JEA

Northside Generating Station

JACKSONVILLE, FLORIDA

JEA NGS N01
Isolated Phase Bus
Cleaning Inspection and Repair Spring 2025

General Requirements and Scope of Work

Revision 0 8/30/23
Revision 1 1/12/24 – Changed Min Quals
Revision 2 Feb.28.2024 – Omit DLRO of Flex Links
Revision 3 Apr.4.2024 – Add Point System for Evaluation
Revision 4 Apr.17.2024 – NGR, Insulators, Grease, Master Elec, 3 Proj. Min Quals.
Revision 5 April.23.2024 – Min Quals; Omission of welding Duct feet to GND bar.
Revision 6 June.12.2024 – Requirement to send ground bus off site.
Revision 7 July.9.2024 – Extra Work to match Bid Form.

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General Requirements and Scope of Work

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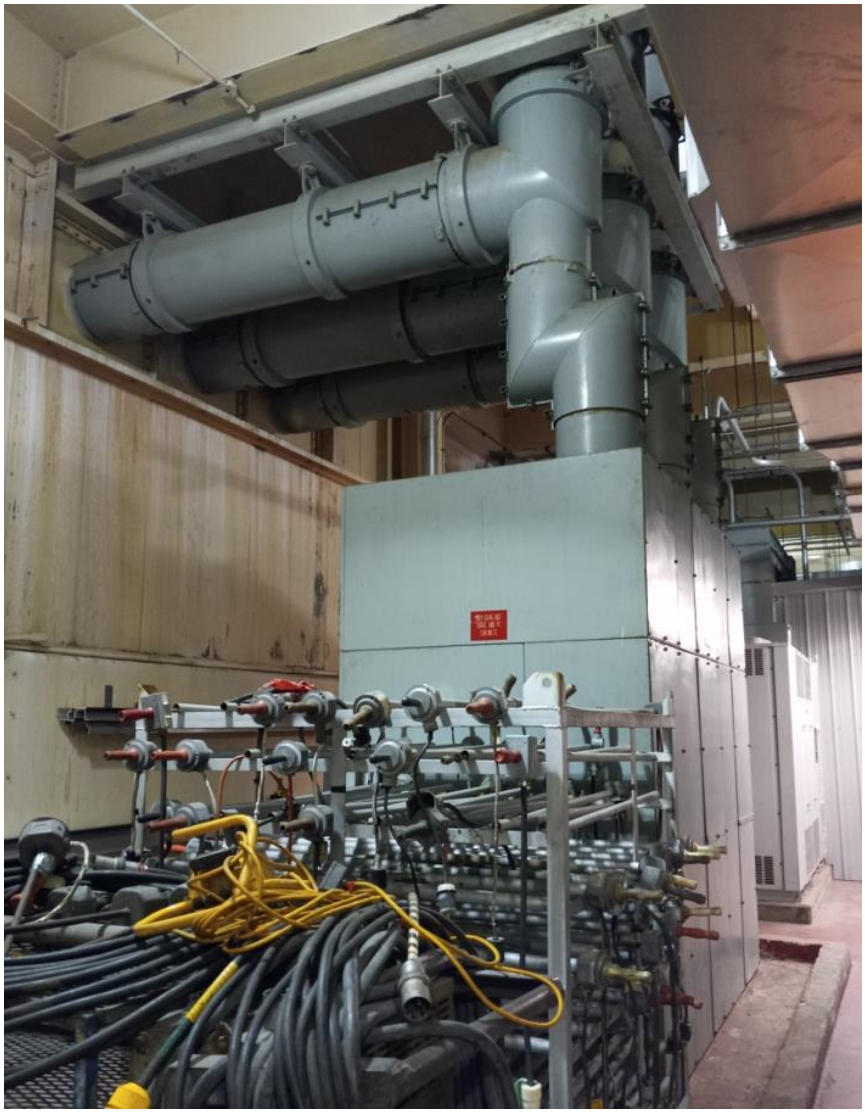
1.1 Overall Site Description

The Northside Generating Station (NGS) is located north of downtown Jacksonville on 4377 Heckscher Drive, Jacksonville, FL 32226, in Duval County. JEA's NGS has four combustion turbines (CT's) (Units N33, N34, N35, and N36) that have been in service since 1975 and three steam turbine units (N01, N02 and N03) that have been in service since 1965, 1972, and 1977 respectively. The unit that will be worked on during the upcoming major outage is N01 and has a legacy ITE non-continuous isolated phase bus system. The unit operates at 20kV. There are two paralleled GSU's and a Station Service transformer on the outside of the Turbine building and the PT's and Relays are inside the switchgear room on the first floor just beyond a wall plate. At the PT cabinets the bus turns vertically, runs roughly ten feet above the Mezzanine floor and is suspended on Aluminum structure for approximately seventy feet to the generator terminals.

View of IPB on Mezzanine from below Generator 2023.

View of Forced Air Fans 2023.



