DATA REQUEST

AG-KIUC 1_1	In its Order dated June 23, 2023 in this proceeding, the Commission stated:

"It is clear to the Commission from the records of Case Nos. 2022-00283 and 2023-00145 that Kentucky Power does not have sufficient capacity available to serve customers' energy needs, has been aware of that shortcoming for a significant amount of time, understands the detriment that insufficiency can cause customers, has described the speed and ease by which it could fix that shortcoming, and yet has chosen not to address its inadequacy of service."

a. Provide all evidence that the Company had sufficient capacity and energy from owned and/or contract purchased capacity and energy, as opposed to as-available market priced energy, after the expiration of the Rockport UPA in December 2022 necessary to meet its load requirements, including the effects of extreme weather.

b.Provide a copy of all analyses, studies, reports, and correspondenc e developed by or on behalf of the Company prior to the expiration of the Rockport UPA that addressed the Company's capacity and energy requirements, the alternatives considered to meet those requirements, the risk exposures of inadequate and/or insufficient owned or contract purchased capacity and energy and the cost of purchasing as-available energy.

c. Provide a narrative description of the Company's decision making process and the decision(s) made not to acquire additional capacity whether owned or under contract after the termination of the Rockport UPA, including energy attributes of the capacity. Provide all supporting evidence relied on for the decision(s) that were made, including, but not limited to, the decision that the resources owned and under contract were adequate and sufficient to meet the Company's capacity and energy requirements and manage and mitigate the risk exposures of inadequate and/or insufficient owned or contract purchased capacity and energy and the cost of purchasing as-available energy.

RESPONSE

a. The question contains a false premise that as-available market energy, which is available to the Company by contract with PJM as an RTO member, does not also qualify as “sufficient capacity and energy” for purposes of the Company’s service obligations under Kentucky law. The Company has had and does have sufficient energy and capacity secured to serve its customers’ load requirements. The professed shortcoming does not exist as evidenced by the Company’s continued ability to provide electric service to its customers through winter and summer peak periods (including the period of historically high demand during Winter Storm Elliott), prior to and after the expiration of the Rockport UPA.

The Company has had no interruptions of service due to inadequate power supply and has met the FERC approved reserve margin requirements of the RTO in which it participates. This is inclusive of all the Company’s peak power supply requirements throughout the year, not just the summer RTO peak requirements. The Company has met its customers’ power needs during all periods through its owned and contracted for resources, which include its membership in the PJM RTO which provides access to the energy supply within the entire RTO. The Company’s strategy has also proved in reality to be more durable from a reliability standpoint when compared to that of other load serving entities within Kentucky, as more than one has had to interrupt service to customers because of inadequate power supply.

b. Please refer to the Company’s 2019 IRP (Case No. 2019-00443) for the alternatives considered to replace the capacity deficit that resulted from the expiration of the Rockport UPA. The Company’s decision to replace the unforced capacity (UCAP) MW shortfall in the short-term with market purchases of one-year terms was included in the IRP and was supported by KIUC and the AG in their comments. Please refer to AG/KIUC’s comments on the Company’s IRP at pages 6-15, where they notably state: “This is further evidence that the Company should adjust its Preferred Plan to include additional MPs (market purchases), and it should not be overlooked that we have been in a low-cost environment for more than ten years with no indication this will change any time soon”. Additionally, please see the Company’s 2023 IRP and subsequent RFP that was issued for long-term resources to meet the Company’s future capacity needs and to replace the short-term capacity purchases the Company has engaged in. This aligns with the Company’s 2019 IRP preferred plan. Furthermore, the AEPSC Commercial Operations team continually monitors fuel, purchased power and capacity needs of Kentucky Power and the associated markets for such products to assure the Company’s needs are met in a prudent manner.

c. Please see the Company's response to parts A and B.

Witness: Brian K. West

Witness: Alex E. Vaughan

DATA REQUEST

AG-KIUC 1_2	Explain why the Mitchell units did not operate at 100% capacity factor during Winter Storm Elliott. To the extent the units were not physically available to operate at 100% capacity factor, describe all limitations and the reasons for each such limitation. Provide a copy of all maintenance reports, root cause analysis, and all other analyses that address specifically why the Mitchell units could not and were not operated at 100% capacity factor during Winter Storm Elliott.

RESPONSE

Mitchell Unit 1 and Mitchell Unit 2 were available and operated throughout the Winter Storm Elliott period (12/23/2002-12/27/2022), but were partially derated during certain periods for the reasons shown in KPCO_R_AG_KIUC_1_2_Attachment1. A derate is a condition that limits a generating unit's output to a level less than its full rated output. At no point during the storm event were either of the Mitchell Units unavailable for service. Rarely do generating units achieve a 100% Net Capacity Factor over an extended period of time due to operational and equipment constraints, availability of the unit, economic reasons, and fuel availability. In the case of Mitchell Units 1 and 2 during Winter Storm Elliott, the units were not available for their fully rated output primarily due to Electrostatic Precipitator (ESP) performance as discussed below. The derates on Units 1 and 2 for opacity and weather-related issues were not significant and resulted in the units running at 13.6% and 21.6%, respectively, less than their potential fully rated generating output during the Winter Storm Elliott period. In addition, Mitchell Units 1 and 2 ran exceptionally well compared to past performance during calendar years 2016 through 2022 as shown below.

Mitchell Units 1 and 2
Net Capacity Factors and Equivalent Availability Factors
2016-2022 and Winter Storm Elliott Period (12/23-27/2022)

Plant-Unit	Year	Net Cap Ftr (NCF)	Eq Availability Ftr (EAF)
Mitchell Unit 1	2016	52.07	68.09
Mitchell Unit 1	2017	46.50	63.31
Mitchell Unit 1	2018	38.12	60.15
Mitchell Unit 1	2019	35.97	55.84
Mitchell Unit 1	2020	22.43	56.51
Mitchell Unit 1	2021	26.39	38.89
Mitchell Unit 1	2022	31.45	67.23
Mitchell Unit 1	12/23-27/2022	80.31	86.34
Mitchell Unit 2	2016	59.99	70.56
Mitchell Unit 2	2017	65.77	84.77
Mitchell Unit 2	2018	42.37	61.33
Mitchell Unit 2	2019	37.78	62.21
Mitchell Unit 2	2020	30.20	72.64
Mitchell Unit 2	2021	43.19	64.42
Mitchell Unit 2	2022	19.94	47.84
Mitchell Unit 2	12/23-27/2022	74.11	78.44

The following is a full list of the partial derates that affected the Mitchell Units during portions of the Winter Storm Elliott period:

- Starting on 12/22/2022, Unit 1 was partially derated due to a clinker and boiler slagging. The unit's soot blowers' automated sequence was not functioning properly, and the blowers were operated manually. Damage resulted to the soot blowers at the entry to the boiler due to the slagging conditions.
- On 12/23/2022, Unit 2's ESP experienced a reduction in performance that led to opacity issues and thereby partial derates. Opacity limits are dictated by the West Virginia Department of Environmental Protection (WV DEP) State Implementation Plan (SIP) requirements. In addition, #25 pulverizer burner dampeners did not open due to the primary air shut off solenoid.

- On 12/24/2022, Unit 1 and Unit 2 Flue Gas Desulfurization (FGD) auto controls were not functioning properly due to manual dosing. A level transmitter froze on Reclaim Tank A that resulted in a low tank level. Both units were partially derated to minimum loading until the proper level could be re-established.
- On 12/24/2022, Unit 1 and Unit 2 experienced opacity spikes that led to partial derates due to ESP performance issues.
- On 12/25/2022, Unit 1 was partially derated due to frozen coal until the Plant could re-establish flow to the pulverizers.
- On 12/25/2022, Unit 2 experienced opacity spikes that led to curtailments due to ESP performance issues.
- 12/26/2022 through 12/27/2022, Unit 1 and Unit 2 experienced opacity spikes that led to curtailments due to ESP performance issues.
- On 12/27/2022, Unit 1 was curtailed due to the worsening condition of the clinker and slagging in the boiler along with the need to blow slag continuously due to declining ESP performance. The unit transitioned to all low sulfur coal because the high sulfur feed was frozen and led to pulverizer feeder trips due to the frozen coal.

See KPCO_R_AG-KIUC_1_2_Attachment1 through KPCO_R_AG-KIUC_1_2_Attachment6 for additional information. Please also see the Affidavit of Timothy C. Kerns, attached as Exhibit B to the Company’s July 21, 2023 Response to the Commission’s Show Cause Order, which provides additional details concerning the Mitchell Plant Winter Storm Elliott Preparation and Performance.

Witness: Timothy C. Kerns

INSPECTION REPORT

UNIT 2
ELECTROSTATIC PRECIPITATORS

AMERICAN ELECTRIC POWER
MITCHELL PLANT
MOUNDSVILLE, WV

Dates of Trip:
January 9 thru January 21, 2023

Prepared by:
Rick Arancio
Kirpal Barrientos
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Frank Chapman

Reviewed by:
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TRK Report # AEPMP230121

I. EXECUTIVE SUMMARY

TRK Engineering Services, Inc. was retained by AEP Mitchell Plant to inspect the Unit 2 electrostatic precipitators (Box 3 and Box 4), develop a punch list of mandatory repairs, document needed repairs and make recommendations after evaluating the findings. Work priority was established with the plant during a “kick-off” meeting prior to entering the unit.

The Wheelabrator design ESPs are from the 1970s and as such are showing age related wear. There are many internal components and moving parts that require routine maintenance and repair to keep the fields operating optimally. Unfortunately, with age these units can become high maintenance, particularly if neglected due to being over-sized. If a unit is oversized it will usually be capable of maintaining compliance with minimal maintenance, however this does not mean that maintenance should be ignored. This design is also not particularly maintenance friendly.

Review of the 12/27/2022 Unit 2 precipitator power readings indicated there were numerous fields out of service or operating poorly prior to the outage. In all, there were forty-six (46) of one hundred twenty-eight (128) sections (≈ 36%) that were either out-of-service, operating with low power levels or with questionable readings.

The goal for the January emergency outage was to restore as many of the compromised fields as possible. The focus began with the inlet fields then prioritized “lanes” requested by the plant. An extension in outage time allowed for inspections in all priority fields; inspection findings were limited to high priority items only. An example of these items includes fields that were shorted or near shorted due to issues such as broken discharge electrodes, broken collecting plate shock bars, full hoppers, and wire frame to collecting plate misalignment.

There are several issues affecting the performance of the Unit 2 precipitators. These include:

1. Gas Flow Distribution
2. Condition of Discharge Electrodes & Collecting Plates
3. Collecting Plate to Discharge Electrode Alignment
4. Rapping Systems
5. Corona Shield Failure and Internal Component Failure
6. Hopper Buildup

The precipitator was primarily inspected from the side access internal walkways above the hoppers. There is no top access. Close inspection of the upper regions requires climbing the high voltage frames between fields. This is generally only done where a better look is warranted based on observations from below. In several instances the knee brace level (Level 4) was utilized for a more detailed look at suspected irregularities. In a few instances, a climb to the upper support channel was made to assess the condition of components.

Unit 2 Precipitator System Description

The AEP Unit 2 electrostatic precipitator (ESP) system consists of two (2) side-by-side precipitators (ESP 3 & ESP 4) operating in parallel. The precipitators serve an 850 MW boiler. The dual chamber precipitators were designed and manufactured by Wheelabrator (installation circa late1970s).

Each precipitator has eight (8) 12’-6” fields in the direction of gas flow. The precipitators are one hundred twenty (120) gas passages wide (60 per chamber) with 12 inch collecting plate spacing. Each 12’-6” x 46’-5” collecting plate assembly is composed of eight (8) panels (CS strips). The eight panels that make up each 12’-6” collecting plate are tied together along the bottom with shock bars that impart the rapping force to the collecting plate. The shock bars are essentially two pieces of flat bar that sandwich the bottom of the collecting plates with a spacer on the leading edge and an anvil on the trailing edge. Each of the eight panels is bolted to the shock bar, creating a rigid member to which, rapping energy is transmitted. Rapping of the collecting plates at the bottom is done via internal hex-shaft mounted tumbling hammers driven by external motors.

The discharge system has four-point suspension, two points of suspension on the leading edge and two points of suspension on the trailing edge. The high voltage frames that hold the discharge electrodes are made of heavy angle iron. The discharge electrodes are the mast frame type. In each gas passage there are two (2) pipe frames; the upper frame is a 5-section 25’ frame, the lower frame is a 4-section 20’ frame. Each of the pipe frames are suspended from the high voltage frames at four (4) points. The upper attachment point of the pipe frames are “A-frame” hangers and the lower attachments points are “J-Bolts”. The “A-frame” hangers rest in notched sections of the high voltage frame and are bolted to the pipe frames. The J-Bolts are bolted to pre-drilled holes in the high voltage frames and to the pipe frames.

There are twenty-four (24) discharge electrodes in each 5’ section of the mast frames in the direction of gas flow. The discharge electrodes, or wires, are thin flat strips of steel with alternating barbs cut on the leading and trailing edges of the metal. The electrodes are welded to the mast frame sections to maintain electrical spacing and tautness. Each mast frame is trailing edge rapped by internal shaft mounted rapper hammers that are driven via a cam lift mechanism actuated from a top mounted (external) motor.

Each precipitator is eight (8) electrical bus sections wide (4 per chamber; 15 gas passages per bus). Each bus section has a dedicated power supply for a total of sixty-four (64) power supplies per precipitator. NWL PowerPlus 56 kW, 70 kVDC, 800 mADC high frequency power supplies have been installed on the 2nd and 4th fields. Conventional transformer-rectifier power supplies (TR Sets) are used on the remaining fields. All TR Sets are rated 102.8 kVA, 60 kVDC, 1200 mADC output. The TR Set AVCs (automatic voltage controller) are the Neundorfer MVC-4 Controllers, with a Neundorfer POS centralized energy management control system computer.

II. DISCUSSION OF MAJOR ISSUES

1. Gas Flow Distribution

Overall, the effectiveness of the gas flow distribution has been diminished by the condition of the perforated plates and buildup. Boxes 4A & 3B receive considerably more gas flow at higher velocities, particularly at the outboard edges. This is caused by the erosion of the upstream perforated plates, or lack of perforated plates in these sections. The remaining perf plate in these sections was found to be clean, due to the high flue gas velocities. The inboard Boxes, 4B & 3A receive much slower gas velocities. This allows for more accumulation of ash on the floors, and allows the panel perforations to become plugged. It is safe to assume that the precipitators are not seeing uniform gas flow distribution, which is affecting the performance of the boxes.

It is recommended to replace or repair damaged or missing perforated plates and to add rapping to the perforated plates to prevent them from plugging. It is also recommended that the gas flow distribution be evaluated due to the removal of the “egg crate” straightening vanes. An altered design of perforated plate may be able to achieve uniform gas flow distribution. All ash accumulation between the perf plates and on the inlet walkways should be removed. All construction materials and debris should be removed to prevent the hopper evacuation system from becoming plugged.

A flow model was completed by the plant in September of 2022. The report and recommended modifications should be reviewed and evaluated by TRK Engineering prior to making any changes.

2. Condition of Collecting Plates & Discharge Electrodes, HV Frames

a. Collecting Surfaces

The eight (8) collecting plate panels or strips that make up each 12’-6” collecting plate are tied together along the bottom with a shock bar (rapper bar) that imparts the rapping force to the collecting plate. The shock bars are two flat bars that sandwich the bottom of the collecting plates, with a spacer on the leading edge and an anvil on the trailing edge.

Damage to the shock bars is widespread throughout the precipitators. Many of these were broken, allowing the associated collecting plate to move laterally, creating a swinging ground. There were also shock bars that were partially broken, or previous repairs were failing. The damage to the shock bars is largely observed on the rapped edge of the collecting plates.

The shock bars are designed to move fore and aft on rapper impact, but many of the plates are bound at the anti-sneak baffle and unable to move on impact. This can bow the shock bar near the rapped end. There were also locations along the leading edge of the inlet and trailing edge of the outlet where shock bar movement was impeded by hardened ash buildup on the walkways. The result is fatigue and eventual failure of the shock bar and/or anvil.

There were also several locations where shock bars are bent and bowed across their width, which reduces the electrical clearance and lowers the sparkover threshold. These areas of bowing were observed near the hopper peaks, which suggests the bowing was caused by overfilled hoppers stressing the shock bars. The time of exposure and temperature of the hot ash resulted in permanent deformation of the shock bars and bowing of the collecting plate bottoms. The reduced clearances in these areas have promoted lower sparkover voltages.

There were also some locations where the CS hammer baffle or anti-sneak baffle is bowed to within 2-3 inches of the high voltage frames. There is usually a small flat bar that is welded near the top of the baffle sections to join adjacent baffles together. This flat bar is on the leading edge of the baffle and in some cases was causing premature sparkover to the discharge wire frames.

The collecting plate assemblies are made up of individual panels or strips. The hardware that secures the individual strips to the shock bars at the bottom was missing or loose in numerous locations. This reduces the transmission of rapper impact forces and results in poor cleaning of the individual strips. It can also create alignment issues. Numerous bolts were observed at an angle, indicating they were coming loose and would eventually fall out.

Holes were observed in the bottom of collecting plate panels, likely the result of prolonged arcing due to contact, or near contact, with the adjacent discharge electrodes/frames. These were generally confined to the plate panels/strips on the trailing edges. These had largely been addressed by stabilizing the plates and/or electrode frames and removing the adjacent discharge electrodes. There were a couple of locations where past repairs made to stabilize the plates had deteriorated and were promoting sparkover.

There were several places found where the collecting plate panels at the top of the field were disconnected and creating close clearances or grounds. These were generally found in the 1st (inlet) field, the field most exposed to the high gas velocities at the precipitator inlets. It is suspected that the high gas velocities caused chattering/vibration at the top of the collecting plates that resulted in wear to the top connection and the eventual failure of the connection. The condition of the collecting plate panels, the flat plate straps, and the hardware at the upper connection is a concern.

It is recommended that broken shock bars be repaired, any missing bolts be replaced and bowed/bent shock bars be straightened or replaced. Ideally, any damaged shock bars should be completely replaced because welded repairs tend to fail over time. This would require scaffolding of the hoppers to execute. All shock bars should also be freed up to allow some movement on rapper impact. Any hardened buildup on the inlet and outlet walkways that is restricting movement should be removed. Binding at the anti-sneak baffles along the rapped edge also needs to be addressed. In these locations, opposing angles should be welded to the back side of the baffle to provide a smooth transition as has been done in locations where previous repairs were made. A closer inspection of the top leading and trailing edges of the collecting plates in field 1 and along the leading edge of field 2 is recommended.

b. Discharge Electrodes & HV Frames

There were random broken discharge electrodes found throughout the precipitators at various frame levels. In some cases, these created an obvious ground. In other cases, they may not have created a dead short, but there was evidence of sparkover to the adjacent collecting plate. These were in need of removal. Given the age of these precipitators, more failures should be anticipated. There are also a considerable number of slackened discharge electrodes within the frames. These can oscillate in the gas stream and promote sparking. Those that are visibly loose and reachable should be cut out. Also, the welded connections between the electrode and the mast frame pipe tube have failed on a number of electrodes. These connections allow localized spit arcing and will eventually allow the electrode to swing freely. These should be removed to prevent grounding and to reduce sparking in the field.

There are a number of the discharge electrode pipe frames that have been damaged from repetitive spark-over and electrical erosion. These have mostly been repaired or stabilized in some manner. Future repairs should be made with round pipe members to avoid creating sharp edges that generate corona and sparking/arcing. There are many instances where the round pipe repair was not welded to the pipe frame. This can create spit arcing from the damaged pipe frame to the stabilization tube. All high voltage components must be securely attached at all ends. Any loose ends will generate spit arcing.

There were also numerous instances of J-Bolts that were completely detached from the pipe frames, or where the bolted connection at the pipe frame and/or high voltage frame angle iron had become loosened and rattled from spit arcing. In the instances where the J-Bolt failed completely, the failure is allowing lateral movement of the pipe frame, thus creating a swinging ground. The loose connections that are spit arcing will eventually lead to the same type of failures.

There is tie wire to the high voltage support insulators and rapper components that is still in place in most fields from previous repairs. The tie wire is not securely fastened to the high voltage frames and will generate spit sparking. All construction materials should be removed from the field after repairs have been made.

Broken discharge electrodes need to be removed, and any broken or otherwise damaged pipe frames need to be repaired/stabilized and all construction materials need to be removed after repairs are completed. All loose or broken J-Bolts need to be repaired.

3. Collecting Plate to Discharge Electrode Alignment

The collecting plate to discharge electrode frame alignment in many of the bus sections was off-center to varying degrees, mostly along the bottoms. This is the suspected result of support insulator replacements. The frames must be temporarily off-weighted during an insulator replacement and if they are not returned to proper elevation there will be a pendulum affect along the bottom. There were several locations noted where the lower alignment was badly off-center. In some cases, there is also skewing of the lower frames from leading edge (LE) to trailing edge (TE), likely due to unequal elevations of the four (4) support points. In these cases, the top support insulator nuts should be adjusted to properly align the HV frame at the bottom of the fields. The plant is currently using gasket material that is equaling roughly ½”. As this gasket material compresses over time, it will cause the fields to become misaligned. The correct gasket material (1/8”) should be used.

Misalignment of some of the individual pipe frames along the bottom is also apparent. This could be corrected by using the lower J-bolt to center the lower portion of the pipe frame in the gas passage. There are some bus sections where nearly all fifteen (15) of the J-bolts have been positioned at an angle to achieve lower pipe frame alignment. In general, this should be avoided because if all the lower frames in a bus section are off-center in a gas passage in the same direction it is very likely that the frames have not been properly adjusted from the support assemblies overhead. Misaligned J-bolts can also disturb rapper hammer to pipe frame anvil alignment. The J-bolts of a well aligned/level pipe frame assembly should be in-line with the pipe frames. This alignment of the J-bolts can be achieved by realigning the horizontal HV frames supports along the leading and trailing ends of the field. It was observed in many cases that the alignment of the Upper High Voltage pipe frame did not match the alignment of the Lower High Voltage pipe frame. This allowed for close clearances in the upper section, while the lower sections had good clearances. It is important to note that the entire electrical field will be spark limited by the worst electrical clearance in that field. It only takes one close clearance to limit the voltage.

There were also many locations in which the high voltage frame was out of alignment in the direction of gas flow. In these instances, the lower pipe frames were found to be only one to two inches away from the rapper anti-sneak baffles, promoting sparkover and reducing the overall performance of the electrical field.

Efforts could be made to improve the alignment in all sections of the precipitator, starting with those identified in the attached charts. This should be done before making any adjustments to individual frames using J-bolts. The J-bolts need routine inspection to make sure they are intact, tight, and properly oriented. Improved alignment would help attain improved power levels.

4. Rapping Systems – Collecting Surfaces & Discharge Electrode Pipe Frames

Material buildup on the collecting plates and discharge electrodes was light throughout the precipitator with the exception of the areas where the rappers were not operating or were not impacting.

a. Collecting Surface Rapping

Rapping of the collecting plates is via internal shaft mounted tumbling hammers driven by external motors. Rapping is done at the trailing edge of each field. There were many random rapper hammers missing or hammer brackets broken throughout the precipitator. There were also hammers that had shifted on the shaft and were not well aligned with the collecting plate shock bars; this caused them to strike the shock bar off center. There were a few others that were jammed, either wedged against the shock bar or walkway grating, or against the upstream baffles. This is largely the result of extensive wear of the hammer arms at the pivot point (hammer pin) where they are pinned to the hex shaft bracket (clamp). This wear is prevalent throughout the precipitator.

There are different types of hammer assemblies in use. Most are still the original cast iron or flame cut steel bracket type, but there are many locations where newer hammer assemblies that have plate steel type brackets/clamps are in use because the original type is no longer available. Some of the newer bracket/clamp halves had loosened up or bolts were missing, and the hammers were not well engaged on the hex shaft. Another issue with the newer brackets is that they allow only 6 positions, whereas the originals allow 12 positions. This prevents the newer brackets from being staged on the shaft according to the original design. Care must be taken when installing replacement rapper hammer assemblies to avoid too many hammers from impacting simultaneously; this can promote opacity spiking. This is particularly important at the outlet. It is also suspected that the newer brackets are not hefty enough for extended wear without loosening and becoming deformed.

Some isolated areas of material buildup on the collecting surfaces were found; it was not enough to create significant problems. These areas generally corresponded to rapper shafts that were not turning, missing rapper hammers and rappers that had shifted on the shaft so they were no longer impacting the shock bar anvil. Rapping effectiveness is impaired by shock bars that are bound and unable to move on impact. Most of the collecting plates were free to move, but there are some that are binding at the cut-out or guide slot in the anti-sneak baffle, and others that are restricted by hardened buildup on the walkways.

b. Discharge Electrode (DS) Pipe Frame Rapping

The discharge electrodes are the rigid mast frame type. In each gas passage there are two (2) pipe frames; the upper frame is a five (5) section 25’ frame, the lower frame is a four (4) section 20’ frame. Each frame is rapped by internal shaft mounted rapper hammers that are driven via a cam lift mechanism actuated from a top mounted (external) motor.

Like the collecting plate rappers, several missing rapper hammers from the upper and lower frame shafts were found. There were also a few loose rappers that had shifted out of position and were no longer impacting their anvils. There were also several locations where the entire shaft had shifted so that none of the rappers were impacting. Another widespread problem is with the lift mechanisms that actuate the rappers. Some of these were broken or had slop in them due to component wear. The result is either no lift or inadequate lift. Wear can occur at the lifting clevis (lift housing), the turnbuckles and/or the treads of the rods.

Many of the discharge rapper components show extreme wear and are out of alignment and tolerance. The rapper rods have bows and kinks in them and are off centered. This causes the rapper rods to wear into the adjacent components and wear away the rapper rods.

It was recommended that, during the outage, all missing DE rappers be replaced and all rappers/shafts be positioned as needed to impact the frame anvils squarely. The lifting mechanisms should be re-worked as needed, starting with those that are broken or visibly bowed over their length from sloppy (worn) connections. Any broken or worn lift rod components (rods, lift housings, pins, turnbuckles) should be replaced. Visual confirmation of rapper operation should be made prior to closing the precipitator at the end of an outage. The operational procedure is to de-energize the DS rappers with the rappers in the lifted position to aid in identification of inoperable DS rapper motors. This procedure was not followed in all instances during the outage.

The rapper issues found in the Unit 2 precipitators had a detrimental effect on the ESP performance. Many of the rapping issues directly caused grounding of one or more electrical fields.

5. Corona Shields and Internal Component Failure

Corrosion has jeopardized the structural integrity of internal components including sneak baffles, roof stiffeners, high voltage support tubes and corona shields.

Throughout the precipitators, the internal components on the hot roof are showing signs of corrosion, wear, and age. It should be anticipated that the compromised roof mounted internal components will continue to fail, grounding the electrical fields and causing risk of damage upon failure to internal components. Removal and reinforcement are the only solutions to these issues.

The plant has proactively started to replace sections of the hot roof. An overview of the completed sections is documented with the plant. The completion of this is encouraged during future outages, this work should be planned in conjunction with other priority outage work. Multi-tasking work can result in delays or cancellations when not planned accordingly.

It is recommended that the hot roof components be inspected at the beginning of the next outage to evaluate their condition. Time and resources should be allocated and budgeted to either remove or reinforce these components before failure occurs.

6. Hoppers

The hopper access doors were not yet opened during the inspection. The Inspection of the hoppers was made from the internal walkways above. The evacuation system was in service during the inspection. Many of the hoppers were clear to the throat, but there were many others that still had varying levels of material in them, including fields that were grounded due to high hopper levels. There were also hoppers that had fly ash on the walls or were rat-holed with material above the throats. Some hoppers had throat restrictions; accumulations on the butterfly valve, and foreign material blocking the throat.

A hopper chart was compiled and submitted showing locations of hoppers that had material or debris in them so that they could be addressed during the outage. Over-filled hoppers have contributed to bowed shock bars and elevated opacity.

Complications with the hopper level detection system were addressed during the emergency outage. The plant identified and worked to correct shutter operation, calibration and failed microchips in numerous cards.

The plant has completed a hopper heater inspection for Unit #2. The inspection report lists multiple findings, and time is needed to address and correct these issues.

Efforts need to be made to avoid over-filling the hoppers. All hopper evacuation valves and the operation of the system should be confirmed prior to startup. The lower hopper slope areas, the throat, and the upper valve could all be grit blasted clean to ensure good flow of flyash into the ash system. The slopes should all be scraped of all residual flyash, leaving no buildup on any hopper surface. All hoppers should be inspected by plant personnel and verified clear after all internal work is completed and before any doors are closed and locked.

III. SUMMARY COMMENTS & LONG TERM RECOMMENDATIONS

The Unit 2 precipitators (Box 3 and Box 4) are in poor condition physically. There is moderate corrosion damage to collecting plates and discharge electrode frames as well as age related issues (wear, fatigue) that are likely to continue. There are some collecting plates and discharge electrode frames with holes and/or damage to them as a results of poor clearances between plates and electrode frames; most of these instances have been stabilized. The vast majority of the plates are intact, but the lack of routine maintenance and quick repairs have created many issues that would need to be addressed to preserve the unit. Future maintenance and outage plans and attention to these areas will either aid in successful operations or result in operating at reduced operations with potential for necessary unplanned outages. Needed repairs are mostly along the bottom and involve the shock bars and missing bolts. Both the collecting plate and discharge electrode rapping systems need to be rehabilitated. The discharge electrode frames should be better aligned with the collecting plates. Broken discharge electrodes need to be removed entirely (multiple DE were found with a tail connected to the HV frames and/or wrapped around the HV frame), and any broken or otherwise damaged pipe frames need to be repaired/stabilized. Unfortunately, access for repairs can be challenging due to the scaffold requirements. A meeting should be planned with the plants safety department to discuss other options for scaffolding such as a tag line between girders that retractable lanyards could be connected to. Given the age of this unit, the necessity for repair work is likely to continue and could potentially accelerate. If or when that occurs, a rebuild part or all of the precipitator fields may be warranted.

Long Term Recommendations

Reliable precipitator performance into the future will require staying on top of maintenance and repairs. As the unit continues to age, there are likely to be more of the same issues that will develop. Unfortunately, this ESP design is high maintenance and neglect can result in reduced performance. For more reliable ESP operation and performance in the future, the following areas will need attention.

1. The Sparks Per Minute for all the AVC controllers with traditional TR sets were set to 10 and the Spark Set Back was set to 15%. Tuning for the AVC Controllers should be prioritized to preserve the internal components of the precipitator.

2. The perforated plates in all chambers should be repaired, and the addition of perforated plate rappers should be considered. Before modifications, a review of the flow study should be considered.

3. All sources of air inleakage should be addressed. These include holes found in the ductwork and/or precipitator casing, as well as the poorly sealing packing glands at the rapper penetrations. All door gaskets should inspected be replaced as needed during every outage to ensure proper functionality. Monthyly walkdown of the system should be made to identify and repair any air leaks found.

4. Collecting Plates/Surfaces – The top of the collecting plates need to be checked to make sure they are secure. Failure of the upper attachment points has been observed from the lower walkways at numerous points; however most of the needed repair to the collecting plates is at the bottom and involves the shock bars. Panels with upper attachment point failures should be removed to prevent grounds. Missing

shock bar bolts should be replaced and any broken, bent, or bowed shock bars should be completely replaced. Bound shock bars need to be freed up – replacement may be warranted. The addition of opposing angles at the openings in the anti-sneak baffles where the shock bars penetrate provide a transition and reduced wear related binding. Ideally, broken shock bars should be replaced rather than repaired.

Access to replace the shock bars would require scaffolding the hoppers. That can be a time consuming process. The Plant might consider a long term, progressive program whereby a number of bus sections or whole fields are rehabilitated during each outage as time permits. However, priority will always need to be given to locations where shock bars have broken to the point that they allow the associated collecting plate to move side-to-side.

Collecting plates that are found with ragged, sharp edges from arcing, or are no longer secured to the other panels and shock bars, should be replaced with segments of spare panels. The smooth surfaces will help discourage sparking and arcing activity.

5. Discharge Electrodes & Pipe Frames - Random breakage of discharge electrodes is likely to continue and could accelerate as the ESP ages. Broken discharge electrodes should be removed as encountered. Any pipe frame anomalies (broken, worn from arcing, bent, bowed, etc.) should also be addressed as encountered. J-bolts need to be intact and tight. Ideally, they should be oriented in line with the associated frame, although in some cases they are off at an angle to improve alignment. J-bolts should not be used to achieve alignment until efforts to align the frames from the suspension points are exhausted.

6. Collecting Surface to Discharge Electrode Alignment - Improving alignment would improve the potential for attaining higher power levels, which translates to improved performance. There were many sections of the precipitators that were poorly aligned, particularly along the bottom. A few were grossly out of alignment and undoubtedly limiting power. In almost all cases, disturbed alignment is the suspected result of changing broken support insulators and can be corrected from the support points.

7. Insulator Compartments & Insulators - The insulator compartments are formed by the structural box girders that support the collecting plates. The insulator compartments should be inspected during every maintenance outage. Insulators should be routinely cleaned. Any cracked or otherwise damaged insulators (holes, evidence of tracking) should be replaced. The support insulator heaters should be verified operational, and repaired/replaced as needed. The plant is currently using gasket material that is equaling roughly ½”. As this gasket material compresses over time, it will cause the fields to become misaligned. The correct gasket material (1/8”) should be used.

Ideally, the method of replacing the support insulators should be changed. Currently, when a support insulator is replaced, the weight of the field is temporarily suspended by the adjacent fields. Chain falls are used to pull the field up from the adjacent fields and the load is never lifted directly upward; there are always shear forces being exerted on all fields involved. This causes the alignments to fall out of tolerance. A lifting mechanism should be added to allow for support insulator replacement as found with other ESP manufacturers, where the field is lifted directly upwards. This allows for the alignment to be corrected and adjusted while not affecting the alignment of the adjacent fields.

8. Rapping of Collecting Surfaces and Discharge Electrodes – Missing CS Rapper hammers should be replaced as found. Any hammers found to be misaligned need to be repositioned appropriately. DS Rapper shafts that are bent and bowed should be replaced to prevent catastrophic failure. DS cam systems, which have slipped out of alignment, need to have linkage components replaced as the internals have worn and are allowing the shaft assembly to shift. The Standard Operating Procedure should always be followed to identify rapper drive systems that are not functioning correctly.

   Most of the rapper hammer assemblies (original) are badly worn where they are pinned to the shaft clamp. Progressive replacement of the hammers on a field-by-field basis should be considered.

9. Internal structural components and baffles should be inspected and reinforced where necessary. These components have been found loosely secured on the upper HV frames and easily removed from the ESP casing with little effort exerted. These items have the ability to ground the electrical fields upon failure. Most Western style corona shields are typically 12” in height or less. The corona shields installed here are 35” in height. The girder box itself creates a 10” smooth surface, which can act as a corona shield without the potential for falling onto the high voltage frame and grounding the field. It is recommended that weakened or failing corona shields be removed and not replaced, and that the edges at the girder boxes be ground smooth to discourage sparkover. Additional time and resources should be allocated during the next outage to identify and correct possible failures of structural components at the hot roof.

10. Hoppers – Efforts should be made to keep the hoppers free of excessive buildup. This includes making sure all insulation is intact. It was noted during the inspection that some of the insulation blankets used on the lower areas were partially detached. This can result in localized cooling of the hopper wall(s), which promotes buildup and corrosion. Hopper heater operation should be verified. The operation of the hopper vibrator should also be verified along with the coordination between the gate valve operation and evacuation.

Attachments:

1. AEP Mitchell Unit 2 Box 3 & Box 4 Precipitator Field Charts (by section) (Submitted to plant at the completion of the inspection)
2. Inspection Photographs
3. Pre-outage Power Readings from 12-27-22
4. Post-outage Power Readings from 01-21-23

ATTACHMENT 1

AEP Mitchell Unit 2 ESP Box 3 & Box 4 Field Charts

(By bus section)

AEP MITCHELL STATION – UNIT 2 ESPs
FIELD CHART NOMENCLATURE

Fields shaded RED:	Grounded fields or section out of service from unknown reasons from operational power readings preoutage.
Fields shaded YELLOW	Fields with poor power from operational power readings preoutage.
Work details GREEN	Work that was reviewed by TRK Engineering inspectors.

SYMBOLS

CE/CS: Collecting Surface / Plate
DE/DS: Discharge Surface Electrode Wire
LDS: Lower Discharge Electrode System
UDS: Upper Discharge Electrode System
HV: High Voltage
GP: Gas Passage
LE: Leading Edge (direction of gas flow)
TE: Trailing Edge (direction of gas flow)
SB: Shock Bar

AEP MITCHELL UNIT #2 - BOX #3 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
3-11A	3-21A	3-31A	3-41A
Full Hopper -Remove CP 16 Painted blue -Shock Bar Plate 15, 11, 10 replace -GP 15, LE, remove broken wire, lower mast, accessible from catwalk.	Full Hopper -GP 7, TE, Lower Mast, Broken Wire UE -TR SET Troubleshoot No Secondary E10583356 -Shock Bar 10 warped, replace. -Shock bar 13, repair.	-Repair Rapper rod insulator	-HV rappers not working, build up on wires roughly 5” -Shock bar 14 and 10, repair. -GP 15, LE, repair broken HV lower mast, bottom.
WALKWAY			
Hot roof replaced. -GP 3, remove glove UE - CP 5, trim HV bar at orange mark -CP 9 shock bar, repair and replace hammer.	**Hot roof replaced.** **Full hopper** -Shock bar CP 16, 14, 10, 7, 3, repair. -GP 2, LE, upper mast, HV align bar repair	**Hot roof replaced.** **Full hopper** -Shock bar CP 14, repair.	**Hot roof replaced.** **Full hopper** -Aligned Field - UE -Shock bar CP 12, 11, 5, 4, repair.
3-12A	3-22A	3-32A	3-42A

AEP MITCHELL UNIT #3 - BOX #3 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
3-13A	3-23A	3-33A	3-43A
Hot roof replaced. -Voltage Divider - UE - Alignment bar Repair needed GP 9 LE, upper mast, and GP 15, TE. -Weld or replace CP 15 and 4 shock bar.	**Hot roof replaced.** -GP 6, upper mast, LE, align bar repair UE -GP 8 and 11, TE, upper mast, align bar repair - UE - Shock bar CP 16, 8, 2, repair.	**Hot roof replaced.** **Full hopper.** -CP 13, repair, anvil.	**Hot roof replaced.** **Full Hopper.** **-GP 8, LE, upper mast, HV alignment bar, repair.** **-GP 1, TE, lower mast, out of clip UE** **-GP 1, TE, upper mast, out of clip UE** **-GP 2, LE, upper mast, out of clip UE** **-GP 9, lower mast, middle, broken wire UE** **-GP 1 TE, upper mast out of clip UE** **-CP 6 shock bar, repair** **-Hammer baffle, repair**
WALKWAY			
Hot roof replaced. **Full Hopper.** -GP 4 LE, Lower Mast, remove welding rod - UE	**Hot roof replaced.** **Full Hopper.** -GP 10, LE, Lower Mast, Broken Wire UE -GP 13, LE, Upper Mast, Alightment Bar repair -GP 3, 4, 9, 10, LE, Upper Mast, HV alignment bar, repair -ALIGNMENT NEEDED	**Hot roof replaced.** **Full Hopper.** -GP 10, LE, Upper Mast, Alignment Bar, repair	**Hot roof replaced.** -GP 4, 5, upper mast, LE, HV alignment Bar repair -CP 5, 11 shock bars, repair -Alignment needed
3-14A	3-24A	3-34A	3-44A

AEP MITCHELL UNIT #2 - BOX #3 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
3-15A	3-25A	3-35A	3-45A
Full Hopper.	**Full Hopper.** -GP2, LE, Lower Mast, Broken Wire - UE -Repair hammer baffle -CP 2, upper section, remove all failed panels -CP 3, upper section, remove all failed panels -GP 2, remove upper mast		
WALKWAY			
		-Aligned Field - UE -GP 5, TE, Upper Mast remove bundle of wire. -GP 3, 4, 7, 8, 13, TE, upper mast, HV alignment bar repair -GP 15, LE & TE, upper mast, HV alignment bar repair -Repair hammer baffle	Aligned Field - UE
3-16A	3-26A	3-36A	3-46A

EP MITCHELL UNIT #2 - BOX #3 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
3-17A	3-27A	3-37A	3-47A
			-CP 12, 13 shock Bar, repair
WALKWAY			
			-CP 11 shock bar, repair
3-18A	3-28A	3-38A	3-48A

AEP MITCHELL UNIT #2 - BOX #3 B-Side

Section 5: GP 1→15	Section 6: GP 1→15	Section 7: GP 1→15	Section 8: GP 1→15
3-11B	3-21B	3-31B	3-41B
	Full Hopper.	**Full Hopper.**	**Full Hopper.**
- CP 1, trim plate, LE, Low priority - GP 4, LE, Broken wire, upper mast - UE - Top Wires Collecting Ash, Dirty, clean - Plates in poor condition - Broken Shock Bar 1, 2, 4, 6, 11 EFAB -Alignment needed	-Top wires are dirty, -Shock Bar CP 11, 9, 2, Repair - Replace hammer for CP 8 - next outage -Reposition hammer baffle for better clearance -CP 6, 11 trim TE Low priority -Alignment needed	-GP 8, Lower Mast, Broken Wire - UE - Repair shock bars 12, 11- EFAB	-GP 9, top of the bottom mast, remove piece of wire. UE -Remove Tie Wire between CP 9 and 10, bottom UE -GP 15, TE, Build up at hopper crotch ~2" to HV Frame
WALKWAY			
-Hot roof replaced. **-Full Hopper.** **-BOTTOM HAMMER MOTOR IS NOT WORKING DUST ON ALL THE HAMMERS FOR WHOLE A ROW**	**-Hot roof replaced.** **-Full Hopper.** **-BOTTOM HAMMER MOTOR IS NOT WORKING DUST ON ALL THE HAMMERS FOR WHOLE A ROW**	**-Hot roof replaced.** **-Full Hopper.** **-BOTTOM HAMMER MOTOR IS NOT WORKING DUST ON ALL THE HAMMERS FOR WHOLE A ROW**	**-Hot roof replaced.** **-Full Hopper.** **-BOTTOM HAMMER MOTOR IS NOT WORKING DUST ON ALL THE HAMMERS FOR WHOLE A ROW**
-Repair shock Bars - GP 1, Lower Mast, TE, Broken Wire - UE -GP 15 repair HV square arm, upper mast (Fixed UE) - GP10, TE, bottom of top HV, piece of wire 3" from plate - UE -Aligned Field -UE -Replace hammer for CP 9- next outage	-GP 15 repair HV square arm, upper mast -Cut/ Trim, CP 2, 11, Low priority -Repair shock bars EFAB	-Aligned Field - UE	- Ash Buildup on wires - Repair Shock Bars ENERFAB
3-12B	3-22B	3-32B	3-42B

AEP MITCHELL UNIT #2 - BOX #3 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
3-13B	3-23B	3-33B	3-43B
-Hot roof replaced. -CP 12 and 13 need cut/ trimmed -Repair Shock Bars -TR SET Troubleshoot No Secondary E10583358	**-Hot roof replaced.**	**-Hot roof replaced.** **-Full Hopper.** -GP 8, TE, Lower Mast, Broken Wire - UE -Needs alignment (LE)	**-Hot roof replaced.** **-Full Hopper.** -Alignment Needed
WALKWAY			
-Hot roof replaced. **-Full Hopper.** -Repair multiple broken HV Alignment Bars - UE	**-Hot roof replaced.** **-Full Hopper.** -Needs alignment (TE)	**-Hot roof replaced.** **-Full Hopper.** -Remove broken corona shield, GP13, TE -GP 3, 4, 13, LE, Lower mast, Broken wire -GP 3, TE, lower mast, broken wire UE COMPLETED	**-Hot roof replaced.** -GP13, LE, remove discharge electrode completely -GP15 remove string at upper HV frame -GP12, upper mast, remove glove -Removed coveralls - UE -Repair shock bars
3-14B	3-24B	3-34B	3-44B

EP MITCHELL UNIT #2 - BOX #3 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
3-15B	3-25B	3-35B	3-45B
		-GP 1, 2, TE, upper mast HV Alignment bar broken -GP 9, lower mast, HV align bar broken - UE -Voltage Divider - UE -Pull Hammer baffle north, move square tabs to north side of baffle plate	
WALKWAY			
-GP 1,2, (LE Lower) and 5 (TE Upper) HV Alignment Bar repair UE -Lower Leading, HV Alignment Shifted towards door - UE -Voltage Divider -UE -Aligned lower hammers - UE -Alignment needed	-GP 10,11,12, TE, Broken Wires - UE -Alignment needed	-GP 15, LE, Remove MIG wire, Lower mast- UE -GP 15, HV alignment bar repair - UE -GP7 TE, Upper mast, broken wire - UE -GP4, LE, upper mast, HV alignment bar, Repair - UE -Field Aligned - UE	-GP 3-9 Remove steel plate at top of upper HV mast, LE- UE -GP 1, 6, upper mast, HV align bar repair - UE -GP7, TE, upper mast. Broken wire - UE -GP5, lower mast, broken wire - UE -Lower HV alignment shifted toward LE - UE
3-16B	3-26B	3-36B	3-46B

AEP MITCHELL UNIT #2 - BOX #3 B-Side

Section 1: GP 15←1	Section 2: GP 15←1	Section 3: GP 15←1	Section 4: GP 15←1
3-17B	3-27B	3-37B	3-47B
-NO KV - Signal Issue -GP 1, 2, Lower Mast, LE, HV alignment bar repair - UE -J-Bolt Replaced still need welded-UE -Aligned Field - UE -TE, CP 11, 12, 13, 14, 15, 16 - repair & stabilize SB	-GP 1, LE, Upper mast, Broken Wire.	-NEEDS ALIGNMENT	-Field in Poor Condition -GP 10, 11, 12, TE, upper mast, broken Wires - GP 3, TE, upper mast, broken Wires -CP 16, remove/ secure plate LE & TE -3-48B TR is powering this field
WALKWAY			
-CP 12, 13, 15 shock bar - Remove nine wire, upper mast, TE		ABANDON	ABANDON
3-18B	3-28B	3-38B	3-48B

AEP MITCHELL UNIT #2 - BOX #4 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
4-11A	4-21A	4-31A	4-41A
-Ice Troubleshoot TR set E10251943 -CP 2, shock bar repair	-Alignment needed -GP 15, pull hammer baffle away from DE mast -GP 15, trim modified lower mast, LE	-TR set Trips Internally - ICE E105833375 -Shock bar CP 3, repair	-Shock bar CP 9, repair -GP 1, LE, Lower mast, broken wire -GP 1, LE, upper mast, broken wires (multiple)
WALKWAY			
Full hopper. -GP 8, TE, upper mast, broken wire - UE -Broken Hammer baffle TE, arcing to DE, Repair - ENERFAB - Correct Alignment on Lower HV Frame, TE ~ 2" of clearance - UE - Repair broken shock bar, CP 1	**Full hopper.** -Shock bar CP 11, repair EFAB -GP 8, LE, Lower Mast, Broken Wire -Replace support insulator, Northeast	-Shock bar CP 3, 9, 16, repair -GP 5, TE, upper mast, Broken Wire -GP 6, TE, upper mast, broken wire -Alignment Needed -Hammer baffle Repair	-GP 15, upper mast, out of clip, TE UE -GP 13, 14, A-frames fixed, LE- UE -CP 8, 9, 10 - remove pieces of plate, visible signs or arcing. -GP 15, upper mast, broken wires, LE & TE -GP 15, lower mast, broken wires, LE & TE -GP7, upper mast, TE, broken wire -TE, hammer baffle, close clearance, GP 1-5, relocate.
4-12A	4-22A	4-32A	4-42A

AEP MITCHELL UNIT #2 - BOX #4 A side

<table>
<tr><th>Section 1: GP 1→15</th><th>Section 2: GP 1→15</th><th>Section 3: GP 1→15</th><th>Section 4: GP 1→15</th></tr>
<tr><td>4-13A</td><td>4-23A</td><td>4-33A</td><td>4-43A</td></tr>
<tr><td>Full hopper.
-GP 10, LE, upper mast, broken wires UE
-GP 9, LE, lower mast, broken wire UE UE
-Shock bars, repair</td><td>Full hopper.
-Removed Wires - UE
-Shock Bars, repair</td><td>-GP 2, LE, Lower Mast, Broken wire
-CP 5, LE, Broken Support clip, panels 1-4</td><td>-ICE TROUBLESHOOT TR set E10421575
-Piece of CP strung across lower mast, LE, remove
-CP 12, LE, Remove first panel</td></tr>
<tr><td colspan="4">WALKWAY</td></tr>
<tr><td>-GP 8, 9, LE, Upper mast, broken wire
-GP 3, 5, 6, 8, repair HV align bar upper
- GP 1, TE, Upper Mast, HV alignment bar, repair - UE
-Shock Bars, repair
-CP 1, TE, Remove, 1st panel EFAB
-Repair hammer baffle
-Alignment needed</td><td>-Shock Bars, repair</td><td>-NEEDS ALIGNMENT</td><td>-Removed Wires - UE
-GP 1, LE, Broken Shock Bar, Repair ~1" clearance
-GP 8, 12, 13, TE, add stiffeners to lower mast support/gusset
-Shock Bars, repair</td></tr>
<tr><td>4-14A</td><td>4-24A</td><td>4-34A</td><td>4-44A</td></tr>
</table>

AEP MITCHELL UNIT #2 - BOX #4 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
4-15A	4-25A	4-35A	4-45A
Full hopper. -GP 15, LE/Middle, upper mast, broken wires - UE -GP 13, LE, lower mast HV Gusset Bolt Missing, repair UE -CP 16 remove entire Panel High Priority – ENERFAB -GP 15, remove broken wires, upper & lower mast. -Aligned Field - UE -Shock Bars, repair	**Full hopper.**	-Aligned Field - UE -GP 12, 9, TE, Add stiffener to upper mast support/gusset. GP 13, TE, Upper mast, HV alignment bar repair. SCAFFOLD NEEDED	Removed Wires - UE
WALKWAY			
-GP 14, LE, upper mast, broken wire -GP 13, 15, TE, Up mast, broken wire -GP3, middle, upper mast, broken wire -ICE TROUBLESHOOT TR set E10421574		-ICE TROUBLESHOOT TR set , trips within several minutes E10440084 -NEEDS REALIGNMENT	-Shock Bars, repair
4-16A	4-26A	4-36A	4-46A

