measured at a no load condition shall not exceed 85 dBA when determined in accordance with IEEE Standard 85, latest edition.

F. Combustion Turbine-Generator Control System

1. General: The CTG package shall be equipped with Vendor's standard computer-based control system including meters, gages, alarms and controls, locally mounted in modular enclosure, suitable for interface with Owner's Plant Control System (PCS). While the CTG control system must include all functions required to operate and maintain the CTG, it must also support integration with the PCS while minimizing the engineering and support effort to perform the initial integration as well as ongoing maintenance and modifications. The interface between the CTG control system and the PCS (or other direct impact units such as the HRSG) should follow the guidelines below:
 - a. Cyber Security: The PCS is classified as a Security Level SL-2 subject to a full risk assessment and functional requirements determination as described in standard IEC 62443. This extends to associated plant subsystems design to support the overall plant cyber security protection; for example:
 - 1) Remote access to the CTG controls shall not be allowed. However, connectivity for remote monitoring will be evaluated for compliance with cyber security requirements.
 - 2) Software patches or upgrades shall be vetted by an offline computer prior to upload to the CTG control system.
 - b. Interlocks: All safety and equipment protection interlocks are to be interfaced between the CTG and PCS via individual hardwired I/O signals. All permissives/interlocks between systems shall be implemented with fail-safe design practices such that loss of circuit continuity will remove the permissive and result in the appropriate protective action.
 - c. Load Control: Load control to the CTG shall be via 4-20 mA isolated inputs.
 - d. Optimization: Various optimization control strategies may require interface between two or more vendor control systems (CTG, HRSG, Inlet Air, etc). Non-critical interfaces which support these control strategies shall be implemented utilizing data communication interface. Loss of connection of this interface shall not result in shutdown of the unit but may limit the operating mode of the unit.
 - e. Visualization: The CTG control system shall include a means to remotely view/operate the CTG control system HMI from the PCS. This functionality must not require duplicate development of HMI screens within the PCS and must not require communication of CTG process data to the PCS controller(s). The intent is to give operations maximum access to the CTG information from the PCS without incurring additional development or engineering support to maintain duplicate HMI applications. The vendor shall identify all technical solutions supported by the CTG control system, such as:
 - 1) Local (network) desktop control of the CTG HMI.
 - 2) Installation of the CTG foreign HMI software onto the PCS HMI with additional runtime licensing as applicable.
 - 3) Execution of the CTG HMI application within the PCS HMI window as an ActiveX control.
 - 4) IIS application to serve the CTG HMI application windows as read/write web pages.

- f. Alarms: The CTG control system shall support monitoring of alarm conditions within the CTG controller(s) by the PCS HMI. Access to CTG control processors shall not negatively impact the throughput or latency of the CTG controller communications with its I/O, the CTG HMI(s) or the PCS controller(s). The vendor shall include a database listing of all CTG alarm conditions including: Tag/Address, Description, Alarm State.
 - g. Historian: The CTG control system shall support collection of data by the PCS historian. Access to CTG control processors shall not negatively impact the throughput or latency of the CTG controller communications with its I/O, the CTG HMI(s) or the PCS controller(s).
2. Standard CTG control screens shall include all normal operator functions, including setpoints, alarms, startup and shutdown control. Engineering interaction with the CTG control system shall be accomplished through Manufacturer's standard interface. PCS interface to the CTG control system will include standard start-up / shutdown, summary alarm acknowledge, auto-synch permissive, MW / MVAR setpoints, raise / lower commands for speed / voltage, etc. First-out indication shall be included as part of the information provided on the control interface system.
 3. Communications link shall be provided via Modbus TCP/IP (Cat 6) to the PCS to allow monitoring and control of equipment at either local control panels/stations or from the primary control room located in the main plant building.
 4. Provide redundant communications connections to the turbine control system.
 5. The CTG control system shall include the following features as a minimum:
 - a. Complete control of CTG Package, including normal start, automatic synchronization, operator manual synchronization, normal stop, emergency stop, base load, peaking, load following and manual load changes. The Control System shall display parameters such as generator voltage, current, power, reactive power, frequency and kWh and status of all key auxiliary devices.
 - b. Start sequence shall allow rapid automatic start, purge, firing, and synchronization, consistent with NFPA requirements and safe practices.
 - c. Automatic, load-following operation between 15 percent and 100 percent of CTG output.
 - d. Complete vibration and bearing temperature monitoring.
 - e. Turbine Governor
 - f. Microprocessor/Sequencer
 - g. Fire and Gas Detection Controls
 - h. Complete Turbine performance mapping system, including transducers, wiring, software, monitor and hardware. System shall allow real-time computation of CTG heat rate, plus trending of compressor efficiency, and other key performance parameters.
 - i. Automatic and manual synchronizing and closing of the generator circuit breaker control will be provided. Governor and Exciter shall accept raise/lower pulses from remote signals from Owner's PCS and manual controls.
 - 1) Synchroscope shall be provided in both software and a hardwired meter.
 - j. KW load control input from load controller as a 4-20 mA signal.
 - k. KVAR/power factor control input from load controller as a 4-20 mA signal.

- l. Turbine shall include two electronic overspeed trip devices, each completely independent of the other. Only one overspeed trip shall be required to shutdown unit.
 - m. Electronic Voltage Regulator with Automatic/Manual Control.
 - n. Generator Metering
 - o. Integral data Historian capable of archiving and trending real time data from the CTG for a minimum of 45 days. System shall include complete graphing trending ability. A listing of the data available to be archived shall be provided. Historical data shall also be made available to the PCS via a network connection, separate from the local HMI network, to support a pair of Owner-furnished redundant data servers.
 - p. In the event of a Plant upset or trip, the Control System shall record the sequence in which the alarm signals were received (“first-out” capability), for later analysis and troubleshooting by Plant personnel. Time stamps shall be 1msec accuracy minimum.
 - q. The plant will utilize a GPS based clock system. Turbine-generator controls and protective devices (as applicable) shall be provided with an IRIG-B clock signal input.
6. The unit control panel shall be designed to permit load control and monitoring by Owner’s Plant Control System (PCS). The unit control panel shall accept the following commands from voltage-free relay contacts (or analog as noted) in the PCS:
- a. Turbine Start/stop
 - b. Raise/Lower Voltage
 - c. Raise/Lower Power Output (4-20 mA from load controller in Auto; dry contacts in manual)
 - d. Raise/Lower VAR’s (or Power Factor) (4-20 mA from load controller in Auto; dry contacts in Manual)
 - e. Emergency Shutdown
 - f. Droop/Isochronous
7. The unit control panel shall provide, as a minimum, a Modbus TCP communication link to the PCS via CAT 6 link which conveys the following functions:
- a. Unit Status (shutdown, starting, on-line, etc.)
 - b. Sensor Values (speeds, temperatures, pressures, vibration, flow, level, etc.)
 - c. Electrical Values (amps, volts, watts, frequency, VAR’s, Power Factor)
 - d. Generator Circuit Breaker Status (closed/tripped)
 - e. Alarms and associated set points.
 - f. Shutdowns
 - g. Sensor Failures
 - h. Status of Auxiliaries

8. The unit control panel shall display, as a minimum, the following parameters (signal source provided in parenthesis):
 - a. Exciter Amps (Exciter Comm. Link)
 - b. Exciter Volts (Exciter Comm. Link)
 - c. Generator MW Output (Turbine Control Panel)
 - d. Generator Amps (Turbine Control Panel)
 - e. Power Factor (Turbine Control Panel)
 - f. Generator and Bus Frequency (Turbine Control Panel, 4-20 mA Signal from Owner's Switchgear)
 - g. Generator Voltage (Turbine Control Panel)
 - h. Bus Voltage (4-20 mA Signal from Owner's Switchgear)
9. The CTG control system HMI shall support a multi-level user security system (least privileges basis) per the following user group permissions guidelines:
 - a. Guest: View only access. Navigation to all process status windows.
 - b. Operator: Permissions to operate equipment, enter process set points, and acknowledge/reset alarms.
 - c. Maintenance: Permissions to tune control loops, calibrate instruments, modify process alarms, and modify process constraint parameters.
 - d. Engineer: Access to all process and machine parameters.
 - e. Admin: Edit control system, assign user access levels and security configuration.

G. Tagging and Marking

1. Each major piece of equipment shall have a standard nameplate securely affixed showing the tag number; the name and address of the Manufacturer; serial and model number; and such other information as the Vendor may consider necessary to complete the identification of the item.
2. Instrument and control valve tag numbering shall be in accordance with the tag numbering scheme described in Attachment 8. The range of process numbers to be used for Vendor equipment shall be confirmed with Owner/Engineer prior to development of Vendor's P&ID's.
3. Provide nameplates for each instrument, transformer, light, meter, switch, control, terminal strip, panel mounted component (including fuses), fuse blocks, timers, relays, auxiliary relays, etc., in accordance with a nameplate schedule. Color coding shall be used for equipment and functional identification.
4. Nameplates shall be corrosion resistant metal for items exposed to process or other severe conditions, or laminated two-ply plastic (white face to black core) with legend engraved to black core for items such as electrical and control panels which are not exposed to process conditions.
5. Characters shall be uniform block style not smaller than ½ inch (13mm) for switchgear sections, switching devices, and panelboards, and not smaller than ¼ inch (6mm) for instrument transformers, relays, alarms, instruments, and control devices.
6. Nameplates and tags shall be provided for all valves, steam traps and other equipment. Label all piping.
7. All items listed on the Bill of Materials shall be identified by assigned tag numbers and fully described by manufacturer, type and model numbers as applicable.

8. All CTG parts, components, assemblies and items shall be clearly and permanently match-marked for field assembly and installation. The match-marks shall be marked by letters or numbers and shall be cross referenced to the shipping paper work and erection drawings and instructions.
9. Corrosion resistant metal nameplates shall be attached at easily accessible locations for all equipment and components. The name plates shall be stamped with the information required by the applicable Code and shall also include the Vendor's name, Vendor's serial number, and equipment tag number.

PART 3 - EXECUTION

3.1 FACTORY TESTS AND INSPECTIONS

- A. Vendor shall provide factory testing of CTG package(s) and all auxiliaries including certified test reports and witnessing of certain tests by Owner's representatives, as tabulated next page. Column headings are defined as:
 1. "Witnessed Test" is a test conducted in manufacturer's factory, witnessed by Engineer or Owner's representative who shall neither participate, nor interfere with test. A certified test report will be provided by manufacturer. Travel costs associated with Engineer or Owner's representative attending the witnessed test will be Owner's responsibility. Vendor's proposal shall include details of all "Witness Tests", including location and duration of test.
 2. "Certified non-Witnessed Test" is a test conducted in manufacturer's factory without Owner representative, but with a certified test report provided by manufacturer.

DESCRIPTION	WITNESSED TEST	CERTIFIED NON WITNESSED TEST
Full load string test of power output and fuel consumption	X	
Turbine, gearbox and generator vibration/mechanical	X	
Functional test of complete turbine-generator and controls package, including demonstration of PCS interface	X	
Generator test, IEEE 115		X
Auxiliary packaged equipment skids		X

- B. Provide step-by-step test procedures including conditions required for testing, method of correcting performance to guarantee conditions, instrumentation required, calibration procedures, and acceptance criteria for Owner approval. All procedures shall be accepted by all parties prior to start of tests. Procedures shall be in accordance with ASME PTC 22 – Gas Turbines Performance Test Code.

- C. Vendor shall provide factory calibration records for all Vendor-furnished instruments prior to final acceptance tests as noted below:
1. Calibration (5 points, up and down scale for analog transmitters; for switches verify action 2 times for increasing and decreasing inputs) of all instrumentation required for both linearity and accuracy in accordance with standard industry practices or manufacturer's recommendations.
 2. Test equipment accuracy shall be calibrated in accordance with the NIST, National Institute of Standards and Technology.
 3. Field mounted instruments shall be bench calibrated and panel mounted instruments shall be calibrated in the panel.
 4. Calibration and installation records shall be documented digitally and submitted with the final records with the following information provided:
 - a. Equipment tag number
 - b. Data component received
 - c. Purchase order number
 - d. Serial number
 - e. Calibration data
 - f. Date of calibration
 - g. Person responsible for calibration
 - h. Date component installed

3.2 PREPARATION FOR SHIPMENT

- A. Vendor shall submit step-by-step procedures for the cleaning, preservation, packaging, handling, lifting, shipping, and storage of the material and equipment provided under this order.
- B. If extended layup of equipment is required due to the Vendor's production schedule, Vendor shall provide a detailed procedure for preservation, along with a list of utility requirements.
- C. Equipment and piping must be cleaned of all foreign material, dirt, scale, grease, oil, and chemical residues, etc., in accordance with the approved cleaning methods. Items will be inspected for compliance with approved cleaning step-by-step procedures. Items which are not immediately packaged or shipped must be protected from contamination until preservation or packing is complete.
- D. Vendor shall provide all special tools for unloading, installation and maintenance of Vendor-furnished equipment. Special tools and handling equipment shall be packed separately and identified as included in the shipment. Spare gaskets shall not be bolted in place, but shall be packed separately and identified. Loose clips and similar small structural items shall be packed separately, marked, tagged, and attached to larger pieces.
- E. All exposed machinery surfaces (threads, flange faces, gasket sealing surfaces, etc.) shall be coated with an easily removable protective coating. All weld bevels of carbon or ferritic alloy steel piping or equipment components that are to be welded by others shall be coated on the inside and outside surfaces for a distance of three inches from the end of the component.

- F. All flange openings shall be protected and made waterproof with bolted full size metal covers and gaskets. Flanges shall be furnished with one bolt for every other hole (minimum of four bolts). Threaded openings shall be plugged with threaded plugs of the same material as the connected part and sealed with PTFE tape thread sealant. Beveled and plain edge openings shall be suitably closed with solid metal wedge type connectors. Where required, based on the Vendor's production schedule, piping shall be filled with inert gas to prevent corrosion.
- G. Piping shall not be designated as attachment points for lifting equipment.
- H. All tagged items need to be identified with permanent stenciled metal tags or a material not subject to deterioration from outdoor storage.

3.3 INSTALLATION SUPERVISION

- A. Bidders shall furnish a list of Site Assistance hours needed for each of the required milestones. Bidders shall include the site assistance hours as a line by line detailed list for each task.
- B. Provide full time (10 hrs/day) field erection supervision for the duration of the tasks listed below by manufacturer's personnel. This erection shall include but not limited to:
 - 1. Installation of Turbine, Generator and other items shipped loose.
 - 2. Alignment of generator and turbine.
 - 3. Installation of air filter module and inlet transition ducting.
 - 4. Installation of turbine/generator foundations and anchors.
 - 5. Installation of lube oil and other auxiliary skids.
 - 6. Installation of wiring and interconnects.
 - 7. Cleaning, connecting, and sealing all parts of the CTG package.
 - 8. Electrical control and utility mechanical and fire system functional check-outs.
 - 9. Installation of CTG exhaust expansion joint and HRSG/exhaust system ductwork.
 - 10. Receiving, unloading and moving all major components into place on foundations.
 - 11. Any items that affect the warranty of the unit.
- C. Balancing of rotating equipment shall be accomplished prior to shipment. Field balancing shall only be performed with the written approval of the Owner and the Engineer.

3.4 COMMISSIONING AND STARTUP SUPERVISION

Vendor shall provide qualified field representative(s) in required disciplines to supervise the commissioning checks and initial startup of the CTG package, including setting up and demonstration of controls, monitoring systems, performance/trending systems and auxiliaries in Vendor's supply, and interfaces with Owner's Plant Control System (PCS). Bidders shall furnish a list of Site Assistance hours needed for each Commissioning and Startup activity.

3.5 FIELD TESTS AND ENGINEERING SUPPORT

- A. The following Acceptance and Performance tests shall be performed in the field upon completion of the installation:
1. Functional Test(s) for purposes of demonstrating that the equipment and systems function as designed, operate safely, reliably, and as part of an integrated Plant system in accordance with good engineering practice. These tests shall include normal operations, such as startup, shutdown and load changes, as well as emergency operations, such as generator trip/overspeed and emergency coastdown. Fully automatic start sequences shall be made repetitively (3 minimum) without manual control override, or failed start attempt.
 2. Functional Test shall also include one hour of operation each at 25 percent, 50 percent, 75 percent, and four hours at 100 percent load.
 3. Performance Test to demonstrate ability to maintain Guaranteed Power and Guaranteed Fuel Consumption.
 4. Reliability Test to demonstrate ability to continuously run for five days without alarm or trip events. No alarm or trip devices may be bypassed during this test without Owner's approval. The performance assessment may be conducted during the Reliability Test.
 5. Performance tests shall be in accordance with the ASME Performance Test Code PTC22.
 6. Tests shall be performed with permanently installed Plant instrumentation unless such instrumentation is non-existent. Where special temporary instrumentation is required, Vendor shall furnish said instrumentation which shall be calibrated within one week before the tests, and the calibration sheets shall become part of the test documentation. No safety device (alarm or trip) shall be bypassed during or following the Reliability Tests.
- B. At least 60 days prior to scheduled Acceptance Testing, the Vendor shall submit, for Owner's and Engineer's review, a complete Acceptance Test step-by-step procedure that defines details such as protocol, type of tests, measurements to be taken, sample calculations and correction formulas, and responsible parties.
- C. Provide all step-by-step procedures and supervision required for the Acceptance Tests. During testing, the Plant shall be operated and maintained by Owner's operating personnel, the Owner's consultant or a third party vendor.
- D. An Emissions Test will be performed by Owner's consultant, with Vendor's assistance. The Emissions Test will be designed to demonstrate and document satisfactory levels of air emissions in accordance with Vendor's guarantee and air permit limits at turbine exhaust, before downstream emissions control equipment (SCR). Demonstrate and document satisfactory levels of air emissions in accordance with Vendor's guarantee and air permit limits at turbine exhaust, before Stack emissions control equipment (SCR).
- E. Vendor shall provide engineering support of and coordination with, the Owner and Owner's engineers for all tests.

