

April 11, 2018

JEA

**Brandy Branch Generating Station
Baldwin, FL**

*Heat Recovery Steam Generator (HRSG)
LP Evaporator Replacement
Section 152590*



PROJECT NUMBER:
151449

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*Heat Recovery Steam Generator (HRSG)
LP Evaporator Replacement*

Section 152590

*PREPARED FOR: JEA
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REVISION HISTORY				
DATE	REVISED BY	CHECKED BY	APPROVED BY	REVISION
3/23/2018	N. Gritz	T. Anderson		A- Issued For Review
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PART 1 - GENERAL

1.1 GENERAL

- A. The Brandy Branch Generation Station is composed of three GE 7FA gas turbines, one in simple cycle and two in combined cycle with a 2x1 arrangement. In addition to the gas turbines the combined cycle has one GE D11 steam turbine and two Nooter/Eriksen supplied heat recovery steam generators (HRSG).
- B. JEA recently conducted a tube wall borescope inspection and evidence of flow accelerated corrosion (FAC) was discovered in the LP evaporator sections for HRSG Units 2 & 3. JEA has decided to replace the existing ASTM SA178A/106B carbon steel tube bundles, headers and risers with SA213/335 T11/P11 chrome-alloy.

1.2 SUMMARY

- A. The project scope includes fabricating and installing new LP evaporator sections, LP header assemblies and risers per the original design while upgrading the material from ASTM SA178A/106B carbon steel to SA213/335 T11/P11 chrome-alloy. The LP downcomers and associated feeder piping will be reused to the fullest extent practical. The LP evaporator section shall be supplied by the original equipment manufacturer, Chanute Manufacturing. Removal and disposal of the existing LP evaporator section is also included in this scope. Drawings showing the areas to be replaced are included in the solicitation package and listed in Appendix B. It will be the responsibility of the Contractor to obtain any necessary information missing from the drawings provided. The Contractor will be allowed to take external field measurements if necessary to fabricate the replacement sections per the original design. Any information not available from visible inspections may be obtained from non-destructive test methods approved by JEA. It will be the responsibility of the Contractor to coordinate inspections with JEA. The Contractor will be responsible for leaving the HRSG in the same condition as it was found prior to any inspections.
- B. It is not the intent to specify herein all the details of design, fabrication, inspection and testing. Contractor shall be responsible for designing, fabricating, inspecting and testing the equipment, as applicable, in accordance with all codes, standards and governmental regulations applicable, and for ensuring performance under the conditions and to the standards specified herein.
- C. Review of Contractors' drawings, data or procedures by JEA shall not constitute acceptance of materials or equipment that do not meet the functional requirements set forth in this specification.
- D. Where the Specification requires approval by JEA for alternate design or materials, Contractor shall obtain such approval in writing. JEA's drawing review does not constitute such approval.
- E. In the event of a perceived conflict between referenced standards, codes and the documents included in this Specification, or an apparent conflict with the technical requirements of the Specification and Contractor's ability to meet the performance requirements contained herein; Contractor shall refer the conflict in writing to JEA for resolution.

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- F. Contractor shall hold a National Board of Pressure Vessel Inspectors “R” certificate to perform this work. Contractor shall submit the appropriate “R” stamp-forms for this repair and/or alteration.

1.3 FURNISHED BY CONTRACTOR

- A. Contractor shall furnish and deliver the following equipment and services in accordance with the requirements of this Specification (also refer to Section 4.4 for further details of Scope of Supply):

1. LP Evaporator Section to include, but not necessarily be limited to, the following:
 - a. LP Evaporator heat transfer surface including pressure parts, mounts, and all steelwork necessary to support from the existing HRSG.
 - b. LP Steam header assembly.
 - c. LP Steam risers located between the LP steam header the LP steam drum.
2. Shipping and delivering of equipment to JEA’s site including all shipping preparations.
3. Submittal of all documents necessary for design review, construction, maintenance and operation.
4. Chemical Cleaning, (JEA does not intend to chemical clean or steam blow after installation)
5. Factory testing of HRSG components including hydrostatic testing
6. Special tools required for erection, including use of lifting jigs.
7. Receiving and unloading of equipment.
8. Razing and removal of existing LP Evaporator section
9. Foundations needed for razing or installation.
10. Field erection of LP Evaporator and accessories.
11. Temporary supports, rails, frames and rigging to remove and install the LP Evaporator Section.
12. Reinstallation of any piping, tubing, vents, drains, valves or instruments removed or relocated for gaining access for the LP Evaporator Section replacement
13. Replacement, and/or reinstallation of any removed baffles, casing, flashing, seals, or packing removed in the LP Evaporator Section replacement. Insulation and lagging removed during installing shall be replaced as new.
14. After installation is complete the contractor shall be responsible for any areas requiring repainting. Repainting shall be per JEA coating specification.

1.4 FURNISHED BY OTHERS

- A. Although Contractor may be required to provide information necessary for performance of this work, the following materials and services will be provided by JEA and do not fall within the scope of this Specification:

1. Steam and feed water piping, valves and accessories external to the HRSG.
2. Steam and water drains.
3. Limited 110V and 480V power is available. Welding receptacles (2ea. 60 A) are located at the top of each HRSG. Other power requirements will need to be met of Contractor.