View of PT / Relay Cabinets 2023.

View of TG1A from East Side 2023.

1.2 Contractor's Scope of Work

This scope of work includes inspecting, cleaning, restoring grounds, documenting materials and measurements and electrically testing the Isolated Phase Bus (IPB) system between the Generator Terminals and the step-up power transformers. The Bidder shall furnish all equipment, supervision, labor, transportation, tools and expendables to clean by removing all foreign matter, restore ground connections and inspect and make repair recommendations, for the existing IPB. The purpose is to ensure that the duct, bus, flex-links and insulators are sufficiently clean and that the duct is properly sealed against moisture intrusion. If any equipment is found to be damaged, it will be up to the JEA Project Manager (PM) to decide if the equipment is to be left as-is, repaired or replaced. A metal cage on the mezzanine shall be deconstructed and placed in the metal recycling bin. Prior to any work on the IPB, the Foreman shall walk down the clearance with the PM and Engineer to gain an understanding of JEA's Lock Out Tag Out (LOTO) and to ensure safety prior to starting work. The bus shall be grounded with spider grounds at the PT cabinets and the flex links shall be removed below the generator and at the GSU's. The surge protectors shall be disconnected in the PT cabinets prior to testing. A daily meeting with the Contractor Foreman or PM shall be completed with the JEA PM to go over any safety issues, discovery work, project status, and the project schedule. An insulator for both the station service run and the main bus shall be removed at the beginning of the work. Three of the smaller insulators from the station service bus along with five of the larger main bus insulators shall be ordered preemptively so as to avoid delaying the outage and to possibly put spares on the shelf.

Electrical Testing – The bus was designed by ITE circa 1964. It is a 3 phase, 20kV, 60Hz, 110kV BIL, 12kA forced-air cooled system with a 1.2kA tap bus for station service. The three phase system is roughly **240** feet in length making this approximately **720** feet of IPB. The conductors were designed to operate at 105C. A 10kV megger test shall be performed before the 40kV DC High Potential testing (Hi-Pot), both as found, and after the cleaning and restoration of grounds, to provide an indication of whether the bus is ready to go back into service or not. The first and last set of flex shunt connections shall be left removed until after the final Hi-Pot. The initial megger will be conducted to have an as-found resistance and leakage current recorded and to see if there are any points of electrical tracking. Each accessible location where it is possible for physical contact with the bus, shall be either manned with an employee, or protected with red danger tape and a barricade information tag that states the hazard information and the Contractor shall be in constant communication with the testing engineer. The bus is expected to meg in the Giga-Ohm range at the end of the job. The megger (MIT515 or equivalent) used by the contractor shall be able to read in the Giga-Ohm magnitude and the Hi-Pot test machine (High Voltage PTS-80 DC HiPot Tester or equivalent) shall be capable of delivering results for leakage in micro-amp magnitude. The megger / Hi-Pot plan, along with expected values, shall be prepared by the contractor and shared with the JEA PM for approval prior to testing. All readings will be shared with the JEA PM and be included in the final digital report. Leakage shall be recorded at equal increments set by JEA in order to obtain a polarization index of the bus. This is primarily to look at the leakage at prescribed voltage levels so that a problem could be corrected before any damage is created. During the increase in voltage, the increase shall be slow enough to keep the leakage below one hundred micro amp; at steps, the leakage shall be observed for thirty seconds with the time set and called by JEA fully in sinc with the Contractor. While a phase is under test, both phases not under test shall be grounded. Electrical testing results will be used to understand the condition of the system and then to prove that all insulators are intact and have been properly cleaned and that there are no grounds on the system at completion of work. The neutral grounding resistor shall be tested for resistance and cleaned. Either the JEA Engineer or PM shall be present for each and every electrical test. It is standard procedure for the bus to be grounded with spider grounds at the PT cabinets during outages. If this is inadequate by the contractor, a grounding plan specific to this scope of work shall be agreed prior to the job plan or proposal. The grounds at the PT cabinets shall have a test tag so that they can be removed during testing.

IPB Inspection – The N01 IPB will be inspected from the outside, at the dog boxes for TG1A and TG1B, to the inside of the turbine building, underneath the generator, unless rain or weather makes starting work inside more practical. Electrical isolation will be verified between the generator, the IPB, and the power transformers TG1A – TG1B & TG1SS. If work starts inside the turbine building, every effort must be made to begin work outside as most of the discovery is expected to be found outside of the turbine building. Ideally, the work will start on top of the Step Up Transformers, TG1A – TG1B, Station Service TG1SS, and work toward the wall plate adjacent to the N01 switchgear room. All seals, insulators and connections shall

be visually inspected using a bore scope and documented with an indexed photograph log both before and after cleaning. The photographs shall be edited (adding pointer, circles, notes and location references) to show any found deficiencies. A copy of the photo log will be included in the contractors final report. It is expected that any existing damage, corrosion or any other issue(s) that might have previously affected reliability, or issues that may affect reliability in the future be brought to the attention of the PM and or Engineer, immediately.