AEP MITCHELL UNIT #2 - BOX #4 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
4-17A	4-27A	4-37A	4-47A
-GP 15, LE, lower mast, remove wire -GP 15, LE , lower, remove thin wires-UE - GP15, LE/TE, upper mast, remove broken wires - NEED SCAFFOLD -Repair Hammer baffle -Realign Frame -GP 15, LE, Remove Stub for wire	-GP 11, LE, upper mast, broken wires -GP 10, TE, lower mast, broken wires -GP 10, upper mast, ~9 wires broken, LE & TE -GP 9, upper mast, broke wires ~7, LE&TE -GP 11, upper mast, broken wires -GP 13, up, HV, TE, Alignment bar -CP 13, TE, repair, swinging panel -Repair hammer baffle -Realign frame	-TR SET Troubleshoot E10583353	-Shock Bars, repair
ALKWAY			
-Remove GP 15 upper/ lower mast -GP 13, repair lower mast J Bolt- UE -GP 11, middle, upper mast, broken wire - UE -GP 14/15, upper mast, broke wires UE DOUBLE CHECK -TR SET ISSUES ICE E10332507 -Shock Bars, repair	-GP 11, removed 9 wire lower mast - UE -GP 5 remove glove, lower mast - UE -GP 7, lower mast, broken wire - UE -ICE - TR set keeps tripping "Int Trip." E10363090 -Alignment needed	-ICE TR set Troubleshoot E10303411 -Aligned Field - UE -Shock Bars, repair	-Aligned Field - UE -Removed Wires - UE -Shock Bars, repair
4-18A	4-28A	4-38A	4-48A

AEP MITCHELL UNIT #2 - BOX #4 B-Side

Section 5: GP 1→15	Section 6: GP 1→15	Section 7: GP 1→15	Section 8: GP 1→15
4-11B	4-21B	4-31B	4-41B
Full hopper. -CP 16, TE, Plate bad, repair/remove -GP 13, Lower mast, LE, Broken Alignment Bar, repair -Removed Wires - UE -Shock bar CP 12, 2, repair -TR set Trips Internal ICE E10576801	**Full hopper.** -GP 10, trim, LE square tab on hammer baffle -Shock bar CP 2 weld or replace -TR set Trips Internally - ICE E10576805	**Full hopper.** -GP 5, 7, 9 , 10 , TE, Upper Mast, Broken Wire - UE -CP 1 shock bar, repair -GP 14, LE, Upper mast, HV Alignment Bar, Repair - UE -TR set Trips Internally - ICE E10576804	**Full hopper.** -GP11, Lower Shock bar bad, Remove Hammer - ENERFAB -GP 9, 10, 11, Middle Upper Mast, Broken Wire (9), Wires (10 and 11) Respectively. - UE -GP 10, LE, Lower Mast, Broken Wire- UE -TR set Trips Internally - ICE E10576802
WALKWAY			
-GP1, upper HV, out of the clip, TE- UE -GP2, upper mast, LE, HV alignment Bar repair- UE -GP3, upper mast, LE, HV align bar repair - UE -Aligned Field - UE -Check bottom rapper motor, appears its not working, hammers have dust -CP 3.4 shock bar repair	-GP1, Upper HV mast, out of clip, LE - UE -Aligned Field - UE -Shock bar CP 1, 3, 15, 16, repair -ICE - troubleshoot TR Set Fan -GP4, TE, upper mast HV alignment bar	-CP 8, Remove Panel, TE -Shock bar CP 7, 13, 14, 15, repair	-ICE - troubleshoot TR Set E10421577 -Aligned Field - UE -Removed Wires - UE
4-12B	4-22B	4-32B	4-42B

AEP MITCHELL UNIT #2 - BOX #4 B-Side

Section 5: GP 1→15	Section 6: GP 1→15	Section 7: GP 1→15	Section 8: GP 1→15
4-13B	4-23B	4-33B	4-43B
		Full hopper.	**Full hopper.**
-Upper HV Mast is tied together with a scaffold pipe between 4-23B and 4-13B, 4th door - BRAND -Aligned Field - UE -Shock Bars, repair	-Upper HV Mast is tied together with a scaffold pipe between 4-23B and 4-13B, 4th door - BRAND -ICE troubleshoot TR set, Instantaneous trips - E10226629 -Shock Bars CP 14, re-bolt lower shock bar	-TR SET Troubleshoot E10583355 -Shock Bars, repair	-Shock Bars CP 9, repair
WALKWAY			
Full hopper.	**Full hopper.**		
-GP2, LE and TE, upper mast, out of the clip -GP 1, LE and TE, upper mast, out of the clip -Shock Bars, repair -TR SET Leaking Oil – ICE E10335807	-Aligned Field - UE	-ICE - troubleshoot TR Set Fan E10303415 -Aligned Field – UE -Remove Glove, GP9, LE -Remove Rag/debris GP 2, LE	
4-14B	4-24B	4-34B	4-44B

AEP MITCHELL UNIT #2 - BOX #4 B-Side

Section 5: GP 1→15	Section 6: GP 1→15	Section 7: GP 1→15	Section 8: GP 1→15
4-15B	4-25B	4-35B	4-45B
Full hopper. -Shock Bars CP 2, 5, 12, repair	**Full hopper.** -Aligned Field - UE	-GP 11, LE, upper mast, Broken Wire - UE -ICE - troubleshoot TR Set E10583357 -Voltage Divider Replaced - UE -Aligned Field - UE	
WALKWAY			
-Aligned Field - UE -Removed Wires - UE	-ICE TROUBLESHOOT E10303414 -Removed Wires - UE	-TR SET Troubleshoot E10583351 -Removed Wires - UE	
4-16B	4-26B	4-36B	4-46B

AEP MITCHELL UNIT #2 - BOX #4 B-Side

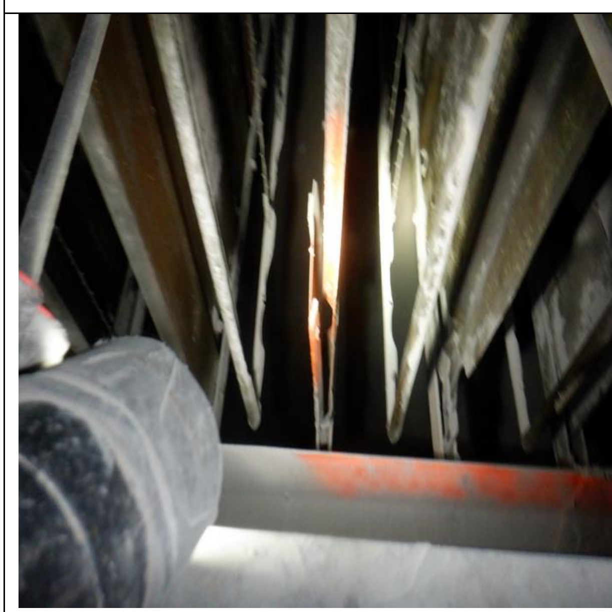
Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
4-17B	4-27B	4-37B	4-47B
-TR SET Troubleshoot E10583354 -Aligned Field - UE -GP 6, TE, Low, Broke Wire -TE, Hammer baffle, close GP 1-5 -GP 1, LE, upper mast, broken align bar, repair -GP 2, LE, upper, broken hv align bar repair -GP 3, LE, lower, HV alignment bar repair - CP 10, 11, 12, 13, 14 shock bars, repair	-Shock Bars, repair	-Aligned Field - UE	-Aligned Field - UE
WALKWAY			
-Aligned Field - UE -Removed Wires - UE -Shock Bars, repair	-TR SET Troubleshoot E10583352 -Aligned Field - UE -Removed Wires- UE	-Removed Wires – UE -Aligned Field - UE	-Aligned Field - UE -Removed Broken Wires- UE
4-18B	4-28B	4-38B	4-48B

ATTACHMENT 2

Photographs

Above: General view depicting the hammers and fields. Observe on the right-side picture the high voltage mast is leaning toward the plate.
Below: A lot of damage was found on the bottom of the collecting plate panels. During this outage the collecting plate panels were stabilized so they would not swing during operation. In the future, a patch plate needs to be installed in these areas.

Above/Below: More photographs of fields with damaged collecting plate panels along the bottom of the fields.



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Above Left: Collecting plate damage along the hot roof by collecting plates and collecting plate angle, which holds the panels. Also damage along the tops of the panels. It appears as though the hot roof has been repaired in these areas, however the panels need to be stabilized and patch plates need to be installed. None of this was done during this outage.
Above Right/Bottom: More photographs of collecting plate panel damage along the tops of the fields. Most of this damage has occurred due to hot roof leaks.

Above Left: Another picture of collecting plate damage and holes along the tops of the fields.
Above Right: Many of the outside collecting plates against the walls were found with a lot of damage. A few of these were removed during this outage and a few were stabilized using pieces of flat bar to prevent the panels from moving and causing shorts or close clearances.
Below: Collecting plate hammer baffles in many locations were found bent toward the high voltage frames. These were causing close electrical clearances and spark damage. Observe the rigid mast pipes. During this outage, when the baffles were found bent, time was spent straightening the baffles to improve the electrical clearance over to the high voltage. Once these areas were repaired and the baffles were pulled back as much as possible, the alignment was checked again. If electrical clearances were not acceptable from the high voltage to the baffle, the bottom of the high voltage would be adjusted to move it away from the hammer baffle.

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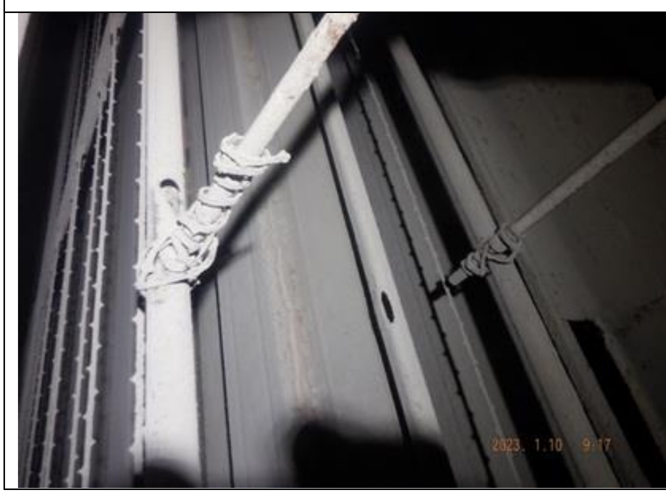
Above: More broken collecting plate hammer baffles causing a close electrical clearance.
Below Left: The tabs, which hold the baffles together on the collecting plate hammers, stick out toward the high voltage. This is causing a spark point. When repairs are made in the future, the tabs should be put on the back of the baffle so a sharp point is not sticking out to the high voltage.
Below Right: An example of damage on a collecting plate causing a close electrical clearance; these panels were removed.

All: Excessive foreign debris was found in thee ESPs including gloves, rags, and tie wire. It is not known for sure but it is suspected most of the debris was from previous outages. During this outage, FME practices were emphasized and observed to improve as the days went on.

Above Left: A piece of a collecting plate panel was found laying on a field. The piece of plate was sitting on the high voltage and touching the collecting plates, grounding out the field.
Above Right: More tie wire found in a field causing a close electrical clearance. **Below Left:** A piece of scaffold was found tied between two electrical fields.
Below Right: Tie wire holding an alignment bar to the high voltage mast. This was found in many areas of the ESPs. The worst areas, which were loose and would cause a close electrical clearance or a ground, were repaired during this outage. More time needs to be spent making repairs in these areas.

Above / Below left: More areas where tie wire was used to hold rigid mast pieces together. The photograph on the left is either causing a close electrical clearance or a ground.
Below Right: Quick repairs on a broken piece of rigid mast. In the future these areas should be replaced with split pieces of pipe and rewelded over the bad areas. The alignment bar can then be properly repaired.



Above: Many areas along the tops of the electrical fields were found with dirty wires. This could be due to air in leakage along the tops of the fields, poor rapping, or even low floor. These were not cleaned during this outage.
Below: Example of fields with broken wires. These wires are either shorting the fields or causing poor power readings.

Above Left: A broken wire between two fields.
Above Right: A broken wire in a higher section of the field. Many areas where broken wires were found were up high and scaffold was required to access them.
Below Left: Broken high voltage mast support piece. These pieces allowed the masts to float toward the collecting plates in the higher sections causing close electrical clearances or a ground.
Below Right: Example of a high voltage support angle knocked from the alignment bar. This was put back in place. This also causes a close electrical clearance or a ground. It is suspected that this occurred from overfilled hoppers.

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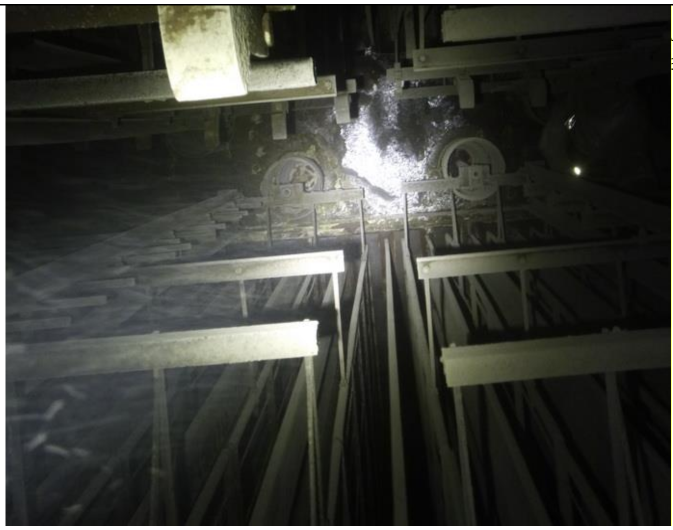
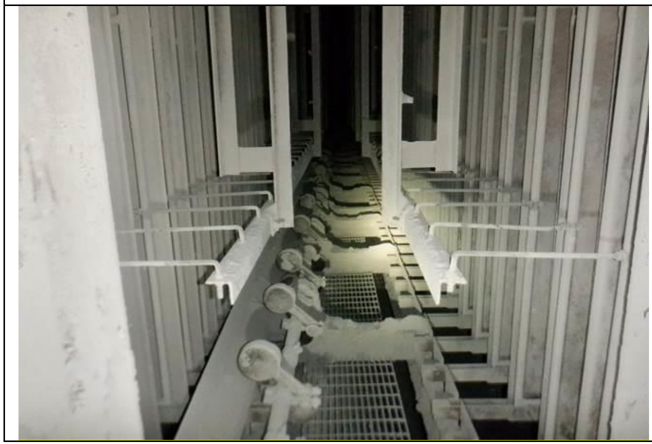
Above Left: Another field where the high voltage angles for the rigid masts are out of position. Again, it is suspected that this is occurring from over filled hoppers.
Above Right: A high voltage rigid mast touching a collecting plate causing a short. This is a result of one of the high voltage support pieces being broken and out of position.
Below Left: Another high voltage support bent out of position.
Below Right: A corona shield that has fallen off the roof and is shorting out a field.

Above: More corona shields that had fallen from the hot roof. These issues are occurring due to air in leakage along the roof, which is causing corrosion problems.
Below Left: A photograph of the girder box area after a corona shield had been removed.
Below Right: A full hopper grounding out a field. The plant had issues with their ash removal system and newly installed nuclear level detectors for a period of time prior to this outage. The plant was still working on the nuclear level detector system when TRK Engineering had departed the site.

	
Above Left: Another area with a full hopper causing a grounded field. **Above Right:** Dampness on the roof above. **Below Left:** A view of hammers and shock bars on the non-rapped side. **Below Right:** Example of damaged shock bars.	
	

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Above/Below Left: There were many damaged shock bars identified during this outage. The only repairs the plant typically performs is to change the anvil piece and weld the side piece of the flat bar back to that piece. There were not enough repair anvil pieces to change all of the broken shock bars that were identified. Instead, only the worst areas were replaced with new anvil pieces and repairs were made in all other areas by pulling the broken pieces of the shock bars in and welding them in place. Both of these repairs are temporary. Plans should be made to replace all shock bars starting with the inlet fields and then moving out to the second field. Hoppers will need to be scaffolded in order to do this. This repair effort should be done systematically.

Bottom Right: Many problems were identified with the collecting plate hammers. There are a significant amount of hammers missing and worn bearings. There are also two different styles of hammers installed.

Above: Example of missing collecting plate hammers. Plans should be made to replace all missing hammers. The plant should also go back to the old style cast hammer clamps shown above; they allow for more positioning.
Below Left: Example of a worn out bearing.
Below Right: A photo of the high voltage hammers.

ATTACHMENT 3

Pre-Outage Power Readings

Date/Time	Device	Precip Load	Precip Opacity
Dec 27 2022 13:00:00	U2Precip	579	10.7

Device	Prim Amps	Prim Volts	SCR Angle	Sec KVa	Sec KVb	Sec MilliAmps	Sparks
3-11A							
3-12A							
3-13A							
3-14A							
3-15A	17.5	147.2	27	26.2	0	58.7	49
3-16A	35	138.6	36	23.8	0	137.5	23
3-17A	131	254.6	76	32.2	0	708	15
3-18A							
3-21A	22.9	169.5	39	32.3	0	81.9	49
3-22A							
3-23A	26.2	141.4	39	27.3	0	105.2	50
3-24A							
3-25A							
3-26A							
3-27A	101	221	61	28.1	0	502.5	17
3-28A	169	264.6	83	32.4	0	947.8	5
3-31A	30.6	186	45	32.1	0	121.9	49
3-32A							
3-33A	143	282.1	88	35.3	0	821.5	39
3-34A							
3-35A	171	250.6	50	29.6	0	695.7	6
3-36A							
3-37A	176	288.9	88	37.9	0	1018.4	1
3-38A	178	291.2	89	35.1	0	1038.1	0
3-41A	16.2	145.5	34	42.3	0	54.7	50
3-42A							
3-43A	14.9	114.4	27	21.4	0	47.1	50
3-44A							
3-45A	13.5	100.7	23	21.4	0	39.7	55
3-46A							
3-47A	104	243.4	77	31.5	0	704.9	18
3-48A							
3-11B							
3-12B							
3-13B	16.6	167.2	36	31.6	0	55.8	37
3-14B							
3-15B	147	285.5	85	37.1	0	812.9	3
3-16B							
3-17B							
3-18B	177	277.8	87	33.6	0	1011.1	1
3-21B	0	0	0	0	0	0	0
3-22B							
3-23B	44.6	210.4	50	32.9	0	193	39
3-24B							
3-25B	164	292.7	89	35.2	0	935.4	30
3-26B							
3-27B	164	270.4	83	32.9	0	932.8	11
3-28B	177	285.1	97	35.1	0	1061	1
3-31B	0	0	0	0	0	0	0
3-32B							
3-33B	26.3	191.5	43	32.9	0	101.7	49
3-34B							
3-35B	0	0	0	0	0	0	0
3-36B							
3-37B	67.4	190.4	56	28.1	0	310	17
3-38B	27.8	103.7	30	19	0	102.7	12
3-41B	0	0	0	0	0	0	0
3-42B							
3-43B	21.2	162.9	39	30.3	0	76.6	49
3-44B							
3-45B	123	260.7	75	33.3	0	633.1	27
3-46B	56.7	156.9	46	23.4	0	251.6	22
3-47B							
3-48B	178	88	57	0	0	1032.3	0
22	GOUNDED						
	NWL HIGH Hz						

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Device	Prim Amps	Prim Volts	SCR Angle	Sec KVa	Sec KVb	Sec MilliAmps	Sparks
4-11A	31.1	184.3	44	31	0	125.2	49
4-12A							
4-13A							
4-14A							
4-15A	68	214.8	56	13.6	0	310.4	49
4-16A	12.5	91	20	18.6	0	44.8	42
4-17A							
4-18A							
4-21A	25.6	161.2	40	36.7	0	95.3	50
4-22A							
4-23A	102	255.4	75	36.5	0	538	39
4-24A							
4-25A	139	268.6	80	34.1	0	752.2	50
4-26A	21.7	107.2	28	20.4	0	77.3	24
4-27A	60	170.9	47	24.7	0	267.8	20
4-28A	29.6	106.7	30	18.4	0	115.9	11
4-31A	28.3	171.4	40	29.1	0	110	49
4-32A							
4-33A							
4-34A							
4-35A							
4-36A	93.6	233.5	66	34	0	461.8	23
4-37A							
4-38A	155	257.8	80	31.6	0	860.8	10
4-41A	0	0	0	0	0	0	0
4-42A							
4-43A	22.6	162.2	38	30	0	81.8	49
4-44A							
4-45A	75.5	228.1	59	32.5	0	353.8	49
4-46A	153	273	81	34.4	0	845.2	20
4-47A	176	288.1	88	34.6	0	1022.4	1
4-48A	178	290.8	88	36.1	0	1027.9	0
4-11B							
4-12B							
4-13B	7.1	113.7	23	25.4	0	20.9	79
4-14B							
4-15B	26.4	168.4	36	28.3	0	96.9	49
4-16B	35.9	141	38	24.2	0	142.4	23
4-17B							
4-18B							
4-21B							
4-22B							
4-23B	10.7	129.8	25	25.1	0	33.9	55
4-24B							
4-25B	36.1	144.2	38	25.5	0	145.7	49
4-26B	139	252.4	78	0	0	0	13
4-27B	176	285.2	86	34.6	0	993.5	1
4-28B	0	0	0	0	0	0	0
4-31B	32.5	182.6	44	30.6	0	129.9	50
4-32B							
4-33B							
4-34B							
4-35B							
4-36B	98.8	238.4	64	31.6	0	486	23
4-37B	170	290.1	85	34.6	0	951.3	7
4-38B	61.5	153.4	47	23	0	281	12
4-41B							
4-42B							
4-43B	24.4	198.2	41	32.6	0	90.4	49
4-44B							
4-45B							
4-46B	46.3	182.6	45	28.4	0	194.8	23
4-47B	133	262.5	76	33.9	0	708.4	18
4-48B							
24	GOUNDED						
	NWL HIGH Hz						

AEPMP230121

ATTACHMENT 5

Post-Outage Power Readings (Air load)

		Precip	Precip
Date/Time	Device	Load	Opacity
Jan 21 2023 12:00:00	U2Precip	0	1.7
	Sec power	4590.7 KW	

Device	Prim Amps	Prim Volts	SCR Angle	Sec KVa	Sec KVb	Sec MilliAmps	Spark Mode	Sparks
3-11A	58	223	63	33.7	0	280	1	50
3-12A								
3-13A	177	73	66	0	0	1080	1	0
3-14A								
3-15A	177	409	109	50.4	0	1040	1	0
3-16A	178	381	105	47.9	0	1050	1	0
3-17A	148	356	96	44.9	0	830	1	0
3-18A	No visiable issues							
3-21A	166	417	122	52.2	0	1020	1	54
3-22A								
3-23A	179	404	124	53.8	0	1120	1	0
3-24A								
3-25A	86	211	74	39.2	0	420	1	29
3-26A	179	377	104	47.5	0	1050	1	0
3-27A	179	379	105	46	0	1050	1	0
3-28A	179	352	101	44	0	1040	1	0
3-31A	179	390	119	48.4	0	1120	1	0
3-32A								
3-33A	178	397	119	48.7	0	1130	1	0
3-34A								
3-35A	176	306	59	38.1	0	710	1	1
3-36A	Condensation found in buss duct							
3-37A	178	359	103	47.4	0	1040	1	0
3-38A	179	351	100	43.7	0	1050	1	0
3-41A	82	282	75	58.4	0	420	1	0
3-42A								
3-43A	179	381	117	46.2	0	1130	1	44
3-44A								
3-45A	160	364	103	47.3	0	920	1	50
3-46A	178	286	76	19.8	0	570	1	0
3-47A	156	388	115	48.4	0	1180	1	0
3-48A	Moisture on thru-bushing							
3-11B	121	295	100	46.5	0	690	1	66
3-12B								
3-13B	90	390	92	52	0	470	1	44
3-14B								
3-15B	149	359	99	46.7	0	840	1	0
3-16B	178	82	58	0.1	0	1040	1	0
3-17B	178	372	106	0	0	1060	1	0
3-18B	179	348	101	43.3	0	1040	1	0
3-21B	178	432	129	54	0	1120	1	1
3-22B								
3-23B	178	438	128	54.5	0	1110	1	0
3-24B	Bad board							
3-25B	177	86	59	0.1	0	1030	1	0
3-26B	179	358	101	45	0	1040	1	0
3-27B	178	359	101	44.4	0	1050	1	0
3-28B	179	359	111	44.6	0	1100	1	0
3-31B	179	425	125	51.8	0	1110	1	3
3-32B								
3-33B	178	438	132	54.1	0	1150	1	0
3-34B	Bad board							
3-35B	177	377	104	45.8	0	1050	1	0
3-36B	179	363	102	44.9	0	1040	1	0
3-37B	145	346	96	44.7	0	800	1	23
3-38B	23	137	33	25	0	80	1	12
3-41B	178	422	126	52.2	0	1120	1	3
3-42B								
3-43B	179	417	126	52.1	0	1120	1	0
3-44B								
3-45B	179	402	110	49.2	0	1030	1	0
3-46B	178	349	100	43.4	0	1040	1	1
3-47B								
3-48B	137	307	86	39.2	0	750	1	11
5	GOUNDED / PERFORMANCE ISSUES							
	NWL HIGH Hz							

Device	Prim Amps	Prim Volts	SCR Angle	Sec KVa	Sec KVb	Sec MilliAmps	Spark Mode	Sparks
4-11A	179	403	119	49.4	0	1120	1	1
4-12A								
4-13A	Bad SCR and Board						1	
4-14A								
4-15A	178	403	110	12.5	0	1050	1	0
4-16A	82	250	61	34.4	0	400	1	24
4-17A	154	351	94	43.7	0	860	1	18
4-18A	178	353	101	43.8	0	1040	1	0
4-21A	10	100	25	18.9	0	30	1	55
4-22A								
4-23A	179	426	124	56.7	0	1120	1	0
4-24A								
4-25A	179	371	104	46.2	0	1050	1	0
4-26A	94	269	66	36.5	0	470	1	22
4-27A	158	343	96	44.1	0	890	1	15
4-28A	179	347	96	35.3	0	1030	1	0
4-31A	179	415	120	51.4	0	1120	1	1
4-32A								
4-33A	16	90	23	14.8	0	60	1	40
4-34A								
4-35A	178	88	59	1.8	0	0	1	0
4-36A	178	393	106	50.5	0	1050	1	1
4-37A	179	366	96	43.9	0	1040	1	0
4-38A	179	351	98	43.2	0	1030	1	1
4-41A	120	282	84	38.5	0	650	1	11
4-42A								
4-43A	179	428	125	53.5	0	1110	1	18
4-44A								
4-45A	179	417	113	52.5	0	1060	1	0
4-46A	179	365	100	45.9	0	1040	1	0
4-47A	178	366	103	45.4	0	1050	1	0
4-48A	175	334	93	41	0	1010	1	0
4-11B	178	377	115	46.2	0	1110	1	0
4-12B								
4-13B	66	243	63	33.9	0	320	1	56
4-14B	Communication issue							
4-15B	129	362	89	46.7	0	700	1	0
4-16B	178	393	105	49.1	0	1050	1	0
4-17B	135	326	87	41.6	0	740	1	16
4-18B	179	342	98	43.1	0	1040	1	8
4-21B	179	380	114	47.1	0	1110	1	0
4-22B	Bad board							
4-23B	179	414	120	50.7	0	1120	1	0
4-24B								
4-25B	179	401	106	56.2	0	1060	1	0
4-26B	179	363	101	0	0	0	1	0
4-27B	Arcing at KV voltage divider							
4-28B	179	338	96	42.6	0	1040	1	0
4-31B	178	375	113	47	0	1090	1	0
4-32B								
4-33B	179	419	120	52.7	0	1100	1	0
4-34B								
4-35B	178	376	104	47.2	0	1040	1	0
4-36B	179	389	102	47.8	0	1050	1	0
4-37B	178	372	101	46	0	1020	1	0
4-38B	179	351	100	44.2	0	1050	1	0
4-41B	178	368	111	44.9	0	1090	1	19
4-42B								
4-43B	178	428	124	53.1	0	1120	1	1
4-44B								
4-45B	179	366	105	47.6	0	1050	1	0
4-46B	179	374	101	46.5	0	1050	1	0
4-47B	178	381	105	47.7	0	1050	1	0
4-48B	179	353	99	44	0	1040	1	0
4	GOUNDED / PERFORMANCE ISSUES							
	NWL HIGH Hz							

INSPECTION REPORT

UNIT 1
ELECTROSTATIC PRECIPITATORS

AMERICAN ELECTRIC POWER
MITCHELL PLANT

MOUNDSVILLE, WV

Dates of Trip:
April 16 thru April 21, 2023

Prepared by:
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TRK Report # AEPMP230421

I. EXECUTIVE SUMMARY

TRK Engineering Services, Inc. was retained by the AEP Mitchell Plant to inspect the Unit 1 Electrostatic Precipitators (ESP 1 & ESP 2), develop a punch list of mandatory repairs, document needed repairs and make recommendations after evaluating the findings. Work priority was established with the plant during a “kick-off” meeting prior to entering the unit.

The Wheelabrator design ESPs are from the 1970s and, as such, are showing age related wear. There are many internal components and moving parts that require routine maintenance and repair to keep the fields operating optimally. Unfortunately, with age these units can become high maintenance, particularly if neglected due to being over-sized for their duties. If a unit is oversized it will usually be capable of maintaining compliance with minimal maintenance, however this does not mean that maintenance should be ignored. This design is also not particularly maintenance friendly.

Review of the 3/28/2023 Unit 1 precipitator power readings indicated there were numerous fields out of service or operating poorly prior to the outage. A review of punchlist items and discussions with plant personnel factored into this list. In all, there were fifty-one (51) of one hundred twenty-eight (128) sections (≈ 39%) that were either out-of-service, operating with low power levels or with questionable readings.

The goal for the March 2023 outage was to identify as many of the compromised fields as possible. The focus began with the inlet fields then prioritized “lanes” requested by the plant. TRK had five (5) days with two (2) engineers to complete the inspection; inspection findings were limited to high priority items only. An example of these items includes fields that were shorted or near shorted due to issues such as broken discharge electrodes, broken collecting plate shock bars, full hoppers, and wire frame to collecting plate misalignment. Plant personnel and hired contractors worked off of the punch list created by TRK Engineering during the inspection. TRK did not have an opportunity to review any of the repair work that was completed during the outage. The inspections were limited to fields 1-5 since they are high priority areas, however TRK inspected other areas as time allowed.

There are several issues affecting the performance of the precipitators, which include:

1. Gas Flow Distribution (Not inspected during this outage)
2. Condition of Discharge Electrodes & Collecting Plates
3. Collecting Plate to Discharge Electrode Alignment
4. Rapping Systems
5. Corona Shield and Internal Component Failure
6. High Voltage Support Insulator Top Plate Clearance Issues to the Insulator Compartment Stiffeners
7. Hopper Buildups

The precipitator was primarily inspected from the side access internal walkways above the hoppers. There is no top access. Close inspection of the upper regions requires climbing the high voltage frames between fields. This is generally only done when a better look is required based on observations from below. In several instances, the knee brace level (Level 4) was utilized for a more detailed look at suspected irregularities. In a few instances, a climb to the upper support channel was made to assess the condition of components.

Please note that Unit 1 and Unit 2 have very similar issues and many of the explanations and recommendations are identical between the units. Most repairs completed in this outage were either critical or emergency type repairs and more permanent repairs should be done in some cases next year. Efforts need to be made to implement long term plan to make proper maintenance and repairs.

Unit 1 Precipitator System Description

The AEP Unit 1 Electrostatic Precipitator (ESP) system consists of two (2) side-by-side precipitators (ESP 1 & ESP 2) operating in parallel. The precipitators serve an 850 MW boiler. The dual chamber precipitators were designed and manufactured by Wheelabrator (circa late1970s installation).

Each precipitator has eight (8) 12’-6” fields in the direction of gas flow. The precipitators are one hundred twenty (120) gas passages wide (60 per chamber) with 12” collecting plate spacing. Each 12’-6” x 46’-5” collecting plate assembly is composed of eight (8) panels (CS strips). The eight (8) collecting plate panels that make up each 12’-6” collecting plate are tied together along the bottom with shock bars that impart the rapping force to the collecting plate. The shock bars are essentially two (2) pieces of flat bar that sandwich the bottom of the collecting plates with a spacer on the leading edge and an anvil on the trailing edge. Each of the eight panels is bolted to the shock bar, creating a rigid member through which rapping energy is transmitted. Rapping of the collecting plates is done at the bottom via internal hex-shaft mounted tumbling hammers driven by external motors. Each collecting plate rapper motor drives four (4) electrical fields of the precipitator across gas flow.

The discharge system has four (4) point suspension, two points of suspension on the leading edge and two points of suspension on the trailing edge. Heavy angle iron form high voltage frames from which the discharge electrodes are suspended. The discharge electrodes are the mast frame type. In each gas passage there are two (2) pipe frames; the upper frame is a five (5) section 25’ frame, the lower frame is a four (4) section 20’ frame. Each of the pipe frames are suspended from the high voltage frames at four (4) points. The upper attachment point of the pipe frames are “A-frame” hangers and the lower attachments points are “J-bolts”. The A-frame hangers rest in notched sections of the high voltage frame, and are bolted to the pipe frames. The J-bolts are bolted to pre-drilled holes in the high voltage frames and to the pipe frames.

There are twenty-four (24) discharge electrodes in each 5’ section of the mast frames in the direction of gas flow. The discharge electrodes, or wires, are thin flat strips of steel with alternating barbs cut on the leading and trailing edges of the metal. The electrodes are welded to the mast frame sections to maintain electrical spacing and tautness of the discharge electrode. Each mast frame is rapped on the trailing edge by internal shaft mounted rapper hammers that are driven by a cam lift mechanism, which is actuated by a top mounted (external) motor.

Each precipitator is eight (8) electrical bus sections wide (4 per chamber; 15 gas passages per bus). Each bus section has a dedicated power supply for a total of sixty-four (64) power supplies per precipitator. NWL PowerPlus 56 kW, 70 kVDC, 800 mADC high frequency power supplies with integral controls are installed on the second and fourth fields. Conventional transformer-rectifier power supplies (TR Sets) are used on the remaining fields. All the conventional TR Sets are rated at 102.8 kVA, 60 kVDC, 1200 mADC output. The conventional TR set AVC (automatic voltage controller) controls are Neundorfer MVC-4 controllers with a Neundorfer POS centralized energy management control system computer.

II. DISCUSSION OF MAJOR ISSUES

1. Gas Flow Distribution

There are two (2) separate air preheaters, each of which has ductwork that is completely isolated from the other. One air preheater outlet is treated by ESP 1 and the other is treated by ESP 2. Each duct has several sets of turning vanes, splitting the gas flow between the A and B chambers of each precipitator box. Downstream of the turning vanes to each of the ESP chamber inlet nozzles, there are three (3) perforated (perf) gas distribution plates used to slow and spread the gas flow in order to create even gas flow distribution into the ESP chamber. Perf plate one is positioned just downstream of the turning vanes and is furthest from the ESP inlet; perf plate three is located just upstream of the inlet field to the precipitators, and perf plate two is positioned between one and three.

No inspections were performed in the inlet duct areas due to time restraints. During previous inspections, holes were found in the floors of the duct work. It is not known if these areas have been patched. In 2015, holes were identified in the floors of 2A and 1B. These holes allow tramp air infiltration, which can adversely affect ESP performance as well as accelerate corrosion. Air inleakage can have an adverse effect on ESP performance by increasing the gas volume and gas velocity, reducing treatment time, modifying temperature (resistivity), distorting gas distribution, and/or promoting material reentrainment. The air inleakage and moisture/water penetration allowed by the holes also promotes corrosion of the units structural components. The flue gas has a high SO_3 content and the cool air being introduced allows sulfuric acid mist to condense out of the flue gas. The acid accelerates the corrosion of the ductwork and the existing holes, causing them increase in size. This can be caused by a combination of water infiltration and condensation from cooling. Efforts need to be made to identify and eliminate all sources of air inleakage each outage.

The condition of the perforated plates and the buildups observed in this area are negatively affecting their ability to distribute gas properly into the unit for treatment. In 2015 it was determined that boxes 1A & 2B receive considerably more gas flow at higher velocities, particularly at the outer edges. This was caused by the erosion of the upstream perforated plates, or the lack of perforated plates in these sections. The remaining perf plate in these sections was found to be clean, due to the high flue gas velocities. The inner boxes, 1B & 2A, receive much slower gas velocities. This allows for more accumulation of ash on the floors, and allows the panel perforations to become plugged. It is safe to assume that the precipitators are not seeing uniform gas flow distribution, which is affecting the performance of the boxes.

If it has not be done, it is recommended that the damaged or missing perforated plates be replaced or repaired and that rapping be added to the perforated plates to prevent them from plugging. It is also recommended that the gas flow distribution be evaluated due to the removal of the “egg crate” straightening vanes. A different perforated plate design may be able to achieve uniform gas flow distribution. All ash accumulation between the perf plates and on the inlet walkways should be removed. All construction materials and debris should be removed to prevent the hopper evacuation system from becoming plugged. This was not done this outage.

A flow model was completed by the plant in September of 2022. The report and recommended modifications should be reviewed and evaluated by TRK Engineering prior to making any changes. During the next outage, time should be allotted to inspect the inlet areas again to verify the above findings and to aide with recommendations for future modifications.

2. Condition of Collecting Plates & Discharge Electrodes, HV Frames

a. Collecting Surfaces

The eight (8) collecting plate panels or strips that make up each 12’-6” collecting plate are tied together along the bottom with a shock bar (rapper bar) that imparts the rapping force to the collecting plate. The shock bars consist of two (2) flat bars that sandwich the bottom of the collecting plates, with a spacer on the leading edge and an anvil on the trailing edge.

Damage to the shock bars is widespread throughout the precipitators. Many of these were broken, allowing the associated collecting plate to move laterally, creating a swinging ground. There were also shock bars that were partially broken, and others where previous repairs were failing. The damage to the shock bars is largely observed on the rapped edge of the collecting plates.

The shock bars are designed to move fore and aft on rapper impact, but many of the plates are bound at the anti-sneak baffle and unable to move when they are struck. This can result in bowing on the rapped end of the shock bar.

There were also several locations where shock bars are bent and bowed across their width, which reduces the electrical clearance and lowers the sparkover threshold. These areas of bowing were observed near the hopper peaks, which suggests that the bowing was caused by overfilled hoppers stressing the shock bars. The exposure time and temperature of the hot ash in the overfilled hoppers resulted in permanent deformation of the shock bars and bowing of the collecting plate bottoms. The reduced clearances in these areas have resulted in lower sparkover voltages.

There were also some locations where the CS hammer baffle or anti-sneak baffle is bowed to within 2”-3” of the high voltage frames. There is usually a small flat bar that is welded near the top of the baffle sections to join adjacent baffles together. This flat bar is on the leading edge of the baffle and, in some cases, it was causing premature sparkover to the discharge wire frames.

The collecting plate assemblies are made up of individual panels or strips. The hardware that secures the individual strips to the shock bars at the bottom was missing or loose in numerous locations. This reduces the transmission of rapper impact forces and results in poor cleaning of the individual strips. It can also create alignment issues. Numerous bolts were observed at an angle, indicating that they were coming loose and would eventually fall out.

Holes were observed in the tops and bottoms of the collecting plate panels. The holes are likely the result of prolonged arcing due to contact, or near contact, with the adjacent discharge electrodes/frames. These were generally confined to the plate panels/strips on the trailing edges. These had largely been addressed by stabilizing the plates and/or electrode frames and removing the adjacent discharge electrodes. There were a couple of locations where past repairs made to stabilize the plates had deteriorated and were promoting sparkover.

There were several places found where the collecting plate panels at the top of the field were disconnected and creating close clearances or grounds. These were generally found in the first (inlet) field; the field most exposed to the high gas velocities. It is suspected that the high gas velocities caused chattering/vibration at the top of the collecting plates that resulted in wear to the top connection and the eventual failure of the connection. The condition of the collecting plate panels, the flat plate straps, and the hardware at the upper connection is a concern.

It is recommended that broken shock bars be repaired, any missing bolts be replaced and bowed/bent shock bars be straightened or replaced. Ideally, any damaged shock bars should be completely replaced because welded repairs tend to fail over time. This kind of repair would require scaffolding the hoppers. All shock bars should also be freed up to allow some movement on rapper impact. Any hardened buildup on the inlet and outlet walkways that is restricting movement should be removed. Binding at the anti-sneak baffles along the rapped edge also needs to be addressed. In these locations, opposing angles should be welded to the back side of the baffle to provide a smooth transition as has been done in locations where previous repairs were made. A closer inspection of the top leading and trailing edges of the collecting plates in field 1 and along the leading edge of field 2 is recommended. Temporary repair solutions, such as using tie wire to hold shock bars together, should be stopped and permanent repair practices should be implemented.

Holes were identified along the hotroof. Most of the holes that were identified are toward the outlet fields, 5-8. These areas typically do not receive much attention with regards to maintenance and repairs.

It is strongly recommended that a systematic replacement program be implemented to ensure that all shock bars are replaced, field by field starting in the inlet fields and moving towards the outer fields. During the process, any panels with damage/holes should be removed and any holes found in the hotroof areas should be patched. All repairs up to this point have been emergency repairs and should be considered temporary.

b. Discharge Electrodes & HV Frames

There were random broken discharge electrodes found throughout the precipitators at various frame levels. In some cases, these created an obvious ground, and in other cases, they may not have created a dead short, but there was evidence of sparkover to the adjacent collecting plate; these required removal. Given the age of these precipitators, more failures should be anticipated. There are also a considerable number of slackened discharge electrodes within the frames and thinning wires in many areas. These can oscillate in the gas stream and promote sparking. Those that are visibly loose and reachable should be cut out.

The welded connections between the electrode and the mast frame pipe tube have failed on a number of electrodes. These connections allow localized spit arcing and will eventually allow the electrode to swing freely. These should be removed to prevent grounding and to reduce sparking in the field.

There are a number of the discharge electrode pipe frames that have been damaged from repetitive spark-over and electrical erosion. Most have been repaired or stabilized in some manner. Future repairs should be made with round pipe members to avoid creating sharp edges that generate corona and sparking/arcing. There are many instances where the round pipe repair was not welded to the pipe frame. This can create spit arcing from the damaged pipe frame to the stabilization tube. All high voltage components must be securely attached at all ends. Any loose ends will generate spit arcing.

There were numerous instances of J-Bolts that were completely detached from the pipe frames, or where the bolted connection at the pipe frame, and/or high voltage frame angle iron, had become loose and was rattling due to spit arcing. In the instances where the J-Bolt failed completely, the failure is allowing lateral movement of the pipe frame, thus creating a swinging ground. The loose connections that are spit arcing will eventually lead to the same type of failures.

There is tie wire on the high voltage support insulators and rapper components that is still in place in most fields from previous repairs. The tie wire is not securely fastened to the high voltage frames and will generate spit sparking. In addition to the tie wire, a lot of construction debris was found in the precipitators including pieces of metal that were sitting on the collecting plates and causing grounds, and loose rags that were found in the fields. Broken discharge electrodes need to be removed, any broken or otherwise damaged pipe frames need to be repaired/stabilized, and all loose or broken J-Bolts need to be repaired. All construction materials should be removed from the field after repairs have been made.

3. Collecting Plate to Discharge Electrode Alignment

The collecting plate to discharge electrode frame alignment in many of the bus sections was off-center to varying degrees, mostly along the bottoms. The misalignment likely occurred during the support insulator replacement process. The frames must be temporarily off-weighted during an insulator replacement and if they are not returned to their proper elevation, there will be a pendulum affect along the bottom. This inspection revealed a few locations where the lower alignment was severely off-center. In some cases, there is also a skewing of the lower frames from leading edge (LE) to trailing edge (TE), likely due to unequal elevations of the four (4) support points. In these cases, the top support insulator nuts should be adjusted to properly align the HV frame at the bottom of the fields. The plant is currently using gasket material that is equaling roughly 1/2”. As this gasket material compresses over time, it will cause the fields to become misaligned. The correct gasket material (1/8”) should be used.

Some of the individual pipe frames along the bottom are misaligned. This could be corrected by using the lower J-bolt to center the lower portion of the pipe frame in the gas passage. There are some bus sections where nearly all fifteen (15) of the J-bolts have been positioned at an angle to achieve lower pipe frame alignment. In general, this should be avoided because if all the lower frames in a bus section are off-center in a gas passage in the same direction it is very likely that the frames have not been properly adjusted from the support assemblies overhead. Misaligned J-bolts can also disturb rapper hammer to pipe frame anvil alignment. The J-bolts of a well aligned/level pipe frame assembly should be in-line with the pipe frames. This alignment of the J-bolts can be achieved by realigning the horizontal HV frame supports along the leading and trailing ends of the field. It was observed in many cases that the alignment of the Upper High Voltage pipe frame did not match the alignment of the Lower High Voltage pipe frame. This allowed for close clearances in the upper section, while the lower sections had good clearances. It is important to note that the entire electrical field will be spark limited by the worst electrical clearance in that field. It only takes one close clearance to limit the voltage.

There were a few locations in which the high voltage frame was out of alignment in the direction of gas flow. In these instances, the lower pipe frames were found to be only 1”-2” away from the rapper anti-sneak baffles, promoting sparkover and reducing the overall performance of the electrical field.

Efforts could be made to improve the alignment in many sections of the precipitator, starting with those identified in the attached charts. This should be done before making any adjustments to individual frames using their J-bolts. The J-bolts need routine inspection to make sure they are intact, tight, and properly oriented. Improved alignment would help attain improved power levels.

4. Rapping Systems – Collecting Surfaces & Discharge Electrode Pipe Frames

Material buildup on the collecting plates and discharge electrodes was light throughout the precipitator with the exception of the areas where the rappers were not operating or were not impacting.

a. Collecting Surface Rapping

Rapping of the collecting plates is accomplished with internal shaft mounted tumbling hammers driven by external motors. Rapping occurs at the trailing edge of each field. There were many random rapper hammers missing or hammer brackets that were broken throughout the precipitator. There were also hammers that had shifted on the shaft and were not well aligned with the collecting plate shock bars; this caused them to strike the shock bar off center. There were a few others that were jammed due to being wedged against the shock bar, the walkway grating, or the upstream baffles. This is largely the result of extensive wear of the hammer arms at the pivot point (hammer pin) where they are pinned to the hex shaft bracket (clamp). This wear is prevalent throughout the precipitator.

There are different types of hammer assemblies in use on the equipment. Most are still the original cast iron or flame cut steel bracket type, but there are many locations where newer hammer assemblies with plate steel type brackets/clamps are in use because the original type is no longer available. Some of the newer bracket/clamp halves had loosened up or had their bolts missing, and the hammers were not well engaged on the hex shaft. Another issue with the newer brackets is that they allow only six (6) positions, whereas the originals allow twelve (12) positions. This prevents the newer brackets from being staged on the shaft according to the original design. Care must be taken when installing replacement rapper hammer assemblies to avoid too many hammers from impacting simultaneously; this can promote opacity spiking. This is particularly important at the outlet. It is also suspected that the newer brackets are not hefty enough for extended use without loosening and becoming deformed.

Some isolated areas of material buildup on the collecting surfaces were found; it was not enough to create significant problems. These areas generally corresponded to rapper shafts that were not turning, missing rapper hammers and rappers that had shifted on the shaft so they were no longer impacting the shock bar anvil. Rapping effectiveness is impaired by shock bars that are bound and unable to move on impact. Most of the collecting plates were free to move, but there are some that are binding at the cut-out or guide slot in the anti-sneak baffle, and others that are restricted by hardened buildup on the walkways.

Proper maintenance is not being performed and need to be done on the collecting surface rapping system.

b. Discharge Electrode (DS) Pipe Frame Rapping

The discharge electrodes are the rigid mast frame type. In each gas passage there are two (2) pipe frames; the upper frame is a five (5) section 25’ frame and the lower frame is a four (4) section 20’ frame. Each frame is rapped by internal shaft mounted rapper hammers that are driven via a cam lift mechanism actuated from a top mounted (external) motor.

Like the collecting plate rappers, the upper and lower frame shafts were missing several rapper hammers. There were also a few loose rappers that had shifted out of position and were no longer impacting their anvils. There were also several locations where the entire shaft had shifted so that none of the rappers were impacting. Another widespread problem is with the lift mechanisms that actuate the rappers. Some of these were broken or sloppy due to component wear. The result is either no lift or inadequate lift. Wear can occur at the lifting clevis (lift housing), the turnbuckles and/or the treads of the rods.

Many of the discharge rapper components show extreme wear and are out of alignment and tolerance. The rapper rods have bows and kinks in them and are off centered. This causes the rapper rods to wear into the adjacent components and wear away the rapper rods.

It was recommended that, during each outage, all missing DE rappers be replaced and all rappers/shafts be positioned as needed to impact the frame anvils squarely. The lifting mechanisms should be re-worked as needed, starting with those that are broken or visibly bowed over their length from sloppy (worn) connections. Any broken or worn lift rod components (rods, lift housings, pins, turnbuckles) should be replaced. Visual confirmation of rapper operation should be made prior to closing the precipitator at the end of an outage. The operational procedure is to de-energize the DS rappers with the rappers in the lifted position to aid in identification of inoperable DS rapper motors.

Proper maintenance is not currently being performed on the DS rapping system.

5. Corona Shields and Internal Component Failure

Corrosion has jeopardized the structural integrity of internal components including sneak baffles, roof stiffeners, high voltage support tubes and corona shields.

Throughout the precipitators, the internal components on the hot roof are showing signs of corrosion, wear, and age. It should be anticipated that the compromised roof mounted internal components will continue to fail, grounding the electrical fields and causing risk of damage upon failure to internal components. Removal and reinforcement are the only solutions to these issues.

In 2015, the plant began to proactively replace sections of the hot roof. An overview of the completed sections is documented with the plant. This should be continued and completed during future outages. The work should be planned in conjunction with other priority outage work. Trying to complete multiple jobs at once without the proper planning can result in delays or cancellations due to job interference. TRK does not know the current status of the hotroof repairs, however fewer holes were noted on the hotroof during this outage. TRK was not able inspect the hotroof areas toward the outlet fields as thoroughly as the first few inlet fields were inspected. This was due to time limitation and other outage priorities.

It is recommended that the hot roof components be inspected at the beginning of the next outage to evaluate their condition. Time and resources should be allocated and budgeted to either remove or reinforce these components before failure occurs.

6. Insulator Compartments

Only a few insulator compartments were entered for inspection. The contract electricians changed the high voltage support insulators found with the most damage.