3.6 TRAINING

- A. Provide training, at the Owner's facility, for the personnel listed herein so that the Owner can operate, maintain, change system configuration, and repair the complete system.
- B. Training for Operators shall be conducted to accommodate a multiple shift schedule.
- C. Separate training sessions will be held for each of the following groups:
 - 1. Engineers.
 - 2. Plant Operators (Minimum of 4 sessions over three weeks).
 - 3. Mechanical Maintenance Technicians (Minimum of 2 sessions).
 - 4. Electrical/ Instrumentation Maintenance Technicians (Minimum of 2 sessions)
- D. Prior to project closeout and field acceptance testing, provide training plan and schedule including the following information:
 - 1. List of all classes/courses.
 - 2. Description of course.
 - 3. Duration of course.
 - 4. Sequence of courses.
- E. Provide competent, factory authorized personnel to provide instruction to O&M personnel. Include sufficient hours of training to provide complete training for operation and maintenance of the equipment and system.
- F. Provide the name and resume of proposed instructor; instructor must have at least 5 years' experience teaching the designated course. Instructor's primary language must be English.
- G. Provide training manual that includes, as a minimum, the following:
 - 1. Course objective.
 - 2. Course outline.
 - 3. Theory of operation.
 - 4. Case studies that demonstrate application, operation (including casualty control), troubleshooting, repair and maintenance of equipment.
 - 5. Notes that supplement and enhance information provided in the manufacturer's operation and maintenance manuals.
 - 6. Thorough review of applicable drawings, photos, tables, diagrams and schematics.
 - 7. List of references for further independent study.
- H. Owner reserves the right to require Vendor to repeat training classes if not satisfied objectives are met, at cost of Vendor.
- I. Owner reserves the right to video record the training sessions.
- J. Overview Training for all groups:
 - 1. Course shall cover, as a minimum, the following topics for 15 to 20 persons:
 - a. Describe CTG equipment, interconnections, functions and capabilities.
 - b. Review system terminology, abbreviations and acronyms.

K. Operator Training:

1. Operator-training course shall be conducted at times that accommodate a multiple shift schedule. A minimum of four, eight-hour, on-site training sessions are required.
2. The course shall be an in-depth instruction on the CTG and Package equipment.
3. The course shall enable the Owner's operators to be proficient in the following topics, as a minimum:
 - a. Start-up, Normal Operation and shutdown of equipment.
 - b. Response actions to hardware and software failures.
 - c. Response to system alarms.
 - d. Modifying and locating setpoints.
 - e. Review interface to process control system.
 - f. Control loop tuning concepts and methods.

L. Mechanical Maintenance Training:

1. Mechanical maintenance shall be conducted in two separate and identical sessions in order to train half of the workforce at one time.
2. The course shall be an in-depth instruction on the CTG and Package equipment.
3. The course shall enable the Owner's operators to be proficient in the following topics, as a minimum:
 - a. Start-up, Normal Operation and shutdown of equipment.
 - b. Response actions to mechanical equipment failures.
 - c. Response to System alarms.

M. Electrical/Instrumentation Maintenance Training

1. Electrical/Instrumentation maintenance shall be conducted in two separate and identical sessions in order to train half of the workforce at one time.
2. The course shall be an in-depth instruction on the CTG and Package equipment.
3. The course shall enable the Owner's operators to be proficient in the following topics, as a minimum:
 - a. Start-up, Normal Operation and shutdown of equipment.
 - b. Response actions to hardware and software failures.
 - c. Response to system alarms.
 - d. Modifying and locating setpoints.
 - e. Review interface to process control system.
 - f. Control loop tuning concepts, strategies, and methods.

N. Provide certification in writing that this Training has been accomplished.

END OF SECTION 48 11 23

ATTACHMENTS

Attachment 1 – GENERAL INFORMATION

Guarantee Point, °F DB/% RH (For performance guarantee)	70°F / 45% RH
Site Elevation / FT	123
Site Barometric Pressure / psia	14.63
Site Class	D
0.2 Second Spectral Response Acceleration	8.60%g
1 Second Spectral Response Acceleration	5.10%g
Seismic Importance Factor	1.5
Basic Wind Speed (3 second gust at 33 feet above ground)	140 MPH (ASCE 7-10 strength level)
Record High Dry Bulb Temperature	109
Record Low Dry Bulb Temperature	11.7
Summer Cooling Dry Bulb, 0.4% ASHRAE	93.8
Summer Evaporation Wet Bulb, 0.4% ASHRAE	79.5
Winter Heating Dry Bulb, 99.6% ASHRAE	29.6
Maximum Indoor Temperature, °F	108.8
Minimum Indoor Temperature, °F	45

Attachment 2 – CTG PERFORMANCE TABLES

Bidder shall furnish the performance data and utility requirements summarized in the following tables. In addition, Vendor shall provide a set of Performance Correction curves illustrating the impacts on CTG net power output and net heat rate of the following parameters as a minimum:

Ambient temperature
Ambient relative humidity
Intake pressure drop
Exhaust backpressure
Any other relevant parameters specific to Vendor's equipment

As an alternative, Vendor may furnish performance software (or access to Vendor's online software) which allows for calculation of unit performance corrections for parameters noted above.

Note: Bidder shall submit completed performance data sheets for the proposed CTG.

Bid Alternate (“Base” or Alternate No.): _____

PERFORMANCE DATA		
LOAD POINT	100 Percent (Guarantee)	
AMBIENT TEMPERATURE °F, DB/°F, WB	70°F / 57 °F	
TYPE OF FUEL	Natural Gas	
	Required	Submitted
NET POWER OUTPUT, kW	32K to 40K	
GROSS POWER OUTPUT, kW	BY MFG	
NET HEAT RATE (LHV) BTU/kW-hr	BY MFG	
FUEL FLOW, LB/HR	BY MFG	
FUEL FLOW, MMBTU/HR LHV	BY MFG	
INLET AIR MASS FLOW, LB/HR	BY MFG	
COMPRESSOR AIR INLET TEMPERATURE, °F	BY MFG	
EXHAUST GAS MASS FLOW, LB/HR	BY MFG	
EXHAUST VOLUME FLOW, FT3/SEC	BY MFG	
EXHAUST TEMPERATURE, °F	BY MFG	
EXHAUST HEAT, MMBTU/HR	BY MFG	
EXHAUST Cp, BTU/lbm- °R	BY MFG	
INLET PRESSURE LOSS, IN H2O	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - CTG PACKAGE	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - HRSG (ASSUMED)	BY MFG	
EMISSIONS: (At turbine exhaust flange) Corrected to 15% O ₂		
NO _x , PPMV/LB/HR (Guaranteed)	<15ppm	
CO, PPMV/LB/HR (Guaranteed)	<25ppm	
UHC, PPMV/LB/HR	BY MFG	
VOC, PPMV/LB/HR	BY MFG	
PARTICULATE, LB/HR	BY MFG	
PM10, LB/HR	BY MFG	
OPACITY, PERCENT	BY MFG	
SO ₂ , PPMB/LB/HR	BY MFG	
REQUIRED CHILLED WATER FLOW AT THIS CONDITION, gal/min (if applicable)	N/A	N/A
REQUIRED FUEL GAS PRESSURE AT VENDOR INTERFACE, PSIG	BY MFG	
	Start up	Normal Operating
AUXILIARY POWER REQUIREMENTS, KW (Respondent to identify and fill-in: attach separate sheet(s) if necessary)		

Bid Alternate (“Base” or Alternate No.): _____

PERFORMANCE DATA		
LOAD POINT	100 Percent (High Ambient)	
AMBIENT TEMPERATURE °F, DB/°F, WB	96°F / 80°F	
TYPE OF FUEL	Natural Gas	
	Required	Submitted
NET POWER OUTPUT, kW	BY MFG	
GROSS POWER OUTPUT, kW	BY MFG	
NET HEAT RATE (LHV) BTU/kW-hr	BY MFG	
FUEL FLOW, LB/HR	BY MFG	
FUEL FLOW, MMBTU/HR LHV	BY MFG	
INLET AIR MASS FLOW, LB/HR	BY MFG	
COMPRESSOR AIR INLET TEMPERATURE, °F	BY MFG	
EXHAUST GAS MASS FLOW, LB/HR	BY MFG	
EXHAUST VOLUME FLOW, FT3/SEC	BY MFG	
EXHAUST TEMPERATURE, °F	BY MFG	
EXHAUST HEAT, MMBTU/HR	BY MFG	
EXHAUST Cp, BTU/lbm- °R	BY MFG	
INLET PRESSURE LOSS, IN H2O	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - CTG PACKAGE	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - HRSG (ASSUMED)	BY MFG	
EMISSIONS: (At turbine exhaust flange) Corrected to 15% O ₂		
NO _x , PPMV/LB/HR (Guaranteed)	<15ppm	
CO, PPMV/LB/HR (Guaranteed)	<25ppm	
UHC, PPMV/LB/HR	BY MFG	
VOC, PPMV/LB/HR	BY MFG	
PARTICULATE, LB/HR	BY MFG	
PM10, LB/HR	BY MFG	
OPACITY, PERCENT	BY MFG	
SO ₂ , PPMB/LB/HR	BY MFG	
REQUIRED CHILLED WATER FLOW AT THIS CONDITION, gal/min (if applicable)	BY MFG	
REQUIRED FUEL GAS PRESSURE AT VENDOR INTERFACE, PSIG		
	Start up	Normal Operating
AUXILIARY POWER REQUIREMENTS, KW (Respondent to identify and fill-in: attach separate sheet(s) if necessary)		

Bid Alternate (“Base” or Alternate No.): _____

PERFORMANCE DATA		
LOAD POINT	100 Percent (Low Ambient)	
AMBIENT TEMPERATURE °F, DB	25°F	
TYPE OF FUEL	Natural Gas	
	Required	Submitted
NET POWER OUTPUT, kW	BY MFG	
GROSS POWER OUTPUT, kW	BY MFG	
NET HEAT RATE (LHV) BTU/kW-hr	BY MFG	
FUEL FLOW, LB/HR	BY MFG	
FUEL FLOW, MMBTU/HR LHV	BY MFG	
INLET AIR MASS FLOW, LB/HR	BY MFG	
COMPRESSOR AIR INLET TEMPERATURE, °F	BY MFG	
EXHAUST GAS MASS FLOW, LB/HR	BY MFG	
EXHAUST VOLUME FLOW, FT3/SEC	BY MFG	
EXHAUST TEMPERATURE, °F	BY MFG	
EXHAUST HEAT, MMBTU/HR	BY MFG	
EXHAUST Cp, BTU/lbm- °R	BY MFG	
INLET PRESSURE LOSS, IN H2O	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - CTG PACKAGE	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - HRSG (ASSUMED)	BY MFG	
EMISSIONS: (At turbine exhaust flange) Corrected to 15% O ₂		
NO _x , PPMV/LB/HR (Guaranteed)	<15ppm	
CO, PPMV/LB/HR (Guaranteed)	<25ppm	
UHC, PPMV/LB/HR	BY MFG	
VOC, PPMV/LB/HR	BY MFG	
PARTICULATE, LB/HR	BY MFG	
PM10, LB/HR	BY MFG	
OPACITY, PERCENT	BY MFG	
SO ₂ , PPMB/LB/HR	BY MFG	
REQUIRED CHILLED WATER FLOW AT THIS CONDITION, gal/min (if applicable)	N/A	N/A
REQUIRED FUEL GAS PRESSURE AT VENDOR INTERFACE, PSIG		
	Start up	Normal Operating
AUXILIARY POWER REQUIREMENTS, KW (Respondent to identify and fill- in: attach separate sheet(s) if necessary)		

Bid Alternate (“Base” or Alternate No.): _____

PERFORMANCE DATA		
LOAD POINT	75 Percent	
AMBIENT TEMPERATURE °F, DB/°F, WB	70°F / 57 °F	
TYPE OF FUEL	Natural Gas	
	Required	Submitted
NET POWER OUTPUT, kW	BY MFG	
GROSS POWER OUTPUT, kW	BY MFG	
NET HEAT RATE (LHV) BTU/kW-hr	BY MFG	
FUEL FLOW, LB/HR	BY MFG	
FUEL FLOW, MMBTU/HR LHV	BY MFG	
INLET AIR MASS FLOW, LB/HR	BY MFG	
COMPRESSOR AIR INLET TEMPERATURE, °F	BY MFG	
EXHAUST GAS MASS FLOW, LB/HR	BY MFG	
EXHAUST VOLUME FLOW, FT3/SEC	BY MFG	
EXHAUST TEMPERATURE, °F	BY MFG	
EXHAUST HEAT, MMBTU/HR	BY MFG	
EXHAUST Cp, BTU/lbm- °R	BY MFG	
INLET PRESSURE LOSS, IN H2O	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - CTG PACKAGE	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - HRSG (ASSUMED)	BY MFG	
EMISSIONS: (At turbine exhaust flange) Corrected to 15% O ₂		
NO _x , PPMV/LB/HR (Guaranteed)	<15ppm	
CO, PPMV/LB/HR (Guaranteed)	<25ppm	
UHC, PPMV/LB/HR	BY MFG	
VOC, PPMV/LB/HR	BY MFG	
PARTICULATE, LB/HR	BY MFG	
PM10, LB/HR	BY MFG	
OPACITY, PERCENT	BY MFG	
SO ₂ , PPMB/LB/HR	BY MFG	
REQUIRED CHILLED WATER FLOW AT THIS CONDITION, gal/min (if applicable)	N/A	N/A
REQUIRED FUEL GAS PRESSURE AT VENDOR INTERFACE, PSIG	BY MFG	
	Start up	Normal Operating
AUXILIARY POWER REQUIREMENTS, KW (Respondent to identify and fill- in: attach separate sheet(s) if necessary)		

Bid Alternate (“Base” or Alternate No.): _____

PERFORMANCE DATA		
LOAD POINT	50 Percent	
AMBIENT TEMPERATURE °F, DB/°F, WB	70°F / 57 °F	
TYPE OF FUEL	Natural Gas	
	Required	Submitted
NET POWER OUTPUT, kW	BY MFG	
GROSS POWER OUTPUT, kW	BY MFG	
NET HEAT RATE (LHV) BTU/kW-hr	BY MFG	
FUEL FLOW, LB/HR	BY MFG	
FUEL FLOW, MMBTU/HR LHV	BY MFG	
INLET AIR MASS FLOW, LB/HR	BY MFG	
COMPRESSOR AIR INLET TEMPERATURE, °F	BY MFG	
EXHAUST GAS MASS FLOW, LB/HR	BY MFG	
EXHAUST VOLUME FLOW, FT3/SEC	BY MFG	
EXHAUST TEMPERATURE, °F	BY MFG	
EXHAUST HEAT, MMBTU/HR	BY MFG	
EXHAUST Cp, BTU/lbm- °R	BY MFG	
INLET PRESSURE LOSS, IN H2O	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - CTG PACKAGE	BY MFG	
EXHAUST PRESSURE LOSS, IN H2O - HRSG (ASSUMED)	BY MFG	
EMISSIONS: (At turbine exhaust flange) Corrected to 15% O ₂		
NO _x , PPMV/LB/HR (Guaranteed)	<15ppm	
CO, PPMV/LB/HR (Guaranteed)	<25ppm	
UHC, PPMV/LB/HR	BY MFG	
VOC, PPMV/LB/HR	BY MFG	
PARTICULATE, LB/HR	BY MFG	
PM10, LB/HR	BY MFG	
OPACITY, PERCENT	BY MFG	
SO ₂ , PPMB/LB/HR	BY MFG	
REQUIRED CHILLED WATER FLOW AT THIS CONDITION, gal/min (if applicable)	N/A	N/A
REQUIRED FUEL GAS PRESSURE AT VENDOR INTERFACE, PSIG	BY MFG	
	Start up	Normal Operating
AUXILIARY POWER REQUIREMENTS, KW (Respondent to identify and fill- in: attach separate sheet(s) if necessary)		

Attachment 3 – REQUIRED SUBMITTALS

**SPECIFICATION 481123 ATTACHMENT 3
SUBMITTAL REQUIREMENTS**

	Information Required		WARO**
	With Bid	Certified After Order	
GENERAL DATA REQUIREMENTS			
Overall Scope of Supply & Equipment Description	X	X	
Submittal/Shop Drawing List & Schedule	X	X	
Schedule for Engineering, Fabrication, & Delivery	X	X	
Experience & Reference List	X		
Commercial & Technical Clarifications	X		
Listing of all Sub-Suppliers and Subcontractors	X		
Description of Training Program Included	X		
Training Videos (DVD's)		X	
Description of Site Support Included	X		
Completed Performance Data Sheets and Guarantees	X		
Shipping Details & Weights		X	
Equipment Lifting & Rigging Drawings & Details		X	
Description of Noise Mitigation Provisions	X	X	
Shop Testing Procedures		X	
Field Testing Procedures		X	
Description of QA/QC Program	X		
Spare Parts List with Pricing	X		
Special Tools List	X		
Trim List	X		
General Arrangement Plans & Elevations	X	X	
Code Reports & Certifications		X	
Operation and Maintenance (O&M) Manuals	X*	X	
MECHANICAL DATA REQUIREMENTS			
Process Flow Diagrams (PFD's)	X	X	
3D CAD Model(s) - Equipment & Piping		X	
Dimensional Layout Drawings	X	X	
Piping Drawings with Connection/Interface Tables		X	
Permissible Nozzle Loading		X	
Expected Thermal Movements - Equipment		X	
Expected Thermal Movements - Connection Interface Points		X	
Vendor-Furnished Pipe Support Details		X	
Clearance Requirements for Maintenance	X	X	
Equipment Design Details & Materials of Construction		X	
Equipment Data Sheets		X	
Bills of Material (BOM's)		X	
Weld Procedures & Welder Qualifications		X	
Performance Curves		X	
Performance Correction Curves		X	
Accessory Descriptions	X	X	
Utility Requirements (air, water, fuel, lube oil, etc.)	X	X	
Certified Material Test Reports (MTR's)		X	
Equipment Nameplate Facsimile		X	
ELECTRICAL DATA REQUIREMENTS			
Motor List & Power Requirements	X	X	
DC System Load Requirements	X	X	
Accessory Descriptions	X	X	
Motor Data Sheets		X	
Motor Performance Curves		X	
One Line Diagrams	X	X	
Three Line Diagrams		X	
Connection/Interconnection Diagrams		X	
Schematics		X	
Wiring Diagrams		X	
Mounting Details		X	
Grounding Details		X	
Generator Performance Curves		X	

**SPECIFICATION 481123 ATTACHMENT 3
SUBMITTAL REQUIREMENTS**

	Information Required		WARO**
	With Bid	Certified After Order	
GENERAL DATA REQUIREMENTS			
Cable List		X	
Certified Test Reports		X	
Electrical Cabinet Dimensional Drawings		X	
Conduit Entrance Locations/Plan Drawings		X	
Bills of Materials (BOM's)		X	
INSTRUMENTATION & CONTROLS DATA REQUIREMENTS			
Piping & Instrumentation Diagrams (P&ID's)	X	X	
Control System PLC Description	X	X	
Control System Architecture Diagram	X	X	
Control Cabinet Dimensional Drawings		X	
Control Panel Location Drawings		X	
SAMA / ISA (Analog) & Discrete Logic Diagrams		X	
Interconnection Diagrams		X	
Point-to-Point Wiring Diagrams		X	
Termination Diagrams		X	
Control Loop Diagrams		X	
Control System Power Requirements		X	
Cable List		X	
Instrument List (w/Process Ranges & Set Points)	X*	X	
Instrument Installation Details / Dwgs		X	
Control Valve List		X	
Input/Output (I/O) Signal List - in EXCEL format file		X	
Alarm List with Setpoints - in EXCEL format file		X	
Component / Equipment List	X	X	
Instrument Data Sheets (ISA S-20)		X	
Control Valve Data Sheets (ISA S-20)		X	
Calibration Records for all Vendor-Furnished Instruments		X	
Graphical Display Screens (Screen Shots)		X	
Graphical Display Screens - Paging Architecture		X	
Engineering and Configuration Instructions	X*	X	
Control System Test Plan(s) - FAT, CAT, Startup	X*	X	
Control System Test Reports	X*	X	
HMI Tagname Database - exported in EXCEL format file		X	
PLC Tagname Database - exported in EXCEL format file		X	
HMI Application(s) (CD or similar media software file)		X	
PLC Application(s) (CD or similar media software file)		X	
Vendor Data (People, email address, phone#, experience, etc.)	X		
CIVIL/STRUCTURAL DATA REQUIREMENTS			
Code Calculations		X	
Structural Steel Plans & Elevations		X	
Platform, Ladder, & Stair Drawings		X	
Foundation Loading Diagram (Static & Dynamic)		X	
Location, Size, and Projection of Anchor Bolts, Sleeves, and/or Imbeds		X	
Equipment Weights (dry and operating)	X	X	
Field Erection Drawings & Details		X	
Equipment Grouting Requirements and/or Recommendations		X	

* - Template or generic submittal to be provided with bid. Vendor to provide schedule for final submittal of this item.