IPB Repairs – The discovery work found during the inspection shall be discussed in detail with the JEA PM and Engineer prior to commencing any repairs. The awarded contractor shall have the ability to receive the insulators, flex links, bus support assembly's, bushings, and all hardware within 10 business days after the inspection is complete. This is to ensure that the outage will not be extended. All bolts shall be torqued to the same specification and shall be agreed upon by the JEA PM or Engineer. The existing drawings shall be printed out and red-lined in order for JEA to create as-built's drawings if any repairs are accomplished. The redlines shall include the Numbering Convention for Hardware – location and name of each insulator, welded joint, flex links, clamshells, circumference of duct, circumference of conductor and thickness of duct and conductor. It shall be expected that the on-site Contractor PM will communicate and walkdown the system with both the JEA PM and or Engineer on a frequency of at least twice a day.

After the discovery work is addressed and sufficiently complete, the PM shall give permission to start the final Megger and Hi-Pot tests. If the electrical test results show that the bus is ready to be put back in service, the remaining flex links shall be installed and the access points shall be properly closed. If there are questionable results, it will be expected to isolate the problem area and correct the issue before the job is complete. All testing shall be done with either the PM or Engineer present.

Equipment List – The equipment list is intended to be a partial list with special notes on the scope of work. It is not intended to provide an exhaustive list.

1. Access hatches and gaskets - All access hatches (100) are to be removed, three at a time so that the JEA PM and or Engineer can get as found pictures alongside the Contractor. The Clamshell cover bolting clamps shall be left loose until the JEA PM directs the contractor to permanently reinstall them. Prior to removing the clamps, a small amount of Silver Grade Anti-Sieze © shall be brushed onto the threads so that when they are removed, the threading is coated with an anticorrosive. All gaskets will be replaced with new approved gaskets. The covers will be placed back into position or have plastic wrapped in such a way to create a water tight boundary for the bus, at the end of each day, shift or in the event of expected precipitation. This is to prevent wildlife from taking shelter inside of the duct and to prevent foreign material from entering the bus/ duct system. Each access cover shall be labeled top or bottom with an identifying letter for phase and an identifying number per location. The Numbering Convention for Hardware shall be discussed and agreed upon with the JEA PM and or Engineer prior to any work. It is considered critical by JEA that the access hatches and all associated hardware go back into the exact position and orientation that it was found. This will mitigate pieces not fitting together correctly and thus save time and money. All hardware will be replaced with 316 stainless steel supplied by the contractor and verified with neodymium magnet with PM present.

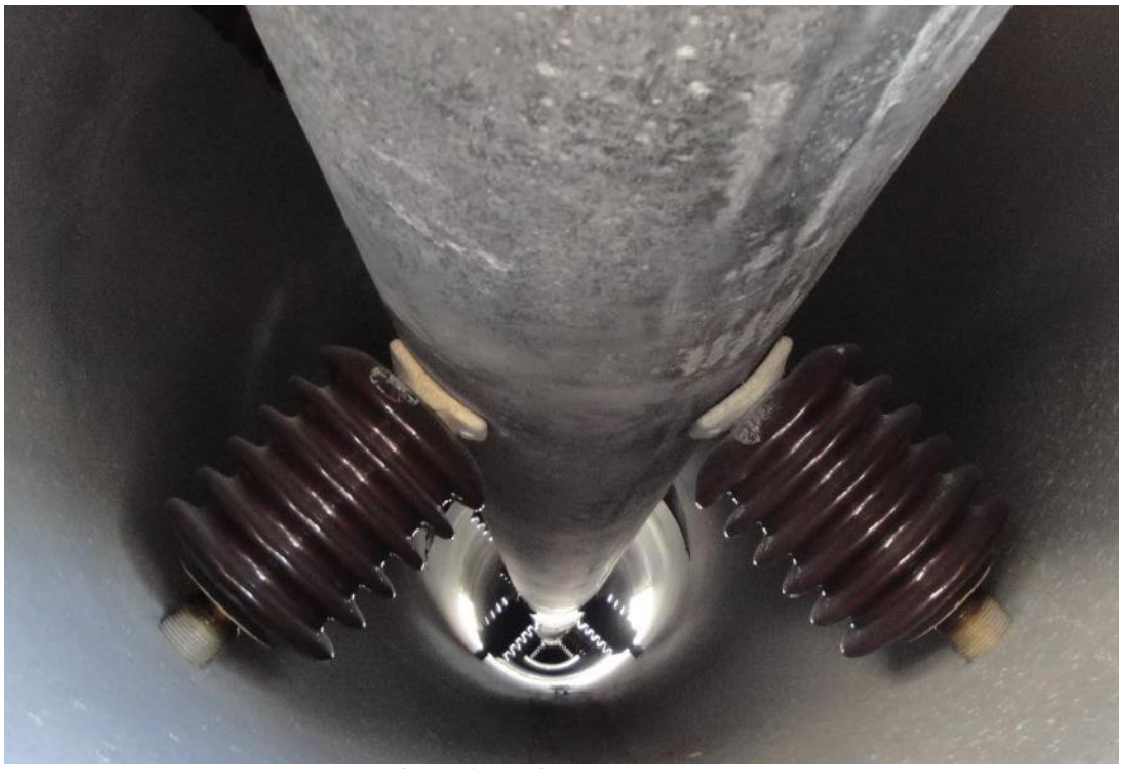
View of Bolting Clamp for N01 Enclosure Clamshells 2023.