In the past, the insulator compartments were stiffened with 3”x3” angles. This modification created spark points from the top of the high voltage support insulators over to the insulator compartment stiffeners. Some spark points were measured at 1”-1.5” away from the high voltage. This is unacceptable and should be modified. The plant installed blade style insulators in an effort to reduce the spark over points, however tracking was evident on all areas that were inspected. These areas will limit field power in all cases. These stiffeners should either be moved or notched to eliminate the spark over points. Structural engineering will need to be involved during this change but it is obvious that whoever did this had limited knowledge of how the ESP was designed and functioned.

As stated in the above sections, when the high voltage support insulators are changed, the plant will support one field with another. This is a bad practice and should no longer be used during this activity. The plant should consider adding holes in the hotroof on each side of the insulator so the weight can be lifted straight up. This is a safer way to change a support insulator and will eliminate undo stress on fields that are holding the weight of the high voltage frame. Structural engineering support will be required during this change.

7. Hoppers

The hopper access doors were not opened during the inspection. An inspection of the hoppers was made from the internal walkways above. The 5 day outage timeframe did not allow for hopper inspections. Many of the hoppers were clear to the throat, but there were many others that still had varying levels of material in them. Despite having some visible accumulation, none of the hoppers appeared to be grounded due to material. Over-filled hoppers have contributed to bowed shock bars and elevated opacity in the past.

Major holes were observed in the hopper under field 1-47B. More holes are suspected in other fields, particularly towards the outlet fields. Only brief inspections, if any, were performed in these areas.

Efforts need to be made to avoid over-filling the hoppers. All hopper evacuation valves and the operation of the system should be confirmed prior to startup. The lower hopper slope areas, the throat, and the upper valve should all be grit blasted clean to ensure good flow of flyash into the ash system. The slopes should all be scraped of all residual flyash, leaving no buildup on any of the hopper surfaces. All hoppers should be inspected by plant personnel and verified to be clear after all internal work is completed and before any doors are closed and locked.

III. SUMMARY COMMENTS & LONG TERM RECOMMENDATIONS

The work done this outage was very successful in making the needed repairs to almost all of the original fifty-one (51) fields that were out of service at this start of the outage. Two (2) of the fields are permanently out of service and issues were found in the others that should have improved their operations. The effort by the contractor and plant was very good considering the limited time to complete these repairs. However, many repairs are considered temporary and Unit 1 precipitators (ESP 1 & ESP 2) are considered to be in poor condition physically. There is moderate corrosion damage to collecting plates and discharge electrode frames as well as age related issues (wear & fatigue) that are likely to continue. There are some collecting plates and discharge electrode frames with holes and/or damage to them as a result of poor clearances between plates and electrode frames; many of these areas need to be stabilized. Most repairs observed are emergency/temporary repairs. The vast majority of the plates are intact, but the lack of routine maintenance and quick repairs have created many issues that need to be addressed to preserve the unit.

Future maintenance, outage planning and attention to these areas could aid in successful operation of the equipment, however a failure to address some of these issues could result running at reduced levels and/or having to take unplanned outages as critical failures occur. Most of the necessary repairs are located along the bottom of the equipment and involve the shock bars and missing bolts. Both the collecting plate and discharge electrode rapping systems need to be rehabilitated. The discharge electrode frames should be better aligned with the collecting plates. Broken discharge electrodes need to be removed entirely (multiple DE were found with a tail connected to the HV frames and/or wrapped around the HV frame), and any broken or otherwise damaged pipe frames need to be repaired/stabilized. Unfortunately, access for repairs can be challenging due to the scaffolding requirements. A meeting should be planned with the plants safety department to discuss other options for scaffolding such as a tag line between girders that retractable lanyards could be connected to. Given the age of this unit, the necessity for repair work is likely to continue and could potentially accelerate. If or when that occurs, a partial or possibly a full rebuild of the precipitator fields may be warranted.

Long Term Recommendations

Reliable precipitator performance into the future will require staying on top of maintenance and repairs. As the unit continues to age, there are likely to be more of the same issues that will develop. Unfortunately, this ESP design is high maintenance and neglect can result in reduced performance. For more reliable ESP operation and performance in the future, the following areas will need attention.

1. The Sparks Per Minute for all the AVC controllers with traditional TR sets should be set to ten (10) and the Spark Set Back was set to 15%. Tuning for the AVC Controllers should be prioritized to preserve the internal components of the precipitator. This has been done on Unit 2, however TRK Engineering was not onsite for the Unit 1 airload or tuning.

2. The perforated plates in all chambers should be repaired if they were not already repaired after TRK’s departure, and the addition of perforated plate rappers should be considered. Before modifications are implemented, a review of the flow study should be considered.

3. All sources of air inleakage should be addressed. These include holes found in the ductwork and/or precipitator casing, as well as the poorly sealed packing glands at the rapper penetrations. All door gaskets should inspected and be replaced as needed during every outage to ensure proper functionality. A monthly walkdown of the system should conducted in order to identify and repair any air leaks found. The plant has begun this process, however this is an effort which needs to be ongoing.

4. Collecting Plates/Surfaces – The tops of the collecting plates need to be checked to make sure they are secure. Failure of the upper attachment points has been observed from the lower walkways at numerous points, however most of the necessary repairs to the collecting plates are at the bottom and involve the shock

bars. Panels with upper attachment point failures should be removed to prevent grounds. Missing shock bar bolts should be replaced and any broken, bent, or bowed shock bars should be completely replaced. Bound shock bars need to be freed up ; replacement may be required in some instances. The addition of opposing angles at the openings in the anti-sneak baffles, where the shock bars penetrate, provides a transition and reduces wear related binding. Ideally, broken shock bars should be replaced rather than repaired.

The access required in oder to replace the shock bars would require scaffolding the hoppers. That can be a time consuming process. The plant should consider a long term, progressive program whereby a number of bus sections or entire fields are rehabilitated during each outage as time permits. However, priority will always need to be given to locations where shock bars have broken to the point that they allow the associated collecting plate to move side-to-side.

Collecting plates that are found with ragged, sharp edges from arcing, or are no longer secured to the other panels and shock bars, should be replaced with segments of spare panels. The smooth surfaces will help discourage sparking and arcing activity. If they are not replaced, they should be removed to eliminate the spark point.

5. Discharge Electrodes & Pipe Frames - Random breakage of discharge electrodes is likely to continue and could accelerate as the ESP ages. Broken discharge electrodes should be removed as found. During future outages, any wires that are thinning should also be removed. Any pipe frame anomalies (broken, worn from arcing, bent, bowed, etc.) should also be addressed as encountered. J-bolts need to be intact and tight. Ideally, they should be oriented in line with the associated frame, although in some cases they are off at an angle to improve alignment. J-bolts should not be used to achieve alignment until efforts to align the frames from the suspension points are exhausted.

6. Collecting Surface to Discharge Electrode Alignment - Improving alignment would improve the potential for attaining higher power levels, which translates to improved performance. There were many sections of the precipitators that were poorly aligned, particularly along the bottom. A few were severely out of alignment and undoubtedly limiting power. In almost all cases, disturbed alignment is the suspected result of changing broken support insulators and can be corrected from the support points.

7. Insulator Compartments & Insulators - The insulator compartments are formed by the structural box girders that support the collecting plates. The insulator compartments should be inspected during every maintenance outage. Insulators should be routinely cleaned. Any cracked or otherwise damaged insulators (holes, evidence of tracking) should be replaced. The operation of the support insulator heaters should be verified and the system should be repaired/replaced as needed. The plant is currently using 1/2” gasket material. As this gasket material compresses

over time, it will cause the fields to become misaligned. The correct gasket material (1/8”) should be used.

The current method of replacing the support insulators should be changed. Currently, when a support insulator is replaced, the weight of the field is temporarily suspended by the adjacent fields. Chain falls are used to pull the field up from the adjacent fields and the load is never lifted directly upward; this exerts shear forces on all fields involved and causes the filed alignments to fall out of tolerance. A lifting mechanism, similar to those found on other ESP designs, should be added to allow for support insulator replacement, so the field is lifted directly upwards. This allows for the alignment to be corrected and adjusted without affecting the alignment of the adjacent fields.

8. Insulator compartment stiffeners - These should be trimmed or moved to eliminate close electrical clearances to the top of the high voltage insulator plates. Even though the plant has added blade insulators across from the high voltage support insulators, there is still evidence of sparkover in every one of these areas that was inspected during the outage. These areas are limiting power in the fields.

9. Rapping of Collecting Surfaces and Discharge Electrodes – Missing CS rapper hammers should be replaced as found. Any hammers found to be misaligned need to be repositioned appropriately. DS rapper shafts that are bent and bowed should be replaced to prevent catastrophic failure. DS cam systems that have slipped out of alignment, need to have linkage components replaced since the internals have worn and are allowing the shaft assembly to shift. The Standard Operating Procedure should always be followed to identify rapper drive systems that are not functioning correctly.

   Most of the rapper hammer assemblies (original) are badly worn where they are pinned to the shaft clamp. Systematic replacement of the hammers on a field-by-field basis should be considered.

10. Internal structural components and baffles should be inspected and reinforced where necessary. These components have been found loosely secured on the upper HV frames and easily removed from the ESP casing with little effort. These items have the ability to ground the electrical fields if they fail. Most western style corona shields are typically 12” in height or less. The corona shields installed here are 35” in height. The girder box itself creates a 10” smooth surface, which can act as a corona shield without the potential for falling onto the high voltage frame and grounding the field. It is recommended that weakened or failing corona shields be removed and not replaced, and that the edges of the girder boxes be ground smooth to discourage sparkover. Additional time and resources should be allocated during the next outage to identify and correct possible failures of structural components on the hot roof.

11. Hoppers – Efforts should be made to keep the hoppers free of excessive buildup. This includes making sure all insulation is intact. During past inspections, it was

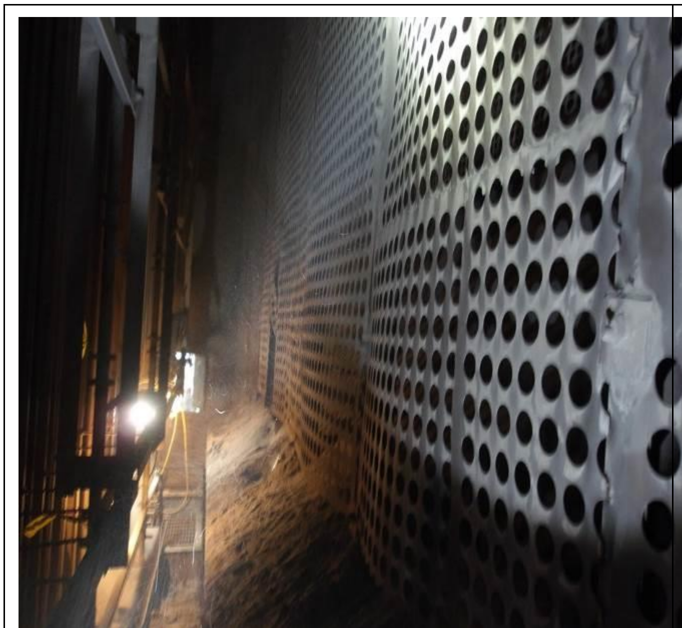
noted that some of the insulation blankets used on the lower areas were partially detached. This can result in localized cooling of the hopper wall(s), which promotes buildup and corrosion. Hopper heater operation should be verified. Hopper vibrator operation should also be verified along with its coordination between the gate valve operation and evacuation.

Attachments:

1. Inspection Photographs
2. AEP Mitchell Unit 1, ESP 1 & ESP 2 Precipitator Field Charts (by section) (Submitted to plant at the completion of the inspection)
3. Pre-outage Power Readings (separate xls file)

ATTACHMENT 1

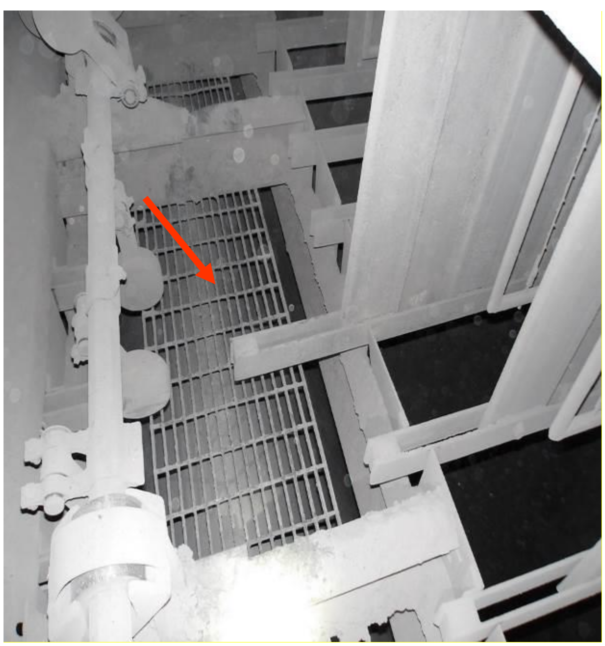
Photographs

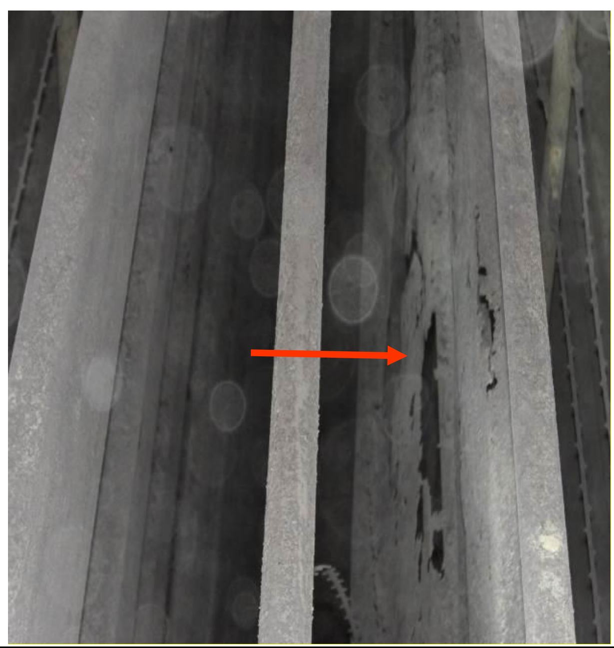


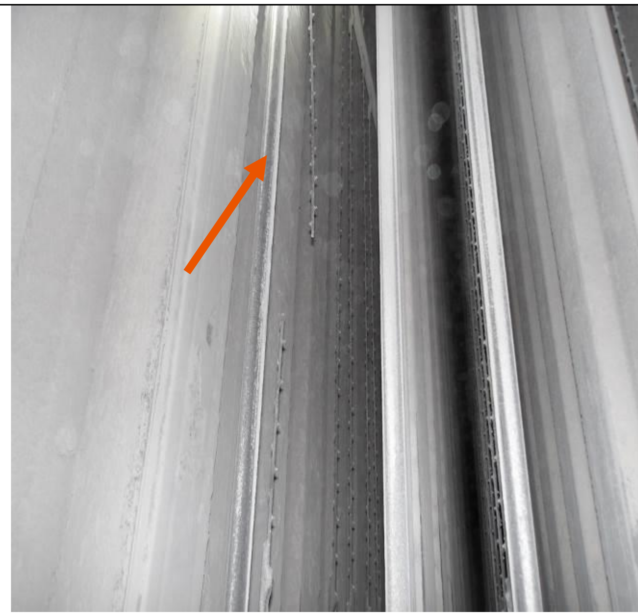
Top Left: A view of the perforated plate closest to the fields. No inspections were performed in the inlet duct areas. **Top Right** An example of the holes found in the collecting plates. Electrodes across from these areas were removed in the past but the ends were still sparking over.

Bottom Left and Right: Examples of broken collecting plate shock bars causing grounds in the fields.

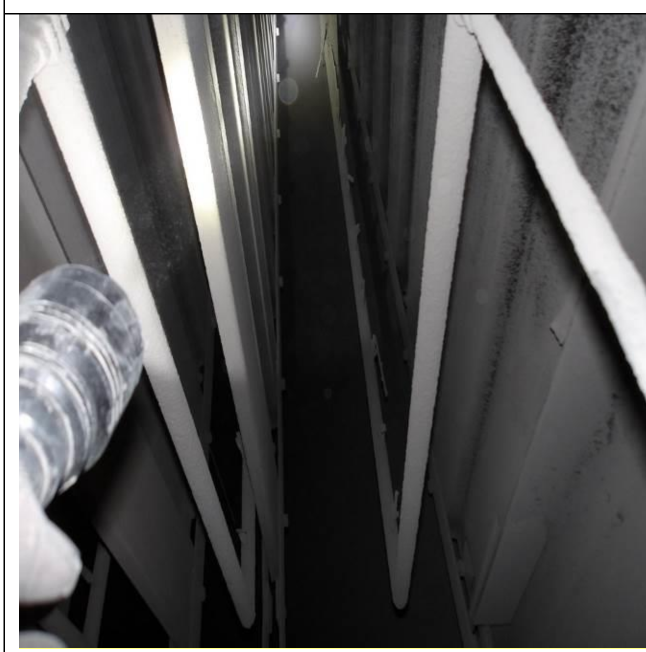
Top Left and Right: A photo of tie wire holding collecting plate shock bars together. This is a poor repair. Shock bars need to be either repaired properly or the entire shock bar should be changed. **Bottom Left:** A photo of a shock bar that has come out of the plate guide. **Bottom Right:** More examples of holes found in the collecting plates.

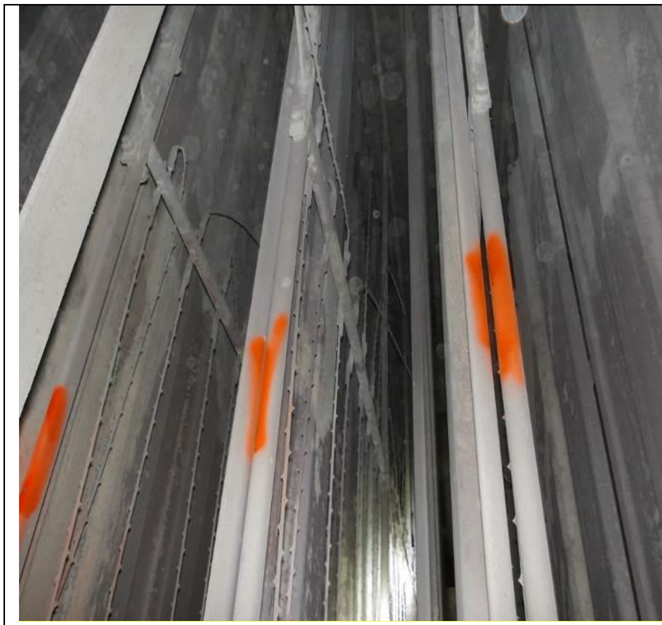


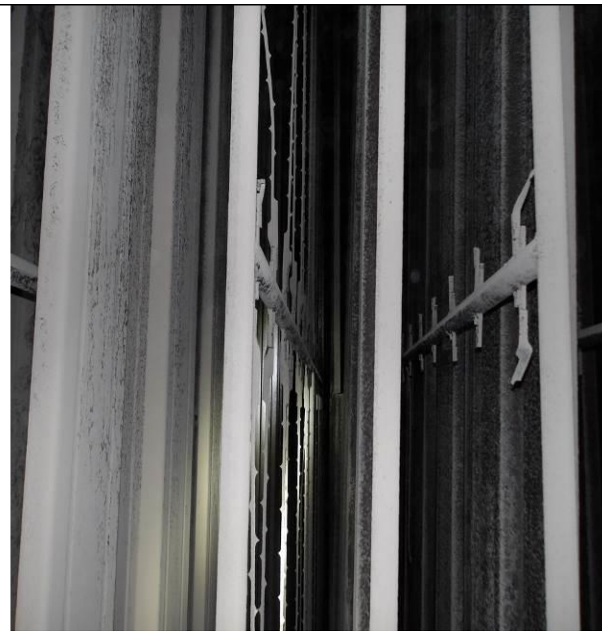




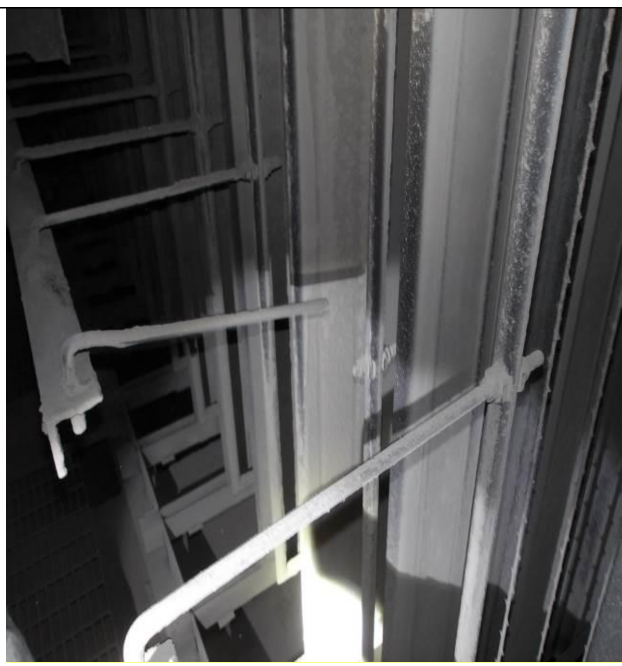
Top Left: A general view of the tops of fields. **Top Right and Bottom Left:** Examples of broken wires found and removed through out ESP. **Bottom Right:** Examples of debris found in the ESP from previous outages. This was observed in both Unit 1 and Unit 2.

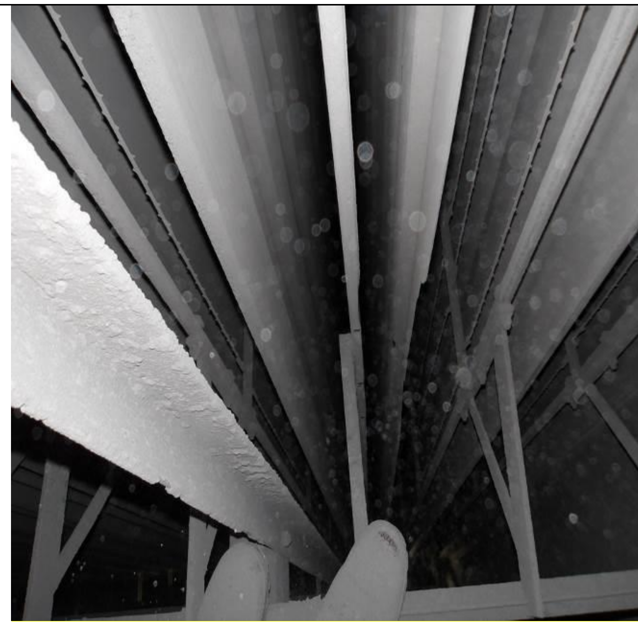






Top Left and Right: More examples of broken wires. **Bottom Left and Right:** Examples of broken rigid mast J-bolts that were causing close clearances and spark points.





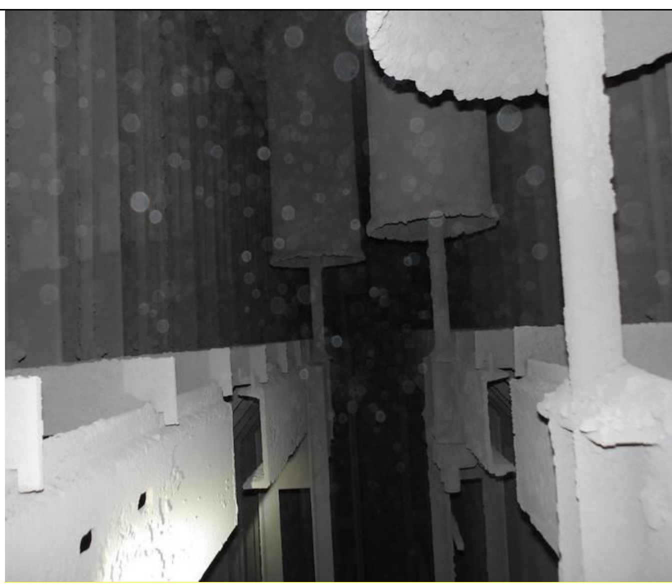
Top Left and Right: More examples of broken rigid mast J-bolts. **Bottom Left and Right:** Examples of broken rigid mast pipes. These are normally broken due to spark damage.

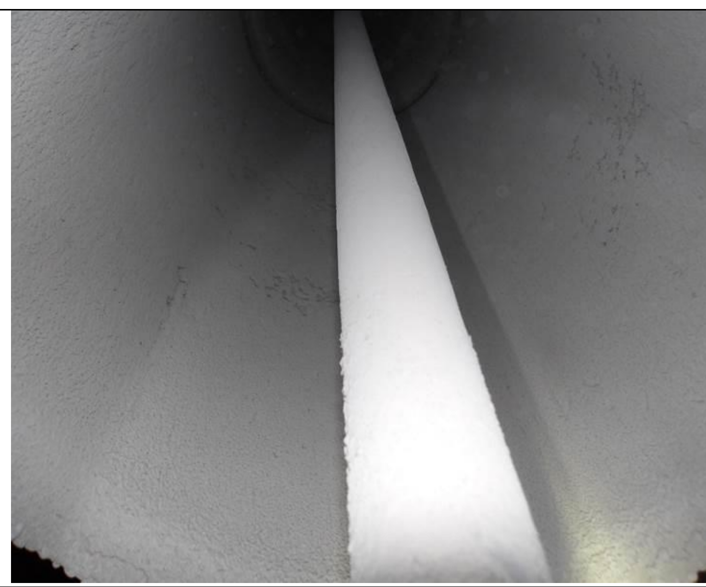
Top Left and Right and Bottom Left: Examples of dirty wires where the high voltage rappers were not in operation. **Bottom Right:** An example of a broken collecting plate hammer. Many hammers were found broken, missing or laying on the ground.

Top Left: Another example of missing collecting plate hammers along with broken shock bars in the same area. **Top Right:** A pallet of replacement hammers for the ESPs. A few different hammer bracket styles are being used in the unit. **Bottom Left:** A photo of a broken high voltage rapper rod. This rod was touching the high voltage from the field beside it. **Bottom Right:** A photo of a broken high voltage lifting rod.

Top Left and Right: General views of the rooftop area. **Bottom Left:** A general view of an insulator compartment area. In view is a high voltage lifting rod insulator. **Bottom Right:** A photo of the insulator compartment stiffeners that were added in the past. In many areas, these were located too close to the top plates of the high voltage support insulators. Spark and arc damage was observed on every one that was inspected during this outage.

Top Left and Right: Documentation of the electrical clearance from the top of the high voltage insulator over to the insulator compartment stiffener. **Bottom Left:** A general view along the tops of fields by the corona shield areas. **Bottom Right:** A photo of the inside of a corona shield and the high voltage support insulator.





ATTACHMENT 2

AEP Mitchell Unit 1 ESP, ESP 1 & ESP 2 Field Charts

(by bus section)

AEP MITCHELL STATION – UNIT 1 ESPs
FIELD CHART NOMENCLATURE

Fields shaded RED:	Grounded fields or sections out of service for unknown reasons from operational power readings taken pre-outage.
Fields shaded YELLOW:	Fields with poor to fair power from operational power readings taken pre-outage.

SYMBOLS

CE/CS: Collecting Surface/Plate
DE/DS: Discharge Surface Electrode Wire
LDS: Lower Discharge Electrode System
UDS: Upper Discharge Electrode System
HV: High Voltage
GP: Gas Passage
LE: Leading Edge (direction of gas flow)
TE: Trailing Edge (direction of gas flow)
SB: Shock Bar

AEP MITCHELL UNIT #1 - ESP #1 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
1-11A	1-21A	1-31A	1-41A
-LE PLATE ROW #14, PANEL #1 BROKEN AND TOUCHING ELETRODE FRAME, REMOVE PANEL. -SHOCK BAR #3 & #10 BROKEN, REPAIR. -UPPER HV HAMMER ROD BROKEN BY COUPLING, REPAIR.	-TE GP#3, LOWER MAST, BROKEN WIRE, REMOVE. -TE PLATE #14 BROKEN SHOCK BAR, REPAIR.		
WALKWAY			
-GP #1, LE HV FRAME ALIGNMENT BAR, REPAIR.	-GP #2,4,9, LOWER MAST, TE BROKEN WIRE, REMOVE. -GP #4, 5, LOWER MAST, LE BROKEN WIRE, REMOVE. -GP #4, UPPER MAST, TE BROKEN WIRE, REMOVE.	-GP #2 LOWER MAST, BROKEN WIRE, REMOVE. -PLATE ROW #10 TE, BROKEN SHOCK BAR, REPAIR. -GP #3,4 LOWER MAST LE, BROKEN WIRE, REMOVE. -GP #4 UPPER MAST TE, BROKEN WIRE, REMOVE.	-BROKEN RAPPER HV ROD TOUCHING THE HV FRAME. - PLATE ROW #3,7 SHOCK BAR BROKE, TE, REPAIR. -GP #4,5 LOWER MAST, BROKEN WIRE, REMOVE. -GP #3 LOWER MAST, LE BROKEN WIRE, REMOVE. -GP #4 LOWER MAST, TE BROKEN WIRE, REMOVE. -GP #5 LOWER MAST, TE BROKEN WIRE, REMOVE. GP #8, UPPER MAST, TE BROKEN WIRE, REMOVE.
1-12A	1-22A	1-32A	1-42A

AEP MITCHELL UNIT #1 - ESP #1 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
1-13A	1-23A	1-33A	1-43A
-CP #4,6,8,10,11 &13, TE SHOCK BAR, REPAIR. -GP #1, TE PIECE OF PLATE SITTING ON WIRE CAUSING A DEAD SHORT, REMOVE.			-TE GP #3 "J" BOLT BROKE, REPAIR. -TE PLATE ROW #3,4 SHOCK BAR BROKE, REPAIR. -UPPER-LEVEL ELECTRODE HAMMER CONNECTION SHAFT SLIPPING, REPAIR.
WALKWAY			
-GP 31 UPPER MAST TIE WIRE TOUCHING HV, REMOVE.	-LE GP #4,5 UPPER MAST "J" BOLT LOOSE, REPAIR.	-GP #13 LE UPPER MAST LOOSE "J" BOLT, REPAIR. -GP #2 UPPER MAST/ LOWER MAST "J" BOLT LOOSE, REPAIR. -LE LOWER MAST, GP #3,11 BROKEN WIRE, REMOVE.	-TE GP #12 UPPER MAST, BROKEN WIRE, REMOVE. -LE GP #2, LOWER MAST FRAME BROKE, REMOVE / REPAIR. -LE GP #13 LOWER MAST "J" BOLT BROKE, REPAIR. -GP #8,11,14 LOWER MAST BROKEN WIRE, REMOVE. -PLATE ROW #15, REMOVE FIRST PANEL.
1-14A	1-24A	1-34A	1-44A

AEP MITCHELL UNIT #1 - ESP #1 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
1-15A	1-25A	1-35A	1-45A
-TE HV FRAME TOUCHING COLLECTING PLATE, REPAIR / REMOVE. -TE, UPPER MAST, GP #15 BROKEN WIRE, REMOVE.			
WALKWAY			
-GP #1 LE LOWER & UPPER FRAME, BROKEN WIRE, REMOVE. -TE GP #1 LOWER MAST, REMOVE WIRE STUBS. -GP #10, 14 TE LOWER MAST BROKEN WIRE, REMOVE. -PLATE ROW #1,2,3,4,9,10,11,15,16 TE LAST PANLE BROKEN, REMOVE. -GP #11, 14 UPPER MAST BROKEN WIRE TE, REMOVE. -GP #14 UPPER MAST BROKEN, TE, REMOVE.	-PLATE ROW AND GP FROM #7 TO #15, UPPER MAST BROKEN, WIRE BROKEN AND PLATE CONNECTION BROKEN LE. -DECOMMISSION	-LE GP #2 UPPER MAST, BROKEN WIRE, REMOVE. -LE ROOF HOLES NEAR GP #2,3,4. REPAIR. -LE GP #10 UPPER MAST, BROKEN WIRE, REMOVE. -TE GP #3 UPPER MAST, BROKEN WIRE, REMOVE (5 OR 6). -TE PLATE ROW #4,5 LAST PLATE BROKEN, REMOVE. TE GP #4 UPPER MAST BROKEN AND BROKEN WIRES, REPAIR / REMOVE.	-LE GP #10 UPPER MAST BROKEN WIRE, REMOVE. -GP #8 UPPER MAST, MID-SECTION, TIE WIRE, REMOVE.
1-16A	1-26A	1-36A	1-46A

AEP MITCHELL UNIT #1 - ESP #1 A Side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
1-17A	1-27A	1-37A	1-47A
-TE GP#1 LOWER MAST AND UPPER MAST, REMOVE TIE WIRE -TE GP#1 UPPER MAST, REMOVE BROKEN WIRE. -PLATE #2 SHOCK BAR OUT OF CLIP, REPAIR. -PLATE #1, REMOVE FIRST PANEL. -PLATE #2, REMOVE PANELS 1-5. -REALIGN TE OF BOTTOM. -TE PLATE ROW #2, REMOVE LAST PANEL. -TE PLATE ROW #1 REMOVE LAST 2 PANELS. -TE PLATE ROW #3, REMOVE LAST 3 PLATES. -TE GP #1 & #2 UPPER MAST, BROKEN WIRE, REMOVE.	-GP #2 TE UPPER MAST, BROKEN WIRE, REMOVE. -GP #14 UPPER MAST CENTER WIRES BROKEN, REMOVE. -PLATE ROW #14, REMOVE FIRST PANEL. -LE GP #10-#13 UPPER MAST, REMOVE BROKEN WIRES, -PLATE ROW #13, REMOVE PANELS 1&2. -PLATE ROW #12, REMOVE PANELS 2&3. -PLATE ROW #11, REMOVE PANELS 1&2. -PLATE ROW #10, REMOVE PANELS 1&2. -TE GP#13 UPPER MAST, BROKEN WIRE, REMOVE.	-LE GP#1, UPPER MAST, REMOVE TWO BROKEN WIRES.	
WALKWAY			
1-18A	1-28A	1-38A	1-48A

AEP MITCHELL UNIT #1 - ESP #1 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
1-11B	1-21B	1-31B	1-41B
-PLATE ROW #1,2,4,6,7,8 BROKEN SHOCK BAR, REPAIR. -GP #5 REPAIR LOWER MAST. -GP #5 UPPER MAST, REMOVE BROKEN WIRE. -REPAIR BROKEN DE UPPER HAMMER COUPLING. -LE GP#5 LOWER MAST BROKEN, REPAIR. -LE GP#5 LOWER MAST, REMOVE BROKEN WIRE. -LE PLATE ROW #6, REMOVE FIRST PANEL.	-GP#13 LOWER MAST TE, BROKEN WIRE, REMOVE. -PLATE ROW #13 TE, SHOCK BAR BROKEN, REPAIR. -GP #4 LOWER MAST BROKEN, REPAIR. -LE GP#3 BROKEN WIRE, REMOVE. -LE GP#4 LOWER MAST BROKEN, REPAIR.	-GP #7,9 UPPER MAST TE BROKEN WIRE, REMOVE. -LE GP#9 SUPPORT BRACKET BROKEN, REPAIR. -LE GP#10, OUT OF PLACE, REPAIR	-PLATE ROW #15 SHOCK BAR BENT, REPAIR. -PLATE ROW #14 TE SHOCK BAR BROKEN, REPAIR. -GP #11 LE LOWER MAST, REMOVE. -PLATE ROW #12 LE, REMOVE FIRST PANEL. -GP #14 LE SHOCK BAR BENT, REPAIR.
WALKWAY			
-PLATE ROW #16 LE SHOCK BAR BROKEN, REPAIR. -GP #15 LOWER MAST TE BROKEN WIRE, REMOVE. -GP #10 LOWER MAST LE BROKEN WIRE, REMOVE. -GP #2 UPPER MAST TE BROKEN WIRE, REMOVE.	-GP #9,11 UPPER MAST TE, BROKEN WIRE, REMOVE. -GP #8 UPPER MAST, TE BROKEN WIRE, REMOVE. -GP #1, LOWER MAST TE, OUT OF SUPPORT CLIP, REPAIR. -GP #9 UPPER MAST LE BROKEN J-BOLT, REPLACE. -GP #2 UPPER MAST LE FAILING J-BOLT, REPLACE. -GP #4 TE UPPER MAST BROKEN WIRE, REMOVE. -GP #7 TE UPPER MAST BROKEN WIRE, REMOVE. -GP #12 TE UPPER MAST BROKEN WIRE, REMOVE.	-GP #1 UPPER MAST TE BROKEN WIRE, REMOVE. -PLATE ROW #14, 16 TE BROKEN SHOCK BAR, REPAIR. -GP #1 LOWER MAST TE, OUT OF CLIP, REPAIR.	-GP #4,9 LOWER MAST BROKEN WIRE, REMOVE. -GP #7 LOWER MAST BROKEN WIRE TE, REMOVE. -GP #1 LOWER MAST TE, REMOVE TIE WIRE. -PLATE ROW #14 TE SHOCK BAR BROKEN, REPAIR.
1-12B	1-22B	1-32B	1-42B

AEP MITCHELL UNIT #1 - ESP #1 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
1-13B	1-23B	1-33B	1-43B
-PLATE ROW #1,9 TE SHOCK BAR BROKEN, REPAIR. -GP #5 LOWER MAST BROKEN, REPAIR.	-PLATE ROW #7 TE SHOCK BAR BROKEN, REPAIR. - PLATE ROW #9 L1E SHOCK BAR BROKEN, REPAIR.	-PLATE ROW #3 TE SHOCK BAR BROKEN, REPAIR. -GP #3 LOWER MAST FAILING, REMOVE.	-PLATE ROW #11,12,15 TE SHOCK BAR BROKEN, REPAIR.
WALKWAY			
-GP #10 TE LOWER MAST BROKEN WIRE, REMOVE. -GP #1 UPPER MAST, REMOVE 3 BROKEN WIRES. -GP #2 UPPER MAST BROKEN WIRE, REMOVE. -GP #2 UPPER MAST, J-BOLT FAILING, REPLACE. -GP #3 UPPER MAST, TE BROKEN MAST FRAME, REPAIR. -GP #9 UPPER MAST TE BROKEN WIRE, REMOVE. -GP #1,3 UPPER MAST BROKEN WIRE, REMOVE.	-GP #8,6,4,2 TE LOWER MAST, J-BOLT FAILING, REPLACE.	-GP #15 LOWER MAST BROKEN WIRE, REMOVE. -GP #10 LOWER MAST BROKEN WIRE, REMOVE. -GP #1,5,7,10,11,12,14 UPPER MAST TE BROKEN WIRE, REMOVE.	-GP #5 LOWER FRAME J-BOLT FAILING, REPLACE. -REALIGN FIELD
1-14B	1-24B	1-34B	1-44B

AEP MITCHELL UNIT #1 - ESP #1 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
1-15B	1-25B	1-35B	1-45B
	KV PROBLEM		-LE LOWER MAST GP #1, BROKEN J-BOLT, REPLACE. -TE UPPER MAST GP #11 BROKEN WIRE, REMOVE.
WALKWAY			
1-16B	1-26B	1-36B	1-46B

AEP MITCHELL UNIT #1 - BOX #1 B-Side

Section 1: GP 15←1	Section 2: GP 15←1	Section 3: GP 15←1	Section 4: GP 15←1
1-17B	1-27B	1-37B	1-47B
-GP #13,14,15 ALL DE NEED TO BE REMOVED.	-PLATE ROW #12,13,14 TE PLATES BROKEN / ERODED, REMOVE.		-LE GP #1,2 UPPER MAST BROKEN WIRE, REMOVE. -LE GP #1,2 REPAIR BROKEN FRAME. -PLATE ROW #7,8 SHOCK BAR OUT OF CLIP, REPAIR. -REALIGN -MAJOR HOLES IN THE HOPPER
WALKWAY			
1-18B	1-28B	1-38B	1-48B

AEP MITCHELL UNIT #1 - ESP #2 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
2-11A	2-21A	2-31A	2-41A
-TE PLATE #3,2 BROKEN, COMPROMISING ALIGNMENT, REPAIR OR REMOVE.	-GP #10 LOWER MAST, REMOVE	-PLATE #4,5,6,10 TE SHOCK BAR BROKEN (GROUNDING FIELD), REPAIR	-LE GP #4 LOWER MAST, REPAIR
WALKWAY			
-GP #1 UPPER MAST LE/TE, OUT OF CLIP, REPAIR. -PLATE #5 TE SHOCK BAR BROKEN, TOUCHING HV MAST, REPAIR. -PLATE #16 TE SHOCK BAR BENT, REPAIR.	-LE/TE PLATE #2,4,8,12,13 SHOCK BAR BROKEN, REPAIR. -GP #1 LE HV LOWER MAST J-BOLT BROKEN, REPLACE. -GP #8 LOWER MAST LE BROKEN WIRE, REMOVE. -GP 1 UPPER MAST OUT OF CLIP, REPAIR. -TE PLATE #1,3,4,5,6,10,11 SHOCK BARS, REPAIR. -REALIGN FIELD TE.		-LE GP #4 LOWER MAST BROKEN WIRE, REMOVE. -TE GP #8 LOWER MAST 2 BROKEN WIRES, REMOVE. -GP #12 LE LOWER MAST BROKEN WIRE, REMOVE. -GP #15 LE LOWER MAST BROKEN WIRE, REMOVE. -PLATE #16 LE SHOCK BAR BROKEN, REPAIR.
2-12A	2-22A	2-32A	2-42A

AEP MITCHELL UNIT #1 - ESP #2 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
2-13A	2-23A	2-33A	2-43A
-TE PLATE #3 BROKEN SHOCK BAR, REPAIR. -TE PLATE #2, REMOVE FIRST PANEL.			
WALKWAY			
-LE GP #7 LOWER MAST BROKEN WIRE, REMOVE. -LE PLATE #13, FIRST PANEL, REMOVE BEND. -TE PLATE #3,9,12,13,14,15 BROKEN SHOCK BAR, REPAIR. -GP #3 TE LOWER MAST BROKEN, REPAIR.	-LE LOWER MAST GP #10, BROKEN WIRE, REMOVE. - LE LOWER MAST GP #13 BROKEN WIRE, REMOVE. -TE UPPER MAST GP #12 BROKEN WIRE, REMOVE.		
2-14A	2-24A	2-34A	2-44A

AEP MITCHELL UNIT #1 - ESP #2 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
2-15A	2-25A	2-35A	2-45A
-LE LOWER MAST GP #1, REMOVE TIE WIRE. -LE UPPER MAST GP #1 BROKEN WIRE, REMOVE. -TE PLATE #4,5 REMOVE FIRST PANEL.	-CHECKED, NO GROUNDS FOUND.		
WALKWAY			
2-16A	2-26A	2-36A	2-46A

AEP MITCHELL UNIT #1 - ESP #2 A side

Section 1: GP 1→15	Section 2: GP 1→15	Section 3: GP 1→15	Section 4: GP 1→15
2-17A	2-27A	2-37A	2-47A
WALKWAY			
2-18A	2-28A	2-38A	2-48A

AEP MITCHELL UNIT #1 - ESP #2 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
2-11B	2-21B	2-31B	2-41B
-TE PLATE #10,12 SHOCK BAR BROKEN, REPAIR. -LE PLATE #15 SHOCK BAR BROKEN, REPAIR.	-TE GP #12 BROKEN WIRE, REMOVE. -LE PLATE ROW #4,6,13,14 SHOCK BAR BROKEN, REPAIR.	-LE GP #7,9 LOWER MAST BROKEN WIRE, REMOVE. -TE PLATE #2,8 SHOCK BAR BROKEN, REPAIR. -HAMMER BAFFLE BROKEN, REPAIR. -TE PLATE ROW #11 BOWED SHOCK BAR, REPAIR.	-TE PLATE ROW #4,11 SHOCK BAR BROKEN, REPAIR. -LE PLATE ROW #3,4 SHOCK BAR BROKEN, REPAIR. -DE LIFTING COUPLING DETACHED, UPPER LEVEL. REPAIR. -REMOVE PANEL #1 ON CP #1.
	-LE PLATE #7 SHOCK BAR BROKEN, REPAIR.	-LE GP #1 HV MAST DAMAGED, REPAIR. -LE PLATE ROW #8 SHOCK BAR BROKEN, REPAIR.	
2-12B	2-22B	2-32B	2-42B

AEP MITCHELL UNIT #1 - ESP #2 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
2-13B	2-23B	2-33B	2-43B
		-PLATE ROW #6,10,13 SHOCK BAR BROKEN, REPAIR.	-PLATE ROW #2,15 SHOCK BAR BROKEN, REPAIR.
WALKWAY			
-TE PLATE ROW #7,9 SHOCK BAR BROKEN, REPAIR. -GP #14 LOWER MAST BROKEN WIRE, REMOVE.	-TE PLATE ROW #1,15 SHOCK BAR BROKEN, REPAIR.	-PLATE ROW #2,3,4,6 SHOCK BAAR BROKEN, REMOVE. -GP #4 TE LOWER MAST J-BOLT, REPAIR.	-PLATE ROW #2,6,7,14 TE SHOCK BAR BROKEN, REPAIR.
2-14B	2-24B	2-34B	2-44B

AEP MITCHELL UNIT #1 - ESP #2 B-Side

Section 5: GP 15←1	Section 6: GP 15←1	Section 7: GP 15←1	Section 8: GP 15←1
2-15B	2-25B	2-35B	2-45B
WALKWAY			
2-16B	2-26B	2-36B	2-46B

AEP MITCHELL UNIT #1 - ESP #2 B-Side

Section 1: GP 15←1	Section 2: GP 15←1	Section 3: GP 15←1	Section 4: GP 15←1
2-17B	2-27B	2-37B	2-47B
WALKWAY			
2-18B	*2-28B*	*2-38B*	*2-48B*

Picture:

The reclaim tank level transmitter has been heat traced & enclosed as shown in the photo below.