** - "Weeks After Receipt of Order": Vendor to fill-in submittal dates, or furnish separate submittal schedule

Attachment 4 – CEP PLANT GENERAL ARRANGEMENT DRAWINGS

GENERAL NOTES

A. REFER TO P-001 FOR GENERAL NOTES AND ABBREVIATIONS.

KEYNOTES

- 1. DEAERATORS
- 2. STEAM TURBINE GENERATOR (STG)
- 3. COMBUSTION TURBINE GENERATOR (CTG)
- 4. CTG AND STG MAINTENANCE SPACE
- 5. DUCT BURNERS ACCESS PLATFORMS
- 6. COOLING TOWERS
- 7. GENERATOR LUBE OIL SKID
- 8. LUBE OIL COOLERS
- 9. CTG/STG EQUIPMENT REMOVAL HATCH
- 10. CTG AUXILIARY SKID

PRELIMINARY FOR REVIEW ONLY

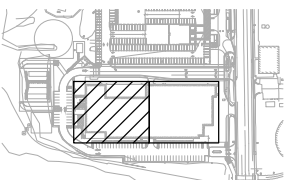
THESE DOCUMENTS ARE FOR CONCEPT DESIGN AND NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:

KEVIN W. FOX
 NAME: 03/08/2019
 REGISTRATION # DATE

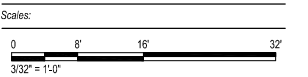
REV	DESCRIPTION	DATE

UF-623: CENTRAL ENERGY PLANT

Key Plan:



TRUE NORTH



Jacobs Project No.: WFXQ2503

Drawing Title:

MECHANICAL
 EQUIPMENT PLAN - PLANT 2ND FLOOR - AREA A

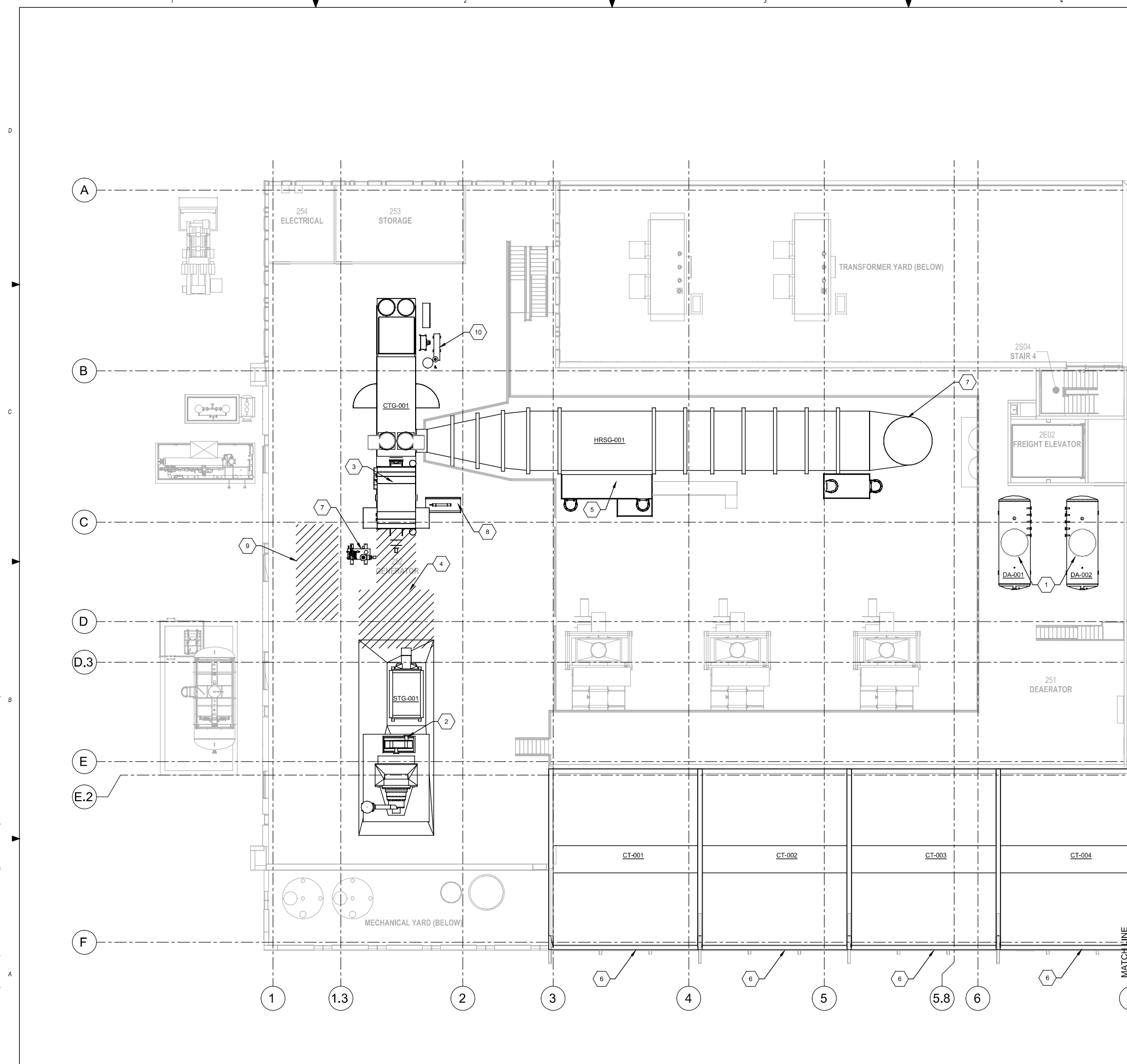
Date: 03/08/2019

Designed: BR

Drawn: CR

Checked: CH

Drawing No.:
M-104A



1 EQUIPMENT PLAN - PLANT 2ND FLOOR - AREA A
 3/32"=1'-0"

MATCH LINE
 RE. M-104B

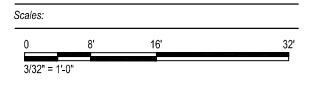
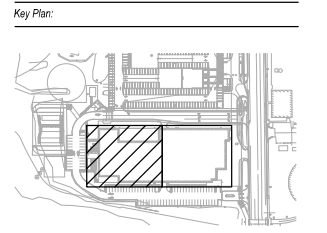
F:\Active Projects\University of Florida\WFO20203 - Central Energy Plant\ITD Working Documents\740 Sheets\740.02 Mechanical\M-105.dwg

3/20/2019 8:52:46 AM

PRELIMINARY FOR REVIEW ONLY
 THESE DOCUMENTS ARE FOR CONCEPT DESIGN AND NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:
 KEVIN W. FOX
 NAME: 03/08/2019
 REGISTRATION # DATE



UF-623: CENTRAL ENERGY PLANT



Jacobs Project No.: WFX02603

Drawing Title:
MECHANICAL EQUIPMENT PLAN - PLANT 2ND FLOOR - PLATFORM

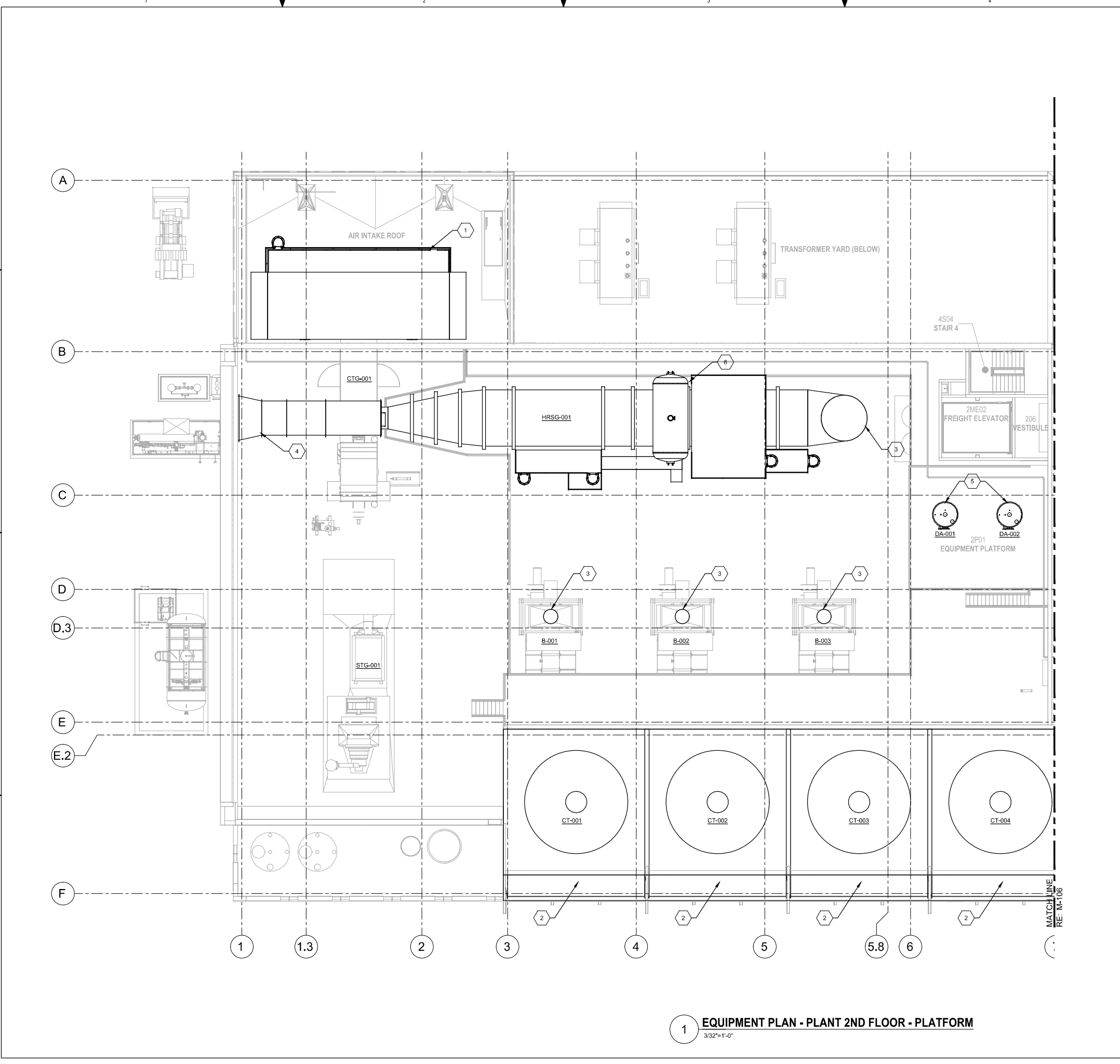
Date: 03/08/2019
 Designed: BR
 Drawn: CR
 Checked: CH
 Drawing No.: **M-105**

GENERAL NOTES

A. REFER TO P-001 FOR GENERAL NOTES AND ABBREVIATIONS.

KEYNOTES

1. COMBUSTION TURBINE GENERATOR AIR INTAKE FILTER HOUSE
 2. COOLING TOWERS
 3. STACK UP TO ROOF
 4. CTG VENTILATION EXHAUST DUCT TO WALL LOUVER
 5. DEAERATOR HEATER VESSEL
 6. HRSG-1 STEAM DRUM AND LEVEL CONTROL VALVE ACCESS PLATFORM



1 EQUIPMENT PLAN - PLANT 2ND FLOOR - PLATFORM
 3/32"=1'-0"

Attachment 5 – PROCESS FLOW DIAGRAMS

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL NOTES

A. # - REFER TO HEAT AND MASS BALANCE TABLES FOR PROCESS DATA REFERENCED BY PROCESS LINE NUMBERS.

PRELIMINARY FOR REVIEW ONLY

THESE DOCUMENTS ARE FOR CONCEPT DESIGN AND NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:

KEVIN W. FOX
NAME: 03/08/2019
REGISTRATION # DATE:

REV	DESCRIPTION	DATE



UF-623: CENTRAL ENERGY PLANT

Key Plan:

Scales:

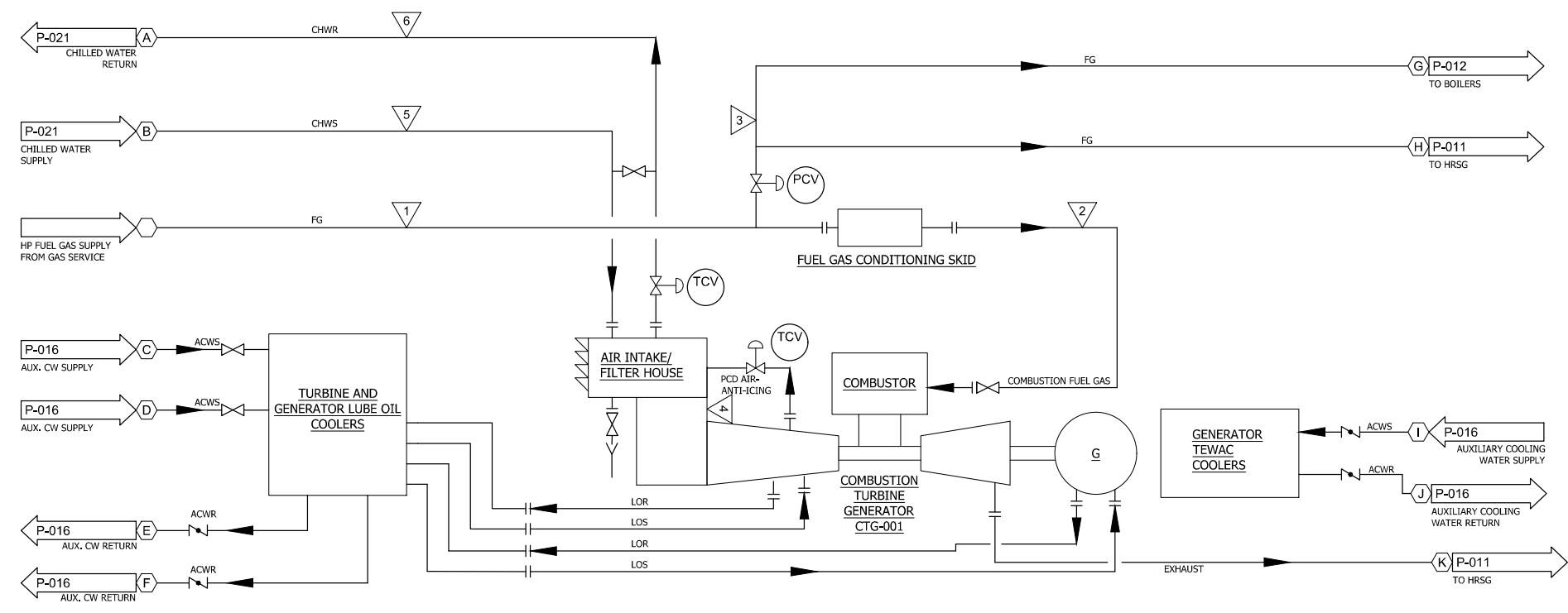
Jacobs Project No.: WFX02603

Drawing Title:

PROCESS FLOW DIAGRAM - COMBUSTION TURBINE GENERATOR

Date: 03/08/2019

Designed: BR | Drawing No.: P-010
Drawn: CR
Checked: CH



1 FLOW DIAGRAM - COMBUSTION TURBINE GENERATOR
N.T.S.

F:\Active Projects\University of Florida\WFX02603 - Central Energy Plant\710 Working Documents\740 Sheets\740.02 Mechanical\P-010.dwg

GENERAL NOTES

A. # - REFER TO HEAT AND MASS BALANCE TABLES FOR PROCESS DATA REFERENCED BY PROCESS LINE NUMBERS.

PRELIMINARY FOR REVIEW ONLY

THESE DOCUMENTS ARE FOR CONCEPT DESIGN AND NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:

KEVIN W. FOX
NAME: 03/08/2019
REGISTRATION #: DATE:

REV	DESCRIPTION	DATE



UF-623: CENTRAL ENERGY PLANT

Key Plan:

Scales:

Jacobs Project No.: WFX02603

Drawing Title:

PROCESS FLOW DIAGRAM - HEAT RECOVERY STEAM GENERATOR

Date: 03/08/2019

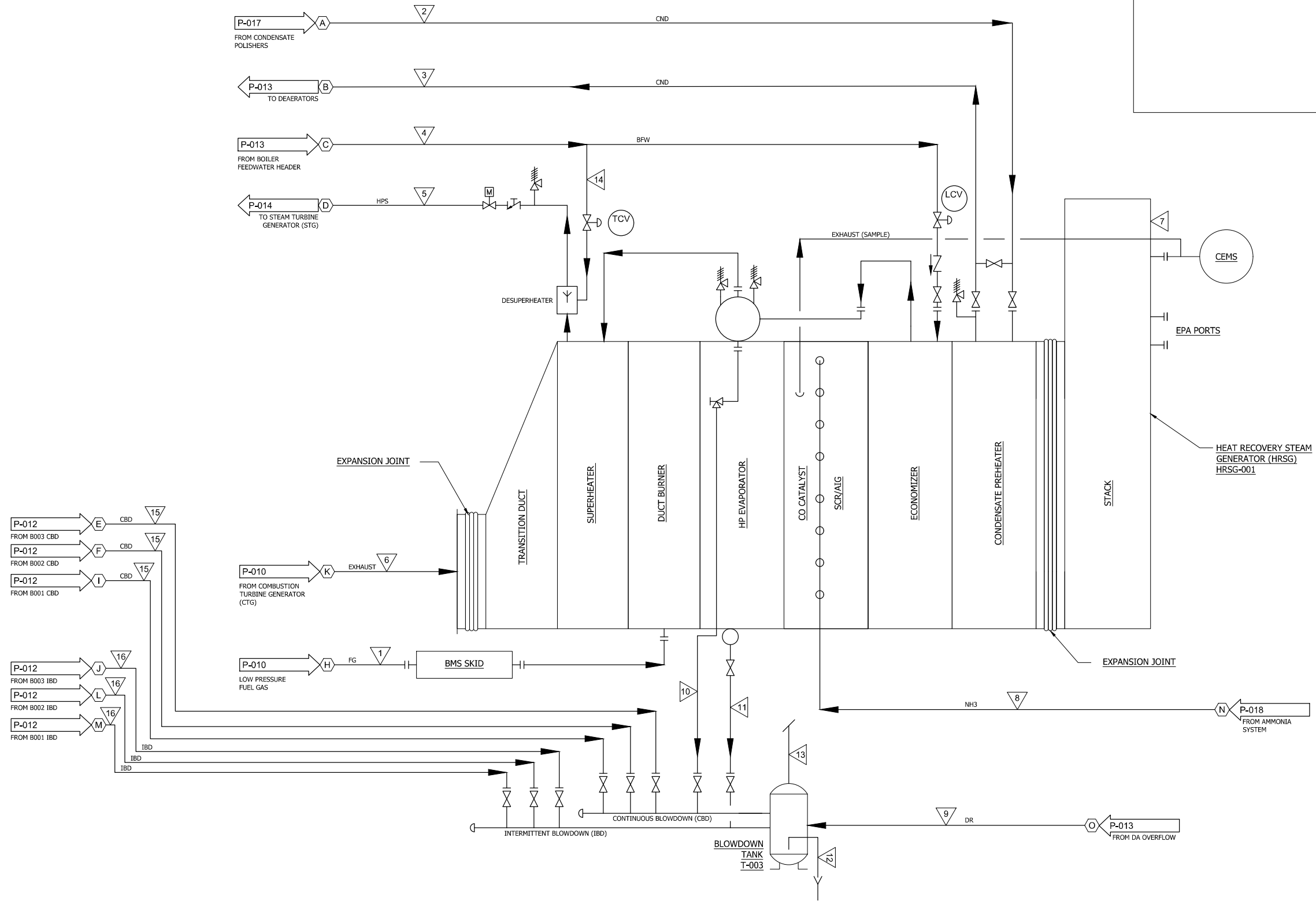
Designed: BR

Drawn: CR

Checked: CH

Drawing No.:

P-011



1 FLOW DIAGRAM - HEAT RECOVERY STEAM GENERATOR
N.T.S.

F:\Active Projects\University of Florida\WFX02603 - Central Energy Plant\770 Working Documents\740 Sheets\740.02 Mechanical\P-011.dwg

3/8/2019 9:48:32 AM

GENERAL NOTES

A. # - REFER TO HEAT AND MASS BALANCE TABLES FOR PROCESS DATA REFERENCED BY PROCESS LINE NUMBERS.

PRELIMINARY FOR REVIEW ONLY

THESE DOCUMENTS ARE FOR CONCEPT DESIGN AND NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:

KEVIN W. FOX
NAME: 03/08/2019
REGISTRATION # DATE:

REV	DESCRIPTION	DATE



UF-623: CENTRAL ENERGY PLANT

Key Plan:

Scales:

Jacobs Project No.: WFX02603

Drawing Title:

PROCESS FLOW DIAGRAM - STEAM TURBINE GENERATOR

Date: 03/08/2019

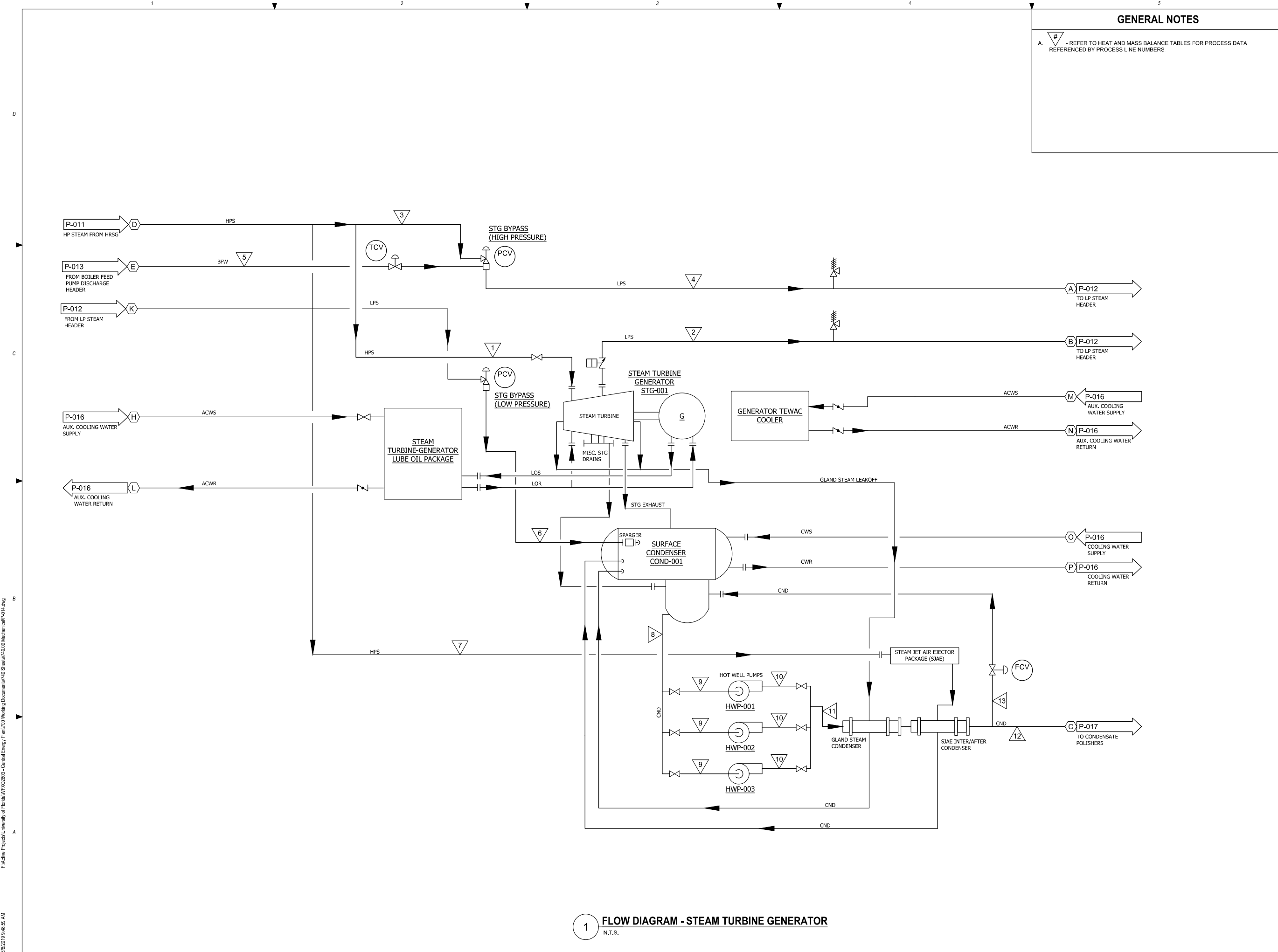
Designed: BR

Drawn: CR

Checked: CH

Drawing No.:

P-014



1 FLOW DIAGRAM - STEAM TURBINE GENERATOR
N.T.S.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 6 – ELECTRICAL SINGLE-LINE DIAGRAM

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL NOTES

A. REFER TO E-001 FOR ABBREVIATIONS, SYMBOLS AND GENERAL NOTES.

B. HALF TONE DEPICTS WORK DONE BY SUBSTATION PROJECT. REFER TO JACOBS PROJECT NUMBER WFX02601 FOR MORE INFORMATION.

PRELIMINARY FOR REVIEW ONLY

THESE DOCUMENTS ARE FOR CONCEPT DESIGN AND NOT INTENDED FOR CONSTRUCTION BIDDING OR PERMIT PURPOSES. THEY WERE PREPARED BY OR UNDER SUPERVISION OF:

MORGAN K. SUTTON
NAME
83479 REGISTRATION # 03/08/2019 DATE

REV	DESCRIPTION	DATE



UF-623: CENTRAL ENERGY PLANT

Key Plan:

Scales:

Jacobs Project No.: WFX02603

Drawing Title:

ELECTRICAL ONE LINE DIAGRAM - OVERALL

Date: 03/08/2019

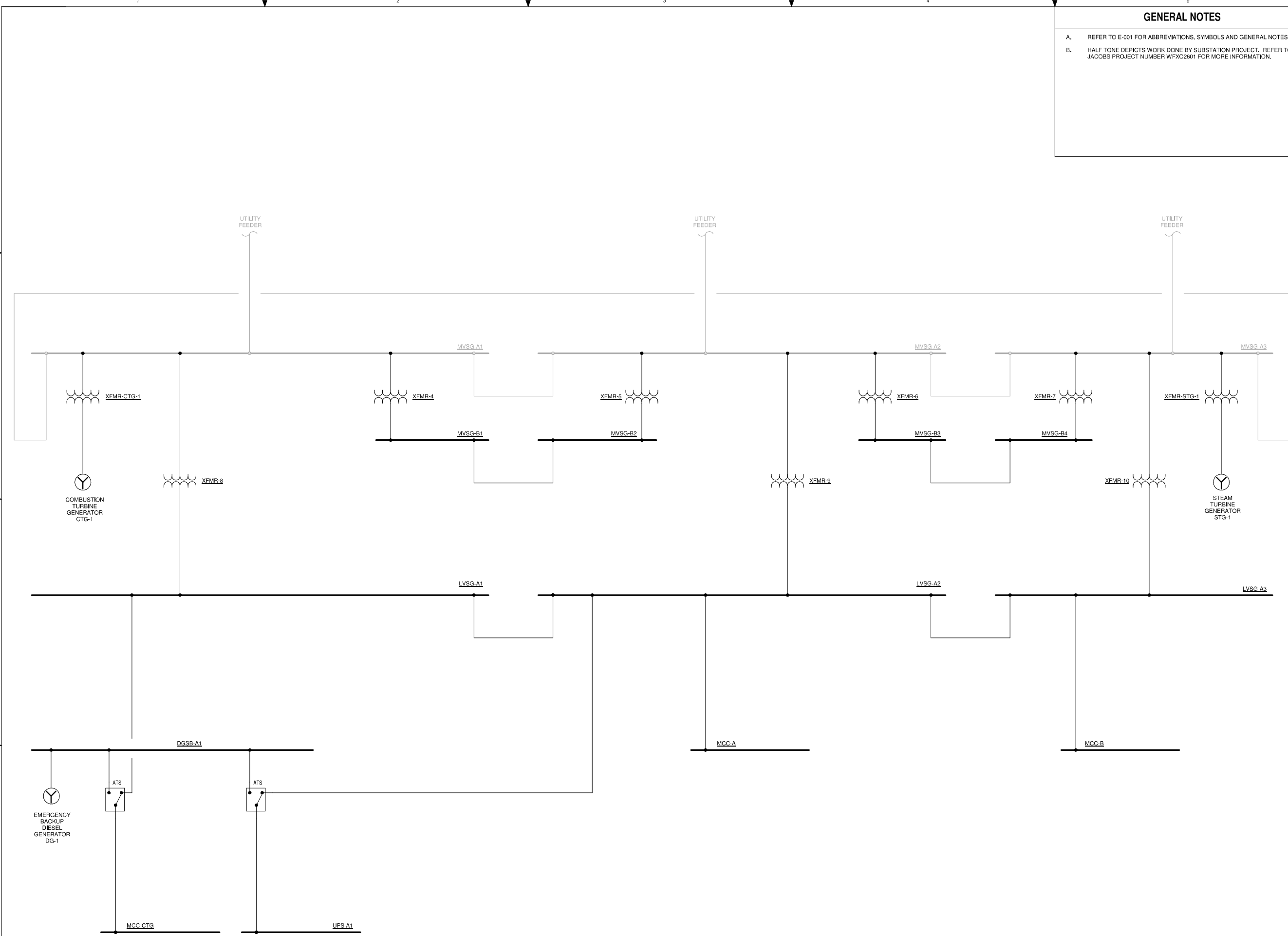
Designed: GA

Drawn: GA

Checked: MKS

Drawing No.:

E-050



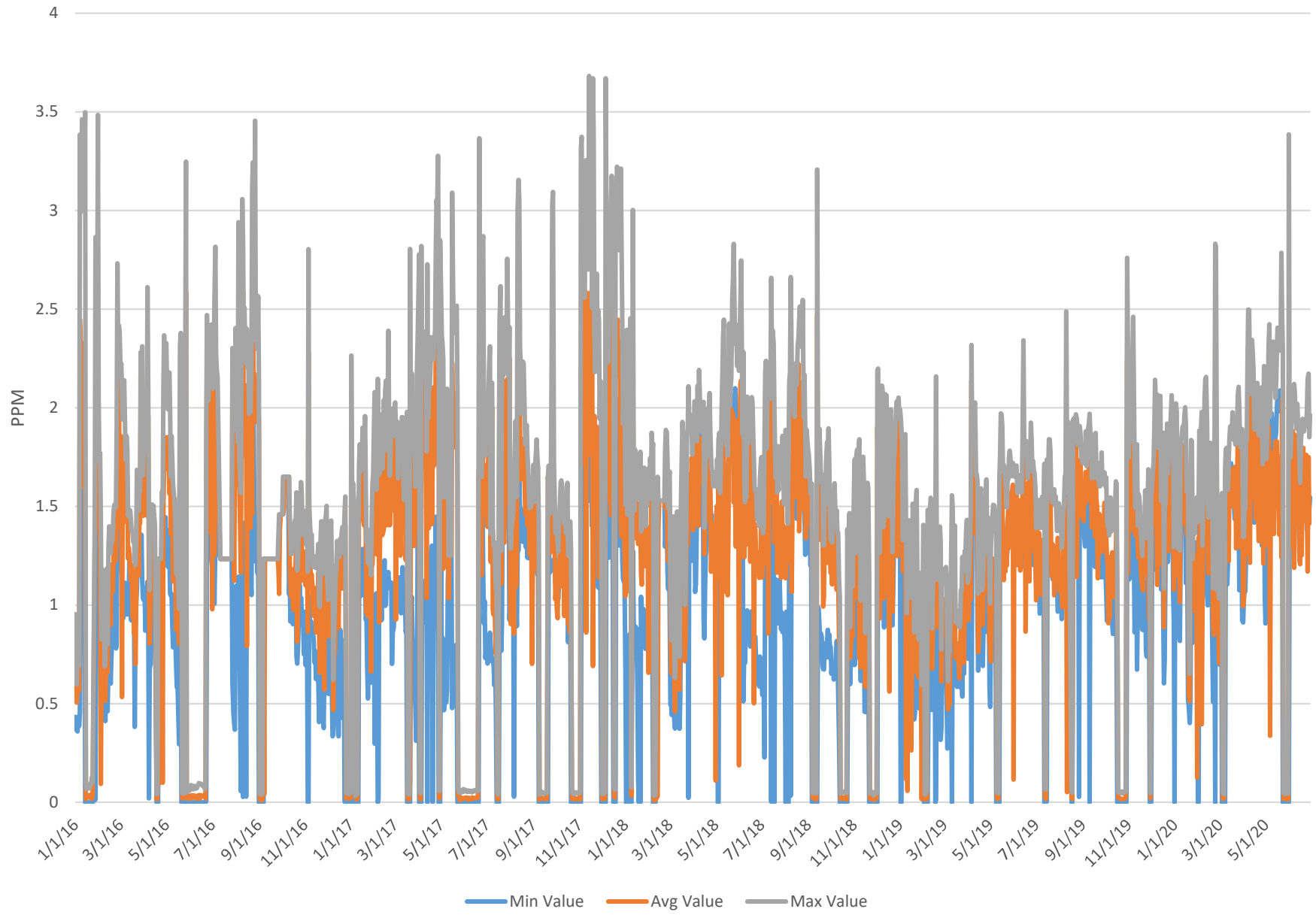
1 ONE LINE DIAGRAM - OVERALL
NTS

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 7 - FUEL SAMPLE ANALYSIS – NATURAL GAS