Prior to removing the clamps, a small amount of Silver Grade Anti-Seize © shall be brushed onto the threads

View of Bonding Linkage Between Enclosure and Clamshell 2023.

2. Insulators and Bushings – The insulators for the conductors (624) are ninety degrees apart at each location. The Contractor shall find any damage using bore scope and or camera. Each insulator shall be assigned nomenclature per the Numbering Convention for Hardware and referred to as such in

photos for as found and as left. All hardware will be replaced with 316 stainless supplied by the contractor. Three of the smaller insulators from the station service bus along with five of the larger main bus insulators shall be ordered preemptively so as to avoid delaying the outage and to possibly put spares on the shelf.



View of Insulators N01 2016.

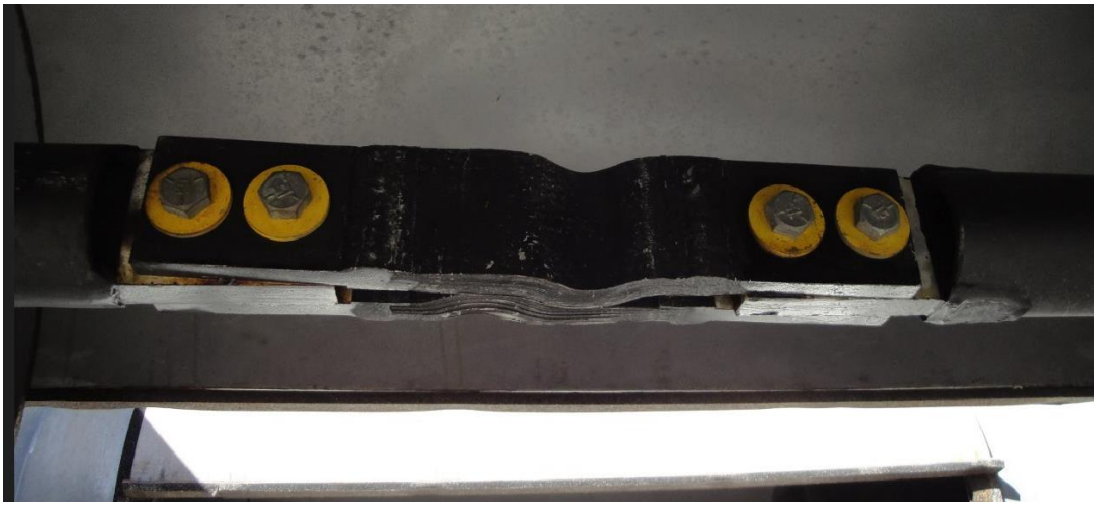
View of Insulators – Saddles, Captures 3 of 4 at this Location 2023.

View of Insulator Bolt on Exterior 2023.

View of Bushing N01 2016.

3. Isolated Phase Bus – The current carrying conductors are painted aluminum pipe. In places, the painted surface may have started to flake. This electrical bus and the inside of the surrounding grounded duct is to be thoroughly cleaned using lint free rags and vacuum cleaners to remove all foreign matter where accessible from the access hatches. Cryogenic cleaning is not acceptable

4. Flexible shunts braids - All of the flexible shunts (flex braids) internal to the IPB shall be indexed per the Numbering Convention for Hardware such that, they could be re-installed in the exact location and orientation that they were removed from. This is to make sure that the face to face connections have the same amount of contact if the original links are put back in place. The flex links shall be disconnected and visually inspected for discoloration, broken leaf's, pits and or hot spots A thin layer of Mobil 28 shall be applied to each electrical connection and then wiped off so that there is barely enough to see. This should guarantee that no dripping occurs. All hardware is to be replaced with 316 stainless steel, including stainless steel conical washers on top of a flat that is 20% larger than the conical. For bidding purposes, it will be assumed that 1/2 inch hardware is 4" in length. When the flex braids are removed it is critical that they are stored in a clean environment and kept out of the weather and away from any foreign material. An acceptable method would be plastic storage bins. If the flex links are welded in position, then the connection shall be inspected visually and photographed from above, below and on each side. If only one side is welded, the connection shall be photographed in the same manner prior to the one-sided disassembly and the silvered connection shall be photographed after bolt removal. It shall be expected that the JEA Engineer and or PM will be very involved with the inspection from the beginning until the end of the project.