ML U1 Opacity 6M Excess Emission Report

Unit 1

From: 12/01/2022 00:00 **To:** 12/30/2022 05:03 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:04 **Location:** Moundsville, WV

Tag Name: U1_Opac_Pct_6M
Total Operating Time: 27,396 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 12,924 Minute(s) Report Time: 40,320 Minute(s)

Inc No	Start Time	End Time	Duration in Minute(s)	Average	Limit	Maximum	Reason Code	Action Code
1	12/01/22 18:36	12/01/22 18:47	12	13	10	13	24 - 24-Pulverizer being brought in or out of service	2 - 02-Adjusted Load/Load Ramping
2	12/02/22 02:30	12/02/22 02:35	6	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
3	12/15/22 07:42	12/15/22 07:47	6	12	10	12	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
4	12/15/22 07:54	12/15/22 07:59	6	13	10	13	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
5	12/15/22 13:54	12/15/22 14:05	12	20	10	25	24 - 24-Pulverizer being brought in or out of service	4 - 04-Stabilize Boiler Control
6	12/17/22 17:42	12/17/22 17:47	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
7	12/17/22 19:00	12/17/22 19:05	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
8	12/17/22 20:18	12/17/22 20:23	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
9	12/17/22 23:00	12/17/22 23:05	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
10	12/18/22 08:18	12/18/22 08:23	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
11	12/18/22 11:00	12/18/22 11:05	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
12	12/18/22 12:18	12/18/22 12:23	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
13	12/18/22 14:06	12/18/22 14:11	6	11	10	11	24 - 24-Pulverizer being brought in or out of service	4 - 04-Stabilize Boiler Control
14	12/18/22 15:00	12/18/22 15:05	6	12	10	12	24 - 24-Pulverizer being brought in or out of service	4 - 04-Stabilize Boiler Control
15	12/19/22 03:36	12/19/22 03:41	6	11	10	11	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
16	12/19/22 04:18	12/19/22 04:23	6	11	10	11	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
17	12/21/22 03:24	12/21/22 03:29	6	11	10	11	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
18	12/21/22 04:18	12/21/22 04:23	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
19	12/21/22 04:42	12/21/22 04:47	6	11	10	11		
20	12/24/22 04:54	12/24/22 05:35	42	12	10	14	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
21	12/24/22 06:12	12/24/22 06:23	12	13	10	13	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
22	12/24/22 06:30	12/24/22 06:35	6	11	10	11	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
23	12/24/22 06:48	12/24/22 06:53	6	12	10	12	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
24	12/24/22 09:30	12/24/22 09:35	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
25	12/24/22 10:48	12/24/22 10:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall

ML U1 Opacity 6M Excess Emission Report

Unit 1

From: 12/01/2022 00:00 **To:** 12/30/2022 05:03 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:04 **Location:** Moundsville, WV

Tag Name: U1_Opac_Pct_6M
Total Operating Time: 27,396 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 12,924 Minute(s) Report Time: 40,320 Minute(s)

Inc No	Start Time	End Time	Duration in Minute(s)	Average	Limit	Maximum	Reason Code	Action Code
26	12/24/22 12:12	12/24/22 12:17	6	11	10	11	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
27	12/24/22 12:30	12/24/22 13:35	66	14	10	15	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
28	12/24/22 13:48	12/24/22 14:05	18	11	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
29	12/24/22 14:12	12/24/22 14:17	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
30	12/24/22 14:48	12/24/22 14:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
31	12/24/22 15:18	12/24/22 15:23	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
32	12/24/22 16:06	12/24/22 16:17	12	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
33	12/24/22 17:18	12/24/22 17:23	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
34	12/24/22 17:30	12/24/22 17:35	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
35	12/24/22 17:54	12/24/22 17:59	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
36	12/24/22 18:36	12/24/22 18:41	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
37	12/24/22 18:48	12/24/22 18:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
38	12/24/22 19:18	12/24/22 19:23	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
39	12/24/22 20:12	12/24/22 20:17	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
40	12/25/22 09:30	12/25/22 09:35	6	14	10	14	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
41	12/25/22 17:30	12/25/22 17:35	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
42	12/25/22 18:48	12/25/22 18:53	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
43	12/25/22 21:42	12/25/22 21:47	6	25	10	25	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
44	12/25/22 22:48	12/25/22 22:53	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
45	12/26/22 00:12	12/26/22 00:17	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
46	12/26/22 02:48	12/26/22 02:53	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
47	12/26/22 06:48	12/26/22 06:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
48	12/26/22 07:18	12/26/22 07:23	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
49	12/26/22 08:12	12/26/22 08:17	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
50	12/26/22 08:36	12/26/22 08:41	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
51	12/26/22 21:30	12/26/22 21:35	6	16	10	16	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall

ML U1 Opacity 6M Excess Emission Report

Unit 1

From: 12/01/2022 00:00 **To:** 12/30/2022 05:03 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:04 **Location:** Moundsville, WV

Tag Name: U1_Opac_Pct_6M
Total Operating Time: 27,396 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 12,924 Minute(s) Report Time: 40,320 Minute(s)

Inc No	Start Time	End Time	Duration in Minute(s)	Average	Limit	Maximum	Reason Code	Action Code
52	12/26/22 22:48	12/26/22 22:53	6	11	10	11	24 - 24-Pulverizer being brought in or out of service	4 - 04-Stabilize Boiler Control
53	12/27/22 00:12	12/27/22 00:17	6	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
54	12/27/22 01:30	12/27/22 01:35	6	15	10	15	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
55	12/27/22 01:54	12/27/22 01:59	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
56	12/27/22 02:48	12/27/22 02:53	6	15	10	15	24 - 24-Pulverizer being brought in or out of service	4 - 04-Stabilize Boiler Control
57	12/27/22 04:36	12/27/22 04:41	6	16	10	16	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
58	12/27/22 05:54	12/27/22 05:59	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
59	12/27/22 08:12	12/27/22 08:17	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
60	12/27/22 09:30	12/27/22 09:35	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
61	12/27/22 10:48	12/27/22 10:53	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
62	12/27/22 16:12	12/27/22 16:29	18	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
63	12/28/22 01:30	12/28/22 01:35	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
64	12/28/22 04:12	12/28/22 04:17	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
65	12/28/22 04:36	12/28/22 04:41	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
66	12/30/22 00:06	12/30/22 04:47	282	16	10	26		
67	12/30/22 04:54	12/30/22 04:59	6	12	10	12		

Total Operating Time:	27,396.00 Minute(s)
Total Duration (Unit Up or Down):	822.00 Minute(s)
Time in exceedance as a percentage of operating time:	3.00 %
Time in compliance as a percentage of operating time:	97.00 %

ML U1 Opacity 6M Excess Emission Report

Unit 1

From: 12/01/2022 00:00 **To:** 12/30/2022 05:03 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:04 **Location:** Moundsville, WV

Tag Name: U1_Opac_Pct_6M
Total Operating Time: 27,396 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 12,924 Minute(s) Report Time: 40,320 Minute(s)

Report Code	Type	Text	Duration	Duration Percent
24	Reason	24-Pulverizer being brought in or out of service	48	5.84
27	Reason	27-Load Change-MATS Also	174	21.17
48	Reason	48-Precipitator Cleaning	306	37.23
2	Action	02-Adjusted Load/Load Ramping	186	22.63
4	Action	04-Stabilize Boiler Control	36	4.38
13	Action	No Action possible ashfall	306	37.23

ML U2 Opacity 6M Excess Emission Report

Unit 2

From: 12/01/2022 00:00 **To:** 12/30/2022 05:02 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:03 **Location:** Moundsville, WV

Tag Name: U2_Opac_Pct_6M
Total Operating Time: 16,722 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 23,598 Minute(s) Report Time: 40,320 Minute(s)

Inc No	Start Time	End Time	Duration in Minute(s)	Average	Limit	Maximum	Reason Code	Action Code
1	12/09/22 11:24	12/09/22 12:11	48	16	10	18		
2	12/16/22 00:00	12/16/22 04:05	246	34	10	43	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
3	12/16/22 04:42	12/16/22 04:47	6	11	10	11	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
4	12/16/22 22:12	12/16/22 23:05	54	15	10	20	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
5	12/17/22 02:48	12/17/22 02:53	6	11	10	11	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
6	12/17/22 14:18	12/17/22 14:23	6	11	10	11	27 - 27-Load Change-MATS Also	4 - 04-Stabilize Boiler Control
7	12/20/22 06:00	12/20/22 07:29	90	20	10	29	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
8	12/20/22 08:00	12/20/22 09:35	96	28	10	37	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
9	12/20/22 14:54	12/20/22 14:59	6	16	10	16	3 - 03-Startup: Enter site/state specific info-MATS Also	10 - 10-Following Normal Startup Procedures
10	12/21/22 15:00	12/21/22 15:05	6	11	10	11	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
11	12/22/22 05:12	12/22/22 05:23	12	17	10	17	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
12	12/23/22 04:12	12/23/22 04:23	12	17	10	19	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
13	12/23/22 09:48	12/23/22 09:59	12	13	10	14	27 - 27-Load Change-MATS Also	2 - 02-Adjusted Load/Load Ramping
14	12/23/22 10:48	12/23/22 10:59	12	13	10	14	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
15	12/23/22 11:48	12/23/22 11:53	6	14	10	14	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
16	12/23/22 12:48	12/23/22 12:53	6	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
17	12/23/22 13:48	12/23/22 13:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
18	12/23/22 14:48	12/23/22 14:53	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
19	12/23/22 21:48	12/23/22 21:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
20	12/23/22 22:48	12/23/22 22:53	6	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
21	12/23/22 23:48	12/23/22 23:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
22	12/24/22 00:48	12/24/22 00:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
23	12/24/22 01:48	12/24/22 01:53	6	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall

ML U2 Opacity 6M Excess Emission Report

Unit 2

From: 12/01/2022 00:00 **To:** 12/30/2022 05:02 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:03 **Location:** Moundsville, WV

Tag Name: U2_Opac_Pct_6M
Total Operating Time: 16,722 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 23,598 Minute(s) Report Time: 40,320 Minute(s)

Inc No	Start Time	End Time	Duration in Minute(s)	Average	Limit	Maximum	Reason Code	Action Code
24	12/24/22 02:48	12/24/22 03:11	24	13	10	15	24 - 24-Pulverizer being brought in or out of service	2 - 02-Adjusted Load/Load Ramping
25	12/24/22 03:48	12/24/22 04:23	36	12	10	15	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
26	12/24/22 05:00	12/24/22 05:17	18	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
27	12/24/22 05:48	12/24/22 05:53	6	15	10	15	48 - 48-Precipitator Cleaning	20 - System wide Emergency Declaration made by PJM
28	12/24/22 06:00	12/24/22 06:23	24	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
29	12/24/22 06:30	12/24/22 06:35	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
30	12/24/22 06:48	12/24/22 06:53	6	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
31	12/24/22 13:48	12/24/22 13:53	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
32	12/24/22 14:00	12/24/22 14:05	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
33	12/24/22 14:48	12/24/22 14:59	12	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
34	12/24/22 15:48	12/24/22 15:59	12	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
35	12/24/22 17:06	12/24/22 17:11	6	11	10	11	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
36	12/24/22 17:48	12/24/22 17:53	6	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
37	12/24/22 18:48	12/24/22 18:59	12	13	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
38	12/24/22 19:48	12/24/22 19:59	12	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
39	12/24/22 20:48	12/24/22 21:05	18	12	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
40	12/24/22 21:48	12/24/22 22:11	24	12	10	14	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
41	12/24/22 22:48	12/24/22 22:59	12	12	10	12	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
42	12/24/22 23:48	12/25/22 00:05	18	12	10	13	48 - 48-Precipitator Cleaning	13 - No Action possible ashfall
43	12/26/22 21:48	12/26/22 21:53	6	11	10	11		
44	12/27/22 01:48	12/27/22 01:53	6	11	10	11		
45	12/27/22 06:48	12/27/22 06:53	6	11	10	11		
46	12/27/22 07:48	12/27/22 07:53	6	11	10	11		
47	12/27/22 09:48	12/27/22 10:17	30	11	10	13		
48	12/27/22 11:00	12/27/22 11:29	30	13	10	14		

ML U2 Opacity 6M Excess Emission Report

Unit 2

From: 12/01/2022 00:00 **To:** 12/30/2022 05:02 **Facility Name:** Mitchell Power Plant
Generated: 12/30/2022 05:03 **Location:** Moundsville, WV

Tag Name: U2_Opac_Pct_6M
Total Operating Time: 16,722 Minute(s) **No Exclusions Allowed**
Non-Operating Time: 23,598 Minute(s) Report Time: 40,320 Minute(s)

Inc No	Start Time	End Time	Duration in Minute(s)	Average	Limit	Maximum	Reason Code	Action Code
49	12/27/22 11:48	12/27/22 12:11	24	14	10	15		
50	12/27/22 12:18	12/27/22 12:41	24	14	10	16		
51	12/27/22 13:24	12/27/22 13:53	30	13	10	14		
52	12/27/22 14:12	12/27/22 14:29	18	12	10	14		
53	12/27/22 15:06	12/27/22 15:47	42	13	10	16		
54	12/28/22 23:42	12/28/22 23:47	6	11	10	11		
55	12/28/22 23:54	12/29/22 00:11	18	12	10	12		
56	12/29/22 00:18	12/29/22 00:53	36	12	10	13		

Total Operating Time:	**16,722.00 Minute(s)**
Total Duration (Unit Up or Down):	**1,212.00 Minute(s)**
Time in exceedance as a percentage of operating time:	**7.25 %**
Time in compliance as a percentage of operating time:	**92.75 %**

Report Code	Type	Text	Duration	Duration Percent
3	Reason	03-Startup: Enter site/state specific info-MATS Also	504	41.58
24	Reason	24-Pulverizer being brought in or out of service	24	1.98
27	Reason	27-Load Change-MATS Also	48	3.96
48	Reason	48-Precipitator Cleaning	306	25.25
2	Action	02-Adjusted Load/Load Ramping	66	5.45
4	Action	04-Stabilize Boiler Control	6	0.50
10	Action	10-Following Normal Startup Procedures	504	41.58
13	Action	No Action possible ashfall	300	24.75
20	Action	System wide Emergency Declaration made by PJM	6	0.50

DATA REQUEST

AG-KIUC 1_3	Describe in detail the planned maintenance outage for Big Sandy 1 in December 2022, including the scheduled start and end dates, the reasons for scheduling the outage at that time, planned work to be performed, and the specific reason(s) why the planned outage was not completed as scheduled. Provide a copy of all maintenance reports, outage post-mortem analyses, root cause analyses, and all other analyses that address why Big Sandy 1 was unavailable during Winter Storm Elliott.

RESPONSE

See KPCO_R_AG_KIUC_1_3_Attachment1 through KPCO_R_AG_KIUC_1_3_Attachment4 for a copy of documents supporting why Big Sandy Unit 1 was unavailable during Winter Storm Elliott. Please also see the Affidavit of Timothy C. Kerns, attached as Exhibit B to the Company's July 21, 2023 Response to the Commission's Show Cause Order, which provides additional details concerning the Big Sandy Plant Fall 2022 Planned Outage. The Company would note that the Original Outage Start date was September 10, 2022.

Witness: Timothy C. Kerns

Big Sandy Unit 1

2022 Generator Inspection Report

DESCRIPTION

A generator rotor out inspection was performed by Patryk Ruchniak and Heidi DeBenedictis of American Electric Power, Electrical Engineering Services Section on 10/11/2022 to 10/14/2022.

Patryk Ruchniak - Author
ENGINEER SR

Jamin Hughes - Reviewer
ENGINEER SR

American Electric Power ▪ Electrical Engineering Services

1 Riverside Plaza ▪ Columbus ▪ Ohio ▪ 43215

1 Contents

2 GENERAL

2.1 OVERVIEW

Central Machine Shop (CMS) winders assisted with the inspection and performed all necessary repairs to ready the unit for operation.

A generator inspection JSA & safety checklist was completed during the inspection. See appendix for the copy of the completed safety checklist JSA and component test data sheets.

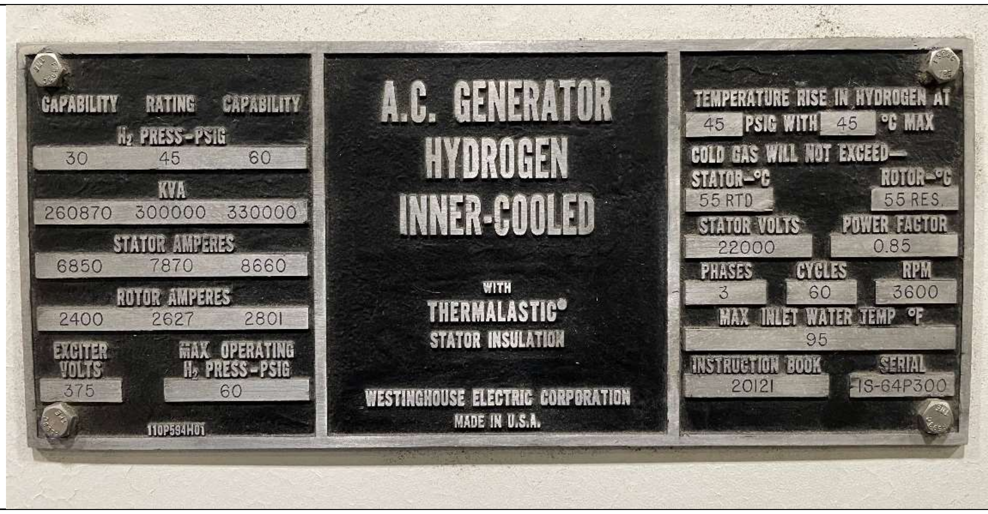
2.2 HISTORY

Big Sandy U1 is a steam turbine driven 2 pole synchronous generator rated at 330 MVA. The generator was manufactured by Westinghouse and is hydrogen cooled. The stator bars were manufactured under the Westinghouse single tube stack inner-cooled design. The stator contains its original winding and is a Westinghouse "Thermalastic" hard bar insulation design.

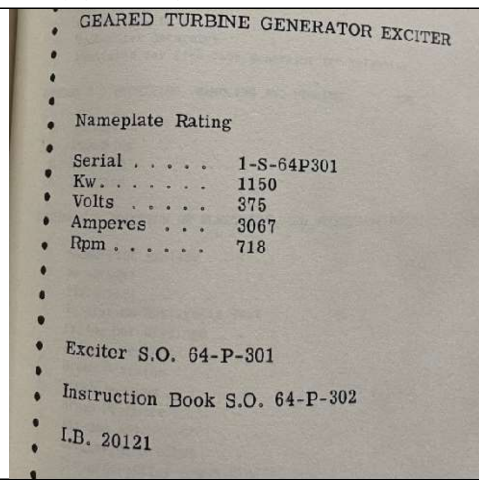
- 1963 – Started commercial operation
- 1996 – Generator field out inspection
    - Core Tightening, AC Hi Pot, EL CID, and Re-wedge
    - Rotor Radial lead seal repair
    - High collector ring carbon deposits
- 2008 – Generator field out inspection
    - Core Tightening, AC Hi Pot, EL CID, and Re-wedge
    - Rotor Radial lead seal repair
    - High collector ring carbon deposits
- 2010 – Generator field in place inspection
- 2014 – Generator field in place inspection
- 2015 – Generator field in place inspection

2.3 NAMEPLATE DATA

BIG SANDY U1 GENERATOR NAMEPLATE



BIG SANDY U1 EXCITER NAMEPLATE



GEARED TURBINE GENERATOR EXCITER

Nameplate Rating

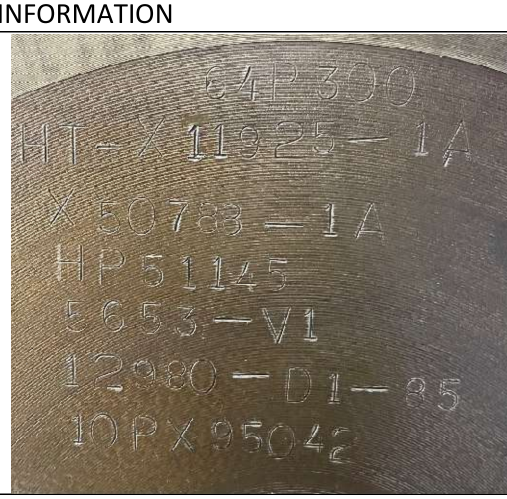
Serial 1-S-64P301
Kw. 1150
Volts 375
Amperes . . . 3067
Rpm 718

Exciter S.O. 64-P-301

Instruction Book S.O. 64-P-302

I.B. 20121

BIG SANDY U1 ROTOR INFORMATION



3 FINDINGS

3.1 VISUAL INSPECTION

3.1.1 STATOR

The stator appeared in satisfactory condition considering its age. The stator winding overall was clean with the typical light coating of oil. The stator iron exhibited some interlaminar greasing in sporadic areas which is indicative of core looseness; otherwise, the stator iron appeared generally in good condition with no signs of overheating or mechanical damage. Stator core tightness checks were performed, and it was found that a significant portion of the building and through bolts were hand tight. The core looseness necessitated that a tightening evolution of the building and through bolts was needed and due to the age of the core, a 60% tightness (final torque values of 780ft/lbs building bolts and 450ft/lbs through bolts) was selected to minimize the risk of creating interlaminar iron shorts. Subsequent core loop tests were performed at 80% magnetic flux before and after tightening to ensure that no core damage occurred; it was identified however, there were a few locations that exceeded the 10 degrees Celsius wound core hot spot acceptance criteria. These areas were repaired on a best effort basis by CMS using a combination of wicking resin, mica insertion (where applicable), and acid etching. The final repairs are documented in the attached report in the appendix.

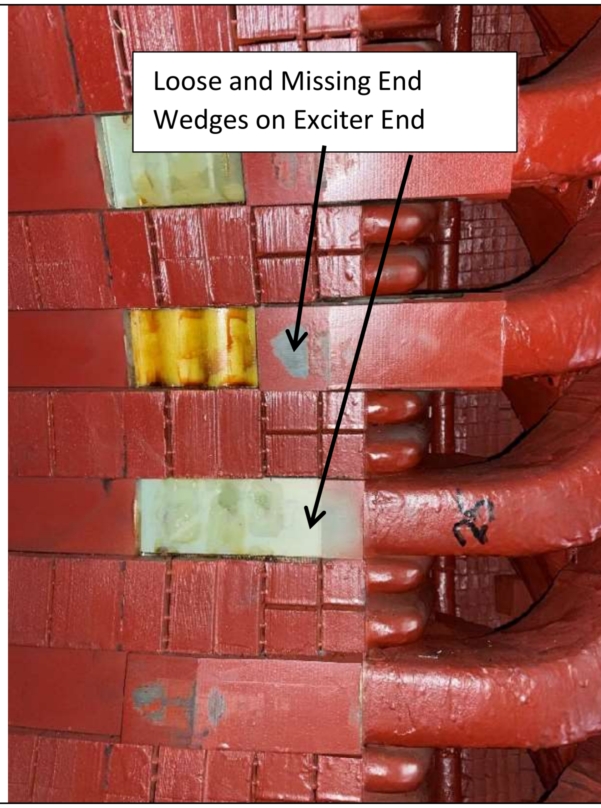
TYPICAL VIEW OF STATOR IRON INTERLAMINAR GREASING

It should be noted that although the stator core has been tightened to a 60% of new value, the core length is shorter than the original design due to compaction from interlaminar insulation wear. Siemens was contacted for original design data, and it was identified that the original stator core length was 200 inches with a minimum of 199.75 inches. Per Siemens, the shorter stator core could impact the step iron region from a greater amount of magnetic flux causing additional heating, however due to past core tightening activities in 1996 and 2008, the unit 1 has been operating with a short core for quite some time and no operational issues have been noted. The overall impact on a short stator core could be unit curtailment if generator operational temperature limits can't be maintained. The final core length measured heavy sheet to heavy sheet is in the table below.

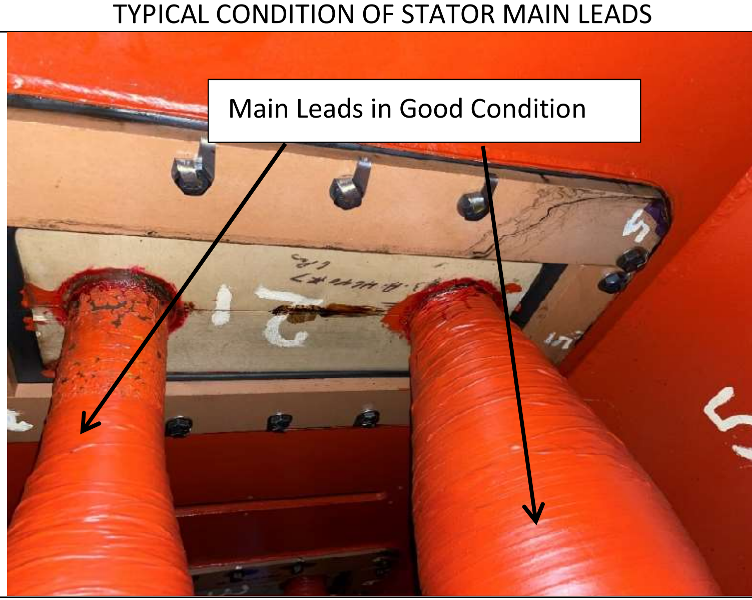
CORE LENGTH **BEFORE** TIGHTENING LOOKING FROM EE TO TE IN INCHES	
12 o'clock	199.250
3 o'clock	199.4375
6 o'clock	199.500
9 o'clock	199.375
CORE LENGTH **AFTER** TIGHTENING TO 60% LOOKING FROM EE TO TE IN INCHES	
12 o'clock	199.125
3 o'clock	199.125
6 o'clock	199.375
9 o'clock	199.250

All the end winding, connection ring ties and blocking were in satisfactory condition. There were a few areas of greasing noted in the winding basket on the turbine end due to the higher vibration experienced in that area during operation. CMS cleaned these areas to remove the dirt and contamination and applied wicking resin (red-eye) to re-establish the mechanical bond. The outer layer of insulating paint appeared in good condition with some minor flaking in sporadic areas. A cursory tap test was also completed in addition to recording the test wedge values, and significant looseness was found; it should be noted that a few exciter end wedges came out during field removal which supports the loose wedge findings. The locking wedges on the turbine and exciter end appear to be of an incorrect style as they were not the typical 'herring bone' style wedges. Consequently, from these findings, a stator re-wedge was performed using new old stock original Westinghouse Kevlar wrapped style wedges. In performing the stator re-wedge, the standard pre and post 120% AC Hi POT and EL CID tests were also completed. Final test data results can be found in the appendix of this report.

The Big Sandy U1 Main Generator has a hydrogen intercooled cooled stator winding, specifically a 'single tube stack' stator bar cooling construction. These tube stacks in each of the stator bars are insulated from each other to increase operational efficiency. The tube resistances were checked against each other, no issues were found. Test data is found in the appendix.

EXCITER END LOOSE AND MISSING END WEDGES


The main leads were inspected on a best effort bases and are satisfactory from what was accessible/visible.

TYPICAL CONDITION OF STATOR MAIN LEADS


The connection rings and winding cross over ties were inspected on a best effort basis and was also satisfactory from what was visible. CMS did find that there were some broken ties on the turbine end winding support brackets which were repaired after the stator core was tightened.

The Metering and Regulating CTs looked satisfactory and no associated loose hardware were found and/or visible however, they were somewhat dirty and should be thoroughly cleaned at the next opportunity.

Main generator high voltage bushings (HVB) are original to the unit. Overall, they are in satisfactory condition however, upon closer inspection it appears that these are oil filled and the porcelain to metal flange gaskets are beginning to leak oil. The high voltage bushings along with the current transformers should be replaced when the main generator is rewound.

GENERATOR NEUTRAL BUS ENCLOSURE HVB

During this inspection the plant requested a flux probe to be installed as there was no existing probe. The flux probe should be read during start up and shut down periods to determine if a rotational electrical issue exists with the rotor, currently (fall 2022) all rotor electrical tests are satisfactory at stand still.

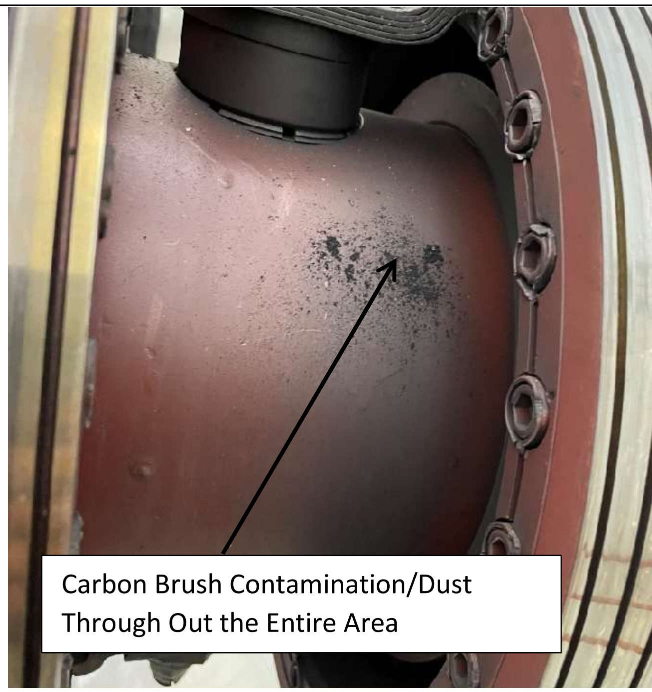
Periodic on-line EMI testing along with visual inspections and standard electrical testing should be continued to ensure maximum generator stator reliability.

3.1.2 ROTOR

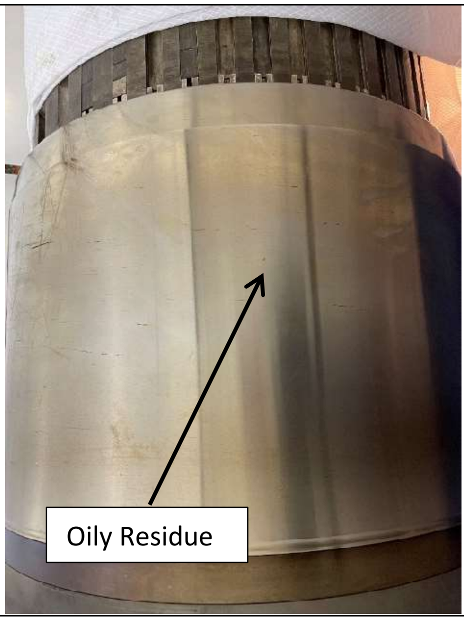
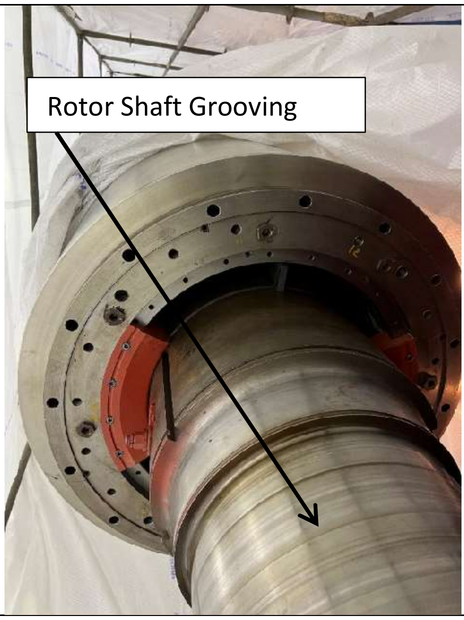
The rotor appeared generally in satisfactory condition. There was a light coating of rust and minor oil contamination. The center vent holes were visually inspected, and no blockages or filler migration was found. CMS cleaned all accessible areas on a best effort basis.

AS FOUND CONDITION OF ROTOR BODY

It should be noted that upon initial electrical testing the insulation resistance was quite low and upon further investigation heavy carbon deposits from the generator brushes on the collector rings was the cause. Significant cleaning was completed in this area to return the rotor's insulation resistance to an acceptable level. The plant was given direction that a yearly PM on cleaning the collector rings is essential to maintaining the rotor's proper electrical characteristics over time as this will ensure a ground fault condition will not occur from carbon contamination. Also, from visual inspection the collector rings do not appear flat and grinding maybe needed depending on the run out, this should be checked during the next outage of sufficient duration.

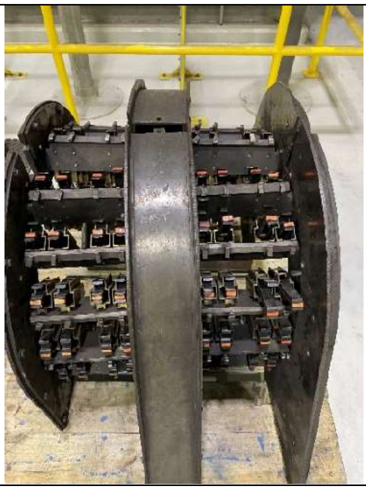
AS FOUND CONDITION OF COLLECTOR RINGS CONTAMINATED WITH CARBON

COLLECTOR RINGS ARE NOT FLAT


Further visual inspection of the retaining rings found that they were slightly dirty and coated with oil. CMS cleaned the retaining rings to remove the oil that was found. In discussion with the turbine coordinator, the rotor shaft where the journal bearing rides an excessive grove was found. It is believed that at some point in the rotor's history shaft damage occurred subsequent repairs and machining was incomplete. This condition does not affect the rotor's operation as the rotor shaft grooving is in an inconsequential location in relation to the journal bearing and hydrogen shaft seal.

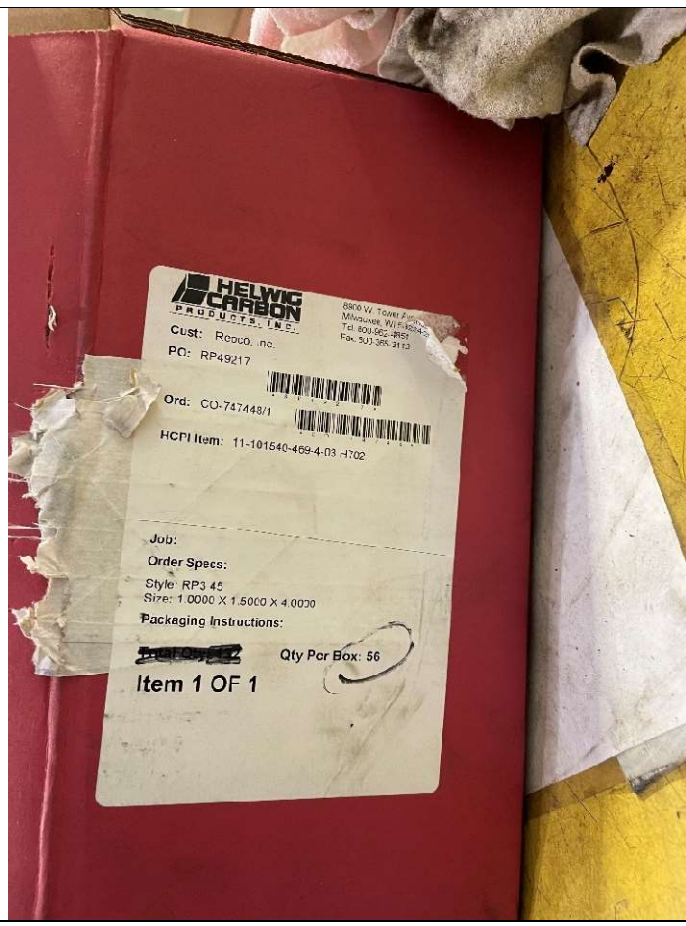
RETAINING RING DIRT	ROTOR SHAFT GROOVING
	

Below are photos of the rotor brush rigging assembly and an example of the carbon brushes that are currently being used by the generator.

All components appeared in very good condition however, a thorough cleaning is needed as there were heavy carbon deposits throughout. Technical brush data can be found in the attachment section of this report.

ROTOR BRUSH RIGGING ASSEMBLY VIEW 1	ROTOR BRUSH RIGGING ASSEMBLY VIEW 2
	

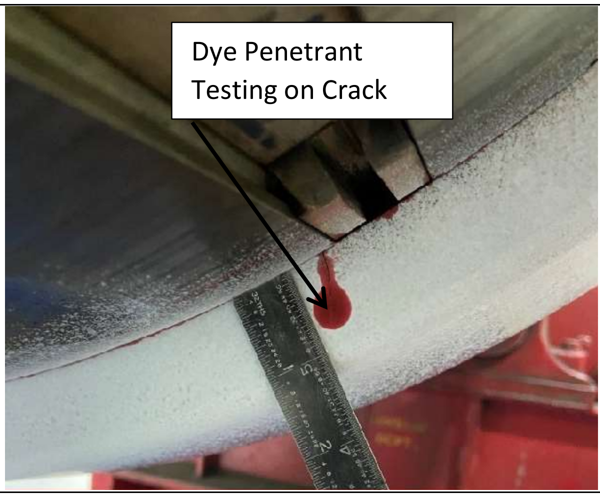
COLLECTOR RING CARBON BRUSH (Helwig Carbon)

NEW CARBON BRUSH BOX TAG


Before rotor final installation into the main generator, an approximately 1-inch crack was found on the inboard side of the exciter end retaining ring. The turbine end retaining ring had non-destructive (NDE) testing (ultrasonic testing) completed and no indications or visible cracks were found; this retaining ring was not replaced. Please see the structural integrity report for further details on the turbine end retaining ring NDE testing.

The exciter end retaining ring was removed and replaced with a new retaining ring from MD&A and was installed by CMS; new retaining ring winding insulation was used and was supplied by GUND company. Due to the outage timeline, the exciter end cracked retaining ring failure analysis was not able to be completed (see ATC failure analysis report) therefore, the AEP team decided to remove any possible stress concentrations on the rotor forging in the retaining ring shrink fit location to prevent a future crack re-occurrence. It should be noted that the shrink fit of the retaining ring was reviewed and is of the industry standard of 2-3 mills per inch of diameter. Finally, the retaining ring inboard side radius was also increased as it appeared that the existing radius was somewhat small. The rotor was not balanced before being returned to service.

AS FOUND EXCITER END RETAINING RING CRACK

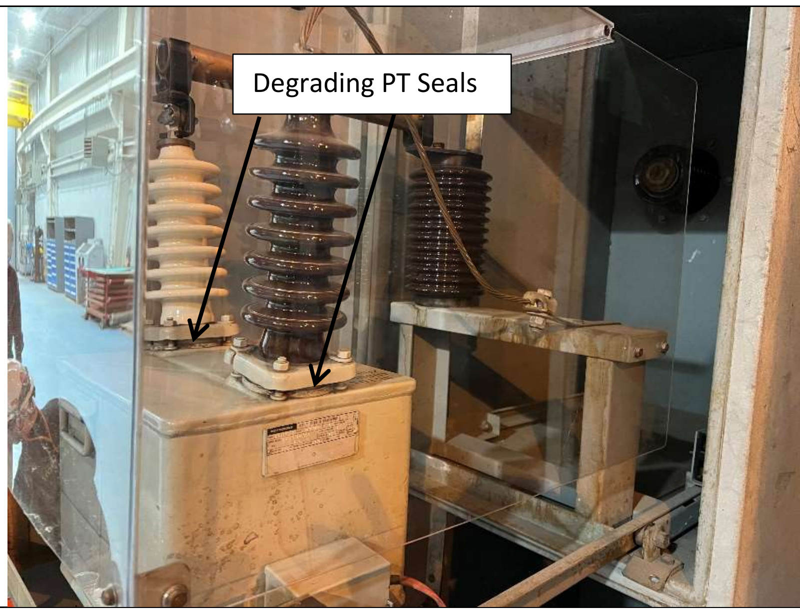
AS FOUND EXCITER END RETAINING RING CRACK WITH DYE PENTRANT


3.1.3 EXCITER

This generator does not have a rotating exciter and is statically excited. The exciter enclosure was noted to be quite dirty, and direction was given to the plant to clean up the excessive carbon dust.

3.1.4 ISOLATED PHASE BUS AND PREIPHERALS

Metering and Regulating Potential transformers are in serviceable condition however, under closer inspection, the rubber seals to the ceramic stand-offs are degrading and are visibly cracking. Frequent inspections are recommended to ensure an oil leak does not develop. It should be noted that one of the six potential transformers has been replaced with an ITEC brand transformer while the remaining five are Westinghouse.

ISOPHASE BUS POTENTIAL TRANSFORMER TYPICAL CONDITION

ISOPHASE BUS POTENTIAL CABINET STAND OFF INSULATOR


Also, during the potential cabinet inspection, all 6 isophase bus stand-off insulators contact points were found to have degraded silver plating and being quite dirty from old dried out grease. The plant was instructed to re-silver plate these connections and use Mobil 28 oxide inhibitor grease going forward to prevent any corrosion in these critical connections.

Stand-Off insulators for Main Generator isophase bus appeared satisfactory with no loose hardware or cracks from what was able to be inspected. The plant was instructed to perform a closer inspection of the stand-off insulators where accessible prior to returning the unit to normal operation.

While inspecting the main generator isophase bus flexible links it was noted that the aluminum laminated sheets are cracking and deteriorating. This is evidenced by the zip ties trying to prevent broken sheets to become foreign material which can cause a bus flash over if one is allowed to completely break off. It is recommended that the bus sections be removed during the next main generator rewind and sent to an isophase vendor to remove all the flexible links and install a new solid connection pad so traditional braided links can be installed.

FAILING ISOPHASE BUS MAIN FLEX LEAD LAMINATIONS	ISOPHASE BUS MAIN FLEX LINK CONNECTIONS
	

4 GENERAL VISUAL INSPECTION DATA SHEET

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Big Sandy Generator Visual Inspection Data Sheet

Plant :	Big Sandy	Generator Stator S/N:	1S-64P300	Name:	Ruchniak/DeBenedictis
Unit #:	1	Manufacturer:	Westinghouse	Date:	10/11/2022

Type of Inspection: Field Out | **Field S/N: 1R-64P300**

A. STATOR	Acceptable	Comments
1. Internal Cleanliness (oil, dust or contamination)	Yes	Fair. Moderate greasing on the end windings at the turbine end. Signs of paint chipping on hydrogen insulation tubes. Minor oil contamination at the bottom of the generator housing.
2. HV Bushing (damage, overheating or leaks)	Yes	Neutral HVBs were found to have a very slight oil dampness on the ceramic to metal interface. Since these are orignal, the seals appear to be degrading.
3. Wedges (greasing, dusting or migration)	Yes	Poor; minor greasing between wedges, several loose wedges and indications of core iron looseness.
4. Leads & blocking (greasing, dusting or overheating)	Yes	Fair. Flexible links between the iso phase bus and HV bushing leads are showing signs of cracking.
5. Bore (overheating, impact damage, migration)	Yes	Stator core of interlaminar greasing was found in various areas which indicate core looseness.
6. Flux Probe (Installed, operational)	N/A	Flux probe ordered & will be installed by CMS during outage.
7. External Cleanliness (oil, signs of leakage)	Yes	Satisfactory, no issues found.
8. Ventilation passages (blockages, migration)	Yes	Satisfactory, no blockages in the core or frame were found.
9. RTD/Thermocouple Wiring	N/A	Not tested but was grounded for AC Hi Pot.
10. Step Iron (greasing, dusting or migration)	Yes	End wedges were dislodged during rotor removal indicating loose wedges.
11. External Hardware (CT's, Neutral Grounding Xfmer)	Yes	Dust accumulation on CTs, and neutral grounding xfmr. Stand-Off Insulators were also dirty with a light coating of dust.

B. END WINDINGS & CONNECTIONS	Acceptable	Comments
1. End winding cleanliness/condition (oil, greasing)	Yes	Satisfactory overall however, there were a few areas of insulated paint chipping on the turbine end.
2. Blocking (looseness, greasing, dusting)	Yes	Good; minor greasing.
3. Ties (looseness, greasing, dusting)	Yes	There were a few locations of greasing on each end winding basket with the turbine end having the majority.
4. Corona Activity	Yes	No corona activity noted.
5. Connection rings (greasing or other damage)	Yes	No greasing was found. Support brackets and ties appear tight.
6. Chemloy Boxes (greasing, clearances)	N/A	
7. End winding support hardware (tensioning bolts)	Yes	Various through and building bolts were found to be hand tight.
8. Bearing Bracket Bolts (greasing, damage)	Yes	Good.
9. Connections (overheating, looseness, damage)	Yes	Good.
10. Stator Coils (greasing, insulation issues)	Yes	Satisfactory, nothing to note.
11. Teflon Hoses (greasing, damage, leaks)	N/A	

C. GENERATOR FIELD s/n: 1S-64P300	Acceptable	Comments
1. Retaining Rings (clean, arcing)	Yes	Clean but there is a light oil contamination on the retaining rings.
2. End Winding (distortion, burning)	Yes	Moderate discoloration of winding under retaining ring and fair amount of dirt accumulation.
3. Wedges (arcing, cracking)	Yes	Wedges remain unpainted, discoloration and dirt accumulation.
5. Forging (cleanliness, arcing)	Yes	Moderate coating of rust and oil on forging.
7. Collector Rings (wear, surface condition)	Marginal	Visible concave wear on rings; heavy carbon build-up due to lack of cleaning.
8. Brushes (wear, chipping, burning)	Yes	Brushes appear to have normal wear to brushes but no signs of chipping or burning.
9. Brush Rigging (cleanliness, arcing)	Yes	Heavy carbon dust from brushes in housing, no visible signs of arcing.

D. EXCITER	Acceptable	Comments
1. External Cleanliness (oil, dust or contamination)	N/A	
2. Stator (Cleanliness, winding condition)	N/A	
3. Brushes (wear, chipping , burning)	N/A	
4. Brush Rigging (Cleanliness, arcing)	N/A	
5. Rotor (Cleanliness, damage)	N/A	
6. **Nameplate (Take Photo)**	N/A	

E. CARBON BRUSH DATA	Brush s/n	# of brushes per ring and brush dimensions (Take Photo of Brush)
1. Generator	11-101540-469-4-03	10 brushes per ring. Dimensions: 3 3/8" L (bottom dimension), 4" L (top dimension) x 1.5" w x 1" h. See attached photos.
2. Exciter	N/A	

D. REMARKS The generator is in overall good condition. The inspection was performed with the generator field removed. There was moderate stator greasing on the turbine end . The stator wedges were found loose from tap testing as well as the test wedges, with minor greasing- especially at the turbine end. After performing breakaway torque testing it was determined the core was loose as a small sample (building and through bolts) were less than 30% of the required torque. Additionally, there was minor oil contamination and rust on the rotor.

5 MECHANICAL & ELECTRICAL TESTING

5.1 GENERATOR STATOR MECHANICAL AND ELECTRICAL TESTING

A series of electrical tests were performed on the generator stator. This included: an AC Hi POT, Stator Tube to Tube Resistances, EL CID, Wedge Tightness, Winding Resistance, and a Polarization Index (10-minute megger) tests. Tests were completed satisfactorily with no concerns noted. It should be noted that the wedge tightness data indicates a portion of the wedge data blocks being red. This indicates that particular wedge is outside of the 10-20 mills acceptance tolerance however, experience has shown that some deviation is acceptable, and correction of condition is not warranted. See appendix attachments 1.2, 1.3, 1.4, 1.5, 1.6, and 1.7 for generator stator testing data sheets for details.

5.2 GENERATOR FIELD MECHANICAL AND ELECTRICAL TESTING

A series of electrical tests were performed on the generator field. The tests included a: Winding Impedance, Winding Resistance, Pole Balance, Bore Pressure test at 60 PSI, and 500VDC polarization index test. Tests were completed satisfactorily with no concerns noted. See appendix attachment 1.1 for generator field testing data sheet for details.

6 RECOMMENDATIONS

Overall, the Big Sandy generator stator winding, and rotor is in serviceable condition however due to the short and loose stator core, a rewind and restack is recommended in the next 2-5 years. The repairs performed during the outage will help extend the life of the generator to the next planned generator core restack and rewind.

The rotor collector rings should be cleaned annually and during extended periods of equipment down time, additional basic electric tests (insulation resistance and polarization index) should be completed on the rotor to trend any potential issues which would require additional maintenance.

Finally, during the generator core restack and rewind project, high voltage bushings, current transformers, along with the isophase bus flexible links should also be replaced as part of that project.

1 APPENDIX

1.1 GENERATOR FIELD TEST DATA

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Big Sandy U1
Generator Field Tests Data

Plant & Unit No.	Big Sandy	Gen. Ser. No.	1S-64P300	Name:	Dustin
	1	Manufacturer:	Westinghouse	Date:	10/26/2022

Insulation Test @ 500 Vdc

Minutes	Megaohms
1	681.00
2	791.00
3	819.00
4	851.00
5	866.00
6	890.00
7	886.00
8	894.00
9	881.00
10	895.00
PI	1.31

AC Impedance Test

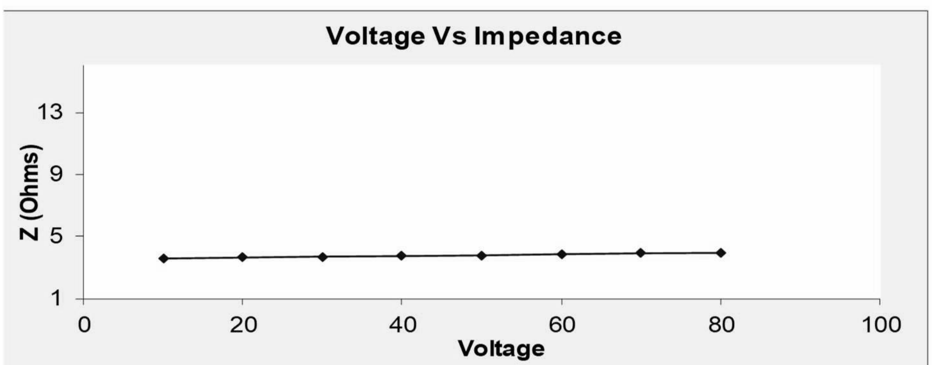
Voltage	Amperes	Z (Ohms)
10.0	2.80	3.6
20.0	5.50	3.6
30.0	8.10	3.7
40.0	10.70	3.7
50.0	13.20	3.8
60.0	15.50	3.9
70.0	17.80	3.9
80.0	20.20	4.0

Winding Resistance

Measured Resistance (ohms)	0.1000
Winding Temp. °C @ 66% Humidity	28.2
Resistance Corrected to 25 °C	**0.0988**
Resistance in 2015 @ 25 °C	0.0962

Pole Balance Test (VAC)

Total Voltage Across Rings	**50.07**
OB Ring to pole connector	**24.98**
IB Ring to pole connector	**25.09**



Bore Pressure Test

Start	Finish	Duration
Pressure	Pressure	Hours
60	59.91	1
Leakage	0.09	
Results	PASS	

Comments: Winding Resistance Scale: 10mA @ 40 Ohms, Signifcant carbon dust was contaminating the collector rings area and this represents final cleaning data.

1.2 GENERATOR STATOR WINDING TEST DATA FINAL

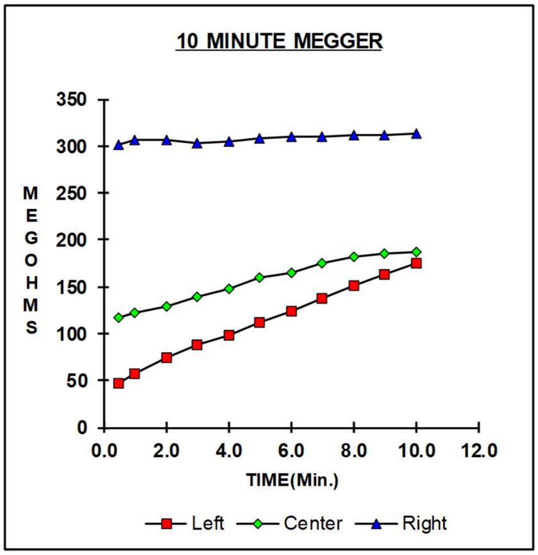
AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Armature Insulation Resistance / HV Proof Tests

Date	11/11/2022	Generator Serial No.	1S-64P300	Prepared by	M.Simmons
Manufacture	Westinghouse	Turbine Serial No.	N/A		
		Customer	AEP		

DC INSULATION RESISTANCE (Megohms)
Voltage: 5000 Volts

Time(Min)	Left	Center	Right
0.5	47.2	117.5	301
1.0	57.2	122.4	306
2.0	73.8	129.6	307
3.0	88.4	139.2	303
4.0	99	147.2	305
5.0	111	159.3	308
6.0	124.2	165.2	310
7.0	138.2	174.8	310
8.0	151.4	181	311
9.0	163.7	185.9	312
10.0	175.8	186.7	313
PI	**3.1**	**1.5**	**1.0**



HIGH VOLTAGE PROOF TEST

(One minute test on each phase with the other phases grounded.)
Rated Voltage (E): 22 KV

Test At:

60 Hz	X
0.1 Hz	
DC	

RECOMMENDED TEST VOLTAGES
AC Test Voltage (60 Hz): 33.0 KV
AC Test Voltage (0.1 Hz): 53.7 KV
DC Test Voltage: 56.1 KV DC
Actual Test Voltage: ~25 KV

	LEFT	CENTER	RIGHT
Passed test at	23.9	24.5	24.8
Failed test at			

Winding Temp:		C
Wet Bulb:		F
Dry Bulb:		F
Rel. Humidity:		%

AC HIPOT DATA (60 HZ) if applicable:
Test Set: Westinghouse

	LEFT	CENTER	RIGHT
Excitation Voltage			
Current (Amps)	1.50	1.55	1.55

Polarization Index
PI = 10min/1min

Comments:

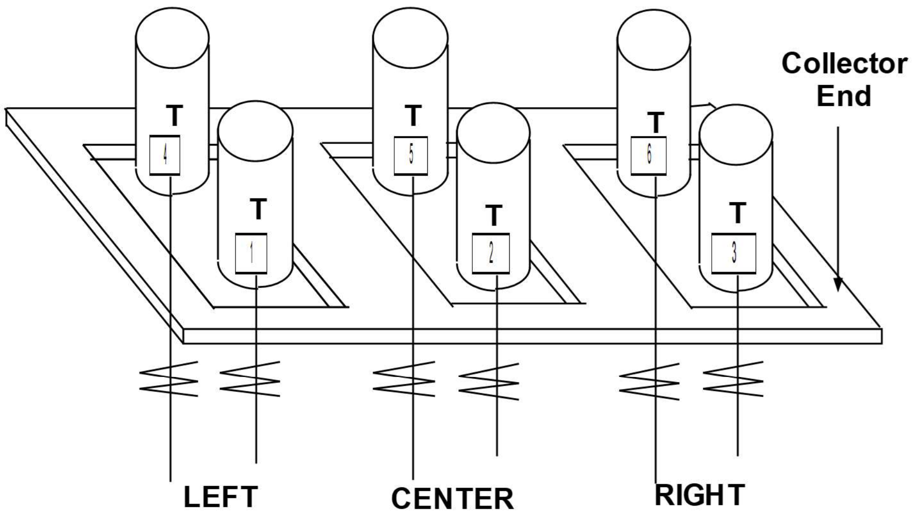
Serial No. of Equipment:
Calibration Date:
Calibration Due Date:

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY™

Generator Winding Resistance

Single Terminal

Date: 11/10/2022 Generator Serial No.: 1S-64P300 Prepared by: M Simmons
Turbine Serial No. N/A
Manufacture Westinghouse



Terminal Labels	Left	Center	Right
Turbine End	4	5	6
Collector End	1	2	3

Customer Phase Designation:	T1 - T4	T2 - T5	T3 - T6
(A-B-C, Left-Center-Right, etc.)			