THIS PAGE INTENTIONALLY LEFT BLANK

H2S at CS 16 Brooker Lab



Source Daily Summary

June, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5818	1005.1	1022.9		1.023	0.482	95.706	2.554	0.177	0.018	0.021	0.006	0.004	0.009					1341.04	-37.17
2	0.5821	1006.1	1023.9		1.016	0.462	95.644	2.638	0.181	0.019	0.022	0.006	0.004	0.009					1342.00	-37.74
3	0.5823	1006.5	1024.3		1.014	0.454	95.613	2.681	0.182	0.018	0.021	0.005	0.004	0.008					1342.35	-39.79
4	0.5821	1006.2	1024.0		1.012	0.460	95.645	2.643	0.183	0.018	0.022	0.005	0.004	0.008					1342.14	-40.50
5	0.5821	1006.5	1024.3		1.002	0.460	95.651	2.635	0.188	0.021	0.024	0.006	0.004	0.008					1342.48	-38.84
6	0.5819	1005.8	1023.6		1.019	0.461	95.669	2.624	0.173	0.018	0.020	0.005	0.004	0.008					1341.75	-40.67
7	0.5819	1005.6	1023.5		1.021	0.461	95.671	2.623	0.171	0.018	0.019	0.005	0.003	0.008					1341.64	-40.96
8	0.5819	1005.6	1023.5		1.021	0.461	95.671	2.623	0.171	0.018	0.019	0.005	0.003	0.008					1341.64	-40.96
9	0.5819	1005.6	1023.5		1.021	0.461	95.671	2.623	0.171	0.018	0.019	0.005	0.003	0.008					1341.64	-40.96
10	0.5819	1005.6	1023.5		1.021	0.461	95.671	2.623	0.171	0.018	0.019	0.005	0.003	0.008					1341.64	-40.96
11	0.5816	1005.4	1023.2		1.044	0.418	95.672	2.684	0.165	0.003	0.002	0.003	0.001	0.008					1341.60	-40.65
12	0.5822	1005.8	1023.6		1.058	0.424	95.619	2.691	0.163	0.015	0.015	0.004	0.002	0.007					1341.51	-42.25
13	0.5827	1006.2	1024.1		1.061	0.430	95.564	2.724	0.170	0.018	0.018	0.005	0.003	0.007					1341.64	-41.90
14	0.5830	1006.0	1023.9		1.090	0.431	95.532	2.720	0.171	0.019	0.020	0.006	0.003	0.008					1340.95	-40.74
15	0.5828	1005.9	1023.7		1.087	0.425	95.582	2.675	0.171	0.020	0.021	0.006	0.004	0.008					1341.03	-38.76
16	0.5829	1006.2	1024.0		1.082	0.427	95.581	2.664	0.180	0.022	0.024	0.007	0.004	0.009					1341.23	-37.70
17	0.5832	1006.8	1024.7		1.080	0.419	95.529	2.719	0.185	0.023	0.025	0.007	0.005	0.009					1341.76	-36.92
18	0.5829	1006.9	1024.7		1.057	0.427	95.537	2.736	0.178	0.022	0.023	0.007	0.004	0.009					1342.11	-38.18
19	0.5831	1006.2	1024.1		1.077	0.446	95.521	2.719	0.175	0.021	0.022	0.006	0.004	0.008					1341.13	-39.31
20	0.5833	1007.0	1024.8		1.064	0.442	95.454	2.810	0.173	0.020	0.021	0.006	0.004	0.008					1341.87	-40.16
21	0.5836	1008.5	1026.4		1.026	0.442	95.338	2.956	0.179	0.020	0.021	0.006	0.004	0.008					1343.48	-40.66
22	0.5836	1008.7	1026.6		1.017	0.440	95.354	2.946	0.181	0.021	0.022	0.006	0.004	0.009					1343.77	-37.23
23	0.5839	1007.8	1025.6		1.061	0.456	95.342	2.896	0.182	0.021	0.022	0.006	0.004	0.010					1342.22	-35.96
24	0.5837	1007.0	1024.8		1.078	0.462	95.385	2.840	0.176	0.020	0.021	0.006	0.004	0.009					1341.35	-36.90
25	0.5832	1005.9	1023.7		1.100	0.442	95.532	2.690	0.175	0.021	0.021	0.006	0.004	0.010					1340.56	-36.07
26	0.5840	1007.2	1025.0		1.096	0.449	95.368	2.836	0.185	0.022	0.022	0.006	0.004	0.010					1341.28	-35.25
27	0.5845	1007.7	1025.5		1.103	0.455	95.282	2.903	0.191	0.023	0.023	0.007	0.004	0.010					1341.39	-34.91
28	0.5849	1008.6	1026.5		1.093	0.456	95.184	3.007	0.194	0.023	0.023	0.007	0.004	0.010					1342.10	-35.04
29	0.5846	1008.1	1026.0		1.092	0.456	95.260	2.927	0.195	0.024	0.024	0.007	0.004	0.011					1341.83	-33.76
30	0.5841	1007.7	1025.5		1.082	0.449	95.358	2.846	0.195	0.024	0.024	0.007	0.004	0.011					1341.85	-33.25
Avg	0.5829	1007.0	1024.4		1.054	0.447	95.520	2.742	0.178	0.019	0.021	0.006	0.004	0.009					1341.77	-38.47

Source Daily Summary

July, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5838	1007.8	1025.6		1.063	0.443	95.386	2.850	0.190	0.023	0.023	0.007	0.004	0.010					1342.34	-34.34
2	0.5832	1008.3	1026.1		1.018	0.427	95.441	2.874	0.181	0.020	0.021	0.006	0.004	0.009					1343.66	-36.96
3	0.5834	1008.1	1026.0		1.031	0.432	95.409	2.887	0.183	0.019	0.020	0.006	0.004	0.008					1343.26	-38.76
4	0.5839	1008.8	1026.7		1.024	0.449	95.340	2.914	0.205	0.023	0.025	0.007	0.005	0.009					1343.62	-36.98
5	0.5846	1009.3	1027.2		1.044	0.452	95.262	2.941	0.221	0.027	0.029	0.008	0.006	0.010					1343.49	-34.00
6	0.5842	1007.8	1025.7		1.073	0.460	95.340	2.851	0.203	0.024	0.025	0.008	0.005	0.010					1341.97	-34.99
7	0.5842	1008.3	1026.2		1.060	0.452	95.302	2.923	0.198	0.022	0.023	0.006	0.004	0.008					1342.58	-38.54
8	0.5840	1008.0	1025.9		1.059	0.453	95.314	2.930	0.186	0.020	0.021	0.006	0.004	0.008					1342.43	-39.83
9	0.5836	1007.6	1025.5		1.060	0.443	95.373	2.889	0.179	0.019	0.020	0.006	0.003	0.008					1342.29	-40.02
10	0.5839	1007.9	1025.8		1.061	0.442	95.326	2.943	0.174	0.018	0.019	0.005	0.003	0.007					1342.47	-41.23
11	0.5841	1008.5	1026.4		1.054	0.434	95.278	3.004	0.176	0.018	0.019	0.005	0.003	0.007					1343.05	-41.84
12	0.5838	1007.8	1025.7		1.075	0.428	95.342	2.925	0.175	0.019	0.020	0.006	0.003	0.008					1342.34	-40.02
13	0.5840	1008.5	1026.3		1.064	0.420	95.320	2.955	0.181	0.021	0.021	0.006	0.004	0.008					1343.01	-38.97
14	0.5848	1010.1	1028.0		1.045	0.418	95.209	3.051	0.202	0.026	0.026	0.008	0.005	0.011					1344.33	-33.05
15	0.5846	1009.1	1027.0		1.075	0.420	95.250	2.993	0.191	0.024	0.024	0.007	0.005	0.011					1343.18	-32.88
16	0.5844	1007.9	1025.8		1.105	0.433	95.302	2.904	0.186	0.024	0.023	0.007	0.004	0.011					1341.75	-32.84
17	0.5844	1007.5	1025.3		1.076	0.496	95.274	2.901	0.186	0.023	0.023	0.007	0.004	0.011					1341.26	-33.76
18	0.5847	1008.8	1026.6		1.072	0.463	95.198	3.007	0.192	0.024	0.023	0.007	0.004	0.010					1342.51	-34.33
19	0.5845	1008.2	1026.1		1.085	0.454	95.256	2.950	0.187	0.024	0.023	0.007	0.004	0.010					1342.05	-33.90
20	0.5847	1008.3	1026.1		1.095	0.448	95.240	2.957	0.190	0.024	0.023	0.007	0.004	0.010					1341.96	-33.99
21	0.5848	1009.1	1027.0		1.078	0.432	95.206	3.022	0.194	0.024	0.023	0.007	0.004	0.010					1342.96	-35.28
22	0.5844	1008.4	1026.3		1.081	0.426	95.309	2.919	0.193	0.025	0.024	0.007	0.004	0.010					1342.59	-33.81
23	0.5835	1007.9	1025.8		1.063	0.411	95.453	2.815	0.187	0.024	0.023	0.007	0.004	0.011					1342.80	-32.94
24	0.5837	1008.0	1025.8		1.057	0.428	95.437	2.808	0.196	0.025	0.026	0.008	0.005	0.011					1342.73	-33.07
25	0.5844	1009.1	1027.0		1.051	0.433	95.310	2.917	0.208	0.027	0.028	0.008	0.005	0.011					1343.44	-32.94
26	0.5843	1008.5	1026.3		1.076	0.431	95.330	2.887	0.200	0.026	0.027	0.008	0.005	0.011					1342.65	-32.82
27	0.5842	1008.5	1026.4		1.071	0.425	95.348	2.879	0.199	0.025	0.028	0.008	0.006	0.011					1342.84	-32.75
28	0.5833	1007.5	1025.3		1.056	0.430	95.432	2.857	0.168	0.019	0.020	0.006	0.004	0.009					1342.45	-38.29
29	0.5830	1008.0	1025.8		1.028	0.413	95.456	2.880	0.170	0.019	0.019	0.005	0.003	0.007					1343.48	-41.38
30	0.5828	1007.6	1025.5		1.018	0.425	95.485	2.856	0.166	0.017	0.018	0.005	0.003	0.007					1343.31	-42.81
31	0.5831	1008.0	1025.8		1.021	0.424	95.459	2.863	0.179	0.019	0.020	0.005	0.003	0.008					1343.48	-41.09
Avg	0.5840	1008.0	1026.2		1.059	0.437	95.335	2.915	0.189	0.022	0.023	0.007	0.004	0.009					1342.78	-36.40

Source Daily Summary

August, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5833	1007.7	1025.5		1.038	0.438	95.419	2.873	0.180	0.018	0.019	0.005	0.003	0.007					1342.81	-42.10
2	0.5830	1007.1	1024.9		1.045	0.438	95.480	2.810	0.175	0.018	0.019	0.005	0.003	0.007					1342.34	-41.80
3	0.5829	1007.4	1025.3		1.026	0.437	95.484	2.825	0.175	0.019	0.019	0.005	0.003	0.007					1342.89	-41.22
4	0.5825	1007.2	1025.0		1.031	0.415	95.580	2.735	0.180	0.020	0.021	0.006	0.004	0.008					1342.92	-39.01
5	0.5822	1007.4	1025.3		1.023	0.380	95.663	2.682	0.186	0.022	0.024	0.007	0.004	0.009					1343.63	-37.36
6	0.5825	1007.8	1025.7		1.031	0.373	95.610	2.730	0.192	0.022	0.024	0.006	0.004	0.008					1343.82	-39.04
7	0.5826	1007.5	1025.3		1.048	0.373	95.613	2.715	0.189	0.021	0.023	0.006	0.004	0.008					1343.30	-38.72
8	0.5827	1007.4	1025.2		1.056	0.372	95.608	2.712	0.189	0.021	0.023	0.006	0.004	0.009					1343.10	-38.22
9	0.5828	1007.2	1025.0		1.062	0.386	95.594	2.705	0.190	0.022	0.023	0.006	0.004	0.009					1342.69	-37.53
10	0.5831	1007.0	1024.8		1.082	0.394	95.571	2.692	0.193	0.023	0.024	0.007	0.005	0.010					1342.13	-34.99
11	0.5828	1006.4	1024.2		1.091	0.391	95.612	2.659	0.182	0.022	0.022	0.007	0.004	0.010					1341.65	-35.35
12	0.5828	1007.1	1024.9		1.060	0.394	95.579	2.726	0.180	0.021	0.021	0.006	0.004	0.009					1342.57	-37.05
13	0.5830	1007.5	1025.4		1.054	0.398	95.527	2.779	0.180	0.022	0.021	0.006	0.004	0.009					1342.90	-36.64
14	0.5834	1007.7	1025.5		1.066	0.403	95.466	2.822	0.181	0.021	0.021	0.006	0.004	0.009					1342.70	-36.56
15	0.5838	1007.6	1025.5		1.083	0.417	95.401	2.856	0.183	0.020	0.021	0.006	0.004	0.009					1342.19	-37.76
16	0.5835	1007.1	1024.9		1.092	0.415	95.467	2.779	0.184	0.021	0.022	0.006	0.004	0.010					1341.72	-35.91
17	0.5838	1007.8	1025.6		1.092	0.403	95.413	2.835	0.190	0.022	0.023	0.007	0.004	0.010					1342.28	-34.43
18	0.5834	1008.2	1026.1		1.053	0.393	95.453	2.857	0.182	0.021	0.021	0.006	0.004	0.010					1343.39	-34.74
19	0.5832	1008.2	1026.1		1.037	0.398	95.478	2.839	0.187	0.020	0.020	0.006	0.004	0.010					1343.62	-35.02
20	0.5828	1007.4	1025.3		1.052	0.388	95.567	2.748	0.184	0.020	0.020	0.006	0.004	0.010					1343.01	-35.27
21	0.5826	1007.2	1025.0		1.047	0.393	95.598	2.726	0.177	0.020	0.020	0.006	0.004	0.010					1342.88	-35.15
22	0.5830	1008.6	1026.5		1.012	0.398	95.484	2.857	0.188	0.021	0.021	0.006	0.004	0.010					1344.33	-35.60
23	0.5830	1007.9	1025.8		1.032	0.407	95.507	2.808	0.185	0.021	0.020	0.006	0.004	0.010					1343.44	-34.96
24	0.5827	1007.4	1025.3		1.038	0.404	95.558	2.758	0.182	0.021	0.020	0.006	0.004	0.010					1343.07	-36.02
25	0.5830	1007.9	1025.7		1.038	0.396	95.518	2.804	0.184	0.021	0.020	0.006	0.004	0.009					1343.43	-37.14
26	0.5830	1008.1	1026.0		1.032	0.392	95.512	2.819	0.185	0.020	0.020	0.006	0.004	0.009					1343.72	-37.28
27	0.5835	1008.8	1026.7		1.031	0.402	95.394	2.930	0.186	0.019	0.020	0.006	0.004	0.008					1344.01	-38.54
28	0.5834	1008.9	1026.8		1.020	0.403	95.405	2.926	0.185	0.020	0.021	0.006	0.004	0.009					1344.29	-36.99
29	0.5835	1008.6	1026.5		1.028	0.418	95.387	2.929	0.179	0.020	0.021	0.006	0.004	0.009					1343.80	-37.39
30	0.5838	1009.2	1027.1		1.010	0.430	95.343	2.963	0.188	0.022	0.023	0.007	0.004	0.010					1344.32	-35.38
31	0.5839	1008.7	1026.5		1.033	0.440	95.324	2.959	0.183	0.020	0.021	0.006	0.004	0.009					1343.44	-36.57
Avg	0.5831	1008.0	1025.6		1.047	0.403	95.504	2.802	0.184	0.021	0.021	0.006	0.004	0.009					1343.11	-37.09

Source Daily Summary

September, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5836	1008.7	1026.5		1.025	0.432	95.369	2.928	0.184	0.021	0.021	0.006	0.004	0.010					1343.70	-35.58
2	0.5830	1008.1	1026.0		1.015	0.417	95.485	2.845	0.177	0.021	0.020	0.006	0.004	0.009					1343.75	-36.27
3	0.5833	1009.1	1026.9		1.011	0.399	95.483	2.823	0.206	0.026	0.027	0.008	0.006	0.010					1344.58	-34.04
4	0.5835	1009.3	1027.2		1.022	0.377	95.496	2.805	0.215	0.029	0.031	0.009	0.006	0.011					1344.80	-33.07
5	0.5833	1009.2	1027.1		1.028	0.366	95.512	2.799	0.215	0.027	0.029	0.008	0.005	0.010					1344.77	-34.20
6	0.5835	1009.0	1026.9		1.054	0.351	95.495	2.817	0.208	0.026	0.027	0.008	0.005	0.009					1344.32	-35.80
7	0.5838	1008.6	1026.4		1.075	0.380	95.377	2.925	0.183	0.021	0.020	0.006	0.004	0.009					1343.36	-37.95
8	0.5838	1008.4	1026.3		1.071	0.397	95.371	2.916	0.186	0.021	0.020	0.006	0.004	0.009					1343.12	-36.97
9	0.5838	1008.6	1026.5		1.068	0.388	95.373	2.922	0.190	0.021	0.021	0.006	0.004	0.009					1343.43	-36.98
10	0.5840	1008.3	1026.1		1.085	0.399	95.349	2.926	0.182	0.021	0.020	0.006	0.004	0.009					1342.75	-37.04
11	0.5838	1008.2	1026.1		1.073	0.408	95.353	2.930	0.179	0.020	0.019	0.006	0.003	0.009					1342.86	-36.90
12	0.5839	1008.2	1026.1		1.074	0.403	95.356	2.932	0.178	0.020	0.019	0.006	0.003	0.009					1342.89	-37.48
13	0.5839	1008.5	1026.4		1.068	0.402	95.331	2.968	0.176	0.020	0.019	0.006	0.003	0.009					1343.19	-38.20
14	0.5837	1009.1	1026.9		1.039	0.398	95.345	2.982	0.178	0.020	0.019	0.006	0.003	0.009					1344.07	-37.83
15	0.5834	1008.9	1026.7		1.036	0.389	95.397	2.944	0.176	0.021	0.019	0.006	0.003	0.009					1344.14	-37.77
16	0.5836	1008.4	1026.3		1.059	0.391	95.404	2.905	0.181	0.021	0.020	0.006	0.004	0.009					1343.42	-37.33
17	0.5839	1008.4	1026.3		1.068	0.400	95.372	2.915	0.182	0.022	0.021	0.006	0.004	0.010					1343.14	-35.66
18	0.5839	1008.4	1026.3		1.069	0.401	95.367	2.918	0.182	0.022	0.021	0.006	0.004	0.010					1343.12	-35.43
19	0.5839	1008.2	1026.0		1.080	0.402	95.357	2.925	0.177	0.020	0.020	0.006	0.004	0.009					1342.76	-38.06
20	0.5839	1008.0	1025.9		1.085	0.406	95.365	2.900	0.182	0.021	0.021	0.006	0.004	0.009					1342.52	-37.96
21	0.5836	1007.2	1025.1		1.091	0.413	95.427	2.833	0.176	0.020	0.020	0.006	0.004	0.009					1341.85	-38.21
22	0.5838	1008.1	1025.9		1.085	0.401	95.370	2.902	0.181	0.021	0.021	0.006	0.004	0.009					1342.63	-37.53
23	0.5839	1008.4	1026.2		1.074	0.399	95.363	2.924	0.181	0.021	0.020	0.006	0.004	0.009					1343.03	-37.07
24	0.5836	1008.3	1026.2		1.057	0.398	95.401	2.909	0.178	0.020	0.019	0.006	0.004	0.009					1343.32	-37.69
25	0.5833	1007.9	1025.7		1.051	0.409	95.430	2.886	0.170	0.019	0.018	0.005	0.003	0.008					1343.04	-38.75
26	0.5833	1008.2	1026.0		1.042	0.400	95.407	2.942	0.162	0.017	0.016	0.004	0.002	0.008					1343.50	-40.61
27	0.5839	1009.6	1027.5		1.023	0.404	95.270	3.084	0.170	0.017	0.017	0.005	0.002	0.008					1344.62	-40.02
28	0.5840	1010.1	1027.9		1.001	0.415	95.233	3.129	0.174	0.017	0.017	0.004	0.002	0.007					1345.18	-41.83
29	0.5840	1009.6	1027.5		1.022	0.410	95.251	3.098	0.173	0.017	0.017	0.004	0.002	0.007					1344.57	-42.88
30	0.5843	1009.0	1026.9		1.068	0.403	95.269	3.025	0.178	0.021	0.019	0.005	0.003	0.008					1343.44	-39.03
Avg	0.5837	1009.0	1026.5		1.054	0.399	95.379	2.925	0.183	0.021	0.021	0.006	0.004	0.009					1343.53	-37.47