View of 1.2kA Tap Bus Connection 2009.

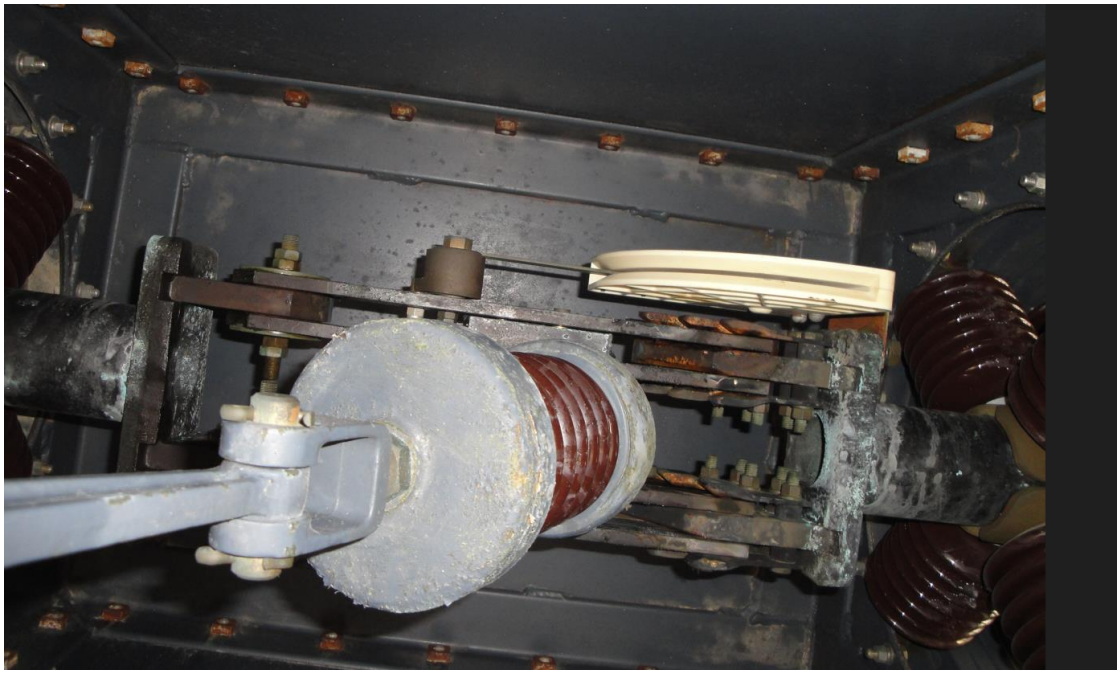
View of 12000A Main Bus Welded Connection 2023.

5. Grounding Connections – All bare 400 MCM shall be replaced with 500MCM and cad welded to existing building steel and to the existing grounds Four (4) feet above grade. This will require scaffolding and in some locations, a harness where the scaffolding cannot be “green tagged”. There is approximately 350’ that shall be replaced. Tap cons with stainless steel straps shall be used every 18 to 24 inches. There are existing studs which There are 8 locations that require a cad weld 500MCM to 500MCM parallel, and 6 locations that require a cad weld to building steel. The bare copper ~ 15’ that is bonded to the NGR shall also be replaced. These cables can be measured with a caliper during the walk down to verify sizing.

View of 500MCM on the Mezzanine.

View of Bonding connection between Aluminum bus and cable.

6. 20 kV Connections – All electrical bolted connections in the bus duct are believed to be silver plated copper or copper clad silver plated aluminum. If damaged, it will be up the JEA PM to decide if the stab/connector is to be repaired or cut out and replaced with a new silver plated connector. All stainless steel conical washers and hardware to be replaced with 316 stainless steel. The drawings show mostly welded connections. The transformer ends and generator end are bolted.



View of the Station Service Isolation Outdoor Switch – DWG 001888

7. Enclosures and Seals – The transformer termination enclosures, the disconnect inside the switchgear room, and the dog houses on the mezzanine have seals that will have to be replaced.

8. Torque All Bolts – After inspection and upon reassembly, all bolts that are used for the 18 kV electrical connections will be re-torqued to manufacturer recommendations with a calibrated (within 1 year) torque wrench. In the absence of any manufacture recommendations:

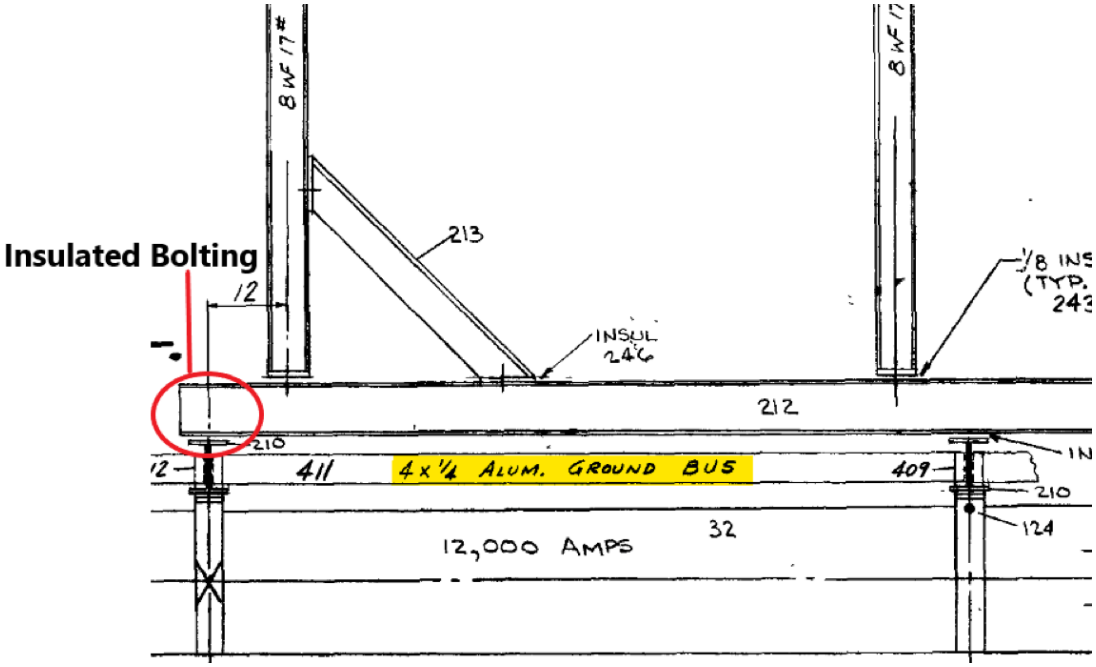
   5/8" 55Ft-lbs
   1/2" 45Ft-lbs

9. Grounding – The enclosure of the IPB is non-continuous, and has an exterior ground bus. In some locations the suspended bus is directly bonded to the external ground bus and in other locations it is insulated from the suspending structure. Each section of external ground bus (0.25" X 4.0") shall be indexed per the Numbering Convention for Hardware and disassembled and silver plated (4" X 4"). **Only the external ground bus inside of the turbine building (approximately 85') shall be disassembled.** During the time the external ground bus is removed from the system, each enclosure foot location that is directly bonded to ground bus, shall be DLRO tested and recorded. Every DLRO measurement shall require removing paint and or dirt/ corrosion with a soft grinding wheel or JEA approved method. Each bonded location will likely have varying resistance values due to different parallel paths, however, this test shall be conducted for documentation purposes and to identify extreme outliers. Where an outlier is found (outliers will be determined after data is collected), the ground bus hardware shall be removed while supporting the suspended IPB with jacks positioned under the insulators to the north and south of the respective location. It is expected that **800 square inches will need to be silver plated as a part of the base scope of work**.
   The insulated locations shall be megger tested and the measurement should be within 3% from one location to another. The expected values will be at least 20Mohm. The bolts that are removed to replace insulation will require a G10 or G11 sleeve or bushing to maintain electrical isolation between the threading and the enclosure. All bolts shall be checked for tightness and torqued based on hardware size and consensus with PM.

View from below of one Insulated Connection for Enclosure.

View from above of One Insulated Connection for Enclosure.

View of Insulation between Building Structure and IPB Bonding Structure.



Location in DWG 001886 Typical of at least 8 places.

10. Cleaning – All insulators, bushings and connections and shall be wiped down and cleaned to remove all FME (foreign material). The inside of the bus duct that can be reached by hand and with vacuums from the access hatches shall also be cleaned. Sufficient cleanliness shall be defined as the inability to wipe dust off of a surface before any access point is closed. For the final cleaning, the contractor shall supply and use the following products **or approved equivalent** to wipe down the insulators and bushings:

    ELECTRON® 4×1 – Gallon Case – 6850-01-375-5554
    SUBSTITUTE ONLY BY APROVAL THROUGH JEA*

    Denatured Alcohol. It has been seen in the past that limestone at the plant was removed from insulators more effectively by using both products sequentially. This is expected to be a non-issue with this specific bus.

11. Welding – It shall be expected that the Contractor has welded bus and bus duct in the past and currently has an established procedure in place to safely perform the welds. The Contractor shall possess the AWS D1.2/D1.2M certification for welding aluminum and provide the certificate and resume belonging to the employee who would do the work.