Electrical Outline Drawing No.	

	T	T	T
Line Terminals			
Neutral Terminals			

WINDING RESISTANCE (OHMS)			LEFT	CENTER	RIGHT
			T1 - T4	T2 - T5	T3 - T6
Resistance @	15.55	ºC	0.001640	0.001630	0.001640
Resistance corrected to 25ºC:			0.001702	0.001692	0.001702
Factory Resistance @ 25ºC			N/A	N/A	N/A
Prior test @ 25ºC,	Date:	12/2/2015	0.001070	0.001090	0.001070

Comments:	DLRO was set on the 1A/40MOhm Scale. Test is satisfactory as windings are balanced.

1.3 GENERATOR STATOR WEDGE TIGHTNESS FINAL

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Test Wedge Row #1 (Starts Turbine End) Tightness Verification

Ripple Spring Deflection

Date (m/d/y)	11/10/2022	**Generator Serial No.**	1S-64P300
Manufacturer	Westinghouse	**Prepared By**	M.Simmons
Plant	Big Sandy		

SLOT #	WEDGE HOLE #	UNITS IN MILS			
1	#1- TE	0	0.014	Max	Min
	#2	-0.0025		0	-0.014
	#3	-0.0085			
	#4	-0.009			
	#5	-0.014			
	#6	-0.014			
	#7-EE	-0.014			
2	#1-TE	0	0.0195	Max	Min
	#2	0.0015		0.0165	-0.003
	#3	0.002			
	#4	0.0165			
	#5	-0.003			
	#6	-0.003			
	#7-EE	-0.001			
3	#1-TE	0	0.02	Max	Min
	#2	0.018		0.02	0
	#3	0.02			
	#4	0.01			
	#5	0.009			
	#6	0.009			
	#7-EE	0.011			
4	#1-TE	0	0.017	Max	Min
	#2	0.015		0.017	0
	#3	0.012			
	#4	0.009			
	#5	0.011			
	#6	0.016			
	#7-EE	0.017			
5	#1-TE	0	0.019	Max	Min
	#2	0.019		0.019	0
	#3	0.017			
	#4	0.017			
	#5	0.015			
	#6	0.019			
	#7-EE	0.015			
6	#1-TE	0	0.0145	Max	Min
	#2	0.007		0.0075	-0.007
	#3	0.002			
	#4	0.007			
	#5	0.0075			
	#6	0.001			
	#7-EE	-0.007			

7	#1-TE	0	0.011	Max	Min
	#2	-0.002		0	-0.011
	#3	-0.0105			
	#4	-0.011			
	#5	-0.0085			
	#6	-0.007			
	#7-EE	-0.0085			
8	#1-TE	0	0.01	Max	Min
	#2	0.0045		0.008	-0.002
	#3	0.0035			
	#4	0.001			
	#5	0.008			
	#6	-0.002			
	#7-EE	0.0005			
9	#1-TE	0	0.003	Max	Min
	#2	0.0015		0.0015	-0.0015
	#3	0.0015			
	#4	-0.0015			
	#5	-0.001			
	#6	-0.0015			
	#7-EE	0.0005			
10	#1-TE	0	0.009	Max	Min
	#2	-0.0045		0	-0.009
	#3	-0.0035			
	#4	-0.007			
	#5	-0.0045			
	#6	-0.006			
	#7-EE	-0.009			
11	#1-TE	0	0.012	Max	Min
	#2	0.002		0.002	-0.01
	#3	0			
	#4	-0.003			
	#5	-0.0065			
	#6	-0.01			
	#7-EE	-0.01			
12	#1-TE	0	0.0075	Max	Min
	#2	0.003		0.0065	-0.001
	#3	0.0045			
	#4	0.0065			
	#5	0.0045			
	#6	-0.001			
	#7-EE	-0.001			

2022 Big Sandy Unit 1 Generator Inspection Report 10/11/2022 to 10/14/2022

13	#1-TE	0	0.0075	Max	Min
	#2	0.006		0.006	-0.0015
	#3	0.006			
	#4	-0.001			
	#5	-0.0015			
	#6	-0.001			
	#7-EE	0.002			
14	#1-TE	0	0.005	Max	Min
	#2	0.004		0.005	0
	#3	0.005			
	#4	0.003			
	#5	0.003			
	#6	0.0005			
	#7-EE	0.001			
15	#1-TE	0	0.008	Max	Min
	#2	-0.0005		0.001	-0.007
	#3	0.001			
	#4	0			
	#5	-0.001			
	#6	-0.0055			
	#7-EE	-0.007			
16	#1-TE	0	0.015	Max	Min
	#2	-0.001		0	-0.015
	#3	-0.003			
	#4	-0.006			
	#5	-0.0085			
	#6	-0.0115			
	#7-EE	-0.015			
17	#1-TE	0	0.01	Max	Min
	#2	-0.0005		0	-0.01
	#3	-0.0055			
	#4	-0.01			
	#5	-0.0095			
	#6	-0.007			
	#7-EE	-0.0075			
18	#1-TE	0	0.0045	Max	Min
	#2	0		0	-0.0045
	#3	-0.001			
	#4	-0.003			
	#5	-0.0045			
	#6	-0.004			
	#7-EE	-0.003			
19	#1-TE	0	0.0045	Max	Min
	#2	0		0	-0.0045
	#3	-0.004			
	#4	-0.003			
	#5	-0.0045			
	#6	-0.001			
	#7-EE	-0.003			
20	#1-TE	0	0.0105	Max	Min
	#2	0.01		0.0105	0
	#3	0.0105			
	#4	0.005			
	#5	0.001			
	#6	0.001			
	#7-EE	0.0095			
21	#1-TE	0	0.0085	Max	Min
	#2	0.0005		0.0005	-0.008
	#3	-0.0045			
	#4	-0.0075			
	#5	-0.008			
	#6	-0.003			
	#7-EE	-0.003			

2022 Big Sandy Unit 1 Generator Inspection Report 10/11/2022 to 10/14/2022

22	#1-TE	0	0.003	Max	Min
	#2	0.003		0.003	0
	#3	0.001			
	#4	0.0005			
	#5	0			
	#6	0.003			
	#7-EE	0.003			
23	#1-TE	0	0.01	Max	Min
	#2	-0.002		0	-0.01
	#3	-0.0025			
	#4	-0.0045			
	#5	-0.007			
	#6	-0.0085			
	#7-EE	-0.01			
24	#1-TE	0	0.018	Max	Min
	#2	0.003		0.003	-0.015
	#3	-0.001			
	#4	0.0019			
	#5	0.0005			
	#6	-0.0055			
	#7-EE	-0.015			
25	#1-TE	0	0.0045	Max	Min
	#2	0		0	-0.0045
	#3	-0.0015			
	#4	-0.001			
	#5	-0.003			
	#6	-0.0035			
	#7-EE	-0.0045			
26	#1-TE	0	0.014	Max	Min
	#2	-0.001		0	-0.014
	#3	-0.0015			
	#4	-0.0065			
	#5	-0.0065			
	#6	-0.0105			
	#7-EE	-0.014			
27	#1-TE	0	0.008	Max	Min
	#2	0		0	-0.008
	#3	-0.008			
	#4	-0.0055			
	#5	-0.006			
	#6	-0.0005			
	#7-EE	-0.0025			
28	#1-TE	0	0.0115	Max	Min
	#2	-0.001		0	-0.0115
	#3	-0.004			
	#4	-0.0055			
	#5	-0.0065			
	#6	-0.009			
	#7-EE	-0.0115			
29	#1-TE	0	0.009	Max	Min
	#2	-0.001		0	-0.009
	#3	-0.009			
	#4	-0.0085			
	#5	-0.004			
	#6	-0.001			
	#7-EE	-0.001			
30	#1-TE	0	0.013	Max	Min
	#2	0.001		0.001	-0.012
	#3	-0.002			
	#4	-0.0075			
	#5	-0.012			
	#6	-0.0085			
	#7-EE	-0.0115			

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Test Wedge Row #2 Tightness Verification

Ripple Spring Deflection

Date (m/d/y)	11/10/2022	**Generator Serial No.**	1S-64P300
Manufacturer	Westinghouse	**Prepared By**	M.Simmons
Plant	Big Sandy		

SLOT #	WEDGE HOLE #	UNITS IN MILS			
1	#1- TE	0	0.01	Max	Min
	#2	-0.007		0.001	-0.009
	#3	-0.007			
	#4	-0.009			
	#5	0			
	#6	0.001			
	#7-EE	-0.007			
2	#1-TE	0	0.013	Max	Min
	#2	-0.0085		0.004	-0.009
	#3	-0.009			
	#4	0			
	#5	0.004			
	#6	0.001			
	#7-EE	-0.0085			
3	#1-TE	0	0.014	Max	Min
	#2	-0.0105		0.0035	-0.0105
	#3	-0.0105			
	#4	0			
	#5	0.0035			
	#6	0.002			
	#7-EE	-0.0075			
4	#1-TE	0	0.019	Max	Min
	#2	-0.011		0.008	-0.011
	#3	-0.01			
	#4	0.0065			
	#5	0.008			
	#6	0.0015			
	#7-EE	-0.0105			
5	#1-TE	0	0.02	Max	Min
	#2	-0.015		0.005	-0.015
	#3	-0.014			
	#4	-0.0015			
	#5	0.005			
	#6	0			
	#7-EE	-0.014			
6	#1-TE	0	0.018	Max	Min
	#2	-0.0005		0.002	-0.016
	#3	-0.016			
	#4	-0.015			
	#5	-0.012			
	#6	0.002			
	#7-EE	0.0015			
7	#1-TE	0	0.019	Max	Min
	#2	0.004		0.006	-0.013
	#3	0.002			
	#4	-0.013			
	#5	-0.013			
	#6	-0.0045			
	#7-EE	0.006			
8	#1-TE	0	0.02	Max	Min
	#2	-0.016		0	-0.02
	#3	-0.02			
	#4	-0.0195			
	#5	0			
	#6	0			
	#7-EE	-0.0195			

2022 Big Sandy Unit 1 Generator Inspection Report 10/11/2022 to 10/14/2022

9	#1-TE	0	0.019	Max	Min
	#2	-0.002		0	-0.019
	#3	-0.0175			
	#4	-0.019			
	#5	-0.0115			
	#6	-0.001			
	#7-EE	-0.003			
10	#1-TE	0	0.0125	Max	Min
	#2	-0.008		0.0035	-0.009
	#3	-0.008			
	#4	0			
	#5	0.0035			
	#6	0.001			
	#7-EE	-0.009			
11	#1-TE	0	0.0145	Max	Min
	#2	-0.014		0.0005	-0.014
	#3	-0.014			
	#4	-0.008			
	#5	0.0005			
	#6	0			
	#7-EE	-0.0125			
12	#1-TE	0	0.009	Max	Min
	#2	-0.002		0.007	-0.002
	#3	-0.002			
	#4	0.007			
	#5	0.002			
	#6	0			
	#7-EE	-0.0015			
13	#1-TE	0	0.016	Max	Min
	#2	-0.001		0.0005	-0.0155
	#3	-0.014			
	#4	-0.0155			
	#5	-0.011			
	#6	0.0005			
	#7-EE	-0.001			
14	#1-TE	0	0.0165	Max	Min
	#2	-0.012		0	-0.0165
	#3	-0.0165			
	#4	-0.014			
	#5	-0.003			
	#6	-0.003			
	#7-EE	-0.01			
15	#1-TE	0	0.0195	Max	Min
	#2	0.0095		0.0095	-0.01
	#3	0.0075			
	#4	-0.0085			
	#5	-0.01			
	#6	-0.004			
	#7-EE	0.009			
16	#1-TE	0	0.02	Max	Min
	#2	0.003		0.003	-0.017
	#3	-0.0065			
	#4	-0.016			
	#5	-0.017			
	#6	-0.0015			
	#7-EE	0.0015			
17	#1-TE	0	0.0105	Max	Min
	#2	-0.001		0	-0.0105
	#3	-0.0075			
	#4	-0.0105			
	#5	-0.01			
	#6	-0.001			
	#7-EE	0			
18	#1-TE	0	0.01	Max	Min
	#2	0.001		0.001	-0.009
	#3	-0.0085			
	#4	-0.009			
	#5	-0.0045			
	#6	0.001			
	#7-EE	0			

19	#1-TE	0	0.02	Max	Min
	#2	-0.017		0.002	-0.018
	#3	-0.018			
	#4	-0.0105			
	#5	0.002			
	#6	-0.001			
	#7-EE	-0.017			
20	#1-TE	0	0.0195	Max	Min
	#2	-0.012		0	-0.0195
	#3	-0.0195			
	#4	-0.018			
	#5	-0.002			
	#6	-0.0045			
	#7-EE	-0.014			
21	#1-TE	0	0.0095	Max	Min
	#2	-0.009		0	-0.0095
	#3	-0.0095			
	#4	-0.005			
	#5	-0.0005			
	#6	-0.001			
	#7-EE	-0.0085			
22	#1-TE	0	0.0195	Max	Min
	#2	-0.014		0	-0.0195
	#3	-0.0195			
	#4	-0.015			
	#5	-0.001			
	#6	-0.001			
	#7-EE	-0.013			
23	#1-TE	0	0.02	Max	Min
	#2	-0.019		0	-0.02
	#3	-0.02			
	#4	-0.0195			
	#5	-0.0065			
	#6	-0.0075			
	#7-EE	-0.0165			
24	#1-TE	0	0.02	Max	Min
	#2	-0.0015		0	-0.02
	#3	-0.02			
	#4	-0.019			
	#5	-0.018			
	#6	-0.002			
	#7-EE	-0.001			
25	#1-TE	0	0.02	Max	Min
	#2	-0.014		0.004	-0.016
	#3	-0.013			
	#4	-0.0065			
	#5	0.004			
	#6	0.001			
	#7-EE	-0.016			
26	#1-TE	0	0.0185	Max	Min
	#2	-0.011		0.004	-0.0145
	#3	-0.0115			
	#4	-0.0005			
	#5	0.004			
	#6	-0.0005			
	#7-EE	-0.0145			

27	#1-TE	0	0.01	Max	Min
	#2	0		0.0085	-0.0015
	#3	-0.0015			
	#4	0.008			
	#5	0.0085			
	#6	0.0045			
	#7-EE	0.0025			
28	#1-TE	0	0.017	Max	Min
	#2	-0.0035		0.0135	-0.0035
	#3	0.0015			
	#4	0.012			
	#5	0.0135			
	#6	0.003			
	#7-EE	-0.001			
29	#1-TE	0	0.02	Max	Min
	#2	0.001		0.018	-0.002
	#3	0.015			
	#4	0.018			
	#5	0.0055			
	#6	-0.002			
	#7-EE	-0.002			
30	#1-TE	0	0.0105	Max	Min
	#2	-0.0065		0.003	-0.0075
	#3	-0.0075			
	#4	0.002			
	#5	0.003			
	#6	0.001			
	#7-EE	-0.007			

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Test Wedge Row #3 (Center) Tightness Verification

Ripple Spring Deflection

Date (m/d/y)	11/10/2022	**Generator Serial No.**	1S-64P300
Manufacturer	Westinghouse	**Prepared By**	M.Simmons
Plant	Big Sandy		

SLOT #	WEDGE HOLE #	UNITS IN MILS		Max	Min
1	#1- TE	0	0.013	0.0125	-0.0005
	#2	0.012			
	#3	0.0125			
	#4	0.006			
	#5	-0.0005			
	#6	0.001			
	#7-EE	0.0115			
2	#1-TE	0	0.0085	0	-0.0085
	#2	-0.002			
	#3	-0.0085			
	#4	-0.0055			
	#5	-0.001			
	#6	-0.0005			
	#7-EE	-0.002			
3	#1-TE	0	0.008	0.003	-0.005
	#2	0.003			
	#3	-0.001			
	#4	-0.005			
	#5	-0.005			
	#6	-0.0045			
	#7-EE	0			
4	#1-TE	0	0.016	0.015	-0.001
	#2	0.014			
	#3	0.015			
	#4	0.0115			
	#5	0.002			
	#6	-0.001			
	#7-EE	0.012			
5	#1-TE	0	0.0095	0	-0.0095
	#2	-0.0065			
	#3	-0.0085			
	#4	-0.0095			
	#5	-0.001			
	#6	-0.001			
	#7-EE	-0.0065			
6	#1-TE	0	0.0095	0.0085	-0.001
	#2	0.0065			
	#3	0.0085			
	#4	0.005			
	#5	-0.001			
	#6	-0.001			
	#7-EE	0.0065			
7	#1-TE	0	0.0185	0.016	-0.0025
	#2	-0.0025			
	#3	0.0065			
	#4	0.016			
	#5	0.015			
	#6	0.0035			
	#7-EE	0.002			

8	#1-TE	0	0.012	Max	Min
	#2	0.0045		0.008	-0.004
	#3	0.008			
	#4	0.0055			
	#5	-0.003			
	#6	-0.004			
	#7-EE	0.001			
9	#1-TE	0	0.017	Max	Min
	#2	-0.0005		0.0125	-0.0045
	#3	0.006			
	#4	0.0125			
	#5	0.011			
	#6	-0.001			
	#7-EE	-0.0045			
10	#1-TE	0	0.015	Max	Min
	#2	0.014		0.0145	-0.0005
	#3	0.014			
	#4	0.0055			
	#5	-0.0005			
	#6	0.0025			
	#7-EE	0.0145			
11	#1-TE	0	0.008	Max	Min
	#2	-0.001		0.0015	-0.0065
	#3	0.0015			
	#4	0.001			
	#5	-0.0045			
	#6	-0.0065			
	#7-EE	-0.005			
12	#1-TE	0	0.0105	Max	Min
	#2	-0.0005		0	-0.0105
	#3	-0.0055			
	#4	-0.008			
	#5	-0.0105			
	#6	-0.0025			
	#7-EE	-0.0015			
13	#1-TE	0	0.0085	Max	Min
	#2	0.0065		0.0085	0
	#3	0.0085			
	#4	0.005			
	#5	0.001			
	#6	0			
	#7-EE	0.0065			
14	#1-TE	0	0.0075	Max	Min
	#2	0.003		0.004	-0.0035
	#3	0.004			
	#4	0.0015			
	#5	-0.0015			
	#6	-0.0035			
	#7-EE	0.001			
15	#1-TE	0	0.0085	Max	Min
	#2	0.0005		0.0085	0
	#3	0.0065			
	#4	0.0085			
	#5	0.0055			
	#6	0.0035			
	#7-EE	0.003			
16	#1-TE	0	0.012	Max	Min
	#2	0		0.0015	-0.0105
	#3	-0.009			
	#4	-0.0105			
	#5	-0.008			
	#6	0.001			
	#7-EE	0.0015			

17	#1-TE	0	0.0085	Max	Min
	#2	0.008		0.008	-0.0005
	#3	0.006			
	#4	0.003			
	#5	-0.0005			
	#6	-0.0005			
	#7-EE	0.006			
18	#1-TE	0	0.009	Max	Min
	#2	0		0.005	-0.004
	#3	-0.003			
	#4	-0.0035			
	#5	-0.004			
	#6	0			
	#7-EE	0.005			
19	#1-TE	0	0.018	Max	Min
	#2	0.01		0.018	0
	#3	0.018			
	#4	0.0145			
	#5	0.0005			
	#6	0.0005			
	#7-EE	0.014			
20	#1-TE	0	0.013	Max	Min
	#2	0.009		0.0125	-0.0005
	#3	0.0125			
	#4	0.007			
	#5	-0.0005			
	#6	0			
	#7-EE	0.012			
21	#1-TE	0	0.0145	Max	Min
	#2	0		0.014	-0.0005
	#3	0.0105			
	#4	0.014			
	#5	0.0105			
	#6	0.0005			
	#7-EE	-0.0005			
22	#1-TE	0	0.018	Max	Min
	#2	0.003		0.003	-0.015
	#3	-0.013			
	#4	-0.015			
	#5	-0.013			
	#6	0			
	#7-EE	0.001			
23	#1-TE	0	0.098	Max	Min
	#2	0.0085		0.09	-0.008
	#3	0.01			
	#4	0.0025			
	#5	-0.008			
	#6	0.0015			
	#7-EE	0.09			
24	#1-TE	0	0.01	Max	Min
	#2	0.0015		0.0015	-0.0085
	#3	-0.0025			
	#4	-0.0085			
	#5	-0.007			
	#6	-0.0005			
	#7-EE	-0.001			
25	#1-TE	0	0.014	Max	Min
	#2	0.0075		0.0095	-0.0045
	#3	0.007			
	#4	-0.0045			
	#5	-0.0045			
	#6	0			
	#7-EE	0.0095			

26	#1-TE	0	0.009	Max	Min
	#2	-0.0075		0	-0.009
	#3	-0.0075			
	#4	-0.0065			
	#5	-0.0005			
	#6	-0.001			
	#7-EE	-0.009			
27	#1-TE	0	0.019	Max	Min
	#2	0.006		0.0085	-0.0105
	#3	0.0045			
	#4	-0.0105			
	#5	-0.01			
	#6	-0.0025			
	#7-EE	0.0085			
28	#1-TE	0	0.018	Max	Min
	#2	0.0015		0.0025	-0.0155
	#3	-0.0045			
	#4	-0.0155			
	#5	-0.0145			
	#6	-0.003			
	#7-EE	0.0025			
29	#1-TE	0	0.015	Max	Min
	#2	0.014		0.014	-0.001
	#3	0.014			
	#4	0.002			
	#5	-0.001			
	#6	0.001			
	#7-EE	0.0125			
30	#1-TE	0	0.019	Max	Min
	#2	0.0085		0.0085	-0.0105
	#3	0.005			
	#4	-0.0085			
	#5	-0.0105			
	#6	-0.0045			
	#7-EE	0.007			

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Test Wedge Row #4 Tightness Verification

Ripple Spring Deflection

Date (m/d/y)	11/10/2022	**Generator Serial No.**	1S-64P300
Manufacturer	Westinghouse	**Prepared By**	M.Simmons
Plant	Big Sandy		

SLOT #	WEDGE HOLE #	UNITS IN MILS		Max	Min
1	#1- TE	0	0.0195	0.018	-0.0015
	#2	0.015			
	#3	0.018			
	#4	0.0105			
	#5	-0.0015			
	#6	-0.001			
	#7-EE	0.014			
2	#1-TE	0	0.016	0.016	0
	#2	0.014			
	#3	0.016			
	#4	0.009			
	#5	0.001			
	#6	0.0015			
	#7-EE	0.015			
3	#1-TE	0	0.014	0.002	-0.012
	#2	0.0015			
	#3	-0.0095			
	#4	-0.012			
	#5	-0.0095			
	#6	0.0015			
	#7-EE	0.002			
4	#1-TE	0	0.014	0.014	0
	#2	0.007			
	#3	0.014			
	#4	0.014			
	#5	0.0065			
	#6	0.007			
	#7-EE	0.0105			
5	#1-TE	0	0.0125	0.0125	0
	#2	0.008			
	#3	0.0125			
	#4	0.0105			
	#5	0.002			
	#6	0.0025			
	#7-EE	0.0105			
6	#1-TE	0	0.014	0.014	0
	#2	0.0135			
	#3	0.0135			
	#4	0.0065			
	#5	0.0025			
	#6	0.0005			
	#7-EE	0.014			
7	#1-TE	0	0.0155	0.01	-0.0055
	#2	0.0075			
	#3	0.007			
	#4	-0.0005			
	#5	-0.0055			
	#6	-0.0025			
	#7-EE	0.01			
8	#1-TE	0	0.0095	0.004	-0.0055
	#2	0.003			
	#3	0.004			
	#4	0.0005			
	#5	-0.0035			
	#6	-0.0055			
	#7-EE	0.002			

9	#1-TE	0	0.014	Max	Min
	#2	0.0105		0.014	0
	#3	0.014			
	#4	0.011			
	#5	0.0015			
	#6	0.0015			
	#7-EE	0.0105			
10	#1-TE	0	0.008	Max	Min
	#2	0.004		0.006	-0.002
	#3	0.006			
	#4	0.0045			
	#5	-0.002			
	#6	-0.002			
	#7-EE	0.004			
11	#1-TE	0	0.0085	Max	Min
	#2	-0.001		0.0065	-0.002
	#3	0.002			
	#4	0.0065			
	#5	0			
	#6	-0.002			
	#7-EE	-0.002			
12	#1-TE	0	0.01	Max	Min
	#2	0.001		0.01	0
	#3	0.0045			
	#4	0.01			
	#5	0.0045			
	#6	0.0005			
	#7-EE	0.002			
13	#1-TE	0	0.01	Max	Min
	#2	0.001		0.001	-0.009
	#3	0.0005			
	#4	-0.0005			
	#5	-0.009			
	#6	0.001			
	#7-EE	0.001			
14	#1-TE	0	0.01	Max	Min
	#2	0.0005		0.01	0
	#3	0.0015			
	#4	0.0085			
	#5	0.01			
	#6	0.0045			
	#7-EE	0.0035			
15	#1-TE	0	0.0055	Max	Min
	#2	-0.0005		0	-0.0055
	#3	-0.0045			
	#4	-0.005			
	#5	-0.0055			
	#6	-0.0015			
	#7-EE	-0.0015			
16	#1-TE	0	0.017	Max	Min
	#2	0.0155		0.017	0
	#3	0.017			
	#4	0.009			
	#5	0.003			
	#6	0.0025			
	#7-EE	0.0155			
17	#1-TE	0	0.0135	Max	Min
	#2	0.003		0.003	-0.0105
	#3	-0.001			
	#4	-0.01			
	#5	-0.0105			
	#6	0.0005			
	#7-EE	0.003			

18	#1-TE	0	0.012	Max	Min
	#2	0.011		0.012	0
	#3	0.012			
	#4	0.006			
	#5	0.003			
	#6	0.001			
	#7-EE	0.011			
19	#1-TE	0	0.0165	Max	Min
	#2	0.011		0.0165	0
	#3	0.0165			
	#4	0.013			
	#5	0.003			
	#6	0.0045			
	#7-EE	0.013			
20	#1-TE	0	0.0075	Max	Min
	#2	-0.002		0.0055	-0.002
	#3	0.001			
	#4	0.003			
	#5	0.0045			
	#6	0.0055			
	#7-EE	0.003			
21	#1-TE	0	0.0055	Max	Min
	#2	0.001		0.0055	0
	#3	0.0055			
	#4	0.0055			
	#5	0			
	#6	0			
	#7-EE	0.0005			
22	#1-TE	0	0.0055	Max	Min
	#2	-0.0025		0.001	-0.0045
	#3	0.001			
	#4	0.001			
	#5	-0.0015			
	#6	-0.001			
	#7-EE	-0.0045			
23	#1-TE	0	0.008	Max	Min
	#2	0.0005		0.004	-0.004
	#3	-0.004			
	#4	-0.001			
	#5	-0.003			
	#6	0.001			
	#7-EE	0.004			
24	#1-TE	0	0.0085	Max	Min
	#2	-0.007		0.0015	-0.007
	#3	0			
	#4	0.0015			
	#5	0.001			
	#6	0.0015			
	#7-EE	-0.0005			
25	#1-TE	0	0.0055	Max	Min
	#2	0.0045		0.0055	0
	#3	0.0045			
	#4	0.0025			
	#5	0.001			
	#6	0.001			
	#7-EE	0.0055			

26	#1-TE	0	0.0185	Max	Min
	#2	0.0105		0.0185	0
	#3	0.0185			
	#4	0.018			
	#5	0.014			
	#6	0.0065			
	#7-EE	0.0065			
27	#1-TE	0	0.007	Max	Min
	#2	0.003		0.007	0
	#3	0.007			
	#4	0.0065			
	#5	0.001			
	#6	0.002			
	#7-EE	0.003			
28	#1-TE	0	0.005	Max	Min
	#2	0.0005		0.0005	-0.0045
	#3	-0.003			
	#4	-0.004			
	#5	-0.0045			
	#6	0			
	#7-EE	0			
29	#1-TE	0	0.01	Max	Min
	#2	0.0015		0.0095	-0.0005
	#3	-0.0005			
	#4	0.0005			
	#5	0.0015			
	#6	0.0085			
	#7-EE	0.0095			
30	#1-TE	0	0.01	Max	Min
	#2	0.001		0.001	-0.009
	#3	-0.004			
	#4	-0.008			
	#5	-0.009			
	#6	-0.0005			
	#7-EE	0.001			

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Test Wedge Row #5 (Exciter End) Tightness Verification

Ripple Spring Deflection

Date (m/d/y)	11/10/2022	**Generator Serial No.**	1S-64P300
Manufacturer	Westinghouse	**Prepared By**	M.Simmons
Plant	Big Sandy		

SLOT #	WEDGE HOLE #	UNITS IN MILS		Max	Min
1	#1- TE	0	0.02	Max	Min
	#2	0.0175		0.02	0
	#3	0.02			
	#4	0.015			
	#5	0.0015			
	#6	0.003			
	#7-EE	0.0185			
2	#1-TE	0	0.0185	Max	Min
	#2	0.0145		0.0185	0
	#3	0.0185			
	#4	0.01			
	#5	0.001			
	#6	0.0015			
	#7-EE	0.017			
3	#1-TE	0	0.0155	Max	Min
	#2	0.001		0.002	-0.0135
	#3	-0.0105			
	#4	-0.0135			
	#5	-0.0105			
	#6	0.001			
	#7-EE	0.002			
4	#1-TE	0	0.0155	Max	Min
	#2	0.007		0.0155	0
	#3	0.0155			
	#4	0.015			
	#5	0.006			
	#6	0.0065			
	#7-EE	0.0105			
5	#1-TE	0	0.014	Max	Min
	#2	0.0105		0.014	0
	#3	0.014			
	#4	0.0125			
	#5	0.002			
	#6	0.002			
	#7-EE	0.0085			
6	#1-TE	0	0.0185	Max	Min
	#2	0.01		0.01	-0.0085
	#3	0.005			
	#4	-0.0065			
	#5	-0.0085			
	#6	0.0045			
	#7-EE	0.01			
7	#1-TE	0	0.0185	Max	Min
	#2	0.0105		0.0115	-0.007
	#3	0.009			
	#4	-0.0045			
	#5	-0.007			
	#6	-0.001			
	#7-EE	0.0115			

8	#1-TE	0	0.015	Max	Min
	#2	-0.0115		0.001	-0.014
	#3	-0.014			
	#4	-0.008			
	#5	0.001			
	#6	-0.001			
	#7-EE	-0.0085			
9	#1-TE	0	0.0195	Max	Min
	#2	0.0135		0.0195	0
	#3	0.0195			
	#4	0.0125			
	#5	0.004			
	#6	0.005			
	#7-EE	0.0185			
10	#1-TE	0	0.02	Max	Min
	#2	0.016		0.02	0
	#3	0.02			
	#4	0.0175			
	#5	0.007			
	#6	0.008			
	#7-EE	0.019			
11	#1-TE	0	0.02	Max	Min
	#2	0.009		0.015	-0.005
	#3	0.015			
	#4	0.01			
	#5	-0.0045			
	#6	-0.005			
	#7-EE	0.0085			
12	#1-TE	0	0.013	Max	Min
	#2	0.0105		0.012	-0.001
	#3	0.012			
	#4	0.0015			
	#5	-0.001			
	#6	0			
	#7-EE	0.0115			
13	#1-TE	0	0.019	Max	Min
	#2	0.001		0.003	-0.016
	#3	-0.016			
	#4	-0.015			
	#5	-0.014			
	#6	0.003			
	#7-EE	0.003			
14	#1-TE	0	0.018	Max	Min
	#2	0.013		0.016	-0.002
	#3	0.016			
	#4	0.01			
	#5	-0.002			
	#6	-0.001			
	#7-EE	0.011			
15	#1-TE	0	0.0115	Max	Min
	#2	-0.009		0.0025	-0.009
	#3	-0.0085			
	#4	-0.003			
	#5	0.0025			
	#6	-0.002			
	#7-EE	-0.003			

16	#1-TE	0	0.014	Max	Min
	#2	0.0045		0.014	0
	#3	0.0135			
	#4	0.014			
	#5	0.0025			
	#6	0.001			
	#7-EE	0.0065			
17	#1-TE	0	0.0195	Max	Min
	#2	0.0065		0.0195	0
	#3	0.0195			
	#4	0.0175			
	#5	0.0025			
	#6	0			
	#7-EE	0.0075			
18	#1-TE	0	0.02	Max	Min
	#2	0.0125		0.02	0
	#3	0.02			
	#4	0.0145			
	#5	0			
	#6	0.0005			
	#7-EE	0.014			
19	#1-TE	0	0.02	Max	Min
	#2	-0.001		0.009	-0.011
	#3	0.0075			
	#4	0.009			
	#5	0.0085			
	#6	-0.006			
	#7-EE	-0.011			
20	#1-TE	0	0.018	Max	Min
	#2	-0.0025		0.008	-0.01
	#3	-0.01			
	#4	-0.0085			
	#5	0			
	#6	0.003			
	#7-EE	0.008			
21	#1-TE	0	0.0185	Max	Min
	#2	0.011		0.0185	0
	#3	0.018			
	#4	0.0185			
	#5	0.0025			
	#6	0.001			
	#7-EE	0.0105			
22	#1-TE	0	0.015	Max	Min
	#2	0.0105		0.0105	-0.0045
	#3	0.01			
	#4	-0.0025			
	#5	-0.0045			
	#6	-0.001			
	#7-EE	0.0105			
23	#1-TE	0	0.019	Max	Min
	#2	0.013		0.018	-0.001
	#3	0.018			
	#4	0.0105			
	#5	-0.001			
	#6	0.001			
	#7-EE	0.018			

24	#1-TE	0	0.009	Max	Min
	#2	0.0015		0.003	-0.006
	#3	-0.006			
	#4	-0.0035			
	#5	0			
	#6	0.003			
	#7-EE	0.003			
25	#1-TE	0	0.017	Max	Min
	#2	0.0085		0.0085	-0.0085
	#3	0.007			
	#4	-0.0075			
	#5	-0.0085			
	#6	-0.001			
	#7-EE	0.0085			
26	#1-TE	0	0.018	Max	Min
	#2	0.0145		0.018	0
	#3	0.0175			
	#4	0.018			
	#5	0.016			
	#6	0.0065			
	#7-EE	0.007			
27	#1-TE	0	0.008	Max	Min
	#2	0.0035		0.008	0
	#3	0.008			
	#4	0.0075			
	#5	0.0005			
	#6	0.001			
	#7-EE	0.003			
28	#1-TE	0	0.009	Max	Min
	#2	0		0	-0.009
	#3	-0.003			
	#4	-0.0055			
	#5	-0.009			
	#6	-0.0005			
	#7-EE	-0.0005			
29	#1-TE	0	0.008	Max	Min
	#2	0.002		0.0075	-0.0005
	#3	-0.0005			
	#4	0.0005			
	#5	0			
	#6	0.0065			
	#7-EE	0.0075			
30	#1-TE	0	0.01	Max	Min
	#2	0.001		0.0035	-0.0065
	#3	-0.004			
	#4	-0.0065			
	#5	-0.0065			
	#6	0.0035			
	#7-EE	0.0035			

1.4 GENERATOR STATOR TUBE TO TUBE RESISTANCE

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

Single Tube Stack

Tube-Tube Resistance

Date	10/12/22	Gen. Serial No.	**1S-64P300**
Manufacture	Westinghouse	Turbine Serial No.	
Customer	**Big Sandy**		
Prepared by	Savannah Sargent		
FSR #			
Instrument Serial No.			

	RESISTANCE in OHMS									
SLOT #	**T1-T2**	**T2-T3**	**T3-T4**	**T4-T5**	**T5-T6**	**T6-T7**	**T7-T8**	**T8-T9**	**T9-T1**	**COMMENTS**
1.T	41.20	46.00	103.50	113.70	95.60	350.00	195.60	165.60	600.00	
1.B	25.90	43.80	101.00	98.50	67.50	97.00	55.60	62.70	361.00	
2.T										
2.B	48.50	104.90	252.00	110.00	288.50	168,6	103.00	64.40	612.00	
3.T	142.30	132.80	412.00	310.00	332.00	167.00	241.00	710.00	1135.00	
3.B	87.10	49.30	103.60	54.20	96.90	47.30	52.60	49.90	429.00	
4.T	83.30	569.00	734.00	1733.00	1068.00	533.00	236.00	55.70	2192.00	
4.B	42.00	349.40	878.00	187.60	203.70	144.90	83.90	40.50	967.00	
5.T	43.70	44.80	35.00	34.90	51.30	44.30	82.90	29.60	343.00	
5.B	59.30	30.90	35.10	77.10	271.30	220.10	40.70	26.90	658.00	
6.T	55.60	101.10	251.20	65.10	362.90	393.20	177.90	153.40	1103.00	
6.B	41.90	132.80	168.80	212.50	112.70	100.20	38.20	60.90	688.00	
7.T	48.70	340.50	101.60	1258.00	211.80	401.50	75.70	53.60	2075.00	
7.B	57.80	36.00	147.00	171.00	123.50	103.80	412.00	186.80	1049.00	
8.T	223.50	11.01	686.60	1086.00	2106.00	678.00	119.70	144.50	2433.00	
8.B	59.00	112.00	494.20	286.00	449.90	150.80	165.90	201.90	1223.00	
9.T										
9.B										
10.T	56.40	310.10	248,5	229.00	361.00	36.50	221.30	406.80	1230.00	
10.B	38.50	105.60	48.70	50.40	49.00	81.90	297.30	121.30	629.00	
11.T	668.00	1526.00	1349.00	3275.00	1104.00	971.30	274.70	171.40	331.40	
11.B	79.20	103.50	48.60	74.10	125.10	168.80	122.50	40.60	94.70	
12.T	145.30	728.00	5318.00	2416.00	4051.00	2313.00	1380.00	1380.00	2868.00	
12.B	57.40	82.80	63.00	80.80	56.50	96.60	58.50	113.00	590.10	
13.T	90.50	106.60	165.20	156.70	257.90	225.70	236.70	136.50	1231.00	
13.B	20.40	25.20	87.10	79.00	89.70	54.90	105.10	107.50	430.80	
14.T										
14.B										
15.T	45.10	104.00	127.00	156.70	57.40	70.20	170.70	35.90	668.00	
15.B	49.10	18.70	25.80	46.80	29.60	48.00	55.40	105.80	350.10	

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY™

Single Tube Stack

Tube-Tube Resistance

Date 10/12/22 Gen. Serial No. **1S-64P300**
Manufacture Westinghouse Turbine Serial No.
Customer **Big Sandy**

Prepared by Savannah Sargent
FSR #
Instrument Serial No.

	RESISTANCE in OHMS									
SLOT#	**T1-T2**	**T2-T3**	**T3-T4**	**T4-T5**	**T5-T6**	**T6-T7**	**T7-T8**	**T8-T9**	**T9-T1**	**COMMENTS**
16.T	79.50	45.30	47.30	283.00	42.70	58.10	61.50	121.10	612.00	
16.B	64.40	236.00	347.00	317.80	249.80	52.20	37.70	97.20	615.00	
17.T	14.50	23.90	24.10	35.20	149.30	58.70	32.00	60.70	299.00	
17.B	32.40	47.90	219.00	576.50	144.30	172.40	46.70	23.30	847.90	
18.T	27.80	55.00	47.00	137.60	73.00	99.50	97.50	18.80	466.90	
18.B	43.80	108.60	140.10	76.30	42.60	54.30	30.90	35.10	371.00	
19.T										
19.B										
20.T	161.50	252.00	251.20	245.60	153.80	90.00	74.20	37.50	633.00	
20.B	148.60	578.20	144.90	359.30	376.70	68.60	55.80	36.80	1064.00	
21.T	119.30	186.30	288.70	113.10	429.50	370.50	150.50	47.80	799.00	
21.B	136.40	200.00	307.40	408.90	327.20	407.50	235.90	97.50	1263.00	
22.T	68.00	107.50	106.30	148.80	167.60	117.50	50.70	43.30	393.50	
22.B	48.50	35.00	33.40	63.70	93.40	184.90	86.60	33.00	472.60	
23.T	73.80	130.50	137.60	49.40	214.60	97.00	75.00	58.70	4601.70	
23.B	94.10	202.30	193.80	157.50	430.80	466.00	97.60	45.70	942.00	
24.T										
24.B										
25.T	113.00	354.00	507.40	507.50	255.50	166.50	206.20	173.50	845.00	
25.B	62.50	45.80	78.70	201.00	141.20	79.60	37.10	26.00	430.70	
26.T	65.20	81.20	81.40	222.50	71.80	35.00	45.30	67.80	516.70	
26.B	99.50	42.30	84.50	101.70	323.30	293.70	161.00	56.80	668.00	
27.T	73.30	60.70	33.50	131.00	89.20	100.50	38.70	42.30	475.70	
27.B	61.00	76.80	275.50	1058.00	890.00	99.60	150.00	43.80	579.70	
28.T	43.60	38.00	86.30	640.00	137.00	151.20	29.70	44.00	513.80	
28.B	55.30	82.30	212.50	114.20	142.60	33.80	61.70	67.50	481.20	
29.T										
29.B										
30.T	131.20	269.00	401.80	605.00	402.40	265.40	158.60	49.00	893.00	
30.B	63.90	39.20	55.80	97.10	67.50	98.90	45.00	26.20	361.20	

1.5 GENERATOR STATOR CORE TORQUE DATA

BSP1 Fall 2022				
Building Bolt Torque				
TE 400 FT Lbs	TE 780 FT LBS	EE 400 FT LBS	EE 780 FT LBS	Bolt #
Flats Moved	Flats Moved	Flats Moved	Flats Moved	
0	0	0	0.25	1
1	0.25	0.25	0.125	2
1	0.33	0.125	0	3
0	0.125	1	0.25	4
1	0	0	0.5	5
1	0	0	0	6
1	0	0	0	7
0	0	0.25	1	8
1	0	0	0.25	9
1	1	0	0.125	10
0.5	3	0.125	1	11
0.5	0.25	0.25	1	12
0	0	0	0	13
0	0	0	0	14
0	0	0.125	0.25	15
0	0	0	0.5	16
0	0	0.3	1	17
0	0	0.25	1	18
0	0	0	0.5	19
0	0.25	0	0.25	20

BSP1 Through Bolt Torque Six Side Nut			Meg 500 Volts	
Bolt #	**300FT LBS Flats Moved**	**450FT LBS Flats Moved**	**Bolt #**	**Meg Value**
1	6 Flats	4 Flats	1	108G
2	5 Flats	7 Flats	2	107G
3	8 Flats	9 Flats	3	110G
4	5 Flats	3 Flats	4	103G
5	0	3 Flats	5	106G
6	4 Flats	2 Flats	6	120G
7	0	3 Flats	7	98.3G
8	1 Flat	3 Flats	8	109.1G
9	0	3 Flats	9	100.2G
10	10 Flats	12 Flats	10	97.5G
11	6 Flats	9 Flats	11	165.3G
12	8 Flats	10 Flats	12	121.5G
13	8 Flats	10 Flats	13	76.3G
14	2 Flats	4 Flats	14	91.6G
15	7 Flats	8 Flats	15	81.6G
16	0	3 Flats	16	143G
17	0	2 Flats	17	89.9G
18	0	4 Flats	18	110.2G
19	0	2 Flats	19	78.3G
20	1 Flat	2 Flats	20	142.2G
21	6 Flats	9 Flats	21	102.8G
22	4 Flats	5 Flats	22	110.9G
23	6 Flats	8 Flats	23	86.7G
24	8 Flats	9 Flats	24	152.3G
25	5 Flats	4 Flats	25	166.5G
26	8 Flats	4 Flats	26	136.9G
27	8 Flats	4 Flats	27	124.6G
28	5 Flats	10 Flats	28	163.1G
29	2 Flats	4 Flats	29	160.9G
30	0	3 Flats	30	154.2G
31	3 Flats	3 Flats	31	157.4G
32	1 Flat	3 Flats	32	185.8G
33	0	3 Flats	33	154.6G
34	2 Flats	2 Flats	34	150.8G
35	2 Flats	2 Flats	35	166.9G
36	3 Flats	4 Flats	36	123.1G
37	1 Flat	2 Flats	37	149.9G
38	6 Flats	8 Flats	38	121.2G
39	3 Flats	3 Flats	39	141.5G
40	3 Flats	5 Flats	40	149G

1.6 GENERATOR FINAL EL CID TEST DATA

Electromagnetic Core Imperfection Test Results

Station Name	Big Sandy
Unit Name	1
Year of Installation	1962
Test Date	11/10/2022
Report Date & Time	11/10/2022 1:12:42 PM
Client Name	AEP
Test Engineer	M.Simmons

Machine Parameters

Test Date	11/10/2022
Station Name	Big Sandy
Unit Name	1
Machine Type	
Year of Installation	1962
Manufacturer	Westinhouse
Phasing	3 Phase Star
Rated Power	295 MW
Rated Voltage	22 kV
Frequency	60 Hz
Rotation Speed	
Number of Slots	30
Length of Core	5.07 Meters
Windings per Slot	2
Turns per Phase in Series	10
Excitation Turns	4
Excitation Current	12.5 A
Measured Single Turn Voltage	26.37 V
Recommended Single Turn Voltage	27.61 V
Comments	
Core Split Locations	

Test Parameters

First Test Slot	1
Last Test Slot	30
Slot Number Direction	Increasing
Scanning	Alternate Single Scan
Trolley/Timebase Orientation	Connector Forward
Start End	Exciter
Timebase	
Start Position	0 Meters
Return Position	5.07 Meters
Remote Trolley Operation	Yes
Over-Record Traces	No

Analysis Configuration

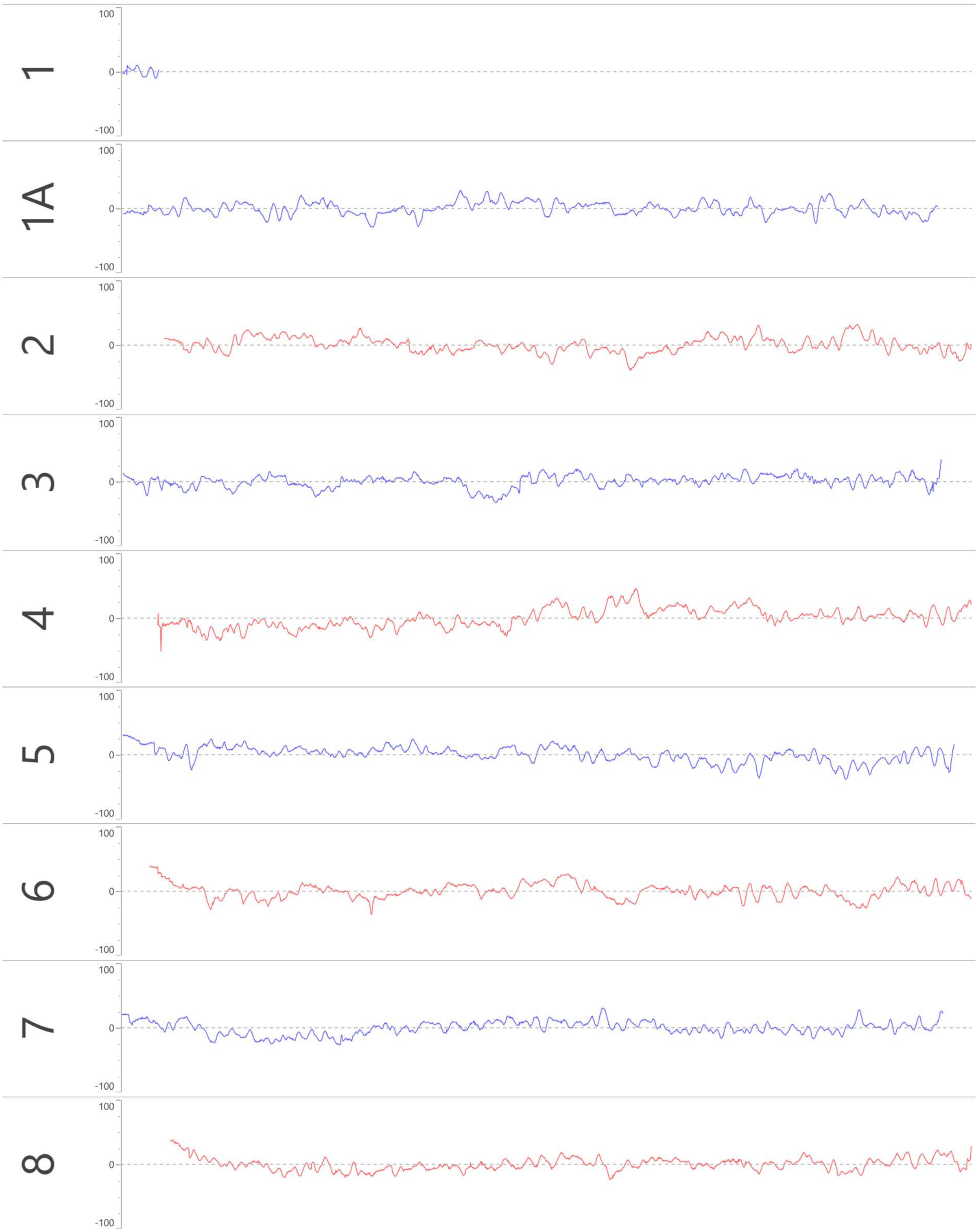
Start	-0.01 Meters
Finish	5.07 Meters
Data	Quad
Direction	Both
Machine End	Exciter
Scale Traces to 4% Excitation	27.61 V
Autoscale Over-Range Trace(s)	Yes
Max Scale	100 mA
Mean Phase	+2553 mA
Quad Fault Polarity	Negative
Backward Offset	0 Meters
Remove Quad DC Component	Yes
Remove Phase DC Component	No
Suppress Zeros From Traces	Yes

Negative Quad Peaks (mA)