Source Daily Summary

October, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5841	1009.4	1027.3		1.048	0.399	95.271	3.048	0.178	0.020	0.019	0.006	0.003	0.009					1344.12	-38.49
2	0.5845	1011.1	1029.0		1.003	0.402	95.159	3.189	0.190	0.021	0.020	0.006	0.003	0.008					1345.88	-39.47
3	0.5844	1010.4	1028.3		1.014	0.412	95.169	3.174	0.181	0.018	0.018	0.005	0.002	0.007					1345.20	-41.72
4	0.5838	1009.7	1027.5		1.004	0.418	95.301	3.039	0.181	0.021	0.020	0.006	0.003	0.008					1344.84	-38.89
5	0.5835	1009.4	1027.3		0.985	0.442	95.316	3.026	0.176	0.020	0.019	0.006	0.003	0.008					1344.77	-39.36
6	0.5838	1010.2	1028.1		0.968	0.449	95.256	3.082	0.185	0.022	0.021	0.006	0.004	0.009					1345.43	-37.86
7	0.5841	1010.6	1028.5		0.967	0.444	95.212	3.132	0.184	0.021	0.021	0.006	0.004	0.009					1345.77	-37.63
8	0.5838	1009.9	1027.8		0.980	0.434	95.273	3.081	0.178	0.019	0.019	0.005	0.003	0.008					1345.24	-40.66
9	0.5835	1009.0	1026.8		1.010	0.429	95.340	2.990	0.176	0.019	0.019	0.005	0.003	0.008					1344.20	-39.07
10	0.5835	1009.0	1026.8		1.008	0.429	95.347	2.985	0.176	0.019	0.019	0.005	0.003	0.008					1344.22	-39.65
11	0.5836	1010.5	1028.4		0.951	0.429	95.290	3.086	0.189	0.019	0.020	0.006	0.003	0.008					1346.21	-39.90
12	0.5832	1010.1	1028.0		0.954	0.417	95.352	3.041	0.184	0.019	0.019	0.005	0.003	0.007					1346.05	-41.97
13	0.5839	1011.5	1029.4		0.947	0.405	95.217	3.187	0.189	0.019	0.020	0.005	0.003	0.007					1347.16	-41.14
14	0.5837	1010.7	1028.6		0.963	0.409	95.261	3.130	0.186	0.018	0.018	0.005	0.003	0.007					1346.34	-42.87
15	0.5838	1010.4	1028.3		0.966	0.428	95.247	3.124	0.183	0.019	0.018	0.005	0.003	0.007					1345.89	-42.09
16	0.5838	1010.7	1028.6		0.956	0.432	95.223	3.156	0.183	0.018	0.018	0.005	0.002	0.007					1346.18	-42.99
17	0.5841	1010.2	1028.1		0.990	0.433	95.209	3.136	0.181	0.018	0.018	0.004	0.002	0.007					1345.22	-43.68
18	0.5839	1009.9	1027.8		0.993	0.437	95.227	3.112	0.181	0.018	0.018	0.004	0.002	0.006					1344.94	-44.33
19	0.5836	1008.3	1026.2		1.020	0.451	95.331	2.977	0.173	0.018	0.017	0.004	0.002	0.007					1343.36	-43.70
20	0.5833	1008.7	1026.6		0.999	0.436	95.360	2.987	0.169	0.018	0.017	0.004	0.002	0.007					1344.14	-43.34
21	0.5833	1009.5	1027.4		0.971	0.427	95.329	3.060	0.167	0.017	0.017	0.004	0.002	0.007					1345.29	-44.13
22	0.5828	1008.7	1026.6		0.964	0.435	95.432	2.955	0.167	0.017	0.017	0.004	0.002	0.007					1344.84	-44.28
23	0.5826	1007.0	1024.8		1.028	0.428	95.531	2.803	0.162	0.018	0.017	0.004	0.002	0.007					1342.71	-42.50
24	0.5831	1006.3	1024.1		1.085	0.439	95.473	2.787	0.164	0.019	0.017	0.005	0.002	0.007					1341.12	-41.42
25	0.5835	1007.3	1025.1		1.062	0.449	95.393	2.866	0.175	0.020	0.019	0.005	0.003	0.008					1342.00	-40.44
26	0.5832	1006.5	1024.4		1.064	0.456	95.460	2.795	0.173	0.019	0.018	0.005	0.003	0.007					1341.43	-41.88
27	0.5838	1007.2	1025.0		1.068	0.471	95.360	2.861	0.183	0.020	0.020	0.006	0.003	0.008					1341.55	-40.44
28	0.5840	1008.1	1025.9		1.043	0.472	95.298	2.944	0.185	0.020	0.021	0.006	0.004	0.008					1342.54	-39.51
29	0.5838	1007.7	1025.6		1.060	0.449	95.360	2.889	0.181	0.022	0.020	0.006	0.004	0.009					1342.31	-38.13
30	0.5840	1007.7	1025.6		1.086	0.430	95.363	2.868	0.189	0.024	0.022	0.006	0.004	0.009					1342.05	-37.04
31	0.5840	1006.9	1024.7		1.120	0.435	95.353	2.859	0.177	0.020	0.019	0.005	0.003	0.008					1340.85	-40.13
Avg	0.5837	1009.0	1027.0		1.009	0.433	95.313	3.012	0.179	0.019	0.019	0.005	0.003	0.008					1344.25	-40.93

Source Daily Summary

November, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5838	1007.0	1024.8		1.104	0.432	95.384	2.848	0.177	0.020	0.019	0.005	0.003	0.008					1341.23	-40.34
2	0.5838	1007.3	1025.1		1.098	0.419	95.382	2.869	0.178	0.020	0.019	0.005	0.003	0.008					1341.69	-41.05
3	0.5838	1007.3	1025.2		1.097	0.418	95.381	2.872	0.178	0.020	0.019	0.005	0.003	0.007					1341.74	-41.16
4	0.5838	1007.3	1025.2		1.097	0.418	95.381	2.872	0.178	0.020	0.019	0.005	0.003	0.007					1341.74	-41.16
5	0.5838	1007.3	1025.2		1.097	0.418	95.381	2.872	0.178	0.020	0.019	0.005	0.003	0.007					1341.74	-41.16
6	0.5838	1007.3	1025.2		1.097	0.418	95.381	2.872	0.178	0.020	0.019	0.005	0.003	0.007					1341.74	-41.16
7	0.5838	1007.3	1025.2		1.097	0.418	95.381	2.872	0.178	0.020	0.019	0.005	0.003	0.007					1341.74	-41.16
8	0.5838	1007.3	1025.2		1.097	0.418	95.381	2.872	0.178	0.020	0.019	0.005	0.003	0.007					1341.74	-41.16
9	0.5837	1007.1	1024.9		1.087	0.436	95.359	2.910	0.160	0.018	0.016	0.004	0.002	0.007					1341.58	-42.34
10	0.5839	1006.9	1024.7		1.112	0.433	95.334	2.914	0.159	0.018	0.016	0.004	0.002	0.007					1341.04	-43.22
11	0.5836	1005.9	1023.7		1.142	0.422	95.426	2.805	0.156	0.019	0.017	0.005	0.002	0.007					1340.05	-42.06
12	0.5832	1005.3	1023.1		1.149	0.414	95.518	2.706	0.159	0.020	0.018	0.006	0.003	0.008					1339.65	-40.14
13	0.5829	1005.7	1023.5		1.116	0.413	95.557	2.695	0.163	0.020	0.018	0.006	0.003	0.008					1340.48	-39.44
14	0.5819	1003.8	1021.5		1.118	0.431	95.748	2.498	0.154	0.019	0.017	0.005	0.003	0.008					1339.09	-40.00
15	0.5828	1005.1	1022.9		1.138	0.392	95.659	2.578	0.174	0.020	0.019	0.006	0.003	0.012					1339.98	-32.10
16	0.5831	1006.5	1024.3		1.107	0.385	95.557	2.724	0.170	0.020	0.018	0.006	0.003	0.011					1341.46	-32.46
17	0.5848	1009.8	1027.7		1.106	0.342	95.255	3.035	0.198	0.022	0.021	0.006	0.004	0.011					1343.99	-32.51
18	0.5853	1010.7	1028.6		1.110	0.326	95.171	3.123	0.203	0.023	0.023	0.007	0.004	0.010					1344.61	-34.53
19	0.5847	1010.4	1028.3		1.078	0.344	95.250	3.054	0.207	0.023	0.023	0.007	0.004	0.010					1344.82	-34.11
20	0.5840	1010.6	1028.5		1.017	0.360	95.322	3.025	0.212	0.022	0.023	0.006	0.003	0.009					1345.86	-37.14
21	0.5843	1010.9	1028.8		1.021	0.365	95.274	3.047	0.227	0.023	0.024	0.006	0.003	0.009					1345.90	-38.11
22	0.5847	1010.2	1028.1		1.085	0.343	95.384	2.881	0.209	0.023	0.029	0.008	0.009	0.028					1344.53	-12.53
23	0.5840	1008.9	1026.7		1.107	0.325	95.511	2.780	0.191	0.022	0.021	0.007	0.004	0.031					1343.57	-9.07
24	0.5836	1009.6	1027.5		1.048	0.331	95.489	2.873	0.186	0.020	0.018	0.006	0.003	0.026					1345.06	-13.07
25	0.5837	1010.1	1028.0		1.036	0.328	95.455	2.917	0.193	0.020	0.019	0.006	0.003	0.023					1345.57	-16.71
26	0.5838	1009.5	1027.4		1.066	0.333	95.434	2.906	0.194	0.020	0.019	0.006	0.003	0.018					1344.62	-22.38
27	0.5837	1008.3	1026.2		1.107	0.337	95.480	2.814	0.196	0.020	0.019	0.006	0.004	0.016					1343.11	-24.33
28	0.5835	1008.4	1026.3		1.077	0.356	95.467	2.853	0.187	0.019	0.018	0.006	0.003	0.014					1343.54	-27.31
29	0.5839	1009.1	1027.0		1.069	0.368	95.343	2.987	0.177	0.018	0.017	0.005	0.003	0.013					1343.94	-29.49
30	0.5839	1008.9	1026.8		1.083	0.355	95.363	2.961	0.182	0.019	0.018	0.005	0.003	0.011					1343.70	-33.98
Avg	0.5838	1008.0	1025.9		1.092	0.383	95.413	2.868	0.183	0.020	0.019	0.006	0.003	0.012					1342.65	-33.51

Source Daily Summary

December, 2019



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5839	1008.5	1026.4		1.096	0.361	95.378	2.923	0.185	0.020	0.019	0.006	0.003	0.009					1343.15	-36.58
2	0.5840	1007.2	1025.0		1.144	0.374	95.403	2.842	0.181	0.020	0.018	0.006	0.003	0.009					1341.32	-37.91
3	0.5833	1006.3	1024.1		1.142	0.367	95.532	2.732	0.172	0.020	0.018	0.006	0.003	0.008					1340.90	-39.42
4	0.5830	1006.6	1024.4		1.116	0.361	95.560	2.736	0.174	0.019	0.018	0.005	0.003	0.008					1341.67	-40.08
5	0.5833	1006.9	1024.7		1.141	0.333	95.533	2.769	0.169	0.019	0.018	0.005	0.003	0.009					1341.70	-37.98
6	0.5842	1008.2	1026.1		1.144	0.328	95.370	2.924	0.176	0.020	0.019	0.006	0.003	0.009					1342.50	-37.36
7	0.5839	1007.4	1025.3		1.158	0.331	95.438	2.842	0.172	0.021	0.019	0.006	0.003	0.010					1341.75	-35.96
8	0.5832	1005.9	1023.7		1.183	0.320	95.600	2.674	0.166	0.020	0.019	0.006	0.003	0.010					1340.51	-35.86
9	0.5829	1006.0	1023.8		1.170	0.306	95.637	2.671	0.163	0.019	0.017	0.005	0.003	0.010					1340.99	-36.36
10	0.5832	1006.8	1024.7		1.143	0.321	95.587	2.706	0.181	0.022	0.020	0.006	0.004	0.009					1341.78	-36.34
11	0.5836	1008.3	1026.2		1.106	0.328	95.491	2.810	0.197	0.024	0.023	0.007	0.004	0.010					1343.28	-34.31
12	0.5831	1007.4	1025.3		1.111	0.321	95.578	2.754	0.177	0.022	0.019	0.006	0.003	0.010					1342.75	-35.78
13	0.5835	1007.7	1025.6		1.132	0.314	95.516	2.795	0.181	0.023	0.020	0.007	0.004	0.009					1342.58	-37.88
14	0.5840	1008.5	1026.3		1.140	0.306	95.430	2.871	0.186	0.024	0.021	0.007	0.004	0.009					1342.96	-36.25
15	0.5836	1007.3	1025.2		1.153	0.310	95.531	2.764	0.178	0.023	0.021	0.007	0.004	0.010					1342.02	-35.32
16	0.5836	1008.7	1026.6		1.084	0.339	95.440	2.893	0.182	0.022	0.021	0.007	0.004	0.009					1343.76	-37.56
17	0.5838	1009.9	1027.7		1.050	0.332	95.392	2.972	0.190	0.023	0.021	0.007	0.004	0.009					1345.15	-36.82
18	0.5838	1010.7	1028.6		1.015	0.337	95.377	3.002	0.198	0.025	0.024	0.008	0.004	0.010					1346.23	-34.97
19	0.5842	1011.5	1029.4		1.008	0.337	95.265	3.137	0.188	0.023	0.022	0.007	0.004	0.010					1346.81	-35.45
20	0.5842	1011.0	1028.9		1.028	0.337	95.255	3.142	0.182	0.020	0.019	0.005	0.003	0.008					1346.17	-39.90
21	0.5817	1008.2	1026.1		1.023	0.280	95.746	2.726	0.171	0.020	0.018	0.005	0.003	0.007					1345.36	-42.93
22	0.5821	1009.4	1027.3		0.996	0.288	95.628	2.869	0.168	0.019	0.018	0.005	0.003	0.006					1346.41	-44.80
23	0.5820	1009.2	1027.1		1.000	0.287	95.636	2.861	0.166	0.019	0.018	0.005	0.003	0.006					1346.27	-45.35
24	0.5818	1008.7	1026.6		1.009	0.279	95.703	2.794	0.163	0.019	0.018	0.005	0.003	0.007					1345.89	-44.04
25	0.5814	1009.7	1027.6		0.940	0.282	95.719	2.845	0.163	0.019	0.018	0.005	0.003	0.006					1347.72	-45.21
26	0.5811	1009.9	1027.8		0.920	0.280	95.737	2.851	0.163	0.018	0.018	0.005	0.003	0.006					1348.28	-45.72
27	0.5814	1009.5	1027.4		0.944	0.289	95.714	2.839	0.166	0.018	0.017	0.005	0.002	0.006					1347.47	-46.36
28	0.5818	1010.5	1028.4		0.931	0.290	95.618	2.942	0.171	0.018	0.018	0.005	0.002	0.006					1348.28	-46.38
29	0.5819	1010.7	1028.6		0.924	0.300	95.602	2.945	0.178	0.019	0.018	0.005	0.002	0.006					1348.36	-46.03
30	0.5817	1009.6	1027.5		0.958	0.297	95.672	2.849	0.171	0.019	0.019	0.005	0.003	0.006					1347.13	-44.59
31	0.5814	1009.7	1027.6		0.931	0.297	95.710	2.840	0.170	0.019	0.019	0.005	0.003	0.006					1347.72	-45.83
Avg	0.5829	1009.0	1026.4		1.059	0.317	95.542	2.849	0.176	0.021	0.019	0.006	0.003	0.008					1344.41	-39.85