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1.5 RELATED SECTIONS

A. Solicitation Number 096-18

B. Drawings Included

1. The following list of drawings identify the scope of fabrication and installation for two (2) HRSG LP Evaporator's. The drawings included are for one HRSG and should be considered interchangeable. It is the responsibility of the Contractor to obtain any additional information necessary for fabrication not available from these drawings and required to fabricate the heat transfer sections per the original design.
2. All drawings are solely for use by the bidders, and for execution of this project. Drawings may not be used for any other purpose without written permission.

Drawing No.	Title:
04130-GA-001	General Arrangement Right Side Elevation
014130-GA-002	General Arrangement Left Side Elevation
014130-GA-003	General Arrangement Plan View
014130-GA-N-01	Elevation View of HRSG
014130-GA-N-02	Plan View of HRSG
014160	Bundle Layout and Flow Schematic Elevation View
014160	Bundle Layout and Flow Schematic Plan View
014140-CB-027	HP Economizer #1 Upper Gas Baffles
014141-CB-001	HP ECON #1/LP EVAP Bundle 'A' Arrangement
014141-CB-002	HP ECON #1/LP EVAP Bundle 'B' Arrangement
014141-CB-003	HP ECON #1/IP ECON/LP EVAP Bundle 'C' Arrangement
014141-CB-004	HP ECON #1/IP ECONO/LP EVAP Header Restraints & Drains (Field Installed)
014141-CB-018	HP ECON #1/IP ECON/LP Evaporator Vibration Support & Details
014141-CB-019	HP Economizer #1 U-Bend Supports
014141-CB-020	HP ECON #1/IP ECON U-Bend Supports
014141-CB-021	HP ECON #1/IP ECON/ LP Evaporator Acoustic Baffles
014130 Sheet A3	Thermal Performance Data Sheet
014130 Sheet A6	Thermal Performance Data Sheet
014130 Sheet B1	Heating Surface Data Sheet
014130 Sheet B2	Heating Surface Data Sheet
014130 Sheet B3	Heating Surface Data Sheet
014130 Sheet H1	Performance Guarantee
014130 Sheet H2	Performance Guarantee
014130 Sheet H3	Performance Guarantee
014130 Sheet H4	Performance Guarantee
014130 Sheet H5	Performance Guarantee
014130 Sheet H6	Performance Guarantee
014130 Sheet H7	Performance Guarantee
014147-LD-001	LP Remote Steam Drum General Arrangement

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014147-LD-002	LP Remote Steam Drum Orientations & Saddle Details
014147-LD-003	LP Remote Steam Drum Internals Details
014147-LD-004	LP Remote Steam Drum Baffle Plate Details
014147-LD-006	LP Remote Steam Drum Nozzle Details
70B5889	V-Bank Vane Bundle
014148-LP-05-1	Interconnecting Piping LP Evaporator to LP Drum (Risers)

1.6 CODES AND STANDARDS

- A. It is not the intent to specify all details of construction, but the installed equipment shall, in all respects conform to high standards of engineering, design, materials, construction and workmanship and shall have capacity to operate efficiently, satisfactorily and without excessive wear or maintenance under the service conditions stated in this Specification.
- B. The design of the LP evaporator and accessories, and material used in construction, shall be as recommended by Contractor and shall comply with all applicable Federal, State and Local statutes and applicable industry standards and codes including but not limited to the latest in effect at time of Contract award of the following:
1. (ABMA) American Boiler Manufacturers Association
 2. (ASME) American Society of Mechanical Engineers including Boiler and Pressure Vessel Code
ASME-B 31.1 - Power Piping Code and ASME I
 3. (ASCE) American Society of Civil Engineers
 4. (ASNT) American Society for Nondestructive Testing
 5. (ASTM) American Society for Testing and Materials
 6. (AISI) American Iron and Steel Institute
 7. (AISC) American Institute of Steel Construction Code, Manual of Steel Construction
 8. (AWS) American Welding Society Code
 9. (SSPC) The Society for Protective Coatings
 10. (ISA) Instrumentation, Systems and Automation Society
 11. (ISO) International Organization for Standardization
 12. (IEEE) Institute of Electrical and Electronic Engineers
 13. (NBIC) National Board Inspection Code
 14. (NEC) National Electric Code
 15. (NEMA) National Electrical Manufacturers Association
 16. (HEI) Heat Exchanger Institute
 17. (HI) Hydraulic Institute
 18. (TEMA) Tubular Exchanger Manufacturer Association
 19. (NFPA) National Fire Protection Association
 20. (EPA) Environmental Protection Agency
 21. (FAA) Federal Aviation Administration
 22. (OSHA) Occupational Safety and Health Administration
- C. The above set forth minimum requirements that may be exceeded by Contractor, if, in his judgment and with JEA's acceptance, superior or more economical designs or materials are available for successful and continuous operation of Contractor's equipment and as required by this Specification.

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- D. In the event of any apparent conflict between standards, codes or this Specification, Contractor shall refer the conflict to JEA for written resolution.

1.7 PROJECT DESCRIPTION

A. Description of Service

1. The heat recovery steam generator (HRSG) LP evaporator section, headers and risers will be replaced in kind. The scope begins at the riser connections of the LP steam drum, as close to the drum shell as practical to not require drum heat treatment, and ends 6" below the HRSG bottom casing. Scope breaks can be seen in the drawings provided with solicitation.
2. The LP evaporator sections shall be supplied by the Original equipment manufacturer, Chanute Manufacturing Company.