(blue)	Normal
(yellow)	Over-Range

1	1A	2	3	4	5	6	7	8	9
-10	-29	-40	-33	-51	-38	-36	-26	-24	-36
0.196m	1.490m	3.034m	2.228m	0.228m	4.316m	1.484m	1.296m	2.908m	0.732m
10	11	12	13	14	15	16	16A	17	18
-33	-36	-29	-23	-22	-36	-20	-29	-30	-22
0.672m	1.066m	1.264m	2.584m	0.534m	2.808m	4.980m	3.732m	3.546m	3.622m
19	20	21	22	23	24	25	26	27	28
-28	-48	-43	-29	-29	-29	-32	-31	-28	-24
0.852m	0.542m	0.422m	2.704m	2.380m	3.016m	3.474m	0.658m	2.906m	4.280m
29	30								
-42	-27								

TRACES



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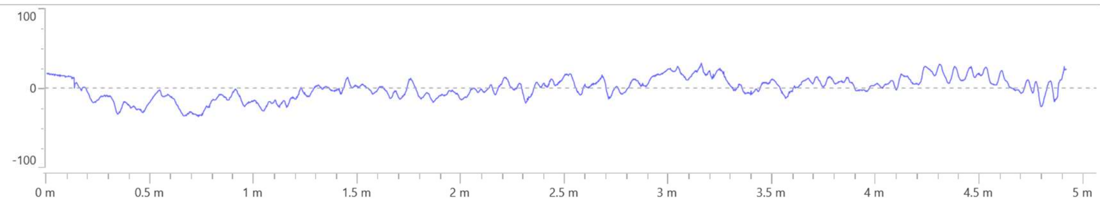
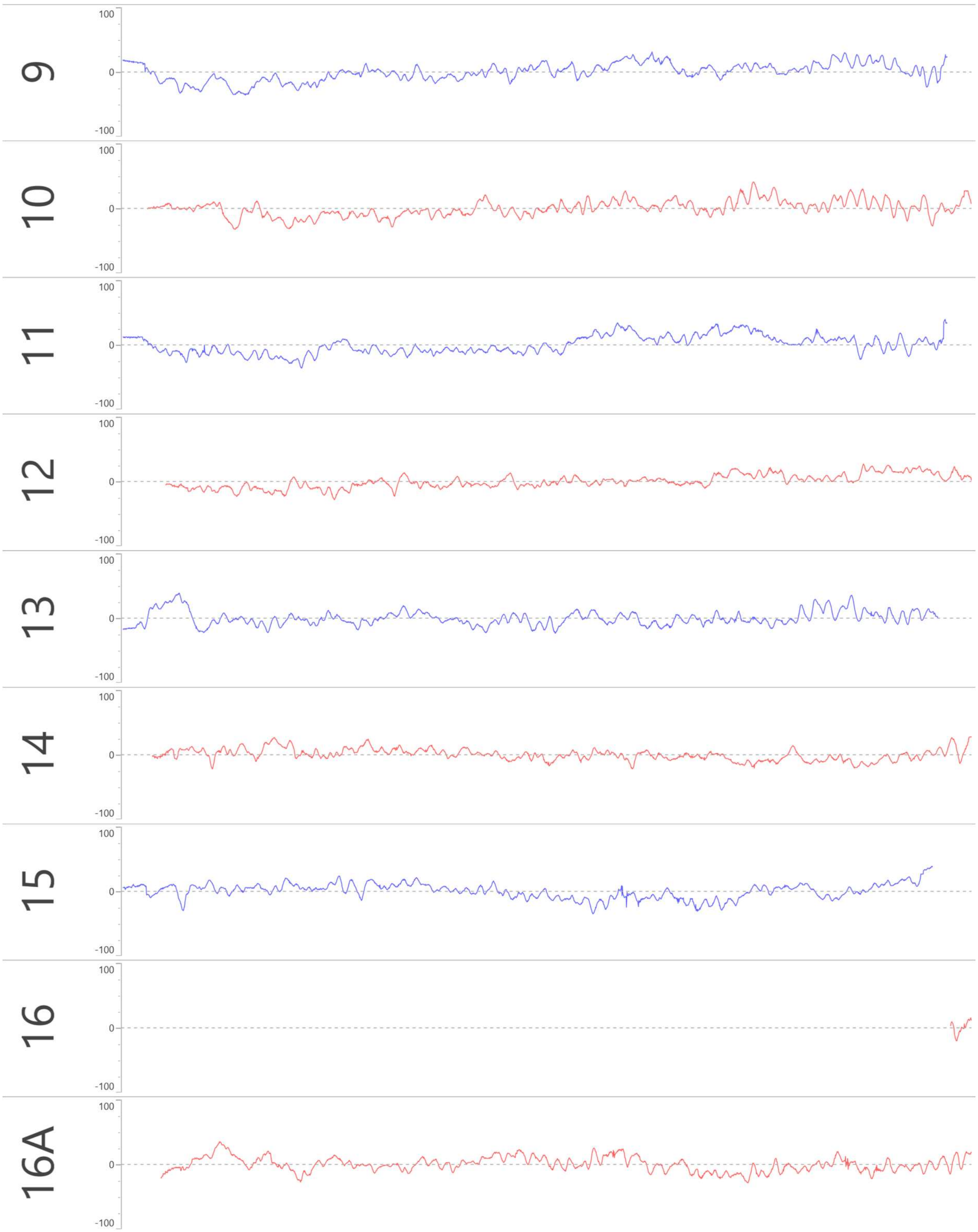
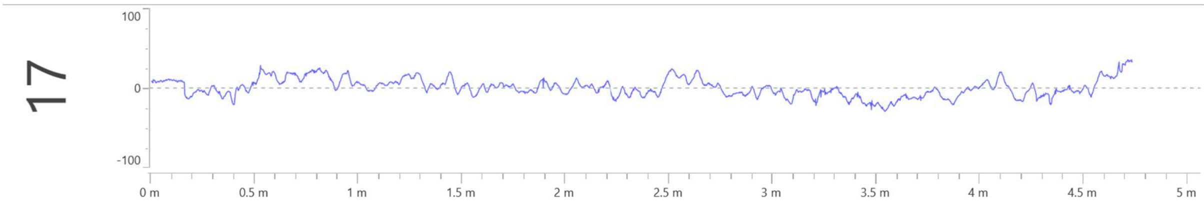
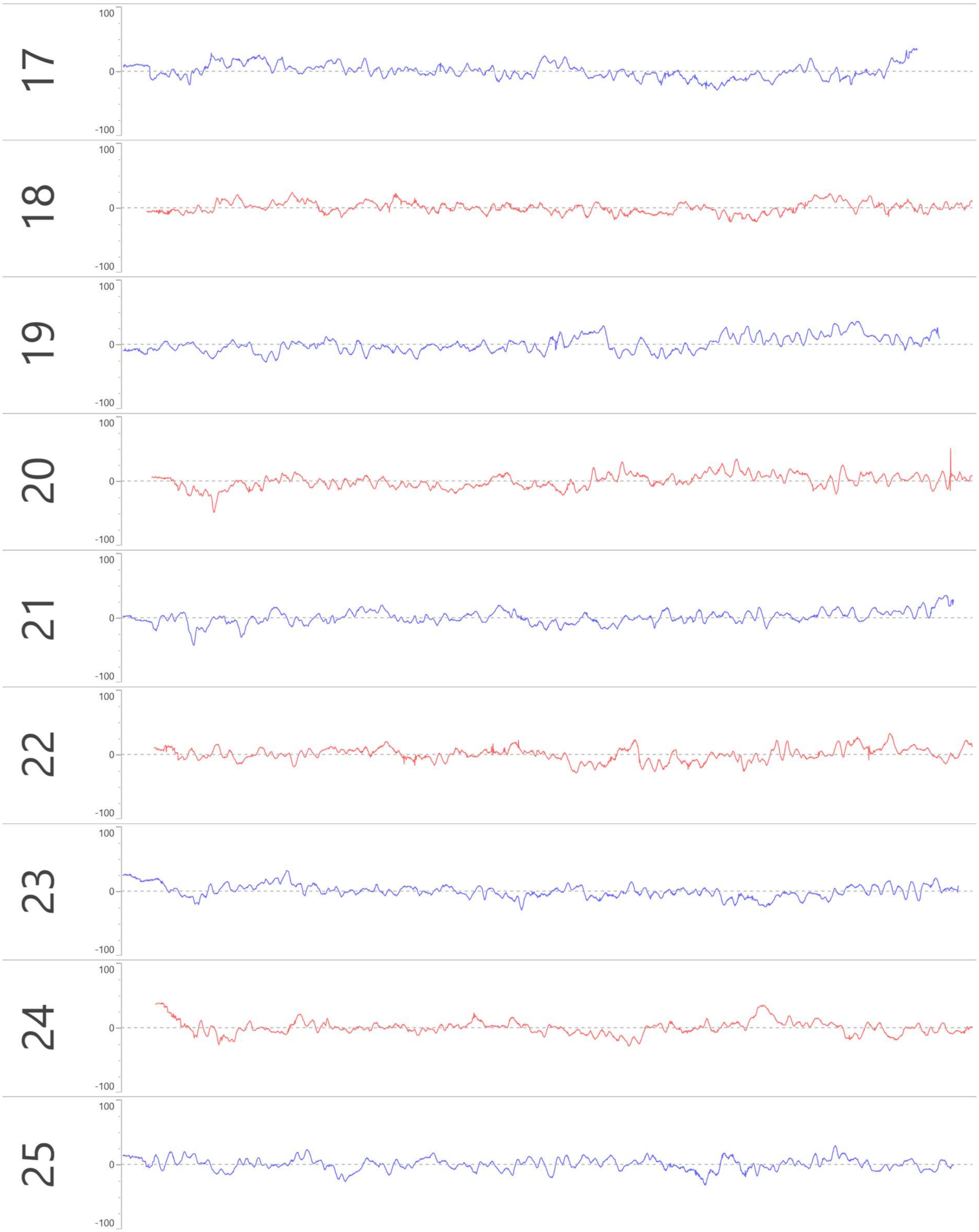
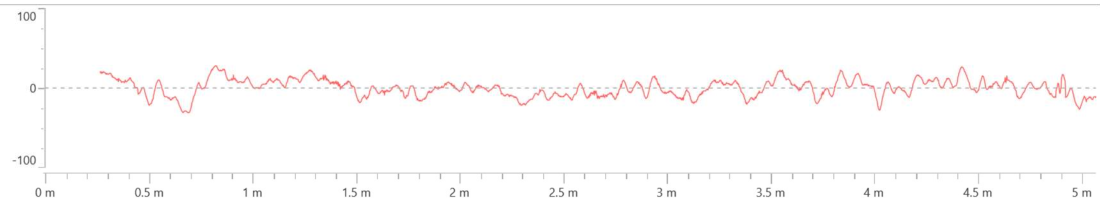


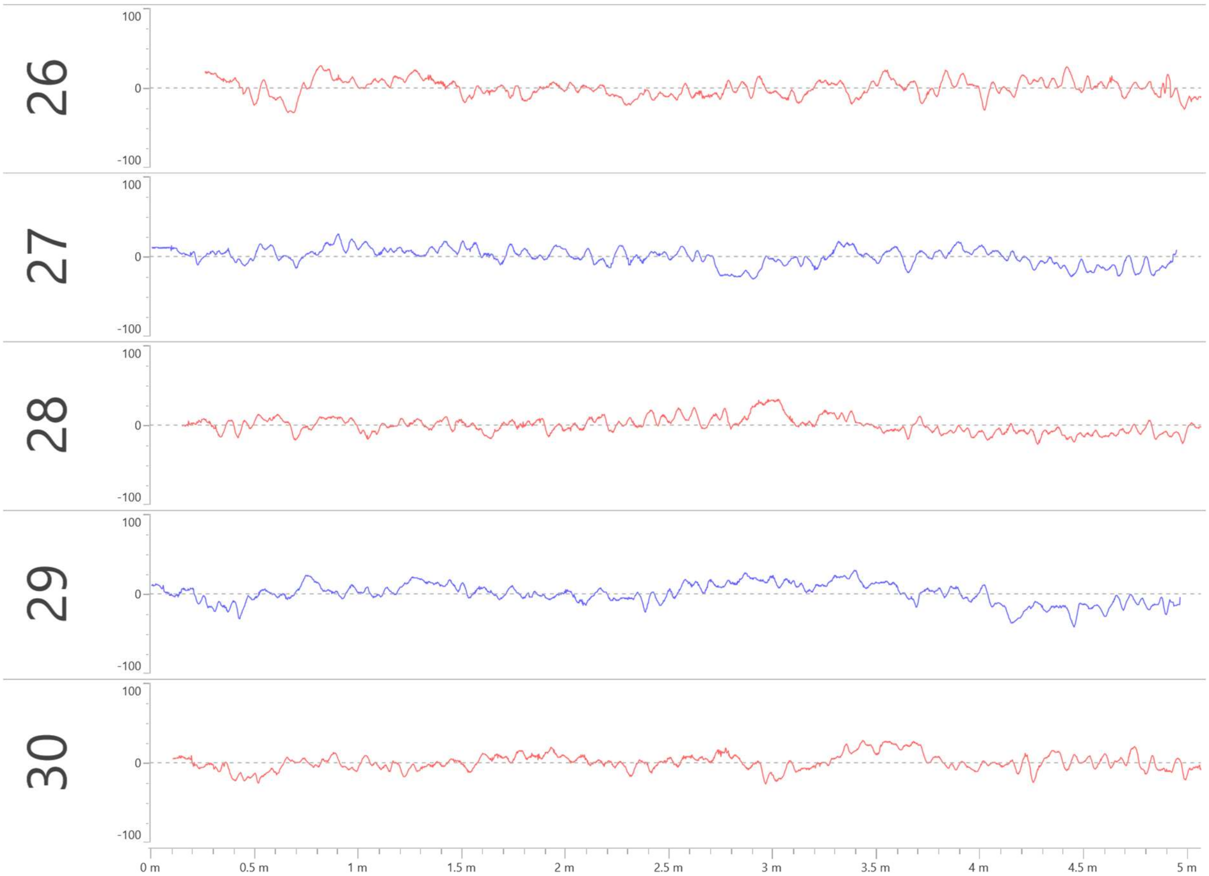

9
10
11
12
13
14
15
16
16A
100
0
-100


17
100
0
-100
0 m
0.5 m
1 m
1.5 m
2 m
2.5 m
3 m
3.5 m
4 m
4.5 m
5 m


17
18
19
20
21
22
23
24
25
100
0
-100

26





Report on Findings

Areas with magnetic potential difference threshold exceeding 100 mA

Slot	Distance	Peak	Comments

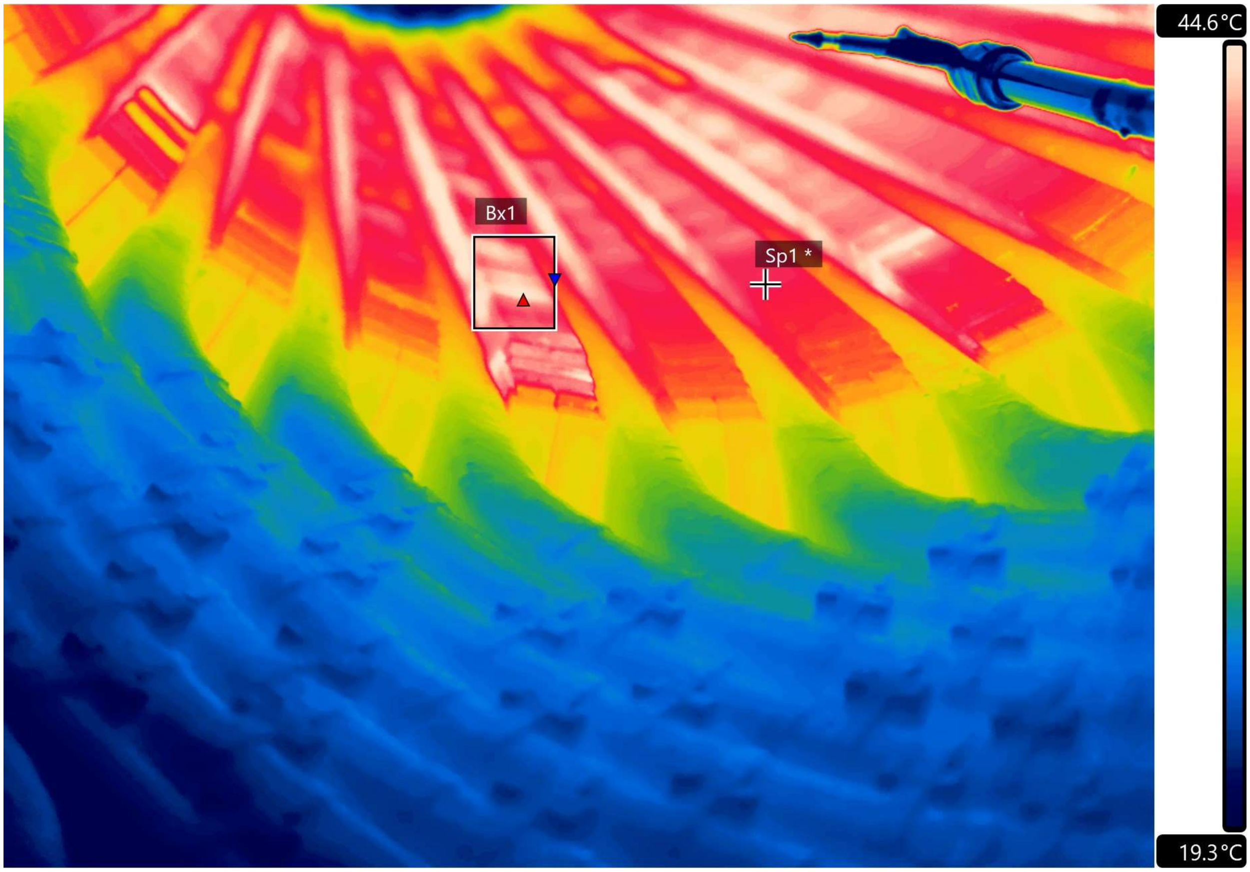
1.7 GENERATOR LOOP TEST FINAL REPORT

THERMOGRAPHY REPORT

CUSTOMER / SITE:	Big Sandy U1 Generator Loop Test (Final)
THERMOGRAPHY DATE:	Nov. 2, 2022
THERMOGRAPHER:	Steven Frank

SUMMARY

File Name	Date	Time	Note
FLIR0542.jpg	11/2/2022	9:44 AM	5 C
FLIR0544.jpg	11/2/2022	9:44 AM	8 C
FLIR0546.jpg	11/2/2022	9:45 AM	5 C
FLIR0548.jpg	11/2/2022	9:47 AM	9 C
FLIR0550.jpg	11/2/2022	9:48 AM	12 C
FLIR0552.jpg	11/2/2022	9:48 AM	11 C
FLIR0554.jpg	11/2/2022	9:49 AM	12 C
FLIR0556.jpg	11/2/2022	9:52 AM	3 C
FLIR0558.jpg	11/2/2022	9:53 AM	6 C
FLIR0560.jpg	11/2/2022	9:56 AM	9 C
FLIR0562.jpg	11/2/2022	9:57 AM	7 C
FLIR0564.jpg	11/2/2022	10:18 AM	13 C

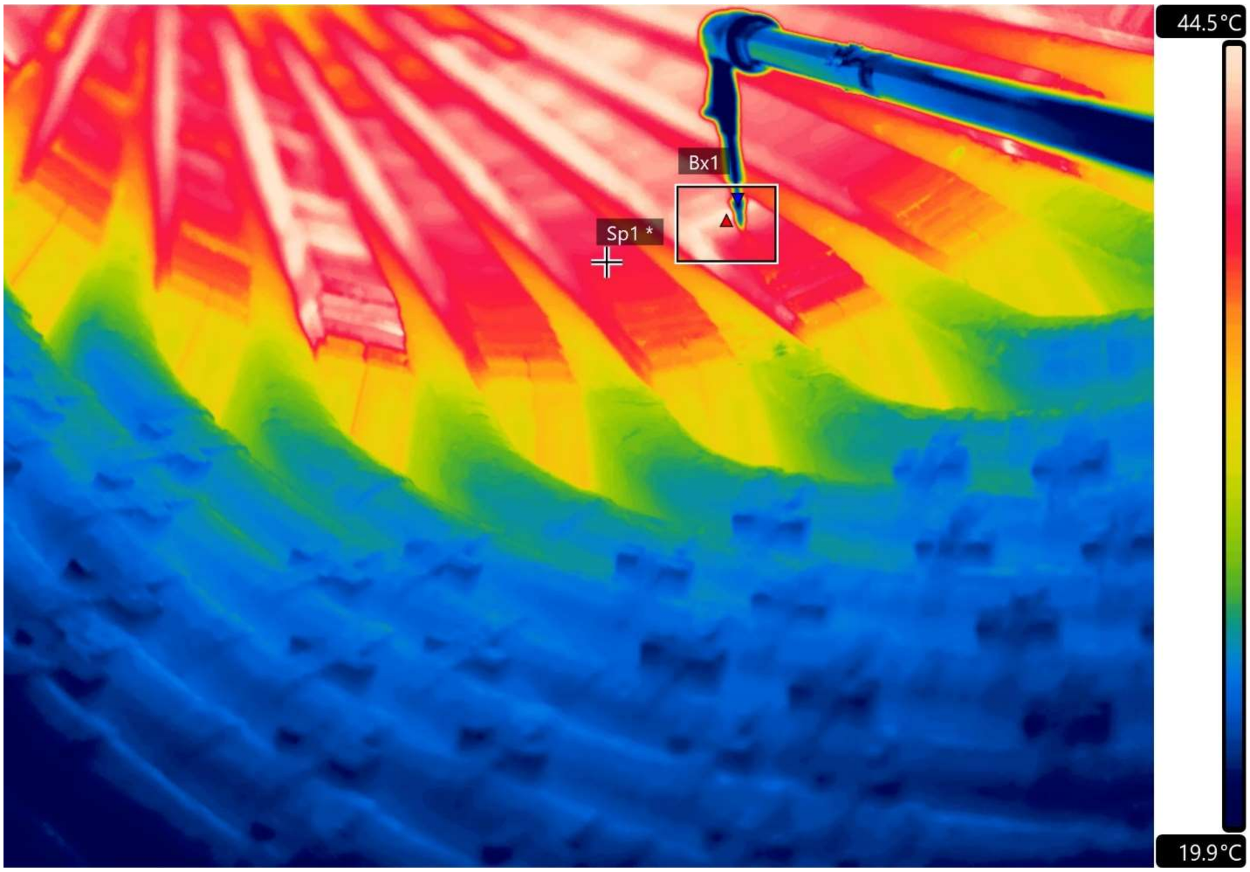


FLIR0542.jpg | 246° SW — 11/2/2022 | 9:44 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	40.2 °C
Ellipses	-
Deltas	-
Bx1 Maximum	45.2 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

5 C
Quadrant 2, exciter end, in the core iron.

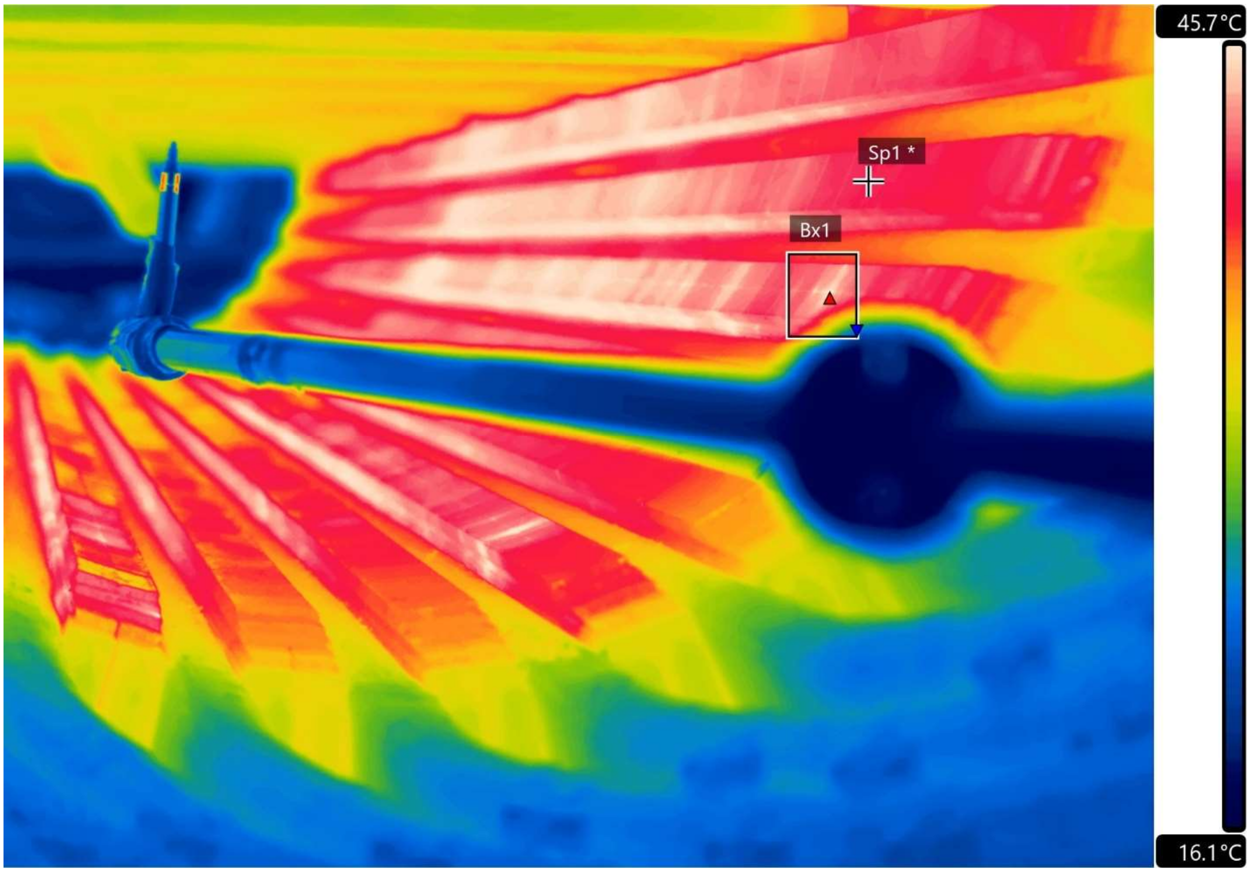


FLIR0544.jpg | 309° NW   11/2/2022 | 9:44 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	39.4 °C
Ellipses	-
Deltas	-
Bx1 Maximum	46.8 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

8 C
Quadrant 2, exciter end, in the core iron, just past the end iron.

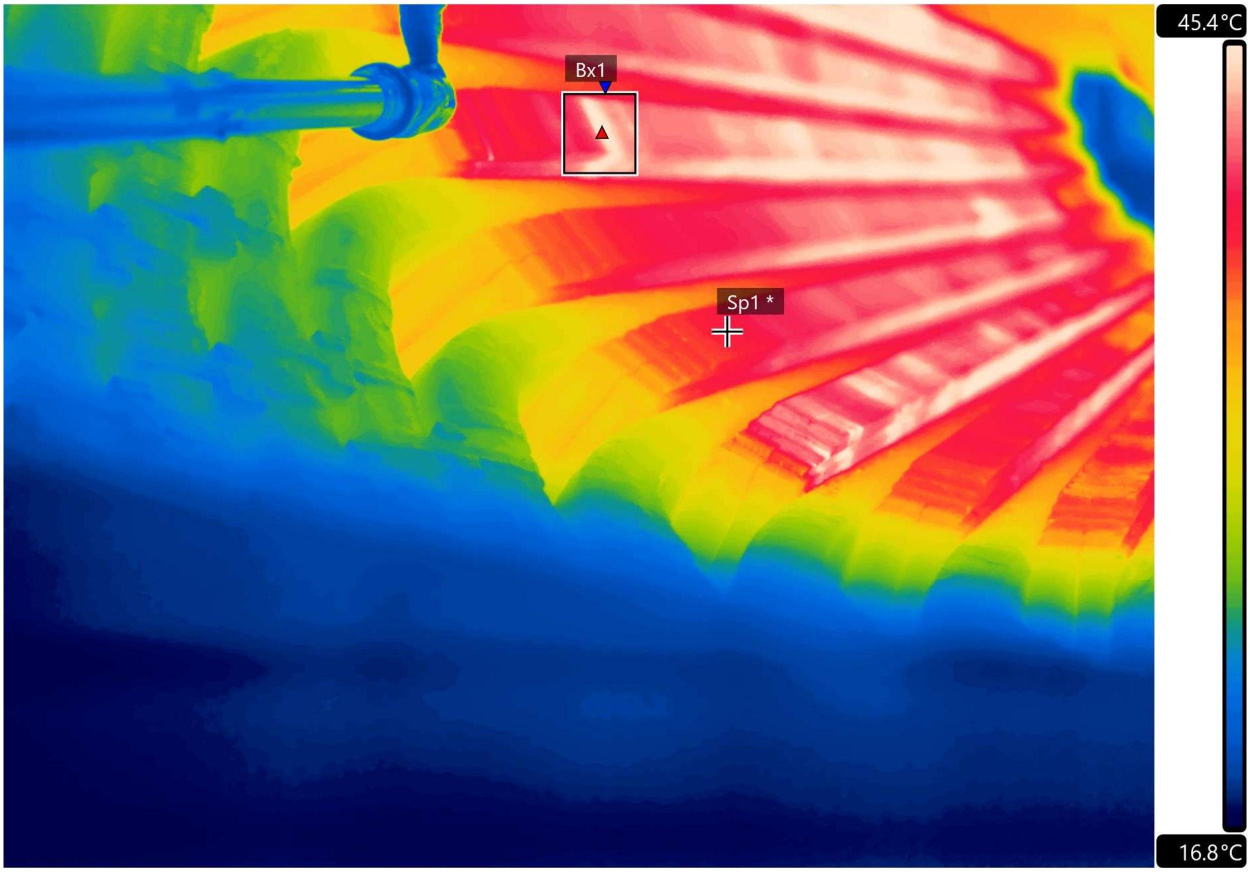


FLIR0546.jpg | 328° NW 11/2/2022 | 9:45 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	41.0 °C
Ellipses	-
Deltas	-
Bx1 Maximum	46.2 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

5 C
Quadrant 2, exciter end, in the core iron.

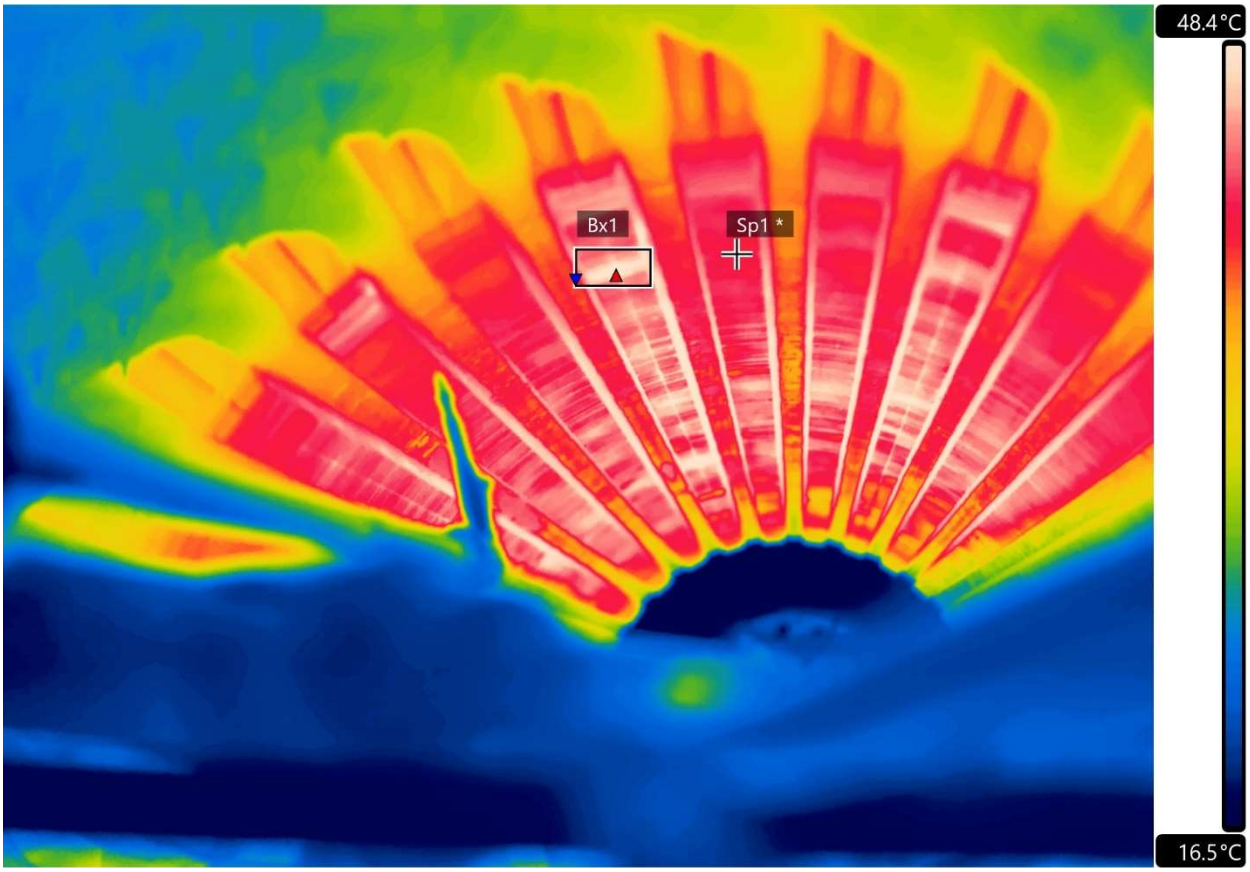


FLIR0548.jpg | 11/2/2022 | 9:47 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	39.2 °C
Ellipses	-
Deltas	-
Bx1 Maximum	48.2 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

9 C
Quadrant 3, exciter end, in the core iron, just past the end iron.

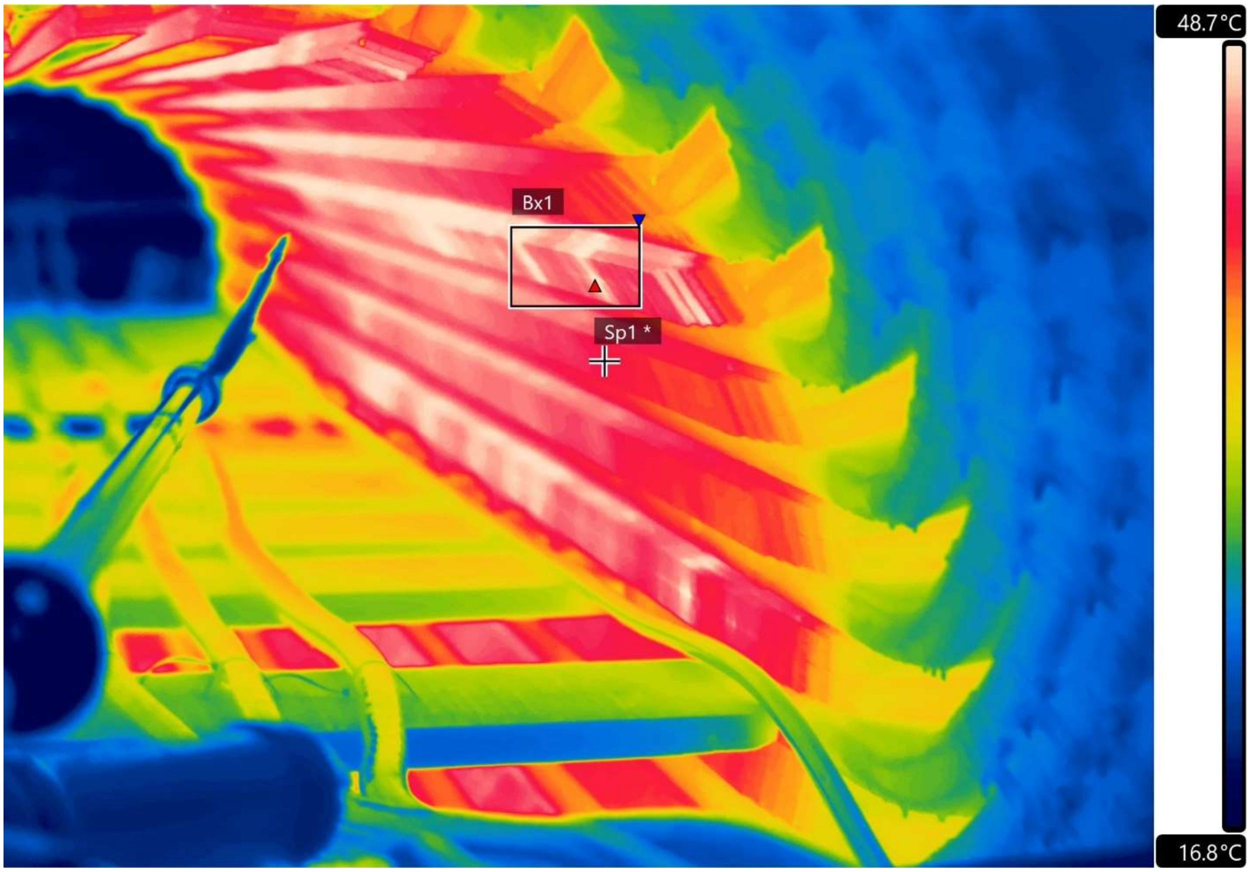


FLIR0550.jpg | 11/2/2022 | 9:48 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	41.8 °C
Ellipses	-
Deltas	-
Bx1 Maximum	53.2 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

12 C
Quadrant 4, exciter end, This is in the core iron, just past the end iron.

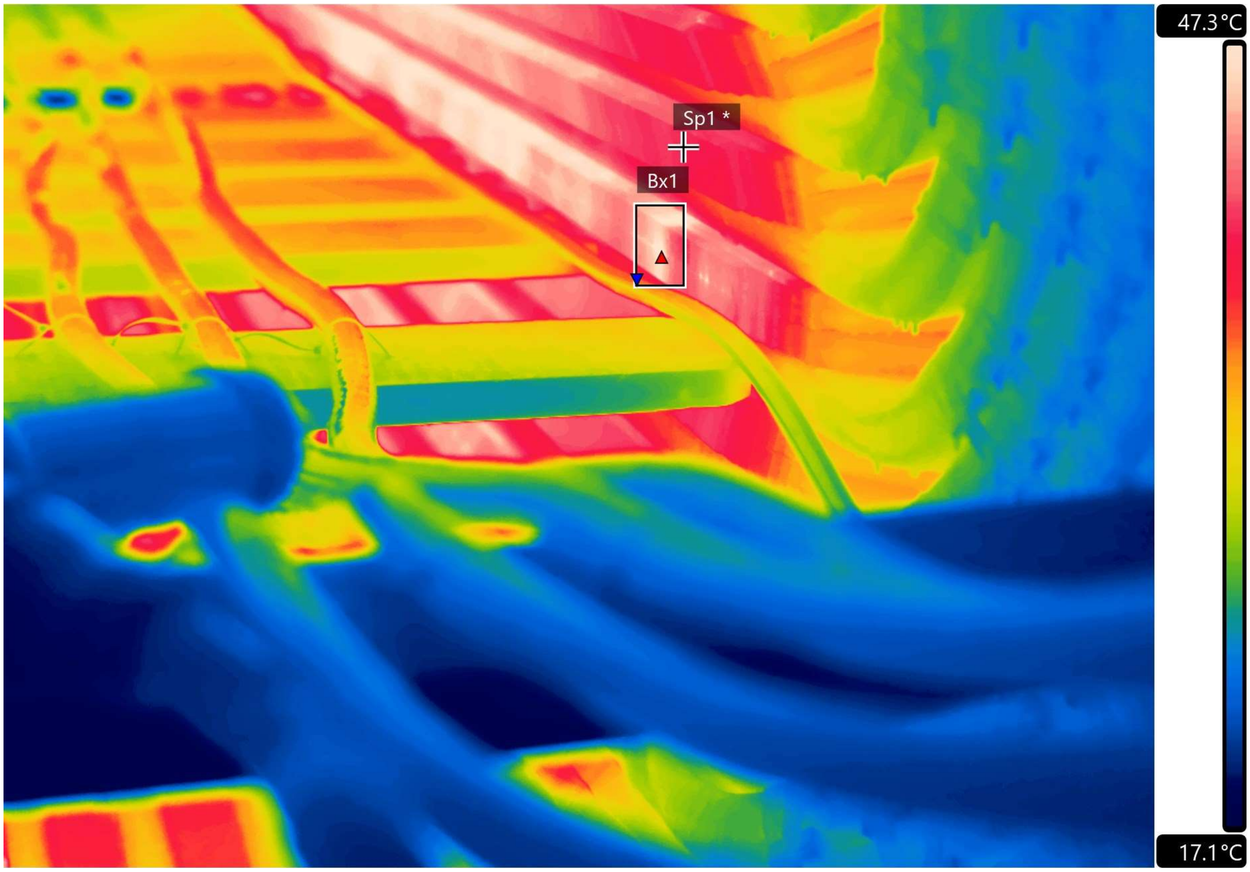


FLIR0552.jpg | 11/2/2022 | 9:48 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	42.5 °C
Ellipses	-
Deltas	-
Bx1 Maximum	51.6 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

11 C
Quadrant 1, exciter end, this is in the core iron, about a foot into the iron.



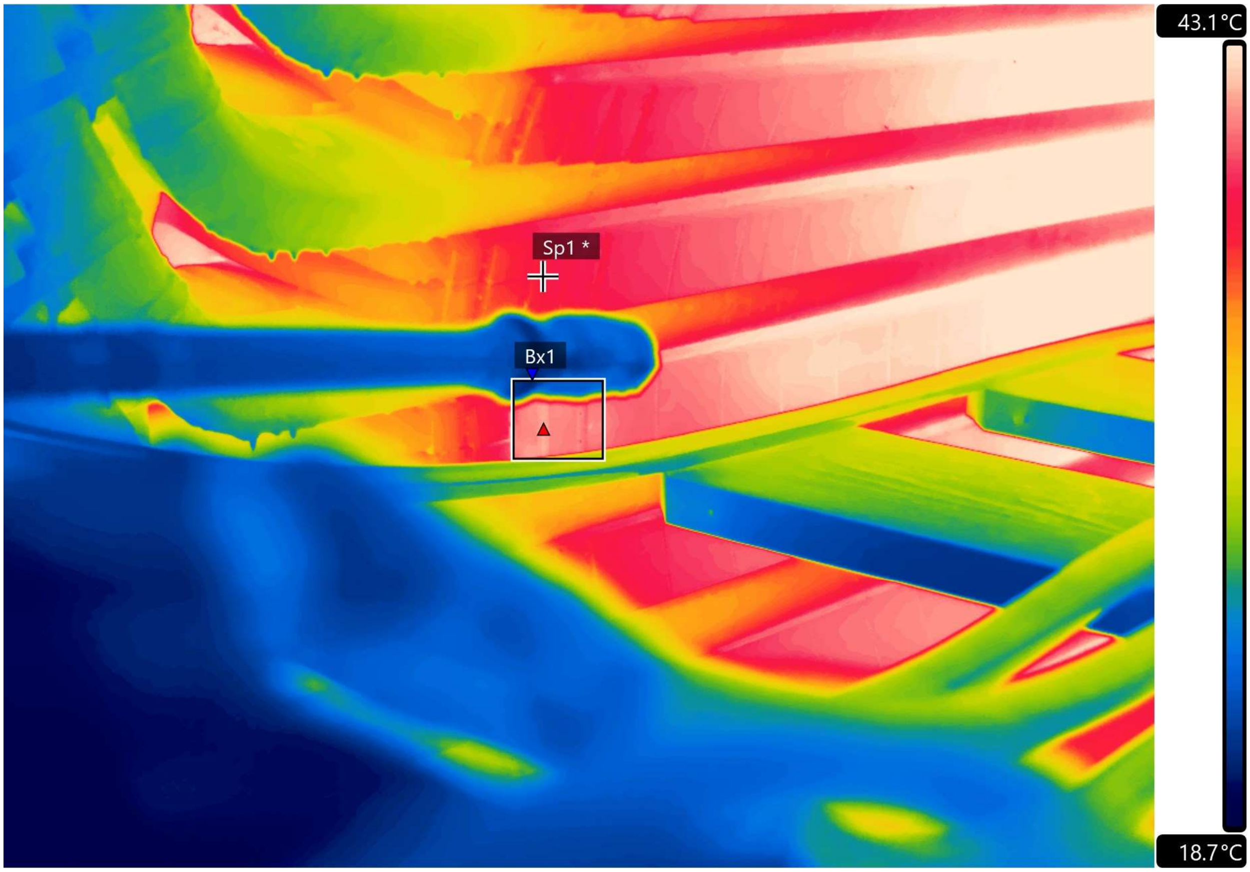
FLIR0554.jpg | 315° NW

11/2/2022 | 9:49 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	40.4 °C
Ellipses	-
Deltas	-
Bx1 Maximum	52.3 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

12 C
Quadrant 1, exciter end, in the core iron about 6 inches past the end ironl

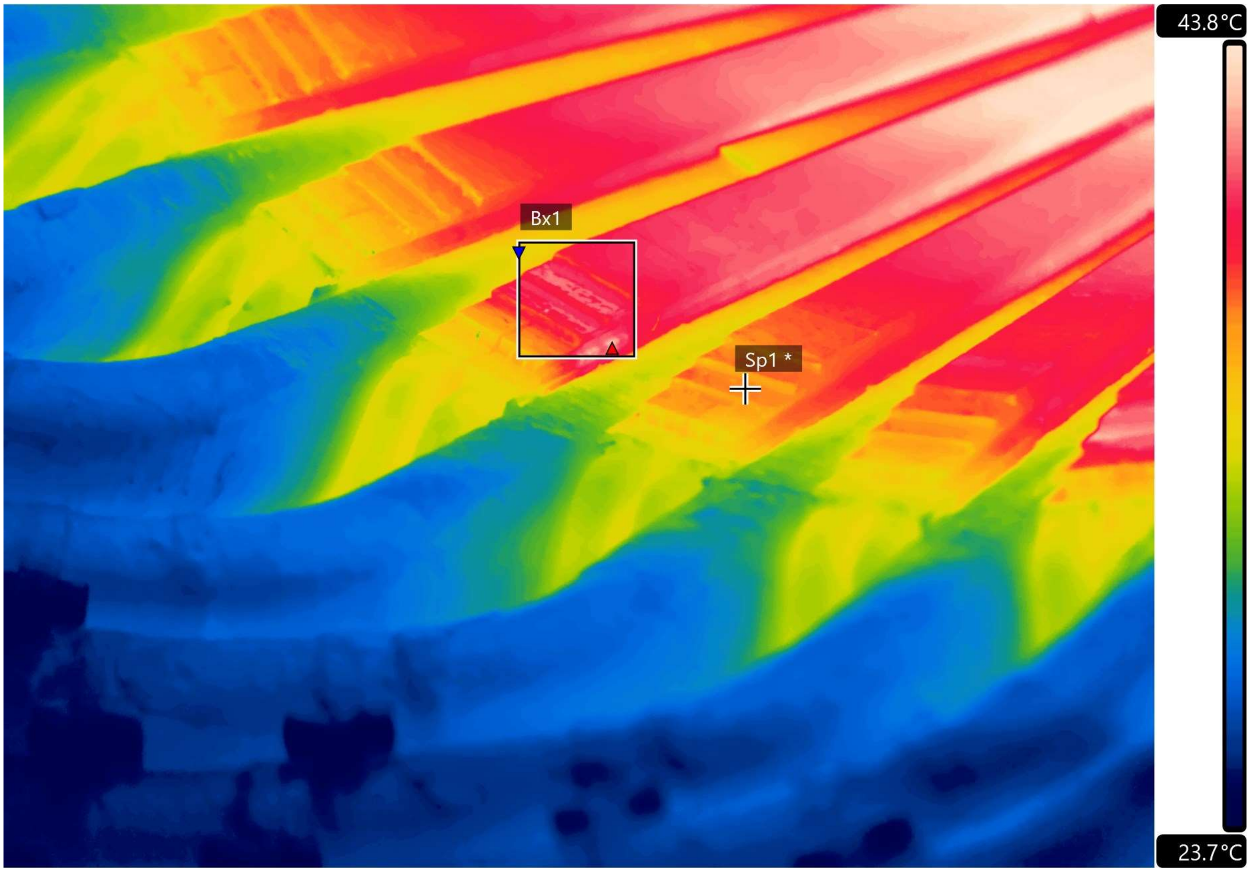


FLIR0556.jpg | 11/2/2022 | 9:52 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	38.2 °C
Ellipses	-
Deltas	-
Bx1 Maximum	41.7 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

3 C
Quadrant 1, turbine end, in the end iron.

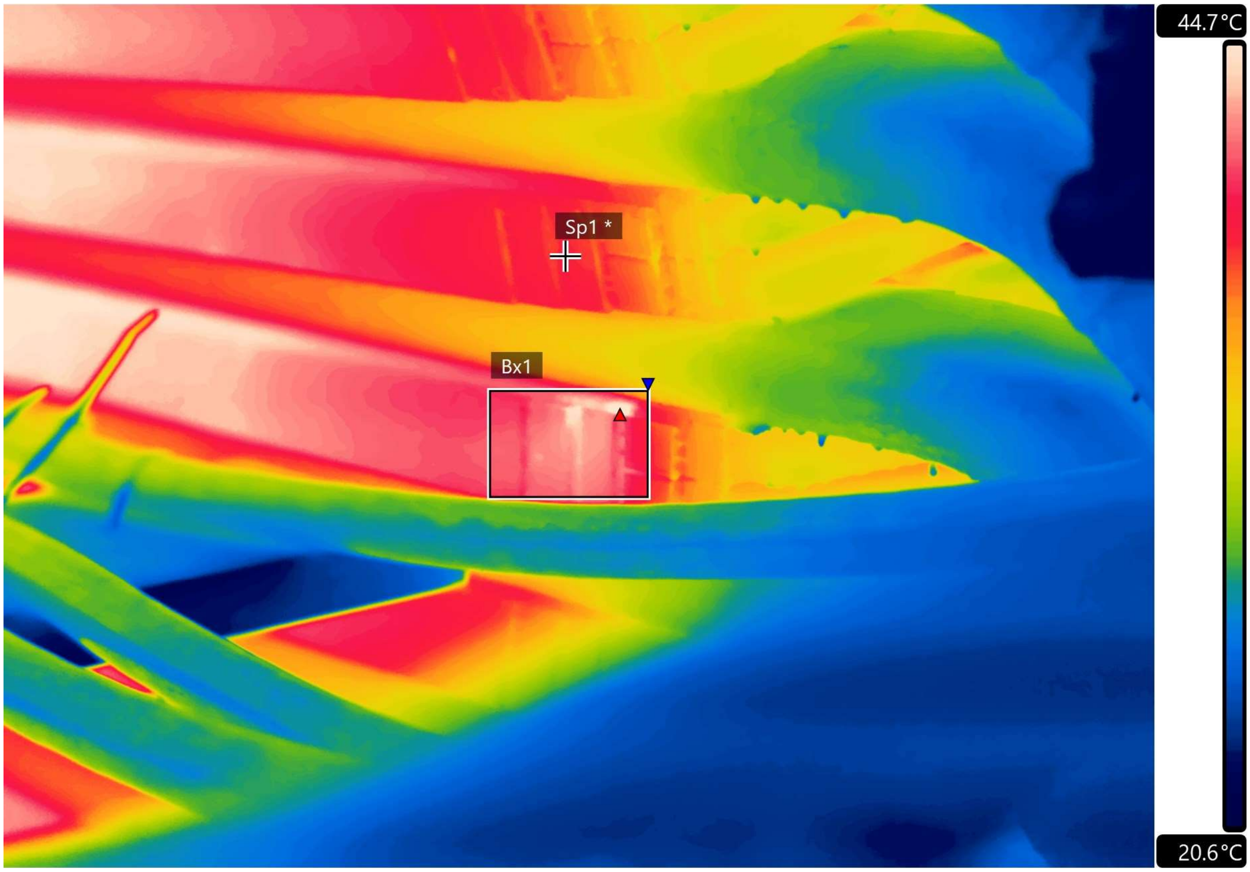


FLIR0558.jpg | 42° NE　　11/2/2022 | 9:53 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	37.3 °C
Ellipses	-
Deltas	-
Bx1 Maximum	42.9 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