Source Daily Summary

January, 2020



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5810	1009.1	1026.9		0.942	0.281	95.794	2.775	0.160	0.018	0.017	0.005	0.002	0.006					1347.31	-47.35
2	0.5810	1008.6	1026.4		0.966	0.276	95.811	2.742	0.158	0.018	0.017	0.005	0.002	0.005					1346.65	-47.56
3	0.5810	1008.1	1026.0		0.985	0.277	95.818	2.720	0.155	0.017	0.016	0.005	0.002	0.006					1346.03	-47.29
4	0.5819	1009.6	1027.5		0.976	0.281	95.646	2.882	0.167	0.018	0.017	0.005	0.002	0.006					1347.02	-47.43
5	0.5826	1010.8	1028.7		0.972	0.284	95.498	3.026	0.171	0.019	0.018	0.005	0.002	0.006					1347.77	-46.44
6	0.5817	1008.6	1026.5		1.003	0.288	95.700	2.796	0.162	0.019	0.018	0.005	0.003	0.006					1345.84	-45.53
7	0.5826	1010.5	1028.4		0.982	0.288	95.513	2.995	0.174	0.019	0.018	0.005	0.003	0.006					1347.34	-47.09
8	0.5832	1012.5	1030.5		0.936	0.294	95.354	3.179	0.185	0.020	0.019	0.005	0.003	0.006					1349.32	-46.56
9	0.5824	1011.4	1029.3		0.931	0.298	95.485	3.065	0.171	0.018	0.018	0.005	0.003	0.006					1348.67	-47.23
10	0.5827	1012.0	1030.0		0.922	0.292	95.432	3.134	0.173	0.017	0.018	0.005	0.003	0.005					1349.32	-47.96
11	0.5836	1013.1	1031.1		0.932	0.293	95.276	3.267	0.180	0.019	0.019	0.005	0.003	0.006					1349.74	-46.36
12	0.5831	1012.3	1030.2		0.935	0.299	95.375	3.161	0.175	0.020	0.020	0.006	0.003	0.007					1349.10	-43.63
13	0.5830	1012.6	1030.5		0.915	0.301	95.367	3.192	0.173	0.019	0.019	0.005	0.003	0.006					1349.66	-44.42
14	0.5826	1009.5	1027.4		0.954	0.387	95.478	2.966	0.161	0.019	0.018	0.006	0.003	0.008					1346.07	-39.79
15	0.5827	1008.3	1026.2		0.997	0.403	95.495	2.896	0.157	0.018	0.017	0.006	0.003	0.008					1344.36	-40.26
16	0.5825	1007.7	1025.5		1.016	0.397	95.533	2.854	0.151	0.017	0.017	0.005	0.003	0.007					1343.71	-41.98
17	0.5826	1008.5	1026.4		0.992	0.392	95.495	2.915	0.157	0.018	0.017	0.005	0.003	0.007					1344.72	-42.88
18	0.5827	1009.4	1027.2		0.962	0.394	95.463	2.964	0.165	0.019	0.018	0.005	0.003	0.007					1345.74	-42.36
19	0.5821	1009.4	1027.3		0.923	0.395	95.542	2.928	0.162	0.018	0.018	0.005	0.003	0.007					1346.48	-42.35
20	0.5824	1009.8	1027.6		0.929	0.389	95.489	2.983	0.159	0.018	0.018	0.005	0.003	0.007					1346.64	-42.58
21	0.5815	1008.1	1026.0		0.941	0.397	95.685	2.754	0.170	0.019	0.019	0.006	0.003	0.007					1345.37	-41.38
22	0.5828	1009.8	1027.7		0.939	0.410	95.433	2.988	0.175	0.019	0.019	0.006	0.003	0.007					1346.25	-41.33
23	0.5830	1009.7	1027.5		0.960	0.412	95.393	3.011	0.171	0.019	0.018	0.005	0.003	0.007					1345.74	-41.42
24	0.5835	1009.5	1027.3		0.994	0.417	95.345	3.011	0.176	0.020	0.020	0.006	0.003	0.008					1344.91	-40.13
25	0.5836	1009.9	1027.8		0.990	0.408	95.319	3.054	0.174	0.020	0.020	0.006	0.003	0.008					1345.37	-40.65
26	0.5835	1010.7	1028.6		0.953	0.405	95.313	3.089	0.180	0.021	0.021	0.006	0.004	0.008					1346.56	-39.53
27	0.5832	1010.1	1028.0		0.958	0.397	95.400	3.009	0.176	0.021	0.021	0.006	0.004	0.008					1346.20	-38.54
28	0.5828	1008.5	1026.3		1.009	0.392	95.501	2.864	0.174	0.021	0.020	0.006	0.004	0.008					1344.37	-39.56
29	0.5828	1008.5	1026.4		1.005	0.391	95.500	2.878	0.171	0.019	0.019	0.006	0.003	0.008					1344.47	-40.95
30	0.5825	1008.2	1026.0		1.006	0.388	95.543	2.839	0.169	0.019	0.019	0.006	0.003	0.008					1344.29	-40.02
31	0.5828	1009.1	1026.9		0.978	0.399	95.473	2.916	0.177	0.019	0.020	0.006	0.003	0.008					1345.21	-39.99
Avg	0.5826	1010.0	1027.7		0.965	0.352	95.499	2.963	0.169	0.019	0.018	0.005	0.003	0.007					1346.46	-43.24

Source Daily Summary

February, 2020



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5825	1008.7	1026.6		0.977	0.399	95.523	2.871	0.174	0.020	0.020	0.006	0.003	0.008					1345.03	-39.81
2	0.5822	1008.5	1026.4		0.972	0.392	95.570	2.836	0.174	0.020	0.019	0.006	0.003	0.008					1345.11	-40.50
3	0.5821	1008.5	1026.4		0.965	0.394	95.603	2.799	0.182	0.020	0.020	0.006	0.003	0.008					1345.19	-40.31
4	0.5831	1010.1	1028.0		0.964	0.391	95.430	2.950	0.201	0.022	0.023	0.007	0.004	0.008					1346.17	-39.14
5	0.5829	1008.4	1026.3		1.010	0.399	95.505	2.839	0.187	0.021	0.021	0.006	0.004	0.008					1344.22	-39.39
6	0.5830	1008.8	1026.7		1.000	0.396	95.467	2.900	0.182	0.019	0.019	0.006	0.003	0.008					1344.70	-40.19
7	0.5825	1008.3	1026.2		0.993	0.392	95.542	2.844	0.175	0.019	0.018	0.006	0.003	0.008					1344.59	-40.61
8	0.5823	1008.1	1025.9		0.991	0.396	95.557	2.836	0.169	0.018	0.017	0.005	0.003	0.007					1344.42	-42.21
9	0.5825	1008.8	1026.7		0.976	0.383	95.528	2.889	0.173	0.018	0.018	0.005	0.003	0.007					1345.32	-43.11
10	0.5826	1009.6	1027.4		0.961	0.373	95.498	2.939	0.178	0.019	0.019	0.005	0.003	0.007					1346.13	-43.69
11	0.5827	1009.5	1027.4		0.972	0.373	95.487	2.936	0.177	0.020	0.019	0.006	0.003	0.007					1345.90	-41.20
12	0.5821	1007.9	1025.8		1.001	0.368	95.623	2.789	0.166	0.019	0.018	0.005	0.003	0.007					1344.49	-41.46
13	0.5819	1006.7	1024.5		1.035	0.373	95.679	2.711	0.154	0.017	0.017	0.005	0.002	0.007					1343.09	-42.67
14	0.5824	1007.0	1024.8		1.051	0.380	95.596	2.764	0.159	0.018	0.017	0.005	0.003	0.007					1342.88	-41.71
15	0.5819	1005.6	1023.4		1.084	0.368	95.716	2.632	0.152	0.017	0.016	0.005	0.002	0.007					1341.58	-43.20
16	0.5825	1007.6	1025.4		1.037	0.370	95.567	2.813	0.164	0.018	0.017	0.005	0.002	0.007					1343.59	-43.57
17	0.5837	1010.7	1028.6		0.975	0.392	95.280	3.118	0.182	0.019	0.019	0.005	0.003	0.007					1346.30	-42.56
18	0.5840	1010.9	1028.9		0.985	0.387	95.247	3.137	0.188	0.019	0.020	0.006	0.003	0.007					1346.34	-41.36
19	0.5826	1007.5	1025.3		1.042	0.382	95.554	2.807	0.165	0.017	0.018	0.005	0.003	0.007					1343.30	-41.79
20	0.5825	1007.0	1024.9		1.051	0.381	95.586	2.772	0.161	0.017	0.017	0.005	0.003	0.007					1342.89	-42.12
21	0.5828	1007.5	1025.3		1.049	0.388	95.524	2.819	0.168	0.018	0.018	0.005	0.003	0.007					1343.09	-41.82
22	0.5825	1006.7	1024.6		1.067	0.371	95.618	2.729	0.166	0.018	0.017	0.005	0.003	0.007					1342.54	-42.34
23	0.5829	1007.9	1025.7		1.047	0.377	95.511	2.836	0.177	0.019	0.018	0.005	0.003	0.007					1343.50	-42.56
24	0.5832	1008.1	1025.9		1.047	0.391	95.459	2.873	0.178	0.019	0.019	0.005	0.003	0.007					1343.46	-41.55
25	0.5831	1008.1	1026.0		1.046	0.384	95.465	2.879	0.174	0.018	0.018	0.005	0.003	0.008					1343.57	-40.99
26	0.5828	1007.4	1025.2		1.055	0.386	95.521	2.823	0.167	0.017	0.017	0.004	0.002	0.007					1342.94	-43.58
27	0.5824	1006.5	1024.3		1.068	0.384	95.602	2.741	0.160	0.017	0.016	0.004	0.002	0.007					1342.20	-44.02
28	0.5829	1008.0	1025.8		1.046	0.374	95.512	2.841	0.175	0.019	0.018	0.005	0.003	0.008					1343.61	-40.82
29	0.5826	1008.1	1026.0		1.023	0.369	95.554	2.825	0.177	0.019	0.018	0.005	0.003	0.007					1344.19	-41.34
Avg	0.5827	1008.0	1026.0		1.017	0.383	95.528	2.846	0.173	0.019	0.018	0.005	0.003	0.007					1344.15	-41.71

Source Daily Summary

March, 2020



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5826	1008.7	1026.6		0.997	0.371	95.532	2.869	0.178	0.019	0.018	0.005	0.003	0.007					1345.00	-41.70
2	0.5824	1008.5	1026.4		0.997	0.371	95.566	2.839	0.173	0.019	0.019	0.005	0.003	0.008					1344.87	-40.10
3	0.5823	1008.3	1026.2		0.998	0.372	95.571	2.840	0.167	0.019	0.018	0.005	0.003	0.008					1344.75	-40.61
4	0.5821	1008.2	1026.0		0.992	0.375	95.592	2.827	0.164	0.018	0.017	0.005	0.003	0.007					1344.72	-41.49
5	0.5827	1009.5	1027.4		0.957	0.395	95.445	2.988	0.166	0.017	0.017	0.005	0.002	0.007					1345.91	-42.09
6	0.5834	1010.6	1028.5		0.954	0.405	95.300	3.116	0.175	0.018	0.018	0.005	0.003	0.007					1346.48	-42.24
7	0.5832	1010.2	1028.1		0.956	0.398	95.350	3.072	0.173	0.017	0.018	0.005	0.003	0.007					1346.32	-42.07
8	0.5832	1010.2	1028.1		0.957	0.397	95.360	3.064	0.172	0.017	0.018	0.005	0.003	0.007					1346.29	-42.04
9	0.5832	1010.2	1028.1		0.957	0.397	95.360	3.064	0.172	0.017	0.018	0.005	0.003	0.007					1346.29	-42.04
10	0.5832	1010.2	1028.1		0.957	0.397	95.360	3.064	0.172	0.017	0.018	0.005	0.003	0.007					1346.29	-42.04
11	0.5829	1009.9	1027.7		0.959	0.392	95.398	3.040	0.164	0.017	0.017	0.005	0.002	0.007					1346.12	-42.90
12	0.5824	1008.9	1026.8		0.960	0.396	95.511	2.920	0.164	0.017	0.017	0.005	0.003	0.007					1345.50	-41.75
13	0.5829	1009.6	1027.5		0.964	0.400	95.420	2.993	0.172	0.018	0.018	0.005	0.003	0.007					1345.75	-41.71
14	0.5830	1009.8	1027.7		0.952	0.408	95.387	3.034	0.170	0.017	0.017	0.005	0.003	0.007					1346.05	-42.80
15	0.5829	1009.3	1027.2		0.961	0.418	95.408	2.999	0.166	0.017	0.017	0.005	0.003	0.007					1345.45	-42.98
16	0.5831	1009.4	1027.3		0.973	0.410	95.387	3.014	0.166	0.018	0.018	0.005	0.003	0.007					1345.39	-42.89
17	0.5832	1010.2	1028.1		0.962	0.397	95.365	3.047	0.175	0.019	0.020	0.006	0.004	0.007					1346.21	-41.25
18	0.5826	1009.0	1026.9		0.974	0.390	95.505	2.907	0.169	0.019	0.020	0.006	0.004	0.008					1345.37	-40.16
19	0.5825	1008.7	1026.6		0.985	0.377	95.550	2.860	0.170	0.019	0.020	0.006	0.004	0.008					1345.16	-39.34
20	0.5828	1009.6	1027.5		0.973	0.379	95.437	2.994	0.166	0.018	0.018	0.005	0.003	0.008					1345.89	-41.00
21	0.5832	1010.6	1028.5		0.952	0.388	95.354	3.081	0.172	0.018	0.019	0.005	0.003	0.008					1346.70	-40.18
22	0.5836	1011.1	1029.0		0.948	0.403	95.271	3.142	0.181	0.019	0.019	0.005	0.003	0.008					1346.88	-40.65
23	0.5837	1011.4	1029.3		0.943	0.396	95.261	3.161	0.184	0.020	0.020	0.006	0.003	0.008					1347.28	-40.47
24	0.5838	1011.1	1029.0		0.948	0.412	95.259	3.135	0.188	0.021	0.020	0.006	0.004	0.008					1346.81	-39.29
25	0.5834	1009.9	1027.8		0.994	0.375	95.383	3.016	0.175	0.020	0.019	0.006	0.004	0.008					1345.68	-40.78
26	0.5836	1009.6	1027.5		1.027	0.359	95.386	2.992	0.177	0.021	0.020	0.006	0.004	0.008					1345.10	-40.05
27	0.5835	1009.5	1027.3		1.031	0.360	95.379	3.005	0.171	0.020	0.018	0.005	0.003	0.007					1344.93	-41.47
28	0.5834	1009.6	1027.5		1.015	0.366	95.381	3.015	0.171	0.019	0.018	0.005	0.003	0.007					1345.23	-42.19
29	0.5832	1009.6	1027.5		0.998	0.377	95.409	2.984	0.176	0.020	0.019	0.006	0.003	0.008					1345.41	-40.51
30	0.5840	1010.6	1028.5		1.005	0.377	95.312	3.037	0.197	0.028	0.023	0.007	0.004	0.009					1345.88	-35.96
31	0.5836	1010.4	1028.3		0.989	0.376	95.361	3.018	0.192	0.025	0.020	0.006	0.004	0.009					1346.05	-37.78
Avg	0.5831	1010.0	1027.6		0.975	0.388	95.405	3.004	0.173	0.019	0.019	0.005	0.003	0.008					1345.80	-41.05

Source Daily Summary

April, 2020



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5838	1010.2	1028.1		1.009	0.371	95.358	3.001	0.193	0.027	0.021	0.007	0.004	0.009					1345.63	-37.62
2	0.5832	1009.2	1027.1		1.006	0.382	95.472	2.877	0.195	0.028	0.022	0.007	0.004	0.009					1345.00	-37.57
3	0.5832	1008.6	1026.5		1.027	0.393	95.468	2.855	0.192	0.025	0.021	0.006	0.004	0.008					1344.11	-38.48
4	0.5828	1007.7	1025.5		1.036	0.403	95.515	2.815	0.174	0.021	0.019	0.006	0.003	0.008					1343.29	-40.11
5	0.5828	1007.6	1025.5		1.031	0.411	95.485	2.865	0.157	0.018	0.017	0.005	0.003	0.008					1343.25	-40.94
6	0.5833	1007.7	1025.5		1.060	0.414	95.415	2.897	0.160	0.019	0.018	0.006	0.003	0.008					1342.69	-40.18
7	0.5838	1008.3	1026.2		1.060	0.415	95.326	2.985	0.160	0.018	0.019	0.006	0.003	0.008					1343.05	-40.29
8	0.5845	1009.9	1027.8		1.048	0.404	95.197	3.117	0.176	0.019	0.021	0.006	0.004	0.008					1344.33	-39.47
9	0.5843	1009.4	1027.3		1.054	0.400	95.233	3.095	0.166	0.018	0.018	0.005	0.003	0.008					1343.96	-40.49
10	0.5846	1009.2	1027.0		1.092	0.396	95.188	3.103	0.167	0.019	0.018	0.005	0.003	0.008					1343.18	-39.87
11	0.5849	1009.7	1027.6		1.089	0.394	95.150	3.132	0.180	0.020	0.019	0.006	0.003	0.008					1343.58	-39.68
12	0.5851	1010.5	1028.4		1.070	0.385	95.111	3.194	0.184	0.021	0.019	0.006	0.003	0.008					1344.52	-39.19
13	0.5848	1010.5	1028.3		1.052	0.393	95.146	3.169	0.183	0.021	0.019	0.006	0.003	0.008					1344.74	-38.90
14	0.5837	1008.8	1026.6		1.050	0.392	95.354	2.979	0.171	0.019	0.018	0.006	0.003	0.008					1343.80	-39.69
15	0.5833	1008.1	1025.9		1.060	0.387	95.422	2.913	0.164	0.019	0.018	0.006	0.003	0.008					1343.25	-40.97
16	0.5835	1008.1	1026.0		1.072	0.378	95.417	2.911	0.167	0.020	0.019	0.006	0.003	0.007					1343.18	-41.33
17	0.5833	1007.8	1025.7		1.071	0.383	95.447	2.873	0.171	0.020	0.019	0.006	0.003	0.007					1342.96	-41.37
18	0.5833	1007.8	1025.7		1.071	0.384	95.452	2.867	0.171	0.020	0.019	0.006	0.003	0.007					1342.93	-41.38
19	0.5840	1009.9	1027.8		1.028	0.383	95.388	2.909	0.209	0.034	0.025	0.008	0.005	0.011					1344.93	-32.77
20	0.5833	1007.9	1025.8		1.071	0.372	95.533	2.762	0.188	0.030	0.022	0.008	0.004	0.011					1343.15	-33.04
21	0.5835	1008.6	1026.4		1.058	0.368	95.462	2.862	0.180	0.027	0.021	0.007	0.004	0.009					1343.80	-36.04
22	0.5837	1008.5	1026.3		1.072	0.375	95.435	2.865	0.181	0.028	0.021	0.007	0.004	0.010					1343.39	-34.36
23	0.5840	1008.9	1026.8		1.063	0.394	95.363	2.919	0.189	0.028	0.022	0.007	0.004	0.010					1343.59	-34.20
24	0.5836	1009.1	1027.0		1.041	0.381	95.408	2.916	0.184	0.027	0.022	0.007	0.004	0.010					1344.27	-34.63
25	0.5832	1009.0	1026.8		1.012	0.389	95.441	2.926	0.173	0.022	0.019	0.006	0.004	0.009					1344.64	-38.45
26	0.5830	1008.8	1026.7		1.015	0.382	95.462	2.910	0.173	0.021	0.019	0.006	0.004	0.008					1344.60	-39.18
27	0.5824	1007.2	1025.0		1.028	0.400	95.578	2.782	0.159	0.019	0.018	0.005	0.003	0.008					1343.17	-40.33
28	0.5820	1005.8	1023.6		1.057	0.400	95.680	2.662	0.151	0.018	0.017	0.005	0.003	0.007					1341.81	-41.78
29	0.5823	1006.7	1024.5		1.060	0.381	95.617	2.733	0.157	0.019	0.018	0.005	0.003	0.007					1342.50	-41.57
30	0.5825	1006.8	1024.6		1.068	0.372	95.611	2.737	0.159	0.019	0.018	0.005	0.003	0.008					1342.51	-40.35
Avg	0.5835	1009.0	1026.4		1.051	0.389	95.404	2.921	0.174	0.022	0.020	0.006	0.004	0.008					1343.66	-38.81