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Chanute Manufacturing
5727 South Lewis, Suite 600
Tulsa, Oklahoma 74105
(918) 488-3209

3. The material for the LP evaporator, headers and risers will be upgraded from ASTM SA178A/106B carbon steel to SA213/335 T11/P11 chrome-alloy.
4. Performance of the LP evaporator sections shall match the original design as listed in the thermal performance and performance guarantee data sheets, see Appendix B.
5. Except for the material listed the evaporator design shall match the original Heating Surface Data Sheets 014130 Sheet B1, B2 and B3, see Appendix B.

1.8 SCHEDULE

- A. The installation of the LP evaporators will take place during 2019 spring outage. The Unit 2 outage is tentatively planned to start on February 25, 2019 and the Unit 3 outage is tentatively planned to start on March 4. Both outages are expected to last 64 days. The actual outage dates will be set by JEA and JEA will notify the Contractor no less than 60 days prior to the scheduled start of each installation outage once specific dates are established.
- B. For each installation outage, Duration, as quoted on the Bid Form, shall be the period of time beginning when the equipment is released to the Contractor to begin installation, and ending when Substantial Completion is achieved. Releasing the equipment to the Contractor for installation is based on the time required to sufficiently cool the HRSG for work, and is expected to be 48 to 72 hours after the HRSG is removed from service.
- C. Substantial Completion is specifically interpreted as the point at which the Contractor's scope of work is sufficiently completed so as to allow the HRSG(s) to be returned to normal operation.
- D. Each HRSG is capable of isolation on the steam side allowing shutdown of one HRSG and its associated Combustion Turbine while the other HRSG and the steam turbine are in operation. The Contractor shall furnish and install any blanking plates required for double isolation of the steam side from other HRSG and the steam turbine.

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1.9 SUBMITTALS

A. Information to be Submitted with Bid

1. Proposal shall be prepared in accordance with Solicitation Number 096-18 Contractor shall furnish all information requested in Section 4.1 and the following:
 - a. List of sub-suppliers for major components.
 - b. Drawings indicating the degree of shop assembly versus field assembly.
 - c. Tube data for all heat transfer surfaces being replaced, including tube sizes, wall thicknesses, corrosion-erosion allowances, materials, and quantities of each material.
 - d. Complete description of manufacturer's quality assurance and quality control program.
 - e. Proposed procurement, fabrication and delivery schedule for Contractor-furnished materials.
 - f. Description of security methods to be provided for limiting HRSG access during replacement of heat transfer surfaces.
 - g. Description of major access requirements to the HRSG's during installation.
 - h. Copy of Contractor's Authorization "R" Certificate from the NBIC.
2. Proposals shall be valid for 60 days from bid opening date. Proposals shall take into account that the full 60 days may be required for evaluation and award when considering the schedule requirements of this solicitation.

B. Information to be submitted After Award

1. Submit the information specified in Section 4.1 within the time frame indicated. Specific information required to be submitted is amplified below:
 - a. Contractor shall furnish arrangement, assembly, and component drawings showing details and methods of installation.
 - b. All correspondence and drawing submittals for the execution of the scope of work shall be addressed as indicated below:
Nick Madaffari <madana@JEA.com>
Northside Generating Station
4377 Heckscher Drive
Jacksonville, Florida 32226

1.10 DELIVERY, STORAGE, AND HANDLING

1. All equipment shall be adequately prepared for shipment and for a period of outdoor storage.
2. Each component shall be properly packed and protected before shipment so that it will reach the site without damage and with all surfaces clean inside and out. In order to prevent damage during shipments, Contractor shall carefully pack and brace all components either within shipping container or on carrier. Containers shall be identified with Purchase Order (PO) number, JEAs name, unit # designation, and destination address. Each container shall include a Bill of Materials.

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3. Prior to shipment, equipment shall be completely drained. When such drainage requires the removal of plugs, drain valves, etc., the Contractor shall be responsible that these parts are reinstated or reassembled prior to shipment.
4. Steel pressure part materials shall be protected during storage, handling, and shipment from seawater, seawater spray, road salt, and rain or dew when subject to industrial atmospheres.
5. All flanges, openings and nozzles shall be blanked with steel caps to prevent corrosion and entrance of foreign matter during shipment and storage.
6. Machined surfaces shall be coated with a heavy grease or similar material before covering. Beveled pipe shall be coated with a weldable primer before covering.
7. Equipment shall be adequately supported for shipment. All loose parts shall be crated and/or boxed for shipment. Each box shall be appropriately marked for identification purposes.
8. Lifting and support points shall be clearly identified.
9. Temporary bracing shall be painted yellow.
10. Metal scraps, fasteners or covers shall not be tack welded to any manufactured part.
11. To facilitate rapid installation, all equipment shall be shop assembled to the maximum extent practicable before shipment to site.

PART 2 - PRODUCTS

2.1 MATERIALS AND WELDING

A. Materials

1. Tube, Header and Piping Materials

- | | | |
|----|--------------------------|-----------|
| a. | Evaporator section tubes | SA213 T11 |
| b. | LP Steam Header | SA335 P11 |
| c. | LP Risers | SA335 P11 |

B. Welding

1. Welding for pressure containing parts shall be tested according to the requirements of the NBIC and ASME, Section I, "Power Boilers" where applicable. Structural welds shall be in accordance with AWS D1.1.