12. Drain system – Each drain will need to be cleaned and inspected.

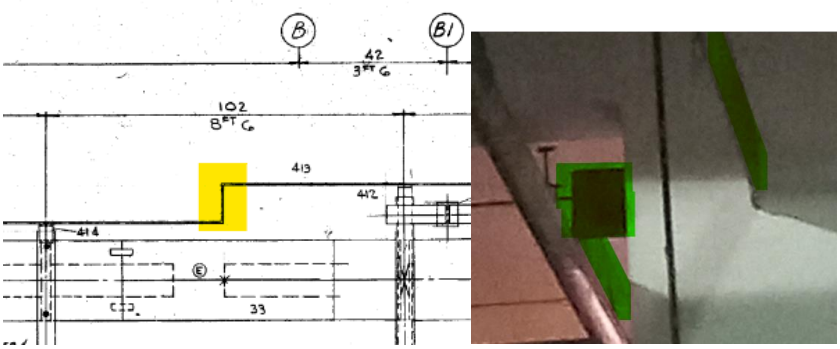
13. NGR – The neutral grounding resistor shall be measured with an ohm meter.

N01 NGR – Test resistance with calibrated (within 1 year) Ohm-meter.

14. Demolish metal cage behind Vertical IPB on Mezzanine – 10’ High, 30’ Wide. The steel cage shall be placed in the metal recycling bin north of the turbine building west of the employee parking lot.

Metal Cage Behind IPB on Mezzanine – 10’ Tall, 30’ Length.

15. Expose Ground Bus inside wall – A sheet rock wall was constructed over the ground bus and will need to be cut back to inspect. If there are bolted connections in the wall, they will need to be unbolted to disassemble the external ground bus and silvered.



GND Bus Shown on 001888 Plan View “A6 - A6”.

Preliminary Reports – During the cleaning and inspection, the contractor shall keep JEA informed of any damaged equipment along with recommendations, including how to repair or replace damaged equipment.

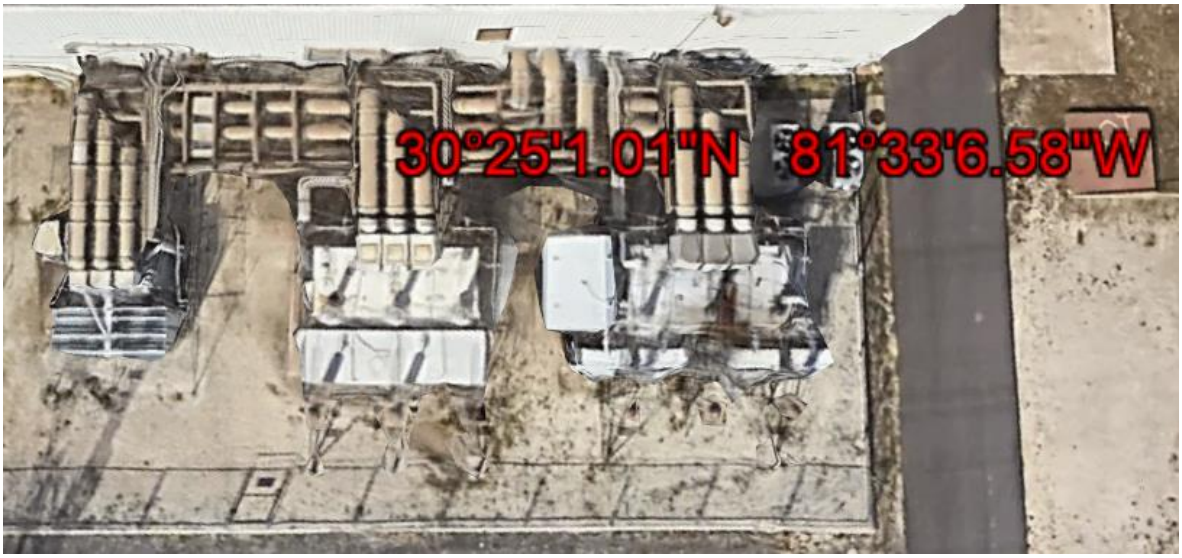
Final Report – The contractor shall prepare a final written report that includes a copy of the photos and picture log. The pictures shall include typical insulators as found, all cleaned insulators and all equipment identified as having flaws before and after repair of all work done.

Extra work – It is anticipated that repair work will be necessary. The contractor shall provide unit costs for each of the following items:

1. Inspect additional electrical bus connections (including disassembly and re-assembly).
2. Clean electrical connections: 4 inch by 4 inch times 3 – (48 square inches)
3. Copper/Silver-plating of aluminum connections: 4 inch by 4 inch X 6 – (96 square inches)
4. Replace hardware: twelve bolts, twenty-four Belleville's, twenty-four flats and twelve nuts 1/2" X 4" (**316** Stainless Steel, **not** 304). **Bottom flat must be larger diameter than Belleville such that, when compressed, the Belleville does not overlap edge of flat washer.**
5. Replace cracked or damaged insulator for 12,000A bus.
6. Replace insulator hardware including saddle for 12,000A bus.
7. Replace cracked or damaged insulator for 1,200A bus.
8. Replace insulator hardware including saddle for 12,000A bus.
9. Replace clamshell cover clamps.
10. Replace 5/8 Structure Hardware along with G11 Insulation, washers, and Sleeves for insulative Bolting for structural members. One set will be defined as enough hardware for all three phases in one location. Twelve Bolts, twelve nuts, six pieces of 4 by 4 G11 insulation, twelve washers, twelve G11 sleeves for bolting, and twelve G11 washers.
11. Replace 1,000A Flexible Braided Shunts.
12. Cut existing 12,000A expansion joint and replace by aluminum welding.
13. Cut existing 1,000A expansion joint and replace by aluminum welding.