Source Daily Summary

May, 2020



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: 14.730

Contract Day: 1

Temperature Base:

Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5825	1006.0	1023.9		1.093	0.382	95.612	2.708	0.153	0.018	0.017	0.005	0.003	0.008					1341.50	-40.32
2	0.5828	1006.5	1024.4		1.090	0.389	95.553	2.755	0.160	0.019	0.017	0.005	0.003	0.008					1341.76	-39.19
3	0.5829	1006.6	1024.4		1.089	0.390	95.545	2.762	0.161	0.019	0.018	0.005	0.003	0.008					1341.82	-39.03
4	0.5829	1006.6	1024.4		1.089	0.390	95.545	2.762	0.161	0.019	0.018	0.005	0.003	0.008					1341.82	-39.03
5	0.5829	1006.6	1024.4		1.089	0.390	95.545	2.762	0.161	0.019	0.018	0.005	0.003	0.008					1341.82	-39.03
6	0.5832	1006.4	1024.2		1.134	0.366	95.514	2.782	0.151	0.019	0.017	0.005	0.003	0.008					1341.14	-39.21
7	0.5835	1006.7	1024.5		1.142	0.362	95.463	2.829	0.151	0.019	0.017	0.005	0.003	0.009					1341.23	-38.49
8	0.5840	1006.9	1024.8		1.166	0.359	95.390	2.878	0.152	0.019	0.018	0.006	0.003	0.009					1340.96	-37.80
9	0.5843	1007.4	1025.2		1.163	0.363	95.336	2.927	0.155	0.020	0.018	0.006	0.003	0.009					1341.22	-37.19
10	0.5842	1007.8	1025.6		1.137	0.368	95.338	2.941	0.160	0.020	0.018	0.006	0.003	0.009					1341.88	-37.46
11	0.5835	1006.8	1024.6		1.150	0.341	95.489	2.808	0.156	0.020	0.018	0.006	0.003	0.008					1341.38	-40.05
12	0.5826	1005.6	1023.5		1.141	0.346	95.642	2.668	0.151	0.020	0.017	0.005	0.003	0.008					1340.83	-40.31
13	0.5824	1006.6	1024.4		1.093	0.341	95.640	2.719	0.154	0.019	0.017	0.005	0.003	0.008					1342.33	-40.85
14	0.5821	1007.2	1025.1		1.039	0.352	95.648	2.757	0.154	0.018	0.017	0.005	0.003	0.008					1343.59	-41.25
15	0.5826	1009.4	1027.3		0.990	0.342	95.510	2.946	0.159	0.019	0.018	0.005	0.003	0.008					1345.87	-40.62
16	0.5826	1008.8	1026.7		1.002	0.358	95.521	2.910	0.156	0.018	0.017	0.005	0.003	0.008					1345.12	-39.53
17	0.5821	1007.6	1025.5		1.019	0.360	95.627	2.790	0.153	0.018	0.017	0.005	0.003	0.008					1344.09	-39.99
18	0.5821	1007.5	1025.3		1.022	0.359	95.637	2.778	0.154	0.018	0.017	0.005	0.003	0.007					1343.96	-41.55
19	0.5821	1006.7	1024.5		1.061	0.355	95.657	2.731	0.147	0.018	0.016	0.005	0.002	0.007					1342.79	-41.70
20	0.5819	1005.1	1023.0		1.105	0.363	95.728	2.616	0.141	0.017	0.016	0.005	0.002	0.008					1340.99	-41.10
21	0.5817	1004.2	1022.0		1.128	0.360	95.798	2.532	0.136	0.017	0.015	0.004	0.002	0.008					1340.06	-40.68
22	0.5818	1005.1	1023.0		1.099	0.359	95.741	2.620	0.136	0.016	0.015	0.004	0.002	0.007					1341.15	-42.65
23	0.5822	1006.8	1024.6		1.072	0.343	95.645	2.743	0.146	0.017	0.017	0.005	0.003	0.008					1342.80	-41.10
24	0.5821	1005.6	1023.4		1.114	0.338	95.715	2.643	0.140	0.017	0.016	0.005	0.003	0.008					1341.38	-40.55
25	0.5820	1005.3	1023.1		1.116	0.347	95.722	2.626	0.139	0.017	0.016	0.005	0.003	0.008					1341.08	-40.29
26	0.5822	1005.6	1023.4		1.109	0.353	95.692	2.653	0.141	0.018	0.017	0.005	0.003	0.008					1341.31	-39.04
27	0.5822	1005.9	1023.7		1.098	0.360	95.678	2.667	0.144	0.018	0.018	0.006	0.003	0.009					1341.60	-38.45
28	0.5824	1006.5	1024.3		1.078	0.368	95.619	2.739	0.145	0.018	0.017	0.005	0.003	0.008					1342.20	-40.68
29	0.5822	1007.0	1024.8		1.052	0.363	95.627	2.758	0.149	0.018	0.017	0.005	0.003	0.008					1343.05	-41.02
30	0.5819	1005.7	1023.5		1.080	0.363	95.723	2.641	0.143	0.018	0.017	0.005	0.003	0.008					1341.78	-40.81
31	0.5820	1006.2	1024.0		1.073	0.357	95.702	2.663	0.152	0.018	0.018	0.005	0.003	0.008					1342.29	-40.37
Avg	0.5826	1007.0	1024.4		1.091	0.361	95.600	2.746	0.150	0.018	0.017	0.005	0.003	0.008					1342.09	-39.98

Source Daily Summary

June, 2020



Source #: 8033
Name: GAINESVILLE LAB - SYSTEM

Pressure Base: Contract Day: 1
 Temperature Base: Contract Hour: 6

Day	Relative Density	Heating Value Wet	Heating Value Dry	Heating Value As Del	CO2	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6	C7	C8	C9	C10	Wobbe	CCT
1	0.5819	1006.3	1024.1		1.064	0.360	95.705	2.670	0.150	0.018	0.018	0.005	0.003	0.008					1342.44	-40.36
2	0.5815	1005.7	1023.5		1.063	0.351	95.796	2.593	0.146	0.017	0.018	0.005	0.003	0.008					1342.21	-40.98
3	0.5812	1005.1	1022.9		1.068	0.355	95.848	2.531	0.148	0.017	0.017	0.005	0.003	0.008					1341.77	-40.98
4	0.5812	1005.9	1023.7		1.031	0.364	95.821	2.580	0.151	0.017	0.018	0.005	0.003	0.008					1342.77	-39.94
5	0.5815	1007.0	1024.9		1.007	0.361	95.746	2.671	0.162	0.018	0.019	0.005	0.003	0.008					1343.93	-39.91
6	0.5811	1005.1	1022.9		1.063	0.350	95.881	2.505	0.150	0.017	0.018	0.005	0.003	0.008					1341.91	-39.77
7	0.5814	1004.8	1022.6		1.113	0.329	95.867	2.485	0.151	0.018	0.019	0.006	0.004	0.009					1341.04	-38.35
8	0.5809	1004.2	1022.0		1.103	0.333	95.949	2.416	0.148	0.018	0.017	0.005	0.003	0.008					1340.84	-39.79
9	0.5806	1003.6	1021.3		1.099	0.341	96.020	2.345	0.144	0.018	0.017	0.005	0.003	0.008					1340.45	-39.77
10	0.5811	1004.2	1021.9		1.102	0.355	95.904	2.440	0.146	0.018	0.017	0.005	0.003	0.008					1340.55	-39.80
11	0.5818	1005.3	1023.2		1.080	0.376	95.755	2.583	0.153	0.018	0.018	0.005	0.003	0.008					1341.42	-39.95
12	0.5814	1005.1	1022.9		1.061	0.385	95.793	2.563	0.147	0.017	0.017	0.005	0.003	0.008					1341.52	-41.00
13	0.5813	1004.8	1022.6		1.062	0.394	95.813	2.535	0.146	0.017	0.017	0.005	0.003	0.008					1341.21	-40.70
14	0.5808	1004.5	1022.3		1.046	0.381	95.929	2.442	0.149	0.018	0.018	0.006	0.003	0.008					1341.49	-39.03
15	0.5803	1004.3	1022.1		1.028	0.384	95.989	2.401	0.147	0.017	0.017	0.005	0.003	0.008					1341.67	-39.32
16	0.5806	1004.5	1022.3		1.029	0.398	95.929	2.447	0.148	0.017	0.016	0.005	0.003	0.008					1341.58	-39.65
17	0.5807	1004.6	1022.4		1.023	0.406	95.906	2.469	0.147	0.017	0.016	0.005	0.003	0.008					1341.67	-39.35
18	0.5807	1003.8	1021.6		1.049	0.411	95.928	2.423	0.141	0.017	0.016	0.005	0.003	0.008					1340.69	-39.48
19	0.5806	1004.1	1021.8		1.045	0.397	95.943	2.423	0.144	0.017	0.016	0.005	0.003	0.008					1341.06	-39.53
20	0.5806	1004.4	1022.2		1.038	0.388	95.937	2.441	0.146	0.017	0.017	0.005	0.003	0.008					1341.52	-39.00
21	0.5809	1004.7	1022.5		1.053	0.373	95.919	2.445	0.153	0.021	0.018	0.006	0.004	0.009					1341.60	-37.08
22	0.5809	1005.1	1022.9		1.039	0.369	95.894	2.496	0.149	0.018	0.017	0.005	0.003	0.009					1342.11	-38.63
23	0.5809	1005.0	1022.8		1.045	0.363	95.896	2.500	0.148	0.017	0.016	0.005	0.003	0.008					1342.03	-39.94
24	0.5808	1004.7	1022.5		1.051	0.370	95.911	2.472	0.147	0.016	0.016	0.005	0.003	0.008					1341.61	-39.47
25	0.5811	1005.3	1023.1		1.044	0.370	95.852	2.530	0.153	0.017	0.017	0.005	0.003	0.008					1342.12	-40.07
26	0.5812	1005.3	1023.1		1.044	0.378	95.836	2.536	0.156	0.017	0.017	0.005	0.003	0.008					1342.05	-39.81
27	0.5814	1005.5	1023.3		1.047	0.383	95.800	2.556	0.160	0.018	0.018	0.005	0.003	0.008					1342.02	-39.05
28	0.5821	1006.0	1023.9		1.049	0.406	95.680	2.645	0.166	0.018	0.019	0.005	0.003	0.008					1342.02	-39.63
29	0.5825	1007.1	1024.9		1.031	0.414	95.593	2.721	0.180	0.020	0.022	0.006	0.004	0.008					1342.86	-39.03
Avg	0.5812	1005.0	1022.9		1.054	0.375	95.847	2.520	0.152	0.018	0.017	0.005	0.003	0.008					1341.77	-39.61

*** End of Report ***

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 8 - CENTRAL ENERGY PLANT (CEP) TAG NUMBERING REQUIREMENTS

UNIVERSITY OF FLORIDA CENTRAL ENERGY PLANT INSTRUMENTATION AND CONTROLS TAG NUMBERING GUIDELINES

Summary

The following guidelines are to be used for assignment of tag numbers for instruments, control valves, and other controls-related input/output (I/O) that interface with the Plant Control System (PCS).

Tag Numbering Standard

Unique alphanumeric tag numbers using the herein described format will be assigned to each of the following device categories:

- Instruments
- Control Valves
- Control System I/O Interface Points

The tag name will be based on standard ISA nomenclature (refer to Table 1) and will consist of an alpha prefix, alpha suffix combinations (where needed) and a numeric tag number. The use of this format is illustrated in the following example:

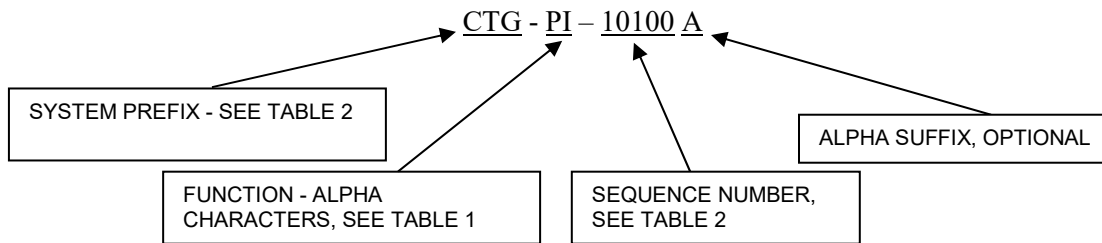


Table 2 lists the tag number ranges to be used for each system.

The plant Piping & Instrumentation Diagrams (P&ID's) will be annotated with the described tag numbers to identify field devices as well as control system “virtual” I/O points. These tag numbers will also be referenced in the plant system Control Sequences that are developed by Jacobs Engineering.

This information will be further utilized by the Controls Integrator in the completion of their I/O databases and other design documentation.

All field devices will have a stainless steel tag that will include the tag numbering and a functional descriptor. A tagging schedule is required for Owner review.

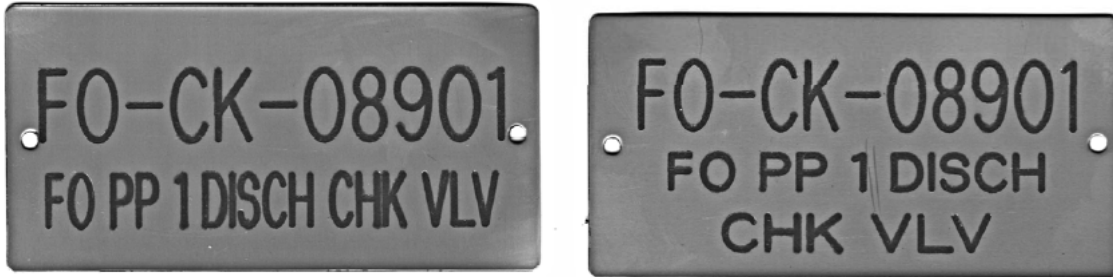
The tags will vary in size as needed to ensure that the functional descriptor of the service is complete and clear in meaning. A typical size will be 2in x 4in; this could have either 2 or 3 line3:

- 2 line tag: line 1 with 0.5in characters and line 2 with 0.375in characters

Jacobs

- 3 line tag: line 1 with 0.5in characters, line 2 and 3 with 0.25in characters

Tags will be affixed to field devices with either stainless steel cable or screws (material may change to accommodate any concerns of chemical compatibility). Examples are shown below:



Identification tags (nameplates) for control panels, terminal panels, junction boxes, and similar will use an engraved 2 ply phenolic with white surface and black undersurface for lettering. Size to vary per panel; letter heights shall be sized for easy viewing from a distance of 5 ft. Attach labels using adhesive backing or stainless steel screws.



Table 1: ISA Guideline for Tag Number Identification Letters (Function)

INSTRUMENT TAG ABBREVIATIONS				
FIRST LETTER		SUCCEEDING LETTERS	OUTPUT	
MEASURED OR	MODIFIER	READ OUT OR	FUNCTION	
INITIATING VARIABLE		PASSIVE FUNCTION		MODIFIER
A ANALYSIS		ALARM	USER'S CHOICE	
B BURNER, COMBUSTION		USER'S CHOICE		
C USER'S CHOICE			CONTROL	
D USER'S CHOICE	DIFFERENTIAL			
E VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F FLOW RATE	RATIO (FRACTION)			
G USER'S CHOICE		GLASS, VIEWING DEVICE		
H HAND				HIGH
I CURRENT (ELECTRICAL)		INDICATE		
J POWER	SCAN			
K TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L LEVEL		LIGHT		LOW
M USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O USER'S CHOICE		ORIFICE, RESTRICTION		
P PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q QUANTITY	INTEGRATE, TOTALIZE			
R RADIATION		RECORD		
S SPEED, FREQUENCY	SAFETY		SWITCH	
T TEMPERATURE			TRANSMIT	
U MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W WEIGHT, FORCE		WELL		
X UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR	
			UNCLASSIFIED FINAL	
			CONTROL ELEMENT	
<p>NOTES:</p> <ol style="list-style-type: none"> "USER'S CHOICE" IS INTENDED TO COVER UNLISTED MEANINGS THAT WILL BE USED REPEATEDLY. MODIFYING LETTERS USED IN COMBINATION WITH A FIRST LETTER REPRESENT A NEW AND SEPARATE MEASURED VARIABLE. APPLIES TO UNCALIBRATED DEVICES SUCH AS SIGHT GLASSES. APPLIES TO VALUE OF MEASURED VARIABLE. 				



Table 2: Tag Numbering Ranges by System

INSTRUMENT & CONTROL VALVE TAG NUMBERING		
UNIVERSITY OF FLORIDA CENTRAL ENERGY PLANT		
<i>System</i>	<i>Prefix</i>	<i>Tag Number Series</i>
Combustion Turbine Generator	CTG	10000-10999
Heat Recovery Steam Generator	HRS	11000-11499
Ammonia System	NH3	11500-11999
High Pressure (200 psig) Steam	HPS	12000-12499
Low Pressure (<100 Psig) Steam	LPS	12500-12999
Steam Turbine Generator	STG	13000-13999
Condensate	CND	14000-14499
Deaerator	DA	14500-14999
Boiler Feedwater	BFW	15000-15499
Natural Gas	NG	15500-15999
Fuel Oil	FO	16000-16999
Cooling Water	CW	17000-17499
Chilled Water	CHW	17500-17999
Instrument Air	IA	18000-18999
City Water	CTW	19000-19499
Makeup Water	MUW	19500-19999
Drains	DR	Consistent with system to which connected
Vents	VT	Consistent with system to which connected

Attachment 9 – PRICING FORM

BIDDER: _____

Bidder proposes to provide the equipment and services as specified for the prices listed below:

- Base Bid :** CTG Package, including fabrication, testing, delivery FOB Job Site, startup, commissioning, and site support services as specified herein \$ _____
- Pricing for Vendor-recommended Long Term Service Agreement (LTSA): Bidder to include detailed description of included services. 5-year term required. \$ _____ /5 Year Pricing Term
- Pricing for one (1) set of recommended special tools to support on-site maintenance of CTG Package; Bidder to furnish priced list of included items \$ _____
- Pricing for 2 years of recommended spare parts (normal operation), including expendables; Bidder to furnish priced list of included items \$ _____
- Pricing for remote monitoring service and associated hardware/software \$ _____ /Yr/Mo
- Unit pricing for additional site assistance hours beyond those included in base bid (Submit rate schedule)

THIS PAGE INTENTIONALLY LEFT BLANK