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2. Qualifications:
 - a. Welding procedures, including procedure qualification records (if applicable), shall be certified in accordance with the referenced code and shall be submitted to JEA.
 - b. Welders and welding operators performing work shall be qualified in accordance with ASME Section IX for the applicable Welding Procedure Specifications (WPS).
 - c. NDE procedures shall be performed in accordance with the appropriate the NDE procedure qualified in accordance with ASME Section V.
 - d. NDE: AWS QC1 CWI or ASNT SNT-TC-1A Level II examiners shall perform weld examination.

3. Joint Layout:
 - a. The clear distance between centerlines of adjacent circumferential butt welds shall not be less than four times the pipe wall thickness or 1 inch (25 mm), whichever is greater.
 - b. Branch connections and welded attachments shall not be made on or within 2 inch (51 mm) of a piping weld.
 - c. Longitudinal joints for seam welded pipe in adjoining lengths of welded pipe shall be staggered and shall be so located as to clear openings and external attachments.

4. Welded Attachments:
 - a. Welded attachments to pipe including pipe supports shall be made from material of the same composition/specification as the pipe. Dissimilar material welds are not permitted without Engineer's approval.
 - b. Corners of attachments shall be rounded to 0.25 inch (6 mm) radius, minimum.
 - c. Continuously welded attachments, which create a sealed cavity, shall be vented with a 0.25 inch (6 mm) vent hole.
 - d. Welds to lined pipe, pipe specialties, components (such as valves) or equipment are prohibited unless shown on the drawings.
 - e. All welded lugs, ears, and other attachments for support of piping, which must be stress relieved, shall be welded on fabricated pipe prior to stress relieving. Attachment welds shall be stress relieved in accordance with the code and not be made on top of piping welds.
 - f. Piping in vertical runs which are greater than 120 inch (3048 mm) long, and which will be insulated, shall be provided with insulation supports. Three lugs on 120-degree radial spacing shall be used at each support level. Lugs on piping which must be stress relieved shall be shop welded to shop fabricated pipe. All other insulation support lugs, collars, skirts, etc., shall be furnished for field installation.
 - g. Erection lugs shall be provided for all field weld joints in vertical pipe over NPS 8 (DN 200) in the piping systems that are required to be stress relieved.
 - h. Erection and field alignment lugs shall be shop welded to both sides of the field weld joint. The erection and field alignment lugs shall be completely removed after erection and attachment welds completely removed by grinding. Location of removed erection lugs shall be dye penetrant tested to confirm no indications are present.

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5. Welded Joints:

- a. Groove welds shall be complete penetration with GTAW, or SMAW root and hot pass. Stringer bead welding is preferred. Where manual oscillation or weave pass welding is used, the total width of the deposited bead shall be limited to a maximum of 6 times the electrode core diameter.
- b. Edge preparation of base metals shall be accomplished by machining, chipping, grinding, or by cutting methods specified. The weld preparation and adjacent base metal surfaces shall be smooth, clean, and free of any foreign material.
- c. All marking fluid, tapes, oil, grease, rust inhibitor or preventive coating and other foreign material shall be removed from the base materials being heat treated prior to welding or starting PWHT.
- d. The edge preparation and each weld bead shall be cleaned free of slag, flux, oxide, and all foreign material before applying the next bead. Only stainless steel wire brushes shall be used on stainless steel and nickel alloys.
- e. Where the weld gap for field welds exceeds that in the welding procedure, Owner's permission is required prior to refitting or weld joint buildup.
- f. The filler metal used for joint buildup shall be of the same F number as the production weld. Where radiographic or ultrasonic examination is specified for the production weld, the built-up areas shall be subjected to the same requirements.
- g. The use of backing rings is prohibited or backing strips prohibited unless shown on drawings or submitted for Owner's approval.
- h. Where the use of purge gas is required by the WPS, the tack welds, weld root, 1st and 2nd hot pass shall be provided with a backside purge. Purge containment shall be completed using Engineer approved purge containment devices or purge dams.
- i. Nitrogen shall not be used as a purging gas.
- j. Tack welds shall be made in accordance with the WPS for the joint by a qualified welder. Cracked or broken tack welds or those of poor quality shall be removed.
- k. Mitered joints shall not be used unless shown on Drawings.
- l. Weld pre-heat and PWHT shall be performed as required by the code by qualified personnel in accordance with an approved procedure. PWHT shall not incur damaging temperatures or thermal stresses on connected or adjacent equipment.
- m. When temperature indicating crayons are used to measure temperatures of base metals, they shall be applied at least 1 inch (25 mm), but not farther than 3 inch (76 mm) from the weld area. When used on stainless steels, temperature-indicating crayons shall be completely removed from the steel surface after use.
- n. PWHT shall be accomplished using induction heating or electric resistance heating equipment controlled by automatic controllers designed to monitor, regulate and record on chart paper the base metal temperature and time-at-temperature cycles.
- o. Temperatures shall be measured by thermocouples in contact with the weldment being heat-treated. A sufficient number of thermocouples shall be used to assure adequate temperature control. (Two minimum)
- p. Stringer beading is preferred. Where weave beading is used, the total width of the deposited bead shall be limited to 6 times the electrode core diameter.
- q. Filler materials shall be handled and stored in accordance with Manufacturer's recommendations except that all low hydrogen filler material shall be stored in heated rod ovens or rod caddies at 250° minimum following initial opening of shipping containers. Exposure limits shall be kept within AWS D1.1 Structural Welding Code specifies allowable atmospheric exposure in Table 5.1 which can be seen below.