1.3 Site Conditions

The Contractor acknowledges that it has investigated prior to bidding and satisfied itself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal handling and storage of materials, availability of labor, roads, or storage areas. Any failure by the Contractor to acquaint itself with the available information will not relieve them from responsibility for estimating properly the difficulty or cost of successfully performing the scope of work. JEA assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by JEA. Site parking will be available on the property in an area designated by the JEA PM. Site access will be available 7 days per week. Site water and power are available for cleaning. Contractor must provide their own telephone services, office spaces and or portable restroom facilities. Any staging areas or work areas that are required to be created due to the existing conditions are the responsibility of the Bidder. Access to work areas may require ladders or JEA provided scaffolding. The scaffolding will be staged per the contractor's direction one week before the start of the project. Contractor shall provide their own rental portable restroom and breakroom.



View of Location and Outdoor IPB 2023.

1.4 Safety, Health, and Accident Prevention

Contractor shall take all JEA required Contractor Safety and Site Specific Safety Training. These are two separate power point presentations. The Contractor Safety Training is expected to be completed off site prior to starting work. The Site Specific Training shall be delivered by the PM at Northside Generating Station and is usually only a twenty minute class barring any questions or differences in practices that might take longer to discuss.

All JEA contractors, and their subcontractors performing safety sensitive work on our projects will adhere to our safety practices and guidelines. Every person who works on any JEA project is expected to follow these practices to ensure their personal safety as well as the safety of every other person on a site or in the nearby community.

Contractors must be safety qualified **before** their bid will be accepted for this scope of work. **Safety qualification is necessary** for contractors and any subcontractors for this project.

All silver plating of ground bus shall be done off site by an ISO 9001 certified metal finishing and electroplating service provider to mitigate on sight contamination of Nickel Acid, Copper Alkaline and non-cyanide silver. Every silver plated surface shall be plated to a 5 mil (0.005”) thickness per industry standard.

1.5 Forced Shutdown

JEA reserves the right to shut down the activities at no additional cost to JEA due to one or more of the following conditions:

- Potential safety concerns.
- Weather
- The need to terminate the unit outage prematurely.

1.6 Site Security

Site security is provided by JEA on a 24 hour, 7day per week basis. All contractor employees will pass thru security and vehicle inspections may occur.

1.7 Schedule

The NGS N01 outage is scheduled for March 6, 2025 thru April 24, 2025. It is anticipated that this work may begin on the fifth day of the outage, March 10, 2025, and must complete by end of business March 29, 2025. No extensions will be granted.

The Contractor shall not commence any work until a notice to proceed is received. A project schedule for this Contract shall be prepared and maintained by the Contractor to provide coordination, to establish the basis for measuring and monitoring Contractor progress and to detect problems for the purpose of taking corrective action. Contractor shall provide JEA with weekly updates. These updates shall include the following:

- Current status of the job progress
- Three day Look-Ahead Schedule
- Report the planned and actual progress of the current day
- Report all planned work that is to be accomplished during the following day
- Changes in the Work Schedule
- Safety and Quality Control issues
- Problem areas or concerns

1.8 Min Quals and Points for Evaluation:

The bidders shall also have a current aluminum AWS D1.2 welding certification (4 points) and there shall be one journeyman electrician on site at all times (4 points) as minimum qualifications for the bid. The cert holders must be on site from beginning to end of the outage schedule.

Cost will be worth 50% of the evaluation score.

All of the license / cert holders below must be on site from beginning to end of the work except for PE to receive points for the bid.

Licensed Master Electrician will be given 4 points. License information has to be given for reference verification.

Access to a Professional Engineer affiliated with IEEE PES and or EPRI TGUG, licensed in any state who is fluent in the requirements of isolated phase bus and specifically, non-continuous IPB will be given 4 points. Contact information has to be given for reference verification. The PE has to be available for phone calls and emails once a day with a two day turn around with question / answer. License number and state shall be provided.

ISO 9001 specifically related to the maintenance of isolated phase bus work shall be 4 points. Cert and quality assurance documentation must be given for reference.

At least three references of previous projects completed in the past three years valued at $ 100,000.00 or more will be required to submit for the remaining 30 points. Any projects completed for JEA must be included and will count as a similar project no matter the cost or date completed. References for each project shall be submitted with the bids. As a part of the reference, safety performance shall be impeccable. These projects are being evaluated on scope, budget, schedule, safety performance, and overall satisfaction.