6 C
Quadrant 2, turbine end, in the end iron. This one was 18 C the day before.

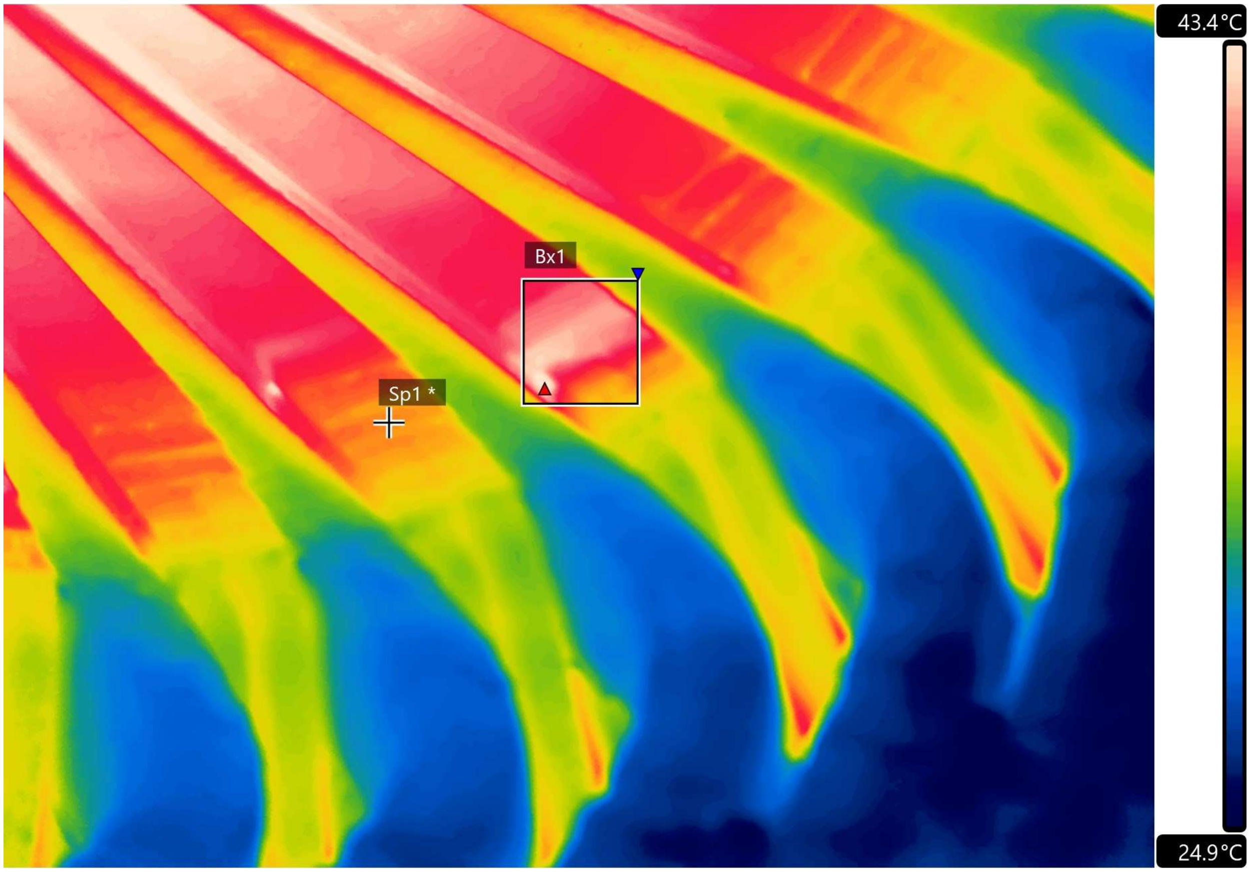


FLIR0560.jpg | 11/2/2022 | 9:56 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	39.1 °C
Ellipses	-
Deltas	-
Bx1 Maximum	48.3 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

9 C
Quadrant 4, turbine end, in the end iron.

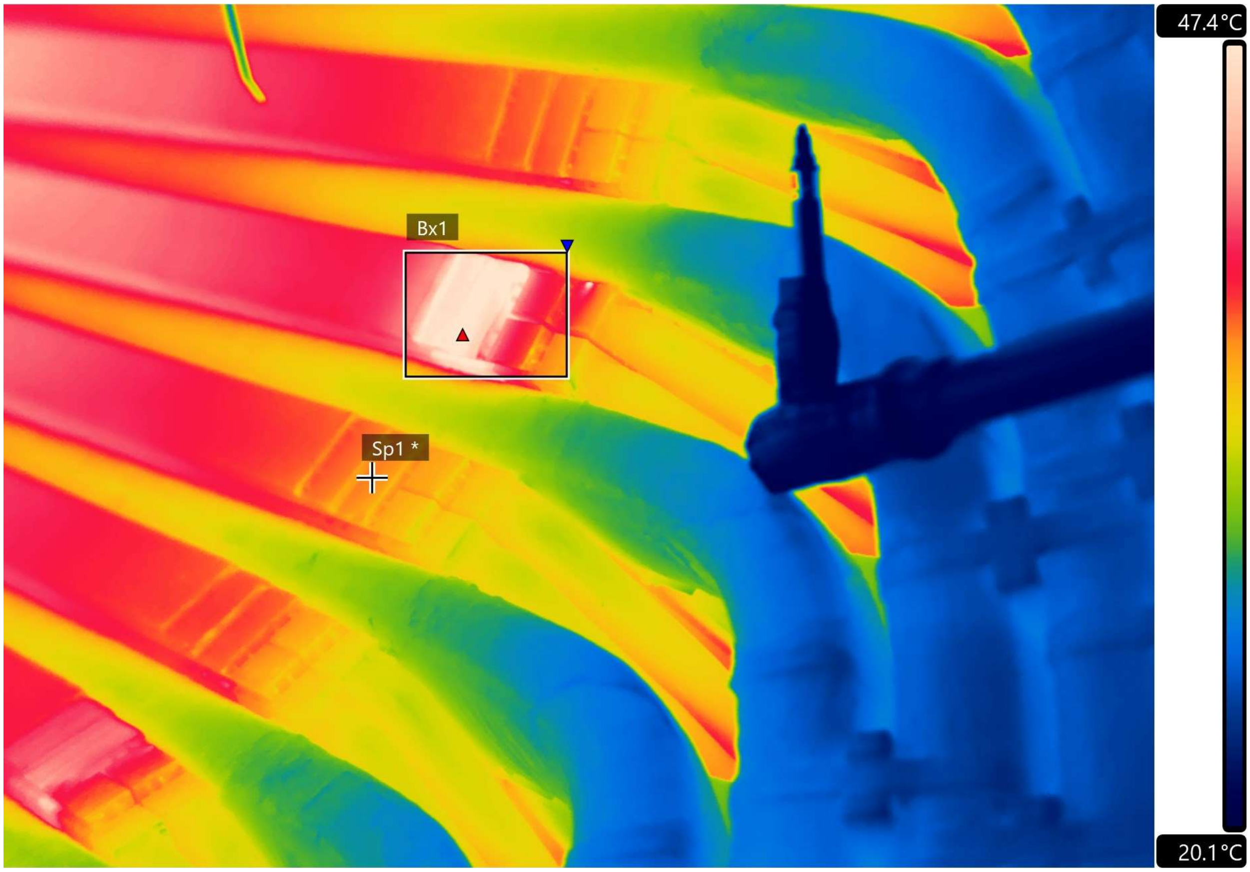


FLIR0562.jpg | 126° SE 11/2/2022 | 9:57 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	37.4 °C
Ellipses	-
Deltas	-
Bx1 Maximum	44.2 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

7 C
Quadrant 3, turbine end, in the end iron.



FLIR0564.jpg | 11/2/2022 | 10:18 AM

Measurements	
Sp1 * (Emiss=0.95 Refl.temp=20.0°C Dist=15.0ft)	38.0 °C
Ellipses	-
Deltas	-
Bx1 Maximum	50.5 °C

Parameters	
Emissivity	0.95
Reflected temperature	22.2 °C

13 C
Quadrant 3, turbine end, in the end iron.

1.8 GENERATOR INSPECTION JSA & SAFETY CHECKLIST

Big Sandy U1 Generator

AMERICAN ELECTRIC POWER

Generator Inspection JSA & Safety Checklist Date: 10/11/2022

Instructions: Verify each line item is completed by checking the appropriate box before conducting inspection

1. Establish On Site Point of Contact with Plant:	Meet with plant contact. Contact name: Wyatt Lewis	☑
2. Pre Job Briefing:	Discuss Scope of Inspection with Plant rep; Unit #, Possible Hazards, Inspection Requirements.	☑
3. Preform Pre Job Walk down of Worksite:	Determine Hazards, Scaffolding and Support Requirements.	☑
4. Sign On to Generator Clearances:	Check with Clearance Permit Authority/Discuss Inspection Workscope.	☑

5. Walkdown Clearances: Verify proper protection/isolation **BEFORE** beginning the generator inspection.

- For Hydrogen Cooled Generators verify H2 Spool Piece has been removed and tagged. ☑
- Verify that grounds are in place for each phase and have appropriate clearance tags. (usually located at PT cubicles) ☑
- Verify that generator circuit breaker or disconnects are open or removed and has appropriate clearance tags ☑
- Verify generator turning gear motor has been tagged with appropriate clearance tag. ☑
- If equipped verify that H2 seal oil system is isolated and has appropriate clearance tag. ☑
- Verify neutral grounding transformer is isolated with appropriate clearance tag and grounded. ☑
- Verify proper isolation from the excitation system. ☑

6. Hazard Assessment: A Job Hazard Analysis is Critical before and througout the inspection

- Confine Space: Yes ☑ or No ☐ follow appropriate clearance permit procedures, Establish/discuss rescue plan.
- Air Monitoring: Verify sufficient air supply exists in all locations, sample air and use continuous monitoring if needed ☑
- Scaffolding: If scaffolding required/erected check for proper tagging/inspect before each shift. ☑
- Slips & Trips: Assess job site conditions and eliminate or control. ☑
- Body Position: Be aware of body position/location during inspection, work with partner if needed. ☑
- Conditions: Any change in conditions during the inspection use the STAR princple Stop, Think, Act, Review. ☑

7. PPE: Determine proper PPE needed for inspection; Safety glasses, Hard hat, Steel toe shoes, Coveralls, Respirator, Etc. ☑

8. FME: Foreign Material Exclusion, No foreign material is to be left inside the generator

- Remove all items from pockets, only take in what is needed for the inspection, what goes in must come out. ☑
- Use lanyards to tie off tooling and equipment as needed. ☑

Comments:____________________

NOTE: Once all work is completed, be sure to sign off the clearances and let your Plant representative know you have completed the inspection. Verify no foreign material was left inside the generator from the inspection. ☑

ZEROHarm

Signature: [signature]

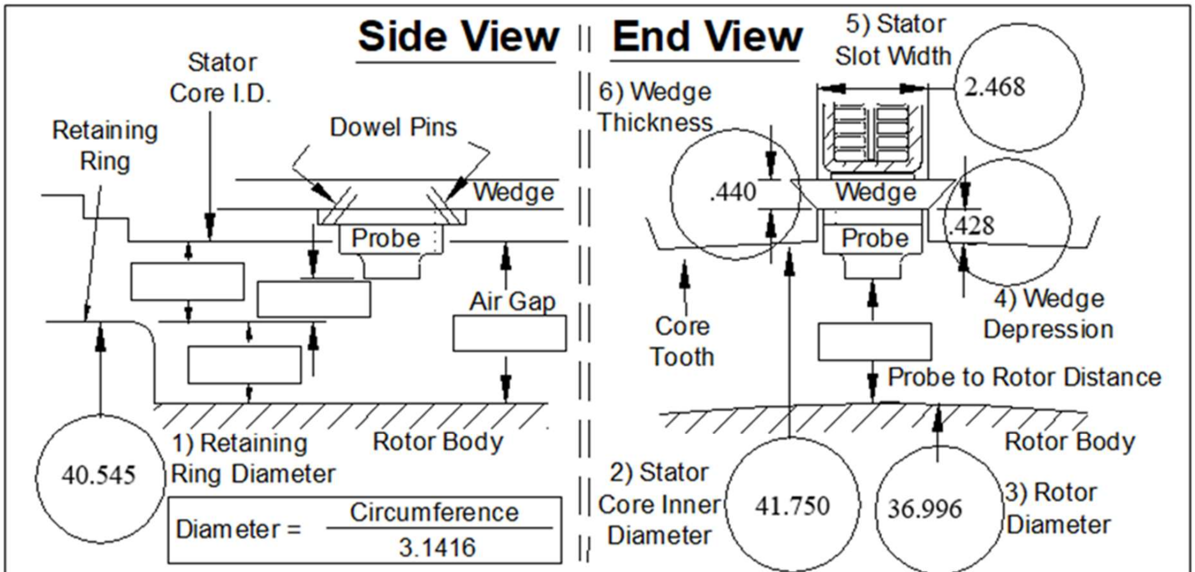
1.9 FLUX PROBE WORKSHEET

GENERATORTECH, INC.
Generator Monitoring - Consulting
31 Sutherland Drive
Scotia, New York 12302

Phone & Fax: (518) 399-4646
Email: support@generatortech.com
Web Page: www.generatortech.com

Air-Gap Flux Probe Design Worksheet

→ Circled information is required to design probe ←



Also required:
1. Is retaining ring the largest diameter rotor component? (yes/no) : YES
2. Is retaining ring magnetic or non-magnetic? NON-MAGNETIC (18/18)
3. Are magnetic wedges used in rotor slots? NO All remaining rotor wedges are non –magnetic.

4. Number of poles: 2	6. Number of turns in each coil:	**1: 7**	**2: 8**	**3: 8**	**4: 8**
5. Coils/pole: 8		**5: 8**	**6: 8**	**7: 8**	**8: 8**
		9: -	**10:** -	**11:** -	**12:** -

Customer name	AEP Big Sandy		
Plant – Unit Number	1		
Turbine/Generator No.	1S-64P300		
Rating (MVA)	330		
Hydrogen Pressure	60		
Generator Service Date	1963		
Dimension supplied by	P.Ruchniak/M.Simmons	Date	10-12-2022

Probe Data (provided by Generatortech, Inc.)		Installation Date & Site:
Probe Height		
Probe resistance as shipped		
Probe resistance after installation		

Structural Integrity Associates, Inc.®
rkissinger@structint.com
11515 Vanstory Drive, Suite 125, Huntersville, NC 28078 | [704-975-6821]

November 20, 2022
REPORT NO. 2201327.401
REVISION: 0
PROJECT NO. 2201327.00

Quality Program: ☐ Nuclear ☒ Commercial

Ricky A. Brown
Energy Production Supervisor
Big Sandy Power Plant
American Electric Power
23000 Highway 23, Louisa, KY 41230

Subject: AEP Big Sandy Plant U1 Generator Rotor Turbine End Retaining Ring Examination Site Preliminary Report

Reference: SI Proposal 2201327R0

Dear Ricky,

Structural Integrity Associates (SI) was contracted by AEP to perform NDE examinations of the Big Sandy Plant Unit One generator rotor turbine end (TE) retaining ring at the Big Sandy Power Plant near Louisa, KY. Specifically, the NDE scope consisted of an automated multi-channel ultrasonic volumetric and a manual eddy current surface inspection of the turbine end retaining ring mounted on the rotor. These techniques have been demonstrated to accurately detect and characterize in-service damage within the retaining ring volume and the ID and OD surfaces.

The request for NDE examinations followed a visual confirmation of radial cracking on the inboard (IB) end radial face of the collector end (CE) 18Mn-18Cr retaining ring during a scheduled outage.

Prior to setting up on the TE ring, SI technicians demonstrated the ability to detect and size the known cracking in the collector end (CE) ring utilizing phased array ultrasonic technique in manual capacity. The radially oriented cracking propagated up the IB end face approximately 0.8” and breaks the corner running across the shrink area and into the lock-ring groove on the rings ID approximately 2.0”, with the crack detected by the manual phased array ultrasonic scanning.

Surface Examination of Turbine End Retaining Ring – Eddy Current

The 40.585" diameter TE retaining ring was wiped down with alcohol and a visual (VT) examination was conducted. The rings 127.5" circumference was laid out in four individual 32" scan quadrants for the eddy current and PEUT examinations.

A manual examination ET examination of the turbine end retaining ring utilizing an Eddyfi Ectane II and an ET array probe revealed no crack-like or recordable indications on the OD surface of the TE ring.

Volumetric Examination of Turbine End Retaining Ring – Automated Pulse-Echo Ultrasonic

The automated pulse-echo ultrasonic system consisted of 4 individual channels of shear-wave and a single zero-degree longitudinal-wave channel. The scan head utilized two 45º channels of axially oriented shear-wave probes, looking both inboard and outboard. Two 40º channels looking CW and CCW of shear-wave probes along with a single 0º longitudinal-wave channel scanning the thickness of the ring. Both axial and circumferential looking channels are utilized as in-service cracking can develop along both the radial-circumferential and radial-axial planes. The ring was scanned in four (4) separate automated scans of 33" each.

Results of the TE Retaining Ring Examination

Following data acquisition, no recordable or crack-like indications were noted on the turbine end (TE) retaining ring on either of the four scans conducted.

A full and final report is forthcoming.

Very truly yours,

Robert Kissinger | Senior Specialist, Turbine/Generator NDE
Structural Integrity Associates, Inc.®
Powered by Talent and Technology

Mobile: 704-975-6821
rkissinger@@structint.com | www.structint.com | LinkedIn
11515 Vanstory Drive | Huntersville, NC 28078

Conco Services LLC

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

Eddy Current Report For

Kentucky Power Big Sandy Unit 1 Main Condenser

September 2022

Conco Job #35134

Prepared By:	[signature]
Approved By:	[signature]

Conco Services LLC

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

TABLE OF CONTENTS

(cont.)

4.0 CERTIFICATIONS

4.1 Personnel
4.2 Equipment
4.3 Calibration Standards

Conco Services LLC

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

1.0 SCOPE OF WORK

During the September 2022 outage maintenance at the Big Sandy plant, an Eddy Current inspection was performed on approximately 10% of the open tubes in each of the four water boxes comprising the Unit 1 Main Condenser. The tube specifications are as follows:

Material	OD Dimension	Wall Thickness	BWG	Length
9010 CuNi	0.875”	0.042”	19	30’
7030 CuNi	0.875”	0.042”	19	30’

This inspection of Main Condenser was performed as part of an ongoing maintenance program at the Big Sandy. The current results will be compared to future inspections to assure performance and trend the progression of previously recorded damage.

Eddy Current Testing is used to inspect a wide range of non-ferrous material for defects and degradation without damaging the test specimen. A digital multi-frequency tester with two-channel mixing was used. The tester is set with high sensitivity to small defects meanwhile still able to size large volume wear.

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2.0 INSPECTION SUMMARY

	Manufacturer	Type	Serial Number
Test System	CoreStar	Omni 200	0301-0611
Analysis Software	CoreStar	EddyVision 9.0	N/A
Calibration Standard	Ecutec	ASME	CSC-526
Calibration Standard	Ecutec	Wall Thinning	CSC-527
Calibration Standard	Zetec	ASME	CSC-025
Calibration Standard	Ecutec	Wall Thinning	CSC-637
Probe	CoreStar	730 ESH/MF	N/A

Big Sandy Unit 1 Main Condenser

The results of this inspection will be summarized in the Results Summary Table and on the Results Maps.

On September 23-25 2022, an Eddy Current inspection was performed on 10% of open tubes in the Unit 1 Main Condenser. The results are as follows:

West Upper Box
Of the 589 tubes tested, a total of 30 tubes were found with pit-like indications measuring between 20% and 84% through-wall. Most of these pits were found on the tube OD. Nearly all were small, solitary indications. A total of 14 tubes had recordable dents. A total of 8 tubes were only partially tested due to restrictions (mainly dents) in the tube.
Overall, the tubes appeared to be in very good condition. One (1) tube is recommended to be plugged, based on the plugging criterion stated below.

East Upper Box
Of the 488 tubes tested, a total of 20 tubes were found with pit-like indications measuring between 20% and 60% through-wall. Most of these pits were found on the tube OD and nearly all were small, solitary indications. A total of 9 tubes had recordable dents. A total of 12 tubes were only partially tested due to restrictions (mainly dents) in the tube.
Overall, the tubes appeared to be in very good condition. There were no tubes recommended to be plugged.

West Lower Box
Of the 513 tubes tested, a total of 5 tubes were found with pit-like indications measuring between 40% and 54% through-wall. All of these pits were found on the tube OD, and all were small, solitary indications. A total of 1 tube was only partially tested due to a restriction in the tube. Overall, the tubes appeared to be in very good condition. There were no tubes recommended to be plugged.

(cont.)

East Lower Box
Of the 518 tubes tested, a total of 5 tubes were found with pit-like indications measuring between 30% and 72% through-wall. All of these pits were found on the tube OD, and all were small, solitary indications. A total of 1 tube was only partially tested due to a restriction in the tube. Overall, the tubes appeared to be in very good condition. There were 31 tubes found to have been previously plugged. There were no additional tubes recommended to be plugged.

Plugging criterion at the time of this inspection was set for all indications greater than 80% through-wall.

Keeping these tubes as clean as possible will help enhance the performance of this heat exchanger. Re-inspect this heat exchanger 1 to 2 operating cycles to assure performance, monitor for any future damage, and trend the progression of previously recorded damage.

ESTABLISHED 1923

Conco Services LLC

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Data Management Codes*

Condition Abbreviations

ADR	Absolute Drift	**DNT**	Dent	**RES**	Restricted Tube
ADI	Absolute Drift with Indication	**BLG**	Bulge	**OBS**	Obstructed Tube
CRK	Crack(s)	**DSM**	Dissimilar Metals	**RBD**	Retest - Bad Data
DSI	Distorted Support Indication	**STC**	Stuck Cleaner	**RNC**	Retest - Number Count
EPE	End Plate Erosion	**PVN**	Permeability Variation	**RNT**	Retest - No Test
GEN	General Pitting	**PLG**	Plugged Tube	**INC**	Incomplete Test
IDI	ID Indication	**NDD**	No Detectable Defects >20%		
NQI	Non-Quantifiable Indication	**COR**	Corrosion		
MUL	Multiple Indications	**ERO**	Erosion		
ODI	OD Indication	**ERI**	Erosion with Impingement		
WAR	OD Wear	**PIT**	Pitting		

Location Abbreviations

ITE	Inlet Tube End	**NTE**	North Tube End	**BA**	Baffle
OTE	Outlet Tube End	**STE**	South Tube End	**TS**	Tube Support Plate
IO	Inlet/Outlet Tube End	**ETE**	East Tube End	**LA**	Land Area
CTE	Common Tube End	**WTE**	West Tube End	**ID**	Inside Diameter
UB	U-Bend			**OD**	Outside Diameter

*See the Examination Technique Specification Sheet for all applicable codes.

DATA REPORT
LEGEND

CHANNEL
Channel the indication was sized on
Channel 1 typically for freespan indications
Channel M# typically for tubesupport indications
Channel 6 typically for wear type indications

SECTION

PERCENT
Amount of wall loss

Nearest support structure

ROW

Distance off of that structure

TUBE

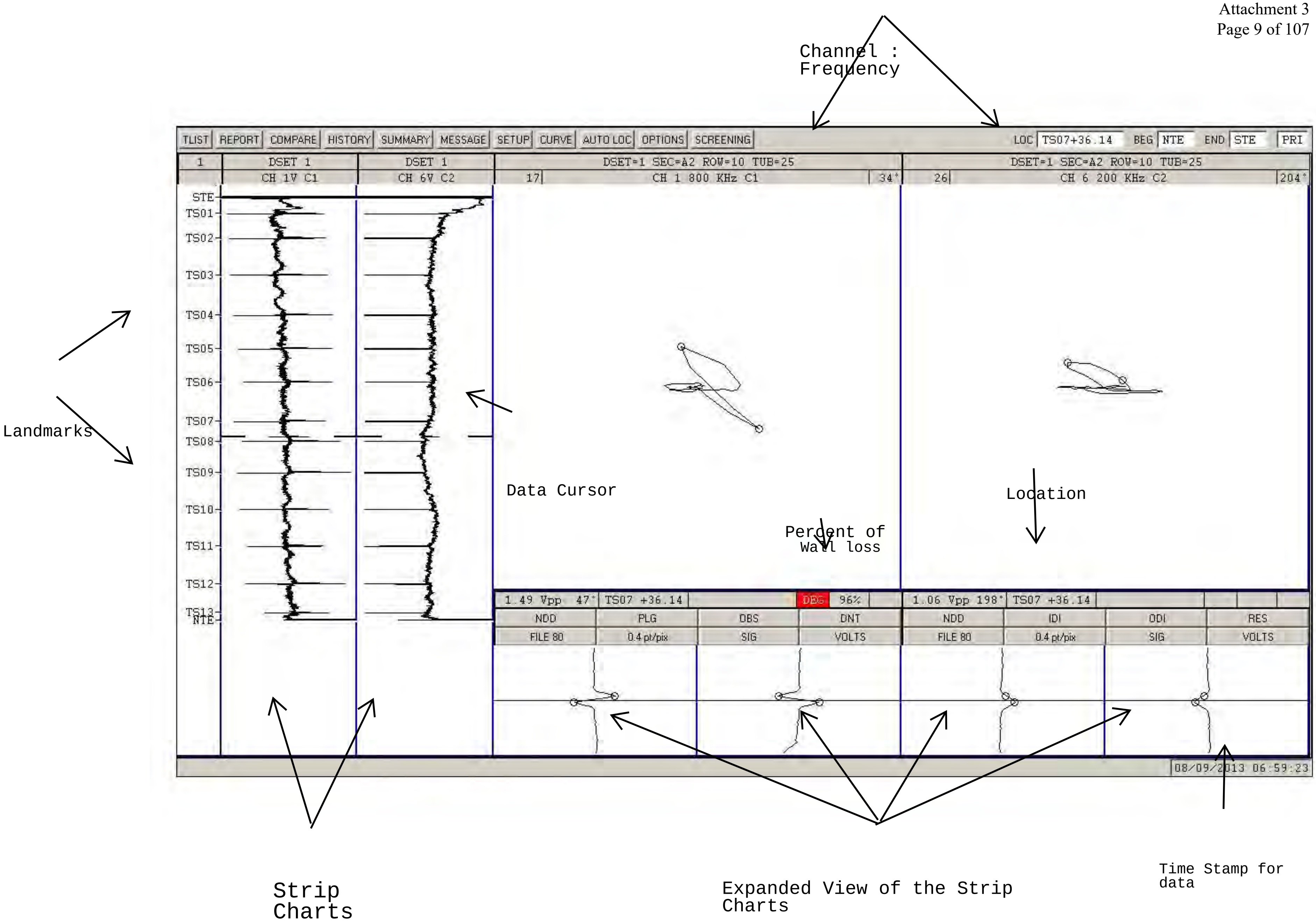
sec	row	tub	volts	phase	pcnt	defect	chan	loc_land	loc_off	beg_test	end_test
B	1	14				NDD				NTE	STE
B	1	15	4.49	9	23	IDI	1	TS1	79.91	NTE	STE
B	1	16				PLG					

VOLTS
Volume of lost material

INDICATION CODE

Directionally indicates the tube test. In this case the tube was tested from the North tube end to the South tube end

PHASE
Measured in degrees
<40 typically indicates an ID defect
>40 typically indicates an OD defect


Channel : Frequency
TLIST
REPORT
COMPARE
HISTORY
SUMMARY
MESSAGE
SETUP
CURVE
AUTO LOC
OPTIONS
SCREENING
LOC TS07+36.14
BEG NTE
END STE
PRI
DSET 1
CH 1V C1
CH 6V C2
DSET=1 SEC=A2 ROW=10 TUB=25
CH 1 800 KHz C1
CH 6 200 KHz C2
STE
TS01
TS02
TS03
TS04
TS05
TS06
TS07
TS08
TS09
TS10
TS11
TS12
TS13
NTE
Landmarks
Data Cursor
Percent of Wall loss
Location
1.49 Vpp 47°
TS07 +36.14
DEG
96%
1.06 Vpp 198°
NDD
PLG
DBS
DNT
IDI
ODI
RES
FILE 80
0.4 pt/pix
SIG
VOLTS
08/09/2013 06:59:23
Strip Charts
Expanded View of the Strip Charts
Time Stamp for data

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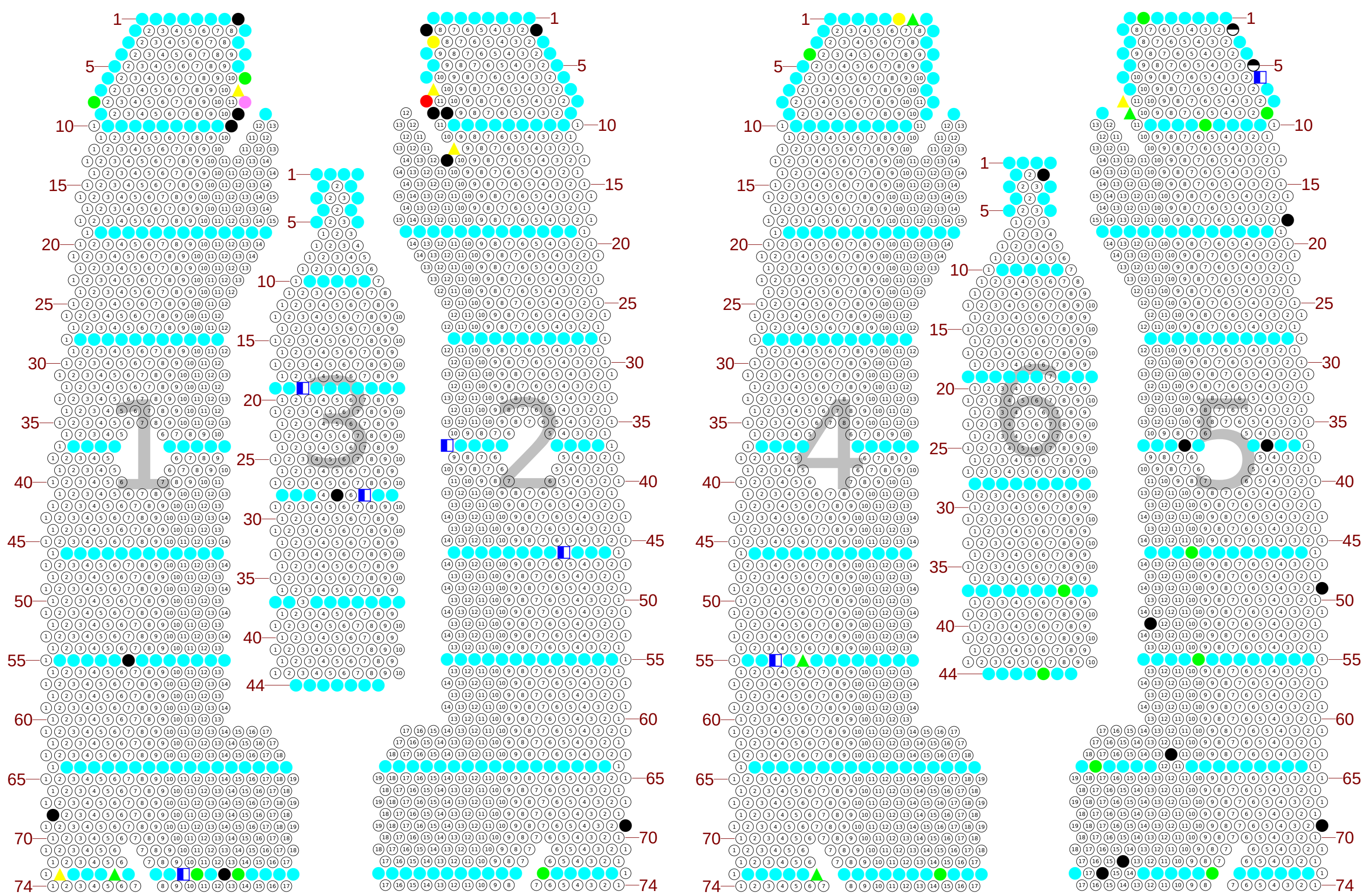
Results Summary
Kentucky Power
Big Sandy
Unit 1
Main Condenser
West Upper

	09-2022 Inspection
Total Tubes in Component (Straight Lengths)	**4,728**
Total Tubes Inspected (Straight Lengths)	**589**
Tubes Recording Damage:	Totals
Approx. Wall Loss 90% & Greater	0
Approx. Wall Loss 80% to 89%	1
Approx. Wall Loss 70% to 79%	0
Approx. Wall Loss 60% to 69%	1
Approx. Wall Loss 50% to 59%	5
Approx. Wall Loss 40% to 49%	2
Approx. Wall Loss 30% to 39%	5
Approx. Wall Loss 20% to 29%	16
Tubes Recording Dents	3
Restricted Tubes (Complete Inspection Not Possible)	8
Obstructed Tubes (No Test Possible)	0
Previously Plugged Tubes (Section 2)	23
Tubes Recommended for Plugging	1
Total of Previously Plugged Tubes & Tubes Recommended for Plugging	24

RESULTS MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

VIEW FROM: INLET/OUTLET END



SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_RESULTS.qry
	8	8	7	QUERY	RES_RESULTS.qry
	552	552	550	QUERY	NDD_RESULTS.qry
	3	3	2	QUERY	DNT_RESULTS.qry
	16	16	16	QUERY	20-29%_RESULTS.qry
	7	7	5	QUERY	30-39%_RESULTS.qry
	4	3	2	QUERY	40-49%_RESULTS.qry
	8	6	5	QUERY	50-59%_RESULTS.qry
	2	1	1	QUERY	60-69%_RESULTS.qry
	0	0	0	QUERY	70-79%_RESULTS.qry
	1	1	1	QUERY	80-89%_RESULTS.qry
	0	0	0	QUERY	90-100%_RESULTS.qry
	24	23	23	QUERY	PLUG_RESULTS.qry
	625	620	612		

Model default
4,728 tubes
4,116 open tubes

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	1	1				NDD				CTE	IO
1	1	2				NDD				CTE	IO
1	1	3				NDD				CTE	IO
1	1	4				NDD				CTE	IO
1	1	5				NDD				CTE	IO
1	1	6				NDD				CTE	IO
1	1	7				NDD				CTE	IO
1	1	8				PLG					
1	2	1				NDD				CTE	IO
1	2	9				NDD				CTE	IO
1	3	1				NDD				CTE	IO
1	3	9				NDD				CTE	IO
1	4	1				NDD				CTE	IO
1	4	10				NDD				CTE	IO
1	5	1				NDD				CTE	IO
1	5	10				NDD				CTE	IO
1	6	1				NDD				CTE	IO
1	6	11	2.19	151	25%	ODI	3	SP03	36.92	CTE	IO
1	7	1				NDD				CTE	IO
1	7	11	2.27	114	59%	ODI	3	SP04	29.36	CTE	IO
1	7	11	2.51	113	59%	ODI	3	SP04	25.98	CTE	IO
1	8	1	0.80	152	23%	ODI	3	SP04	2.84	CTE	IO
1	8	12	1.35	106	64%	ODI	3	SP02	4.87	SP08	IO
1	8	12				RES		SP08	30.37	SP08	IO
1	8	12	1.35	105	65%	ODI	3	SP02	2.12	CTE	IO
1	9	1				NDD				CTE	IO
1	9	11				PLG					
1	9	12				NDD				CTE	IO
1	10	2				NDD				CTE	IO
1	10	3				NDD				CTE	IO
1	10	4				NDD				CTE	IO
1	10	5				NDD				CTE	IO
1	10	6				NDD				CTE	IO
1	10	7				NDD				CTE	IO
1	10	8				NDD				CTE	IO
1	10	9				NDD				CTE	IO
1	10	10				NDD				CTE	IO
1	10	11				PLG					
1	19	2				NDD				CTE	IO
1	19	3				NDD				CTE	IO
1	19	4				NDD				CTE	IO
1	19	5				NDD				CTE	IO
1	19	6				NDD				CTE	IO
1	19	7				NDD				CTE	IO
1	19	8				NDD				CTE	IO
1	19	9				NDD				CTE	IO
1	19	10				NDD				CTE	IO
1	19	11				NDD				CTE	IO
1	19	12				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	19	13				NDD				CTE	IO
1	19	14				NDD				CTE	IO
1	28	2				NDD				CTE	IO
1	28	3				NDD				CTE	IO
1	28	4				NDD				CTE	IO
1	28	5				NDD				CTE	IO
1	28	6				NDD				CTE	IO
1	28	7				NDD				CTE	IO
1	28	8				NDD				CTE	IO
1	28	9				NDD				CTE	IO
1	28	10				NDD				CTE	IO
1	28	11				NDD				CTE	IO
1	28	12				NDD				CTE	IO
1	37	2				NDD				CTE	IO
1	37	3				NDD				CTE	IO
1	37	4				NDD				CTE	IO
1	37	5				NDD				CTE	IO
1	37	6				NDD				CTE	IO
1	37	7				NDD				CTE	IO
1	37	8				NDD				CTE	IO
1	37	9				NDD				CTE	IO
1	37	10				NDD				CTE	IO
1	46	2				NDD				CTE	IO
1	46	3				NDD				CTE	IO
1	46	4				NDD				CTE	IO
1	46	5				NDD				CTE	IO
1	46	6				NDD				CTE	IO
1	46	7				NDD				CTE	IO
1	46	8				NDD				CTE	IO
1	46	9				NDD				CTE	IO
1	46	10				NDD				CTE	IO
1	46	11				NDD				CTE	IO
1	46	12				NDD				CTE	IO
1	46	13				NDD				CTE	IO
1	55	2				NDD				CTE	IO
1	55	3				NDD				CTE	IO
1	55	4				NDD				CTE	IO
1	55	5				NDD				CTE	IO
1	55	6				NDD				CTE	IO
1	55	7				PLG					
1	55	8				NDD				CTE	IO
1	55	9				NDD				CTE	IO
1	55	10				NDD				CTE	IO
1	55	11				NDD				CTE	IO
1	55	12				NDD				CTE	IO
1	55	13				NDD				CTE	IO
1	55	14				NDD				CTE	IO
1	64	2				NDD				CTE	IO
1	64	3				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	64	4				NDD				CTE	IO
1	64	5				NDD				CTE	IO
1	64	6				NDD				CTE	IO
1	64	7				NDD				CTE	IO
1	64	8				NDD				CTE	IO
1	64	9				NDD				CTE	IO
1	64	10				NDD				CTE	IO
1	64	11				NDD				CTE	IO
1	64	12				NDD				CTE	IO
1	64	13				NDD				CTE	IO
1	64	14				NDD				CTE	IO
1	64	15				NDD				CTE	IO
1	64	16				NDD				CTE	IO
1	64	17				NDD				CTE	IO
1	64	18				NDD				CTE	IO
1	68	1				PLG					
1	73	2	3.87	14	35%	IDI	3	IO	30.73	CTE	IO
1	73	2	4.10	21	53%	IDI	3	SP01	34.50	CTE	IO
1	73	3				NDD				CTE	IO
1	73	4				NDD				CTE	IO
1	73	5				NDD				CTE	IO
1	73	6	15.50	13	33%	IDI	3	IO	-0.07	CTE	IO
1	73	7				NDD				CTE	IO
1	73	8				NDD				CTE	IO
1	73	9				NDD				CTE	IO
1	73	10				RES		SP07	29.07	SP07	IO
1	73	11	2.14	10	25%	IDI	3	IO	35.25	CTE	IO
1	73	12				NDD				CTE	IO
1	73	13				PLG					
1	73	14	4.30	9	23%	IDI	3	SP02	28.54	CTE	IO
1	73	15				NDD				CTE	IO
1	73	16				NDD				CTE	IO
1	73	17				NDD				CTE	IO
1	73	18				NDD				CTE	IO
2	1	1				NDD				CTE	IO
2	1	2				NDD				CTE	IO
2	1	3				NDD				CTE	IO
2	1	4				NDD				CTE	IO
2	1	5				NDD				CTE	IO
2	1	6				NDD				CTE	IO
2	1	7				NDD				CTE	IO
2	1	8				NDD				CTE	IO
2	2	1				PLG					
2	2	1				NDD				CTE	IO
2	2	9				PLG					
2	3	1				NDD				CTE	IO
2	3	9	2.88	127	48%	ODI	3	SP02	0.97	CTE	IO
2	3	9	131.51	173	0%	DNT	3	SP02	-0.35	CTE	IO
2	3	9	2.82	127	48%	ODI	3	SP02	7.45	CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	4	1				NDD				CTE	IO
2	4	10				NDD				CTE	IO
2	5	1				NDD				CTE	IO
2	5	10				NDD				CTE	IO
2	6	1				NDD				CTE	IO
2	6	11				NDD				CTE	IO
2	7	1				NDD				CTE	IO
2	7	11	1.65	123	51%	ODI	3	SP03	2.73	CTE	IO
2	7	11	1.77	123	51%	ODI	3	SP03	2.61	CTE	IO
2	8	1				NDD				CTE	IO
2	8	12	2.87	130	45%	ODI	3	IO	35.27	CTE	IO
2	8	12	1.30	74	84%	ODI	3	SP04	26.04	CTE	IO
2	8	12	3.79	125	50%	ODI	3	IO	28.27	CTE	IO
2	9	1				NDD				CTE	IO
2	9	10				PLG					
2	9	11				NDD				CTE	IO
2	9	11				PLG					
2	10	2				NDD				CTE	IO
2	10	3				NDD				CTE	IO
2	10	4				NDD				CTE	IO
2	10	5				NDD				CTE	IO
2	10	6				NDD				CTE	IO
2	10	7				NDD				CTE	IO
2	10	8				NDD				CTE	IO
2	10	9				NDD				CTE	IO
2	10	10				NDD				CTE	IO
2	12	10	4.49	115	58%	ODI	3	SP02	29.73	CTE	IO
2	12	10	1.81	143	33%	ODI	3	IO	28.39	CTE	IO
2	13	11				PLG					
2	19	2				NDD				CTE	IO
2	19	3				NDD				CTE	IO
2	19	4				NDD				CTE	IO
2	19	5				NDD				CTE	IO
2	19	6				NDD				CTE	IO
2	19	7				NDD				CTE	IO
2	19	8				NDD				CTE	IO
2	19	9				NDD				CTE	IO
2	19	10				NDD				CTE	IO
2	19	11				NDD				CTE	IO
2	19	12				NDD				CTE	IO
2	19	13				NDD				CTE	IO
2	19	14				NDD				CTE	IO
2	28	2				NDD				CTE	IO
2	28	3				NDD				CTE	IO
2	28	4				NDD				CTE	IO
2	28	5				NDD				CTE	IO
2	28	6				NDD				CTE	IO
2	28	7				NDD				CTE	IO
2	28	8				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	28	9				NDD				CTE	IO
2	28	10				NDD				CTE	IO
2	28	11				NDD				CTE	IO
2	28	12				NDD				CTE	IO
2	37	2				NDD				CTE	IO
2	37	3				NDD				CTE	IO
2	37	4				NDD				CTE	IO
2	37	5				NDD				CTE	IO
2	37	6				NDD				CTE	IO
2	37	7				NDD				CTE	IO
2	37	8				NDD				CTE	IO
2	37	9				NDD				CTE	IO
2	37	10				RES		SP07	55.48	SP07	IO
2	46	2				NDD				CTE	IO
2	46	3				NDD				CTE	IO
2	46	4				NDD				CTE	IO
2	46	5				RES		SP06	17.05	SP06	IO
2	46	6				NDD				CTE	IO
2	46	7				NDD				CTE	IO
2	46	8				NDD				CTE	IO
2	46	9				NDD				CTE	IO
2	46	10				NDD				CTE	IO
2	46	11				NDD				CTE	IO
2	46	12				NDD				CTE	IO
2	46	13				NDD				CTE	IO
2	55	2				NDD				CTE	IO
2	55	3				NDD				CTE	IO
2	55	4				NDD				CTE	IO
2	55	5				NDD				CTE	IO
2	55	6				NDD				CTE	IO
2	55	7				NDD				CTE	IO
2	55	8				NDD				CTE	IO
2	55	9				NDD				CTE	IO
2	55	10				NDD				CTE	IO
2	55	11				NDD				CTE	IO
2	55	12				NDD				CTE	IO
2	55	13				NDD				CTE	IO
2	55	14				NDD				CTE	IO
2	64	2				NDD				CTE	IO
2	64	3				NDD				CTE	IO
2	64	4				NDD				CTE	IO
2	64	5				NDD				CTE	IO
2	64	6				NDD				CTE	IO
2	64	7				NDD				CTE	IO
2	64	8				NDD				CTE	IO
2	64	9				NDD				CTE	IO
2	64	10				NDD				CTE	IO
2	64	11				NDD				CTE	IO
2	64	12				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	64	13				NDD				CTE	IO
2	64	14				NDD				CTE	IO
2	64	15				NDD				CTE	IO
2	64	16				NDD				CTE	IO
2	64	17				NDD				CTE	IO
2	64	18				NDD				CTE	IO
2	69	1				PLG					
2	73	2				NDD				CTE	IO
2	73	3				NDD				CTE	IO
2	73	4				NDD				CTE	IO
2	73	5				NDD				CTE	IO
2	73	6				NDD				CTE	IO
2	73	7	2.36	149	27%	ODI	3	SP01	18.83	CTE	IO
2	73	8				NDD				CTE	IO
2	73	9				NDD				CTE	IO
2	73	10				NDD				CTE	IO
2	73	11				NDD				CTE	IO
2	73	12				NDD				CTE	IO
2	73	13				NDD				CTE	IO
2	73	14				NDD				CTE	IO
2	73	15				NDD				CTE	IO
2	73	16				NDD				CTE	IO
2	73	17				NDD				CTE	IO
2	73	18				NDD				CTE	IO
3	1	1				NDD				CTE	IO
3	1	2				NDD				CTE	IO
3	1	3				NDD				CTE	IO
3	1	4				NDD				CTE	IO
3	2	1				NDD				CTE	IO
3	2	3				NDD				CTE	IO
3	3	1				NDD				CTE	IO
3	3	4				NDD				CTE	IO
3	4	1				NDD				CTE	IO
3	4	3				NDD				CTE	IO
3	5	1				NDD				CTE	IO
3	5	4				NDD				CTE	IO
3	10	2				NDD				CTE	IO
3	10	3				NDD				CTE	IO
3	10	4				NDD				CTE	IO
3	10	5				NDD				CTE	IO
3	10	6				NDD				CTE	IO
3	19	1				NDD				CTE	IO
3	19	2				NDD				CTE	IO
3	19	3				RES		SP07	1.40	SP07	IO
3	19	4				NDD				CTE	IO
3	19	5				NDD				CTE	IO
3	19	6				NDD				CTE	IO
3	19	7				NDD				CTE	IO
3	19	8				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
3	19	9				NDD				CTE	IO
3	19	10				NDD				CTE	IO
3	28	1				NDD				CTE	IO
3	28	2				NDD				CTE	IO
3	28	3				NDD				CTE	IO
3	28	5				PLG					
3	28	7				RES		SP08	17.04	SP08	IO
3	28	8				NDD				CTE	IO
3	28	9				NDD				CTE	IO
3	37	1				NDD				CTE	IO
3	37	2				NDD				CTE	IO
3	37	4				NDD				CTE	IO
3	37	5				NDD				CTE	IO
3	37	6				NDD				CTE	IO
3	37	7				NDD				CTE	IO
3	37	8				NDD				CTE	IO
3	37	9				NDD				CTE	IO
3	37	10				NDD				CTE	IO
3	44	1				NDD				CTE	IO
3	44	2				NDD				CTE	IO
3	44	3				NDD				CTE	IO
3	44	4				NDD				CTE	IO
3	44	5				NDD				CTE	IO
3	44	6				NDD				CTE	IO
3	44	7				NDD				CTE	IO
4	1	1				NDD				CTE	IO
4	1	2				NDD				CTE	IO
4	1	3				NDD				CTE	IO
4	1	4				NDD				CTE	IO
4	1	5				NDD				CTE	IO
4	1	6	0.80	135	41%	ODI	3	SP04	4.61	CTE	IO
4	1	7	1.09	145	31%	ODI	3	SP04	4.27	SP08	IO
4	1	8				NDD				CTE	IO
4	2	1				NDD				CTE	IO
4	2	9				NDD				CTE	IO
4	3	1				NDD				CTE	IO
4	3	9				NDD				CTE	IO
4	4	1	3.55	8	20%	IDI	3	IO	29.97	CTE	IO
4	4	10				NDD				CTE	IO
4	5	1				NDD				CTE	IO
4	5	10				NDD				CTE	IO
4	6	1				NDD				CTE	IO
4	6	11				NDD				CTE	IO
4	7	1				NDD				CTE	IO
4	7	11				NDD				CTE	IO
4	8	1				NDD				CTE	IO
4	8	12				NDD				CTE	IO
4	9	1				NDD				CTE	IO
4	9	11				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
4	9	12				NDD				CTE	IO
4	10	2				NDD				CTE	IO
4	10	3				NDD				CTE	IO
4	10	4				NDD				CTE	IO
4	10	5				NDD				CTE	IO
4	10	6				NDD				CTE	IO
4	10	7				NDD				CTE	IO
4	10	8				NDD				CTE	IO
4	10	9				NDD				CTE	IO
4	10	10				NDD				CTE	IO
4	19	2				NDD				CTE	IO
4	19	3				NDD				CTE	IO
4	19	4				NDD				CTE	IO
4	19	5				NDD				CTE	IO
4	19	6				NDD				CTE	IO
4	19	7				NDD				CTE	IO
4	19	8				NDD				CTE	IO
4	19	9				NDD				CTE	IO
4	19	10				NDD				CTE	IO
4	19	11				NDD				CTE	IO
4	19	12				NDD				CTE	IO
4	19	13				NDD				CTE	IO
4	19	14				NDD				CTE	IO
4	28	2				NDD				CTE	IO
4	28	3				NDD				CTE	IO
4	28	4				NDD				CTE	IO
4	28	5				NDD				CTE	IO
4	28	6				NDD				CTE	IO
4	28	7				NDD				CTE	IO
4	28	8				NDD				CTE	IO
4	28	9				NDD				CTE	IO
4	28	10				NDD				CTE	IO
4	28	11				NDD				CTE	IO
4	28	12				NDD				CTE	IO
4	37	2				NDD				CTE	IO
4	37	3				NDD				CTE	IO
4	37	4				NDD				CTE	IO
4	37	5				NDD				CTE	IO
4	37	6				NDD				CTE	IO
4	37	7				NDD				CTE	IO
4	37	8				NDD				CTE	IO
4	37	9				NDD				CTE	IO
4	37	10				NDD				CTE	IO
4	46	2				NDD				CTE	IO
4	46	3				NDD				CTE	IO
4	46	4				NDD				CTE	IO
4	46	5				NDD				CTE	IO
4	46	6				NDD				CTE	IO
4	46	7				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
4	46	8				NDD				CTE	IO
4	46	9				NDD				CTE	IO
4	46	10				NDD				CTE	IO
4	46	11				NDD				CTE	IO
4	46	12				NDD				CTE	IO
4	46	13				NDD				CTE	IO
4	55	2				NDD				CTE	IO
4	55	3				NDD				CTE	IO
4	55	4				RES		SP08	20.18	SP08	IO
4	55	5				NDD				CTE	IO
4	55	6	5.33	12	30%	IDI	3	IO	23.88	CTE	IO
4	55	7				NDD				CTE	IO
4	55	8				NDD				CTE	IO
4	55	9				NDD				CTE	IO
4	55	10				NDD				CTE	IO
4	55	11				NDD				CTE	IO
4	55	12				NDD				CTE	IO
4	55	13				NDD				CTE	IO
4	55	14				NDD				CTE	IO
4	64	2				NDD				CTE	IO
4	64	3				NDD				CTE	IO
4	64	4				NDD				CTE	IO
4	64	5				NDD				CTE	IO
4	64	6				NDD				CTE	IO
4	64	7				NDD				CTE	IO
4	64	8				NDD				CTE	IO
4	64	9				NDD				CTE	IO
4	64	10				NDD				CTE	IO
4	64	11				NDD				CTE	IO
4	64	12				NDD				CTE	IO
4	64	13				NDD				CTE	IO
4	64	14				NDD				CTE	IO
4	64	15				NDD				CTE	IO
4	64	16				NDD				CTE	IO
4	64	17				NDD				CTE	IO
4	64	18				NDD				CTE	IO
4	73	2				NDD				CTE	IO
4	73	3				NDD				CTE	IO
4	73	4				NDD				CTE	IO
4	73	5				NDD				CTE	IO
4	73	6				NDD				CTE	IO
4	73	7	1.46	143	33%	ODI	3	SP04	18.50	CTE	IO
4	73	8				NDD				CTE	IO
4	73	9				NDD				CTE	IO
4	73	10				NDD				CTE	IO
4	73	11				NDD				CTE	IO
4	73	12				NDD				CTE	IO
4	73	13				NDD				CTE	IO
4	73	14				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
4	73	15	5.25	8	20%	IDI	3	SP02	23.67	CTE	IO
4	73	16				NDD				CTE	IO
4	73	17				NDD				CTE	IO
4	73	18				NDD				CTE	IO
5	1	1				NDD				CTE	IO
5	1	2				NDD				CTE	IO
5	1	3				NDD				CTE	IO
5	1	4				NDD				CTE	IO
5	1	5				NDD				CTE	IO
5	1	6				NDD				CTE	IO
5	1	7	8.85	10	25%	IDI	3	IO	11.90	CTE	IO
5	1	8				NDD				CTE	IO
5	2	1	43.60	172	0%	DNT	3	SP01	17.27	CTE	IO
5	2	9				NDD				CTE	IO
5	3	1				NDD				CTE	IO
5	3	9				NDD				CTE	IO
5	4	1				NDD				CTE	IO
5	4	10				NDD				CTE	IO
5	5	1	41.62	178	0%	DNT	3	SP05	14.01	CTE	IO
5	5	10				NDD				CTE	IO
5	6	1				RES		SP06	8.13	SP06	IO
5	6	11				NDD				CTE	IO
5	7	1				NDD				CTE	IO
5	7	11				NDD				CTE	IO
5	8	1				NDD				CTE	IO
5	8	12	0.71	115	58%	ODI	3	SP02	16.39	CTE	IO
5	9	1	3.60	8	20%	IDI	3	SP07	37.42	SP08	IO
5	9	11	1.90	143	33%	ODI	3	SP05	25.14	CTE	IO
5	9	12				NDD				CTE	IO
5	10	2				NDD				CTE	IO
5	10	3				NDD				CTE	IO
5	10	4				NDD				CTE	IO
5	10	5				NDD				CTE	IO
5	10	6	3.56	9	23%	IDI	3	SP03	17.97	CTE	IO
5	10	7				NDD				CTE	IO
5	10	8				NDD				CTE	IO
5	10	9				NDD				CTE	IO
5	10	10				NDD				CTE	IO
5	18	1				PLG					
5	19	2				NDD				CTE	IO
5	19	3				NDD				CTE	IO
5	19	4				NDD				CTE	IO
5	19	5				NDD				CTE	IO
5	19	6				NDD				CTE	IO
5	19	7				NDD				CTE	IO
5	19	8				NDD				CTE	IO
5	19	9				NDD				CTE	IO
5	19	10				NDD				CTE	IO
5	19	11				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
5	19	12				NDD				CTE	IO
5	19	13				NDD				CTE	IO
5	19	14				NDD				CTE	IO
5	28	2				NDD				CTE	IO
5	28	3				NDD				CTE	IO
5	28	4				NDD				CTE	IO
5	28	5				NDD				CTE	IO
5	28	6				NDD				CTE	IO
5	28	7				NDD				CTE	IO
5	28	8				NDD				CTE	IO
5	28	9				NDD				CTE	IO
5	28	10				NDD				CTE	IO
5	28	11				NDD				CTE	IO
5	28	12				NDD				CTE	IO
5	37	2				NDD				CTE	IO
5	37	3				NDD				CTE	IO
5	37	4				PLG					
5	37	5				NDD				CTE	IO
5	37	6				NDD				CTE	IO
5	37	7				PLG					
5	37	8				NDD				CTE	IO
5	37	9				NDD				CTE	IO
5	37	10				NDD				CTE	IO
5	46	2				NDD				CTE	IO
5	46	3				NDD				CTE	IO
5	46	4				NDD				CTE	IO
5	46	5				NDD				CTE	IO
5	46	6				NDD				CTE	IO
5	46	7				NDD				CTE	IO
5	46	8				NDD				CTE	IO
5	46	9				NDD				CTE	IO
5	46	10	6.03	11	28%	IDI	3	SP01	20.49	CTE	IO
5	46	11				NDD				CTE	IO
5	46	12				NDD				CTE	IO
5	46	13				NDD				CTE	IO
5	49	1				PLG					
5	52	13				PLG					
5	55	2				NDD				CTE	IO
5	55	3				NDD				CTE	IO
5	55	4				NDD				CTE	IO
5	55	5				NDD				CTE	IO
5	55	6				NDD				CTE	IO
5	55	7				NDD				CTE	IO
5	55	8				NDD				CTE	IO
5	55	9				NDD				CTE	IO
5	55	10	4.59	9	23%	IDI	3	SP04	7.80	CTE	IO
5	55	11				NDD				CTE	IO
5	55	12				NDD				CTE	IO
5	55	13				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
5	55	14				NDD				CTE	IO
5	63	12				PLG					
5	64	2				NDD				CTE	IO
5	64	3				NDD				CTE	IO
5	64	4				NDD				CTE	IO
5	64	5				NDD				CTE	IO
5	64	6				NDD				CTE	IO
5	64	7				NDD				CTE	IO
5	64	8				NDD				CTE	IO
5	64	9				NDD				CTE	IO
5	64	10				NDD				CTE	IO
5	64	13				NDD				CTE	IO
5	64	14				NDD				CTE	IO
5	64	15				NDD				CTE	IO
5	64	16				NDD				CTE	IO
5	64	17	5.31	9	23%	IDI	3	IO	23.68	CTE	IO
5	64	18				NDD				CTE	IO
5	69	1				PLG					
5	72	14				PLG					
5	73	2				NDD				CTE	IO
5	73	3				NDD				CTE	IO
5	73	4				NDD				CTE	IO
5	73	5				NDD				CTE	IO
5	73	6				NDD				CTE	IO
5	73	7				NDD				CTE	IO
5	73	8	4.18	8	20%	IDI	3	SP02	13.00	CTE	IO
5	73	9				NDD				CTE	IO
5	73	10				NDD				CTE	IO
5	73	11				NDD				CTE	IO
5	73	12				NDD				CTE	IO
5	73	13				NDD				CTE	IO
5	73	16				PLG					
5	73	18				NDD				CTE	IO
6	1	1				NDD				CTE	IO
6	1	2				NDD				CTE	IO
6	1	3				NDD				CTE	IO
6	1	4				NDD				CTE	IO
6	2	1				NDD				CTE	IO
6	2	3				PLG					
6	2	3				PLG					
6	3	1				NDD				CTE	IO
6	3	4				NDD				CTE	IO
6	4	1				NDD				CTE	IO
6	4	3				NDD				CTE	IO
6	5	1				NDD				CTE	IO
6	5	4				NDD				CTE	IO
6	10	2				NDD				CTE	IO
6	10	3				NDD				CTE	IO
6	10	4				NDD				CTE	IO