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Table 5.1
Allowable Atmospheric Exposure of
Low-Hydrogen Electrodes
(see 5.3.2.2 and 5.3.2.3)

Electrode	Column A (hours)	Column B (hours)
<u>A5.1</u>		
E70XX	4 max.	
E70XXR	9 max.	Over 4 to 10 max.
E70XXHZR	9 max.	
E7018M	9 max.	
<u>A5.5</u>		
E70XX-X	4 max.	Over 4 to 10 max.
E80XX-X	2 max.	Over 2 to 10 max.
E90XX-X	1 max.	Over 1 to 5 max.
E100XX-X	1/2 max.	Over 1/2 to 4 max.
E110XX-X	1/2 max.	Over 1/2 to 4 max.

- r. Install access holes, bosses and plugs for radiographic inspection of pipe welds in accordance with PFI Standard ES-16 where required for code examination of welded joints.

6. Filler Materials

a. Carbon Steel (ASME Group P-1)

- 1) Covered electrodes shall conform to ASME SFA 5.1 low-hydrogen type; Classification E7016 or E7018.
- 2) Bare wire and consumable inserts shall conform to ASME SFA 5.18 Types ER70S-2, ER70S-5, or ER70S-6.
- 3) Flux cored electrodes shall conform to ASME SFA 5.20, Type E70 T-X.
- 4) Bare mild steel and flux combinations shall conform to ASME SFA-5.17, Type F72-EM 12K.

b. Low-Alloy Steels (ASME Groups P-3, P-4, P-5)

- 1) Covered electrodes shall conform to ASME SFA 5.5 low-hydrogen type classification as follows:

P-3	E7018-A1
P-4	E8016-B2 or E8018-B2
P-5	E9016-B3 or E9018-B3

- 2) Bare wire shall be capable of depositing weld metal similar to the base material composition.

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7. Inspection

- a. The inspection program and requirements shall be applied in accordance with the applicable code and the requirements of the referencing specification section.
- b. The Inspection Test Plan (ITP) shall be submitted to JEA for review.
- c. Visual Examination
 - 1) All welds shall 100% visually inspected.
 - 2) Visual examination shall be performed in accordance with ASME BPVC, Section V, Article 9, and may be augmented with the aid of a magnifying device of not more than 10 power.
- d. Radiographic Examination
 - 1) All field welds shall be 100% radiographed. Alternative examination methods for field inspection may be proposed to JEA.
 - 2) A minimum of 5% of all shop welds shall be randomly radiographed. If the rejection rate is 2 percent or above the inspection percentage will be increased as determined by JEA.
 - 3) Radiographic examination shall conform to ASTM E94 and ASTM E142 unless required otherwise by the applicable codes and specifications.
 - 4) Contractor shall utilize double film (two separate films, not necessarily of the same speed, in the same cassette) procedures with film properly exposed and developed for single film viewing; the appropriate penetrometer hole or wire for the specific areas must be demonstrated. Radiographic film used shall be in accordance with the requirements of ASTM E 94, Class 1 or 2, and shall be exposed to a Hurter-Driffield density of 2.0 to 3.8 per film. Double film viewing can be employed only with the permission of Owner. Chemically coated intensifying screens (fluorescent screens) shall not be used.
 - 5) Permanent radiographic location marks shall be located near the welds with vibro tool, interrupted or round-nose, low stress stamps; or strips of materials which are compatible with the base materials. The weld area shall be identified with lead markers which reference these locations and weld identification numbers during radiography so that the image of the identification markers appears on each film.
 - 6) Radiographs shall become the property of Owner and shall be subject to the requirements of the applicable code.
- e. Liquid Penetrant/Magnetic Particle Examination
 - 1) Liquid penetrant and magnetic particle examination shall be performed in accordance with the requirements of the applicable code; where not otherwise specified, ASME BPVC, Section VIII, Division 1, Appendices 6 and 8 shall apply.
 - 2) Magnetic particle examination may be used as an alternative to liquid penetrant examination, where materials permit.
 - 3) Both liquid penetrant and magnetic particle examination of welds shall include base metal for at least 1 inch (25 mm) on each side of the weld, where possible.
 - 4) All indication in the weld craters or in the line of fusion between base material and weld metal shall be treated as defects. Any indications which are believed

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to be non-relevant shall be explored by removing the surface roughness believed to have caused these types of indications, to determine if defects are present. The absence of indications upon re-inspection after removal of the surface roughness shall be considered to prove that indications were non-relevant. Relevant indications are those that result from mechanical discontinuities.

- 5) Except for castings, blast cleaning prior to liquid penetrant or magnetic particle inspection will not be permitted.
 - 6) When arcing, overheating, or burning occurs from the use of the Prod Method of magnetization, the affected areas shall be ground to clean metal and shall be examined by the liquid penetrant methods for freedom from cracks. Any crack or linear indication is unacceptable.
8. Schedules for shop hydrostatic testing and flushing as to the sequence, durations, test system boundaries, pressures, holding times etc., shall be established and submitted by the Contractor for approval to the Owner or Owner's representative. The Contractor prior to such tests shall make a minimum of 48 hours written notification to the Owner or proper authority.

2.2 EQUIPMENT

A. General

1. The LP Evaporator section shall be designed, fabricated, inspected, tested and stamped in accordance with the NBIC and where applicable the ASME Boiler and Pressure Vessel Code - "Power Boilers" - Sections I, II, V, VIII and IX and applicable Addenda at time of Purchase Order, and in accordance with state or local codes, if applicable. In addition, National Board Registration may be required. Welding procedure qualifications and welder performance tests shall be in accordance with ASME Code - Section IX.
2. All connections into headers and drums shall be of welded design.
3. All penetrations of the casing and external skin of the boiler shall be flashed or otherwise sealed against the leakage of gas or the penetration of water from precipitation, condensation or washing operations.
4. Headers and tubes extending through the casing shall be provided with packing glands, or welded to the casing, in-kind with the original design.

B. Pressure Parts

1. General

- a. All pressure parts shall be designed and constructed in accordance with the NBIC and where applicable the ASME Boiler and Pressure Vessel Code - "Power Boilers" - Section I, II, V, VIII and IX, applicable Addenda, and in accordance with State or local codes, if applicable.
- b. The evaporator and necessary braces, hanger, spacers and other required tube attachments shall be designed for the expected life of the unit.

2. Evaporators

- a. Evaporator banks shall be fully self-draining.

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2.3 COMPONENT

A. Tubes

1. The HRSG shall have heat transfer surfaces that consist of compact banks of tubes that allow venting and draining. Heat transfer surfaces shall be of all welded construction. Screwed joints and connections are not acceptable. Dissimilar metal welds shall be made in the shop.
 - a. All tubing arrangements shall be fully drainable through 2 inch minimum drain valves.
 - b. Tube supports shall be provided to space and support the tubes, while allowing for thermal growth. Tube supports shall be designed to avoid any mechanical damage to tube fins. Supports shall permit easy tube removal and insertion.
 - c. Fins shall be attached to tubes by high frequency, continuous welding.
 - d. Fins shall be serrated.

2.4 FABRICATION

A. Cleaning and Painting

1. All manufacturing waste, such as metal chips and fillings, welding rods and stubs, waste, rags, debris, etc., shall be removed from the interior of each component. All loose mill scale, rust, oil, grease, chalk, crayon, paint marks and other deleterious material shall be removed from interior and exterior surfaces. At time of shipment, product shall be clean inside and out. Each component shall be properly packed and protected before shipment so that it shall reach the site with all surfaces clean inside and out.
2. Interior and exterior of piping shall be protected against corrosion immediately after cleaning. Piping may be coated with properly applied Rust Veto AS in lieu of preservative or oil.
3. Chemical Cleaning
 - a. Prior to installation the assemblies shall be chemically cleaned to removed oil, grease, sand, mill scale and rust.
 - b. Contractor shall develop a chemical cleaning procedure for JEA review.
 - c. Chemical cleaning shall consist of the following processes:
 - 1) Degreasing
 - 2) Iron Removal (Citric Acid or approved equal)
 - 3) Neutralization
 - 4) Passivation
 - 5) Draining
 - 6) Rinsing
 - d. All chemical cleaning waste shall be disposed of by Contractor.
 - e. After chemical cleaning is complete, the assemblies shall be dried and provided with a nitrogen blanket.

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2.5 SOURCE QUALITY CONTROL

A. Quality Assurance Requirements

1. Contractor shall have a Quality Assurance Program to verify that items and services, including subcontracted items and services, comply with the purchase order requirements and this Specification. Contractor shall submit his plan with his proposal.
2. Contractor shall submit, with this proposal, a fabrication sequence describing inspection and/or tests to be performed. The plan will be used in determining inspection points which JEA may desire to witness. JEA's representative may visit the manufacturing facility to set up inspection and plan any in-process inspection and/or final shop inspection as required.
3. All non-conformances to this Specification that occur must be documented and referred to JEA for disposition.
4. All manufacturing, processing, testing and inspections affecting the equipment furnished by Contractor will be subject to quality assurance surveillance by JEA or his representative. JEA, at JEA's discretion, may require submittal of all shop test procedures for review prior to testing.

B. Shop Testing

1. General

- a. All required shop inspections and tests are to be performed in accordance with the NBIC and where applicable the ASME Boiler and Pressure Vessel Code Section I "Power Boilers", applicable Addenda, and in accordance with latest state or local codes, if applicable. In progress dimensional checks, nondestructive tests and required inspections are to be performed during the pressure part manufacture to assure that conformance to applicable codes is maintained.
- b. An authorized inspector, licensed by the National Board of Boiler and Pressure Vessel Inspectors shall signify by signing a Code Data Sheet, that pressure parts comply with all aspects of the ASME Code.
- c. Nondestructive examination of welds shall be performed in accordance with the requirements of all applicable codes.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Examination and Inspection:

1. Examination and inspections shall be completed during the fabrication, installation and erection process.
2. Weld examination shall comply with the designated code. Documentation of examinations shall be made available for review upon request prior to submittal. Defects found in examined piping components and workmanship shall be repaired or replaced and re-examined prior to Pressure Testing.
3. Radiographs taken during fabrication and erection shall be available for examination. Radiography shall follow the site safety plan and be coordinated with other work being completed on the Jobsite.

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4. Contractor shall employ at least one (1) AWS CWI per shift during installation of new tube assemblies, headers, risers, HRSG casing assemblies, etc. to assure all but not limited to the following, internal cleanliness, weld end prep, fit up, preheat, welding, material control, visual inspection, weld tracking, procedure adherence, etc. JEA representative shall be given opportunity to witness/verify these inspections points. These are NOT considered hold points.
5. Piping connections where existing risers, downcomers, headers, etc. are removed shall be covered with rigid covers to prevent any debris from entering piping systems prior to reinstallation of new components. Cleanliness shall be verified and documented prior to fit up of new weld joints. JEA representative shall be given opportunity to verify cleanliness.

B. Material Control:

1. Materials shall conform to the WPS and base material specification as shown on the Drawings. Certified Material Test Reports shall be kept on record for base and filler materials for alloy and low alloy materials.
2. Controls Methods
 - a. Contractor shall install controls for weld filler materials. The controls shall be documented in a welding material control procedure acceptable to Owner. This procedure shall be sufficient to prevent inadvertent misapplication of weld filler materials.
 - b. The procedure shall provide for the following:
 - 1) Positive identification of filler materials.
 - 2) Segregation of filler materials by classification, alloy, size, and type.
 - 3) Storage and conditioning of covered filler materials, flux cored wire, and welding fluxes in accordance with the Manufacturer's recommendations or the ASME BPVC.
 - 4) Storage of bare filler materials to prevent contamination.
 - 5) Distribution of filler materials.
 - 6) Issuance to a welder of welding material types for use on only one P-number base metal at any one time.

3.2 RAZING

- A. Methods used in razing shall be in accordance with all codes, ordinances, and requirements of the governing authority; shall be acceptable to JEA; and shall in all cases assure the safety of the persons, properties, and existing structures.
- B. If found to be in acceptable condition, materials may be reused. These materials include gas/acoustic baffles, piping/header supports, and other miscellaneous supports.
- C. Except for those materials to be reused, all materials, debris, and rubbish resulting from razing or alteration operations shall be removed from site by Contractor.

3.3 INSTALLATION

- A. The LP evaporator, header and risers will be installed by Contractor.

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- B. All welding shall be completed by certified welders. Valid and current welders' certifications shall be maintained in the construction office and shall be made available for inspection upon request.
- C. Welding performed on site will be performed in accordance with ASME Section I, ASME B31.1, AWS D1.1, and AWS D1.6. On-site welding shall be performed by welders certified in accordance with ASME section IX. Avoid welding members while they are under stress. Make welds solid, homogeneous, free from pits and incorporated slag or scale, and of full area required to develop joint strength. Piping and equipment welds shall fulfill the requirements of ASME Section I, ASME B31.1. All welds shall receive the appropriate welder's individual stamp upon completion of work. All welds shall be subject to inspection.
- D. Contractor shall supply the services of a qualified radiographic testing firm to perform radiographic testing on all field welds. The Contractor shall repair any weld which fails radiographic examination.
- E. At the completion of the LP evaporator replacement, the entire boiler area shall be cleaned of debris and rubbish. In addition, all interior areas shall be free of settled dust, or other contaminants.
- F. Areas of boiler casing removed shall be properly packed with insulation before installing liner plates. Liners shall be reinstalled per original design to prevent any warping or impingement of plates. External shell plate and stiffeners shall be welded with 100% penetration welds. These shall meet AWS D1.1

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PART 4 - ATTACHMENTS

APPENDIX A

**SUBMITTAL REQUIREMENTS SCHEDULE
WELDING**

The following Submittals must be furnished to the entity noted under "Submit To" by the dates indicated (Engr = Engineer)

Submittal Description ⁴		Data with Bid		Copies for Review			Certified Copies		
		Submit To		Submit To	Date Req'd	Submit To		Date Req'd	
		Owner	Engr ¹	Owner		Engr ²	Owner		Engr ³
								Equipment No.	
								Requisition No.	
								Specification No.	
								File No.	
1. Administrative Submittals									
	Contract Closeout Submittals						X	10DFC	
2. Shop or Working Drawings									
	Weld Map or Records & Drawings						X	10DFC	
5. Manufacturer's Standard Data									
	Data Sheets	X		X		2ARO	X	X	6ARO
6. Instructions or Procedures									
	Material Control Procedure			X		2ARO			
	Manufacturer Instructions	X		X		2ARO	X	X	10DFC
7. Product Data									
	Dimensional Drawings	X		X		2ARO	X	X	10DFC
	Material Safety Data Sheets (MSDS)	X		X		2ARO			
9. Inspection, Test Reports and Certificates of Compliance									
	Welding Procedure Specifications			X		2ARO			
	Non-Destructive Examination Requirements			X		2ARO			
	Personnel Qualification Testing			X		2ARO			
	NDE reports						X	10DFC	
	Welder Performance Qualification Records			X		1PTC			
	NDE Personnel Qualification records			X		1PTC			
	Certificates of UL Listed Products								
	Material Test Reports			X		1PTC			
10. Operations and Maintenance Data Manual									
	Operation and Maintenance Data	X		X		2ARO	X	X	10DFC
14. Record Documents									
	Project Record Documents						X	X	10DFC
	NBIC R Forms						X	X	10DFC
15. Warranties and Guarantees									
	Warranty	X							

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SUBMITTAL REQUIREMENTS SCHEDULE
WELDING

The following Submittals must be furnished to the entity noted under "Submit To" by the dates indicated (Engr = Engineer)

				Equipment No.				
		Client		Requisition No.				
		Contract		Specification No.				
		Location		File No.				
Submittal Description ⁴	Data with Bid		Copies for Review			Certified Copies		
	Submit To		Submit To		Date	Submit To		Date
	Owner	Engr ¹	Owner	Engr ²	Req'd	Owner	Engr ³	Req'd
<p>SPECIAL NOTES:</p> <ol style="list-style-type: none"> 1. Indicates submittal by Contractor requiring Engineer's review to allow technical evaluation of bids. 2. Indicates submittal by Contractor requiring Engineer's review prior to proceeding with fabrication or construction activities for work covered by submittal. 3. Indicates submittal by Contractor required for Engineer's use as a record document. 4. Quantity of prints/copies/media required for each type of submittal is defined in Project Documents. <p>SCHEDULE ABBREVIATIONS: <i>ARO = Weeks After Order Received by Subcontractor/Supplier</i> <i>AAR = Weeks After Review (defined as date review comments received by Subcontractor/Supplier from Contractor/Engineer)</i> <i>DFC = Days After Completion (completion is defined contractually completion of work)</i> <i>PTC = Weeks Prior To Construction (initiation of fabrication in Supplier's shop or work in field)</i> <i>PTS = Weeks Prior To Shipment (date of shipment from Supplier's shop)</i></p>								

A. Utilities Supplied by JEA

Three Phase AC Power via Limited receptacles.	480V/60 Hz
Single Phase AC Power	110V/60 Hz

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APPENDIX B
DRAWINGS BOUND SEPARATELY

APPENDIX B – FORMS

096-18 Brandy Branch Generating Station Heat Recovery Steam Generator (HRSG) Low Pressure Evaporator Replacement

MINIMUM QUALIFICATIONS

The minimum qualifications shall be submitted in the format attached. The report shall be presented in the order described below. In order to be considered a qualified supplier by JEA you must meet all the criteria listed and be able to provide all the services listed in this specification.

RESPONDENT INFORMATION

COMPANY NAME: _____

BUSINESS ADDRESS: _____

CITY, STATE, ZIP CODE: _____

TELEPHONE: _____

FAX: _____

E-MAIL: _____

- Bidder shall have successfully completed two (2) similar projects. Each project shall be performed within the past 5 years.
 - A similar project shall have been \$1,000,000 or greater in value and includes projects of this complexity or greater on Heat Recovery Steam Generator (HRSG's) on comparably sized combustion turbines where the project required the tube and header assembly or complete HRSG modules were repaired or replaced.
- Bidders are encouraged to submit additional reference projects (5 projects max).

APPENDIX B
BID FORM FOR SOLICITATION 096-18

Brandy Branch Generating Station Heat Recovery Steam Generator (HRSG) Low Pressure Evaporator Replacement

Submit an **original, two (2) copies and one (1) CD or thumb drive** along with other required forms in a sealed envelope to: JEA Procurement Dept., 21 W. Church St., Bid Office, Customer Center, 1st Floor, Room 002, Jacksonville, FL 32202-3139.

Company Name: _____

Company's Address _____

License Number: _____

Phone Number: _____ FAX No: _____ Email Address: _____

BID SECURITY REQUIREMENTS

- None required
- Certified Check or Bond Five Percent (5%)

TERM OF CONTRACT

- One Time Purchase
- Annual Requirements
- Other, Specify - Project Completion

SAMPLE REQUIREMENTS

- None required
- Samples required prior to Response Opening
- Samples may be required subsequent to Bid Opening

SECTION 255.05, FLORIDA STATUTES CONTRACT BOND

- None required
- Bond required 100% of Bid Award

QUANTITIES

- Quantities indicated are exacting
- Quantities indicated reflect the approximate quantities to be purchased Throughout the Contract period and are subject to fluctuation in accordance with actual requirements.

INSURANCE REQUIREMENTS

Insurance required

PAYMENT DISCOUNTS

- 1% 20, net 30
- 2% 10, net 30
- Other _____
- None Offered

Description of Services	TOTAL BID PRICE
Total Bid Price for Work as described in this Solicitation 096-18 (Enter total from Bid Workbook)	\$ _____

I have read and understood the Sunshine Law/Public Records clauses contained within this solicitation. I understand that in the absence of a redacted copy my proposal will be disclosed to the public "as-is".

BIDDER CERTIFICATION

By submitting this Bid, the Bidder certifies that it has read and reviewed all of the documents pertaining to this Solicitation, that the person signing below is an authorized representative of the Bidding Company, that the Company is legally authorized to do business in the State of Florida, and that the Company maintains in active status an appropriate contractor's license for the work (if applicable). The Bidder also certifies that it complies with all sections (including but not limited to Conflict Of Interest and Ethics) of this Solicitation.

We have received addenda

_____ through _____

_____ Handwritten Signature of Authorized Officer of Company or Agent _____ Date

_____ Printed Name and Title