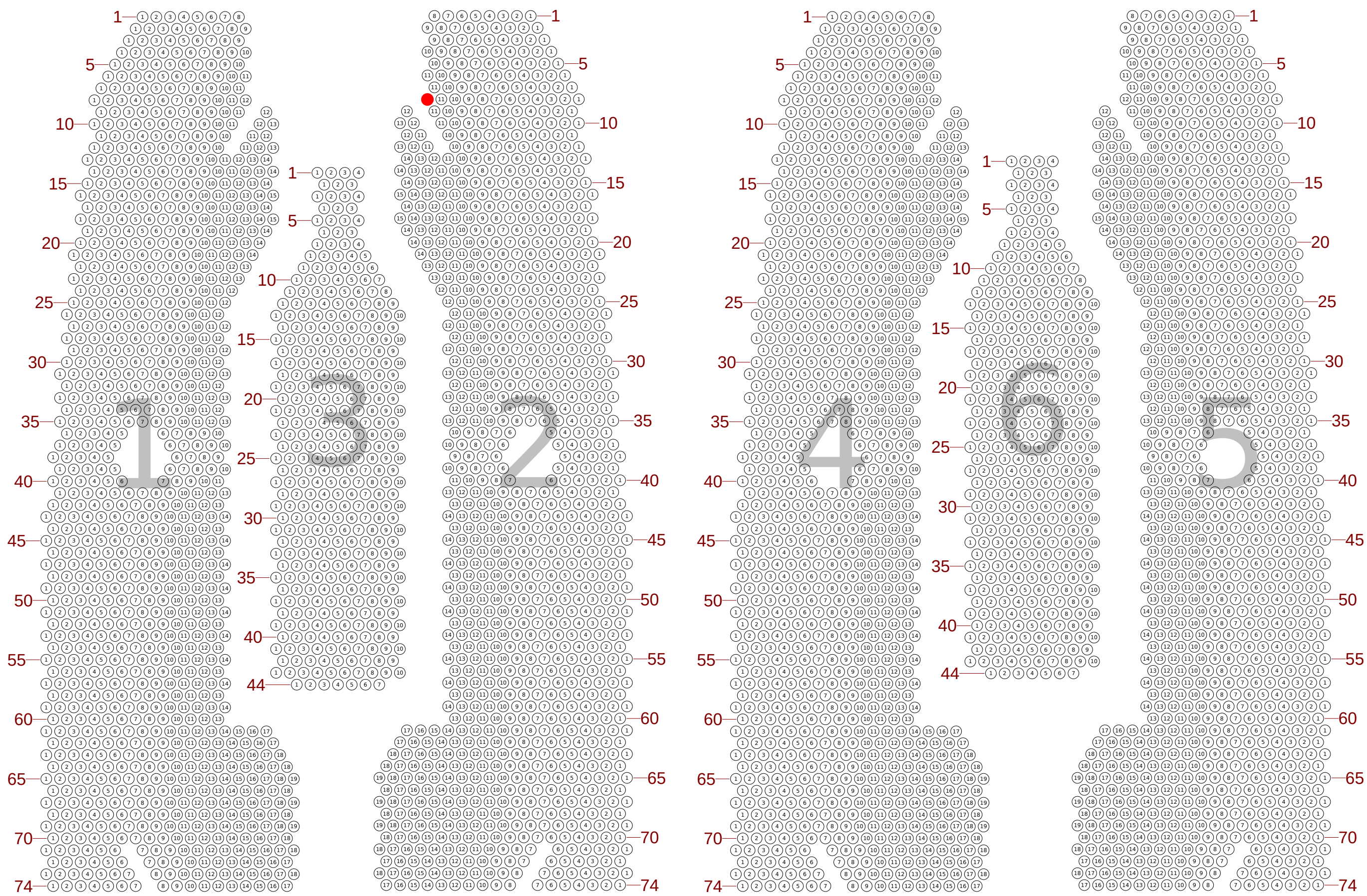
DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
6	10	5				NDD				CTE	IO
6	10	6				NDD				CTE	IO
6	19	1				NDD				CTE	IO
6	19	2				NDD				CTE	IO
6	19	3				NDD				CTE	IO
6	19	4				NDD				CTE	IO
6	19	5				NDD				CTE	IO
6	19	6				NDD				CTE	IO
6	19	8				NDD				CTE	IO
6	19	9				NDD				CTE	IO
6	19	10				NDD				CTE	IO
6	28	1				NDD				CTE	IO
6	28	2				NDD				CTE	IO
6	28	3				NDD				CTE	IO
6	28	4				NDD				CTE	IO
6	28	5				NDD				CTE	IO
6	28	6				NDD				CTE	IO
6	28	7				NDD				CTE	IO
6	28	8				NDD				CTE	IO
6	28	9				NDD				CTE	IO
6	37	1				NDD				CTE	IO
6	37	2				NDD				CTE	IO
6	37	3				NDD				CTE	IO
6	37	4				NDD				CTE	IO
6	37	5				NDD				CTE	IO
6	37	6				NDD				CTE	IO
6	37	7				NDD				CTE	IO
6	37	8	6.52	11	28%	IDI	1	IO	58.53	CTE	IO
6	37	9				NDD				CTE	IO
6	37	10				NDD				CTE	IO
6	44	1				NDD				CTE	IO
6	44	2				NDD				CTE	IO
6	44	3				NDD				CTE	IO
6	44	4				NDD				CTE	IO
6	44	5	5.77	9	23%	IDI	1	SP01	217.57	CTE	IO
6	44	6				NDD				CTE	IO
6	44	7				NDD				CTE	IO

TO BE PLUGGED MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

VIEW FROM: INLET/OUTLET END



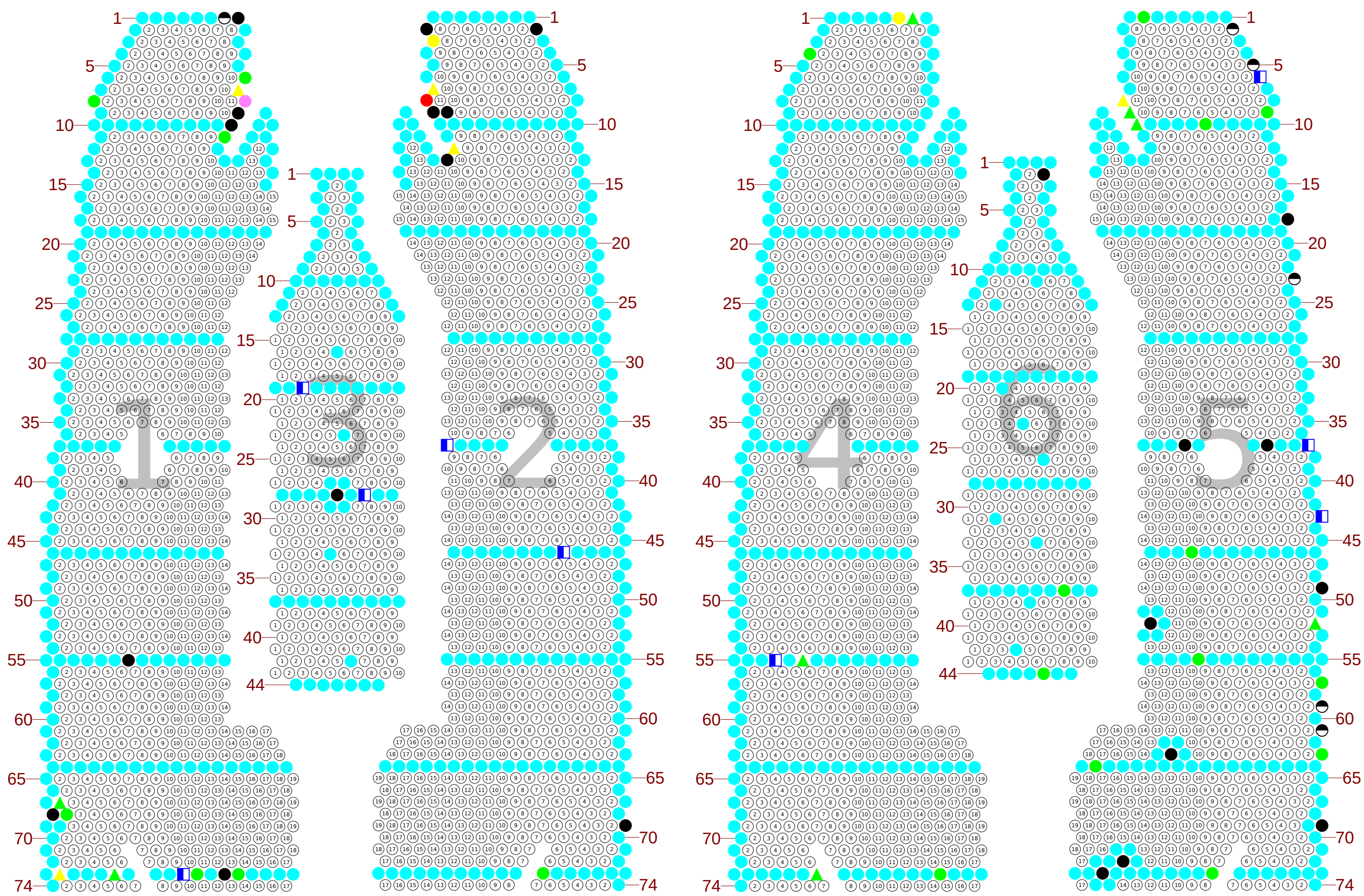
SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
●	1	1	1	QUERY	80-89%_RESULTS.qry
	1	1	1		

Model default
4,728 tubes
4,727 open tubes

HISTORY MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER
09-2022

VIEW FROM: INLET/OUTLET END



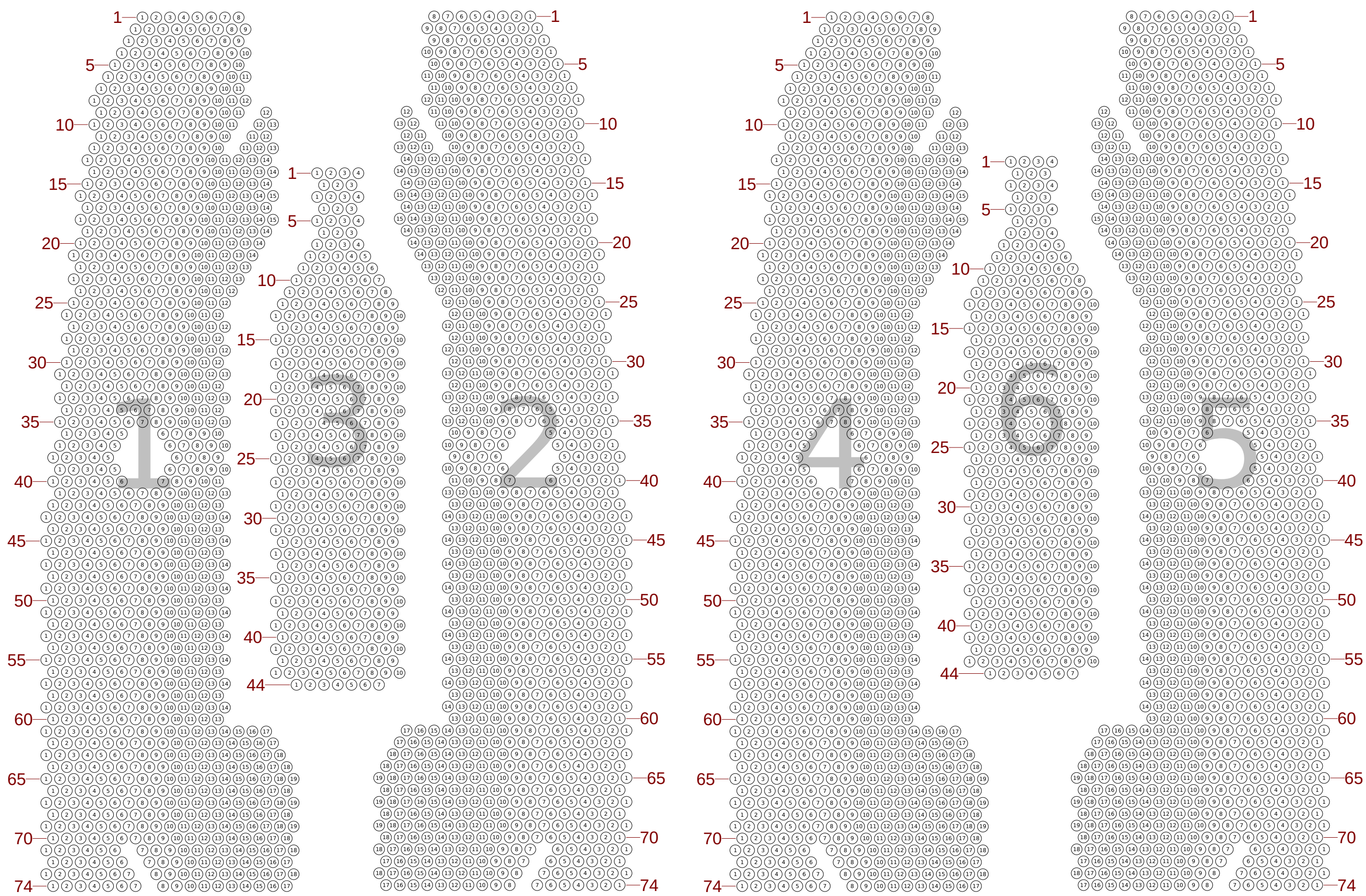
SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_HISTORY.qry
	13	12	9	QUERY	RES_HISTORY.qry
	1031	931	923	QUERY	NDD_HISTORY.qry
	0	0	0	QUERY	PVN_HISTORY.qry
	12	9	6	QUERY	DNT_HISTORY.qry
	22	21	20	QUERY	20-29%_HISTORY.qry
	11	10	8	QUERY	30-39%_HISTORY.qry
	9	5	2	QUERY	40-49%_HISTORY.qry
	13	8	5	QUERY	50-59%_HISTORY.qry
	5	4	1	QUERY	60-69%_HISTORY.qry
	3	3	0	QUERY	70-79%_HISTORY.qry
	1	1	1	QUERY	80-89%_HISTORY.qry
	0	0	0	QUERY	90-100%_HISTORY.qry
	32	23	23	QUERY	PLUG_HISTORY.qry
	1,152	1,027	998		

Model default
4,728 tubes
3,730 open tubes

TUBE SHEET LAYOUT MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST UPPER

VIEW FROM: INLET/OUTLET END



Model default
4,728 tubes
4,728 open tubes

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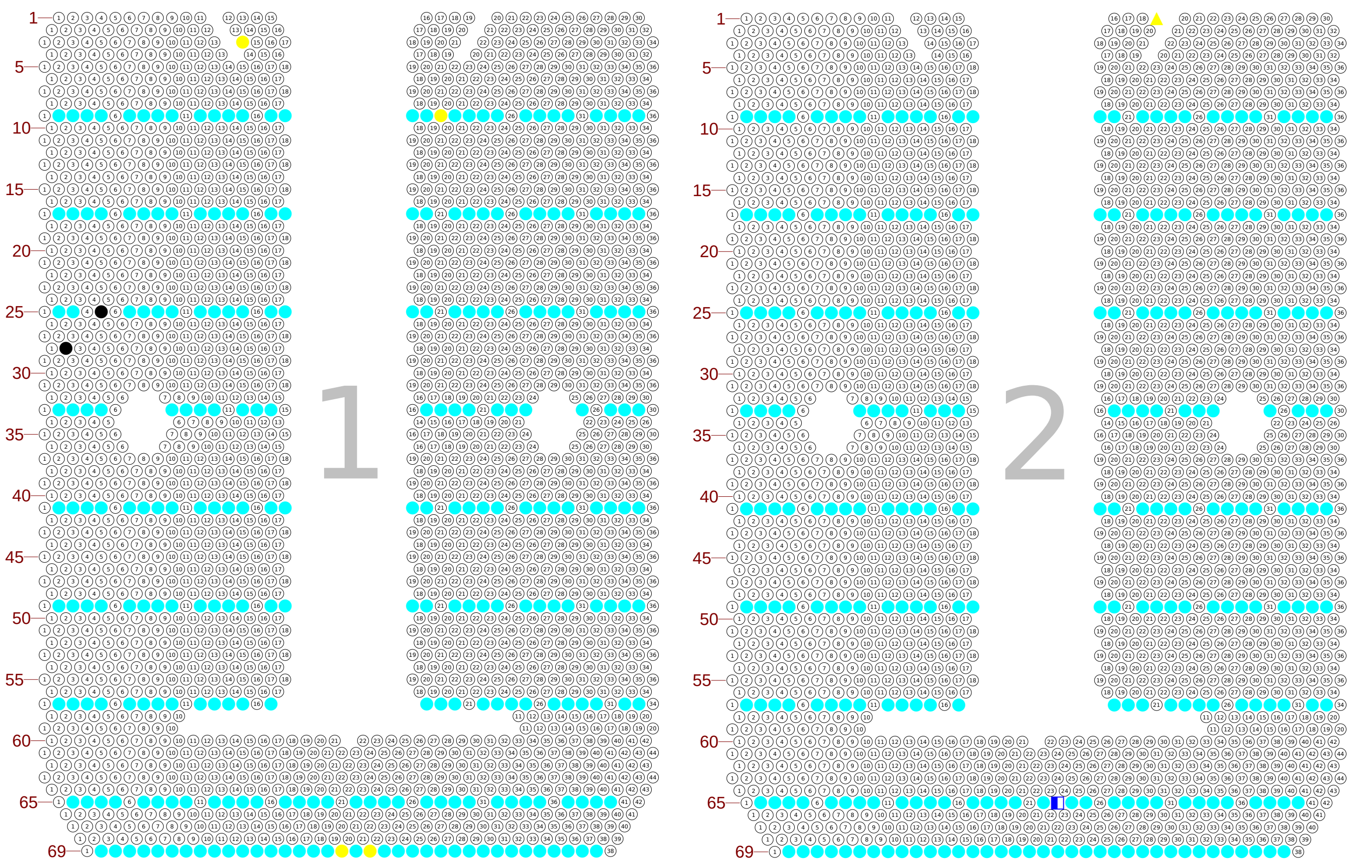
Results Summary
Kentucky Power
Big Sandy
Unit 1
Main Condenser
West Lower

	09-2022 Inspection
Total Tubes in Component (Straight Lengths)	**4,822**
Total Tubes Inspected (Straight Lengths)	**513**
Tubes Recording Damage:	Totals
Approx. Wall Loss 90% & Greater	0
Approx. Wall Loss 80% to 89%	0
Approx. Wall Loss 70% to 79%	0
Approx. Wall Loss 60% to 69%	0
Approx. Wall Loss 50% to 59%	1
Approx. Wall Loss 40% to 49%	4
Approx. Wall Loss 30% to 39%	0
Approx. Wall Loss 20% to 29%	0
Tubes Recording Dents	0
Restricted Tubes (Complete Inspection Not Possible)	1
Obstructed Tubes (No Test Possible)	0
Previously Plugged Tubes (Section 2)	2
Tubes Recommended for Plugging	0
Total of Previously Plugged Tubes & Tubes Recommended for Plugging	2

RESULTS MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

VIEW FROM: INLET/OUTLET END



SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_RESULTS.qry
	1	1	1	QUERY	RES_RESULTS.qry
	507	507	507	QUERY	NDD_RESULTS.qry
	0	0	0	QUERY	PVN_RESULTS.qry
	0	0	0	QUERY	DNT_RESULTS.qry
	0	0	0	QUERY	20-29%_RESULTS.qry
	0	0	0	QUERY	30-39%_RESULTS.qry
	4	4	4	QUERY	40-49%_RESULTS.qry
	1	1	1	QUERY	50-59%_RESULTS.qry
	0	0	0	QUERY	60-69%_RESULTS.qry
	0	0	0	QUERY	70-79%_RESULTS.qry
	0	0	0	QUERY	80-89%_RESULTS.qry
	0	0	0	QUERY	90-100%_RESULTS.qry
	2	2	2	QUERY	PLUG_RESULTS.qry
	515	515	515		

Model default
4,820 tubes
4,305 open tubes

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	3	14	1.23	136	40%	ODI	3	SP08	19.39	CTE	IO
1	9	2				NDD				CTE	IO
1	9	3				NDD				CTE	IO
1	9	4				NDD				CTE	IO
1	9	5				NDD				CTE	IO
1	9	7				NDD				CTE	IO
1	9	8				NDD				CTE	IO
1	9	9				NDD				CTE	IO
1	9	10				NDD				CTE	IO
1	9	12				NDD				CTE	IO
1	9	13				NDD				CTE	IO
1	9	14				NDD				CTE	IO
1	9	15				NDD				CTE	IO
1	9	17				NDD				CTE	IO
1	9	18				NDD				CTE	IO
1	9	19				NDD				CTE	IO
1	9	20				NDD				CTE	IO
1	9	21	0.58	136	40%	ODI	3	SP02	20.36	CTE	IO
1	9	22				NDD				CTE	IO
1	9	23				NDD				CTE	IO
1	9	24				NDD				CTE	IO
1	9	25				NDD				CTE	IO
1	9	27				NDD				CTE	IO
1	9	28				NDD				CTE	IO
1	9	29				NDD				CTE	IO
1	9	30				NDD				CTE	IO
1	9	32				NDD				CTE	IO
1	9	33				NDD				CTE	IO
1	9	34				NDD				CTE	IO
1	9	35				NDD				CTE	IO
1	17	2				NDD				CTE	IO
1	17	3				NDD				CTE	IO
1	17	4				NDD				CTE	IO
1	17	5				NDD				CTE	IO
1	17	7				NDD				CTE	IO
1	17	8				NDD				CTE	IO
1	17	9				NDD				CTE	IO
1	17	10				NDD				CTE	IO
1	17	12				NDD				CTE	IO
1	17	13				NDD				CTE	IO
1	17	14				NDD				CTE	IO
1	17	15				NDD				CTE	IO
1	17	17				NDD				CTE	IO
1	17	18				NDD				CTE	IO
1	17	19				NDD				CTE	IO
1	17	20				NDD				CTE	IO
1	17	22				NDD				CTE	IO
1	17	23				NDD				CTE	IO
1	17	24				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	17	25				NDD				CTE	IO
1	17	27				NDD				CTE	IO
1	17	28				NDD				CTE	IO
1	17	29				NDD				CTE	IO
1	17	30				NDD				CTE	IO
1	17	32				NDD				CTE	IO
1	17	33				NDD				CTE	IO
1	17	34				NDD				CTE	IO
1	17	35				NDD				CTE	IO
1	25	2				NDD				CTE	IO
1	25	3				NDD				CTE	IO
1	25	5				PLG					
1	25	7				NDD				CTE	IO
1	25	8				NDD				CTE	IO
1	25	9				NDD				CTE	IO
1	25	10				NDD				CTE	IO
1	25	12				NDD				CTE	IO
1	25	13				NDD				CTE	IO
1	25	14				NDD				CTE	IO
1	25	15				NDD				CTE	IO
1	25	17				NDD				CTE	IO
1	25	18				NDD				CTE	IO
1	25	19				NDD				CTE	IO
1	25	20				NDD				CTE	IO
1	25	22				NDD				CTE	IO
1	25	23				NDD				CTE	IO
1	25	24				NDD				CTE	IO
1	25	25				NDD				CTE	IO
1	25	27				NDD				CTE	IO
1	25	28				NDD				CTE	IO
1	25	29				NDD				CTE	IO
1	25	30				NDD				CTE	IO
1	25	32				NDD				CTE	IO
1	25	33				NDD				CTE	IO
1	25	34				NDD				CTE	IO
1	25	35				NDD				CTE	IO
1	28	2				PLG					
1	33	2				NDD				CTE	IO
1	33	3				NDD				CTE	IO
1	33	4				NDD				CTE	IO
1	33	5				NDD				CTE	IO
1	33	7				NDD				CTE	IO
1	33	8				NDD				CTE	IO
1	33	9				NDD				CTE	IO
1	33	10				NDD				CTE	IO
1	33	12				NDD				CTE	IO
1	33	13				NDD				CTE	IO
1	33	14				NDD				CTE	IO
1	33	17				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	33	18				NDD				CTE	IO
1	33	19				NDD				CTE	IO
1	33	20				NDD				CTE	IO
1	33	22				NDD				CTE	IO
1	33	23				NDD				CTE	IO
1	33	24				NDD				CTE	IO
1	33	25				NDD				CTE	IO
1	33	27				NDD				CTE	IO
1	33	28				NDD				CTE	IO
1	33	29				NDD				CTE	IO
1	41	2				NDD				CTE	IO
1	41	3				NDD				CTE	IO
1	41	4				NDD				CTE	IO
1	41	5				NDD				CTE	IO
1	41	7				NDD				CTE	IO
1	41	8				NDD				CTE	IO
1	41	9				NDD				CTE	IO
1	41	10				NDD				CTE	IO
1	41	12				NDD				CTE	IO
1	41	13				NDD				CTE	IO
1	41	14				NDD				CTE	IO
1	41	15				NDD				CTE	IO
1	41	17				NDD				CTE	IO
1	41	18				NDD				CTE	IO
1	41	19				NDD				CTE	IO
1	41	20				NDD				CTE	IO
1	41	22				NDD				CTE	IO
1	41	23				NDD				CTE	IO
1	41	24				NDD				CTE	IO
1	41	25				NDD				CTE	IO
1	41	27				NDD				CTE	IO
1	41	28				NDD				CTE	IO
1	41	29				NDD				CTE	IO
1	41	30				NDD				CTE	IO
1	41	32				NDD				CTE	IO
1	41	33				NDD				CTE	IO
1	41	34				NDD				CTE	IO
1	41	35				NDD				CTE	IO
1	49	2				NDD				CTE	IO
1	49	3				NDD				CTE	IO
1	49	4				NDD				CTE	IO
1	49	5				NDD				CTE	IO
1	49	7				NDD				CTE	IO
1	49	8				NDD				CTE	IO
1	49	9				NDD				CTE	IO
1	49	10				NDD				CTE	IO
1	49	12				NDD				CTE	IO
1	49	13				NDD				CTE	IO
1	49	14				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	49	15				NDD				CTE	IO
1	49	17				NDD				CTE	IO
1	49	18				NDD				CTE	IO
1	49	19				NDD				CTE	IO
1	49	20				NDD				CTE	IO
1	49	22				NDD				CTE	IO
1	49	23				NDD				CTE	IO
1	49	24				NDD				CTE	IO
1	49	25				NDD				CTE	IO
1	49	27				NDD				CTE	IO
1	49	28				NDD				CTE	IO
1	49	29				NDD				CTE	IO
1	49	30				NDD				CTE	IO
1	49	32				NDD				CTE	IO
1	49	33				NDD				CTE	IO
1	49	34				NDD				CTE	IO
1	49	35				NDD				CTE	IO
1	57	2				NDD				CTE	IO
1	57	3				NDD				CTE	IO
1	57	4				NDD				CTE	IO
1	57	5				NDD				CTE	IO
1	57	7				NDD				CTE	IO
1	57	8				NDD				CTE	IO
1	57	9				NDD				CTE	IO
1	57	10				NDD				CTE	IO
1	57	12				NDD				CTE	IO
1	57	13				NDD				CTE	IO
1	57	14				NDD				CTE	IO
1	57	15				NDD				CTE	IO
1	57	17				NDD				CTE	IO
1	57	18				NDD				CTE	IO
1	57	19				NDD				CTE	IO
1	57	20				NDD				CTE	IO
1	57	22				NDD				CTE	IO
1	57	23				NDD				CTE	IO
1	57	24				NDD				CTE	IO
1	57	25				NDD				CTE	IO
1	57	27				NDD				CTE	IO
1	57	28				NDD				CTE	IO
1	57	29				NDD				CTE	IO
1	57	30				NDD				CTE	IO
1	57	32				NDD				CTE	IO
1	57	33				NDD				CTE	IO
1	65	2				NDD				CTE	IO
1	65	3				NDD				CTE	IO
1	65	4				NDD				CTE	IO
1	65	5				NDD				CTE	IO
1	65	7				NDD				CTE	IO
1	65	8				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	65	9				NDD				CTE	IO
1	65	10				NDD				CTE	IO
1	65	12				NDD				CTE	IO
1	65	13				NDD				CTE	IO
1	65	14				NDD				CTE	IO
1	65	15				NDD				CTE	IO
1	65	17				NDD				CTE	IO
1	65	18				NDD				CTE	IO
1	65	19				NDD				CTE	IO
1	65	20				NDD				CTE	IO
1	65	22				NDD				CTE	IO
1	65	23				NDD				CTE	IO
1	65	24				NDD				CTE	IO
1	65	25				NDD				CTE	IO
1	65	27				NDD				CTE	IO
1	65	28				NDD				CTE	IO
1	65	29				NDD				CTE	IO
1	65	30				NDD				CTE	IO
1	65	32				NDD				CTE	IO
1	65	33				NDD				CTE	IO
1	65	34				NDD				CTE	IO
1	65	35				NDD				CTE	IO
1	65	37				NDD				CTE	IO
1	65	38				NDD				CTE	IO
1	65	39				NDD				CTE	IO
1	65	40				NDD				CTE	IO
1	69	2				NDD				CTE	IO
1	69	3				NDD				CTE	IO
1	69	4				NDD				CTE	IO
1	69	5				NDD				CTE	IO
1	69	6				NDD				CTE	IO
1	69	7				NDD				CTE	IO
1	69	8				NDD				CTE	IO
1	69	9				NDD				CTE	IO
1	69	10				NDD				CTE	IO
1	69	11				NDD				CTE	IO
1	69	12				NDD				CTE	IO
1	69	13				NDD				CTE	IO
1	69	14				NDD				CTE	IO
1	69	15				NDD				CTE	IO
1	69	16				NDD				CTE	IO
1	69	17				NDD				CTE	IO
1	69	18				NDD				CTE	IO
1	69	19	1.54	133	43%	ODI	3	SP06	4.97	CTE	IO
1	69	20				NDD				CTE	IO
1	69	21	0.89	126	49%	ODI	3	SP03	30.23	CTE	IO
1	69	22				NDD				CTE	IO
1	69	23				NDD				CTE	IO
1	69	24				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	69	25				NDD				CTE	IO
1	69	26				NDD				CTE	IO
1	69	27				NDD				CTE	IO
1	69	28				NDD				CTE	IO
1	69	29				NDD				CTE	IO
1	69	30				NDD				CTE	IO
1	69	31				NDD				CTE	IO
1	69	32				NDD				CTE	IO
1	69	33				NDD				CTE	IO
1	69	34				NDD				CTE	IO
1	69	35				NDD				CTE	IO
1	69	36				NDD				CTE	IO
1	69	37				NDD				CTE	IO
2	1	19	1.91	125	50%	ODI	3	SP08	15.61	CTE	IO
2	9	2				NDD				CTE	IO
2	9	3				NDD				CTE	IO
2	9	4				NDD				CTE	IO
2	9	5				NDD				CTE	IO
2	9	7				NDD				CTE	IO
2	9	8				NDD				CTE	IO
2	9	9				NDD				CTE	IO
2	9	10				NDD				CTE	IO
2	9	12				NDD				CTE	IO
2	9	13				NDD				CTE	IO
2	9	14				NDD				CTE	IO
2	9	15				NDD				CTE	IO
2	9	17				NDD				CTE	IO
2	9	18				NDD				CTE	IO
2	9	19				NDD				CTE	IO
2	9	20				NDD				CTE	IO
2	9	22				NDD				CTE	IO
2	9	23				NDD				CTE	IO
2	9	24				NDD				CTE	IO
2	9	25				NDD				CTE	IO
2	9	27				NDD				CTE	IO
2	9	28				NDD				CTE	IO
2	9	29				NDD				CTE	IO
2	9	30				NDD				CTE	IO
2	9	32				NDD				CTE	IO
2	9	33				NDD				CTE	IO
2	9	34				NDD				CTE	IO
2	9	35				NDD				CTE	IO
2	17	2				NDD				CTE	IO
2	17	3				NDD				CTE	IO
2	17	4				NDD				CTE	IO
2	17	5				NDD				CTE	IO
2	17	7				NDD				CTE	IO
2	17	8				NDD				CTE	IO
2	17	9				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	17	10				NDD				CTE	IO
2	17	12				NDD				CTE	IO
2	17	13				NDD				CTE	IO
2	17	14				NDD				CTE	IO
2	17	15				NDD				CTE	IO
2	17	17				NDD				CTE	IO
2	17	18				NDD				CTE	IO
2	17	19				NDD				CTE	IO
2	17	20				NDD				CTE	IO
2	17	22				NDD				CTE	IO
2	17	23				NDD				CTE	IO
2	17	24				NDD				CTE	IO
2	17	25				NDD				CTE	IO
2	17	27				NDD				CTE	IO
2	17	28				NDD				CTE	IO
2	17	29				NDD				CTE	IO
2	17	30				NDD				CTE	IO
2	17	32				NDD				CTE	IO
2	17	33				NDD				CTE	IO
2	17	34				NDD				CTE	IO
2	17	35				NDD				CTE	IO
2	25	2				NDD				CTE	IO
2	25	3				NDD				CTE	IO
2	25	4				NDD				CTE	IO
2	25	5				NDD				CTE	IO
2	25	7				NDD				CTE	IO
2	25	8				NDD				CTE	IO
2	25	9				NDD				CTE	IO
2	25	10				NDD				CTE	IO
2	25	12				NDD				CTE	IO
2	25	13				NDD				CTE	IO
2	25	14				NDD				CTE	IO
2	25	15				NDD				CTE	IO
2	25	17				NDD				CTE	IO
2	25	18				NDD				CTE	IO
2	25	19				NDD				CTE	IO
2	25	20				NDD				CTE	IO
2	25	22				NDD				CTE	IO
2	25	23				NDD				CTE	IO
2	25	24				NDD				CTE	IO
2	25	25				NDD				CTE	IO
2	25	27				NDD				CTE	IO
2	25	28				NDD				CTE	IO
2	25	29				NDD				CTE	IO
2	25	30				NDD				CTE	IO
2	25	32				NDD				CTE	IO
2	25	33				NDD				CTE	IO
2	25	34				NDD				CTE	IO
2	25	35				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	33	2				NDD				CTE	IO
2	33	3				NDD				CTE	IO
2	33	4				NDD				CTE	IO
2	33	5				NDD				CTE	IO
2	33	7				NDD				CTE	IO
2	33	8				NDD				CTE	IO
2	33	9				NDD				CTE	IO
2	33	10				NDD				CTE	IO
2	33	12				NDD				CTE	IO
2	33	13				NDD				CTE	IO
2	33	14				NDD				CTE	IO
2	33	17				NDD				CTE	IO
2	33	18				NDD				CTE	IO
2	33	19				NDD				CTE	IO
2	33	20				NDD				CTE	IO
2	33	22				NDD				CTE	IO
2	33	23				NDD				CTE	IO
2	33	24				NDD				CTE	IO
2	33	25				NDD				CTE	IO
2	33	27				NDD				CTE	IO
2	33	28				NDD				CTE	IO
2	33	29				NDD				CTE	IO
2	41	2				NDD				CTE	IO
2	41	3				NDD				CTE	IO
2	41	4				NDD				CTE	IO
2	41	5				NDD				CTE	IO
2	41	7				NDD				CTE	IO
2	41	8				NDD				CTE	IO
2	41	9				NDD				CTE	IO
2	41	10				NDD				CTE	IO
2	41	12				NDD				CTE	IO
2	41	13				NDD				CTE	IO
2	41	14				NDD				CTE	IO
2	41	15				NDD				CTE	IO
2	41	17				NDD				CTE	IO
2	41	18				NDD				CTE	IO
2	41	19				NDD				CTE	IO
2	41	20				NDD				CTE	IO
2	41	22				NDD				CTE	IO
2	41	23				NDD				CTE	IO
2	41	24				NDD				CTE	IO
2	41	25				NDD				CTE	IO
2	41	27				NDD				CTE	IO
2	41	28				NDD				CTE	IO
2	41	29				NDD				CTE	IO
2	41	30				NDD				CTE	IO
2	41	32				NDD				CTE	IO
2	41	33				NDD				CTE	IO
2	41	34				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	41	35				NDD				CTE	IO
2	49	2				NDD				CTE	IO
2	49	3				NDD				CTE	IO
2	49	4				NDD				CTE	IO
2	49	5				NDD				CTE	IO
2	49	7				NDD				CTE	IO
2	49	8				NDD				CTE	IO
2	49	9				NDD				CTE	IO
2	49	10				NDD				CTE	IO
2	49	12				NDD				CTE	IO
2	49	13				NDD				CTE	IO
2	49	14				NDD				CTE	IO
2	49	15				NDD				CTE	IO
2	49	17				NDD				CTE	IO
2	49	18				NDD				CTE	IO
2	49	19				NDD				CTE	IO
2	49	20				NDD				CTE	IO
2	49	22				NDD				CTE	IO
2	49	23				NDD				CTE	IO
2	49	24				NDD				CTE	IO
2	49	25				NDD				CTE	IO
2	49	27				NDD				CTE	IO
2	49	28				NDD				CTE	IO
2	49	29				NDD				CTE	IO
2	49	30				NDD				CTE	IO
2	49	32				NDD				CTE	IO
2	49	33				NDD				CTE	IO
2	49	34				NDD				CTE	IO
2	49	35				NDD				CTE	IO
2	57	2				NDD				CTE	IO
2	57	3				NDD				CTE	IO
2	57	4				NDD				CTE	IO
2	57	5				NDD				CTE	IO
2	57	7				NDD				CTE	IO
2	57	8				NDD				CTE	IO
2	57	9				NDD				CTE	IO
2	57	10				NDD				CTE	IO
2	57	12				NDD				CTE	IO
2	57	13				NDD				CTE	IO
2	57	14				NDD				CTE	IO
2	57	15				NDD				CTE	IO
2	57	17				NDD				CTE	IO
2	57	18				NDD				CTE	IO
2	57	19				NDD				CTE	IO
2	57	20				NDD				CTE	IO
2	57	22				NDD				CTE	IO
2	57	23				NDD				CTE	IO
2	57	24				NDD				CTE	IO
2	57	25				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	57	27				NDD				CTE	IO
2	57	28				NDD				CTE	IO
2	57	29				NDD				CTE	IO
2	57	30				NDD				CTE	IO
2	57	32				NDD				CTE	IO
2	57	33				NDD				CTE	IO
2	65	2				NDD				CTE	IO
2	65	3				NDD				CTE	IO
2	65	4				NDD				CTE	IO
2	65	5				NDD				CTE	IO
2	65	7				NDD				CTE	IO
2	65	8				NDD				CTE	IO
2	65	9				NDD				CTE	IO
2	65	10				NDD				CTE	IO
2	65	12				NDD				CTE	IO
2	65	13				NDD				CTE	IO
2	65	14				NDD				CTE	IO
2	65	15				NDD				CTE	IO
2	65	17				NDD				CTE	IO
2	65	18				NDD				CTE	IO
2	65	19				NDD				CTE	IO
2	65	20				NDD				CTE	IO
2	65	22				NDD				CTE	IO
2	65	23				RES		SP07	24.44	SP07	IO
2	65	24				NDD				CTE	IO
2	65	25				NDD				CTE	IO
2	65	27				NDD				CTE	IO
2	65	28				NDD				CTE	IO
2	65	29				NDD				CTE	IO
2	65	30				NDD				CTE	IO
2	65	32				NDD				CTE	IO
2	65	33				NDD				CTE	IO
2	65	34				NDD				CTE	IO
2	65	35				NDD				CTE	IO
2	65	37				NDD				CTE	IO
2	65	38				NDD				CTE	IO
2	65	39				NDD				CTE	IO
2	65	40				NDD				CTE	IO
2	69	2				NDD				CTE	IO
2	69	3				NDD				CTE	IO
2	69	4				NDD				CTE	IO
2	69	5				NDD				CTE	IO
2	69	6				NDD				CTE	IO
2	69	7				NDD				CTE	IO
2	69	8				NDD				CTE	IO
2	69	9				NDD				CTE	IO
2	69	10				NDD				CTE	IO
2	69	11				NDD				CTE	IO
2	69	12				NDD				CTE	IO

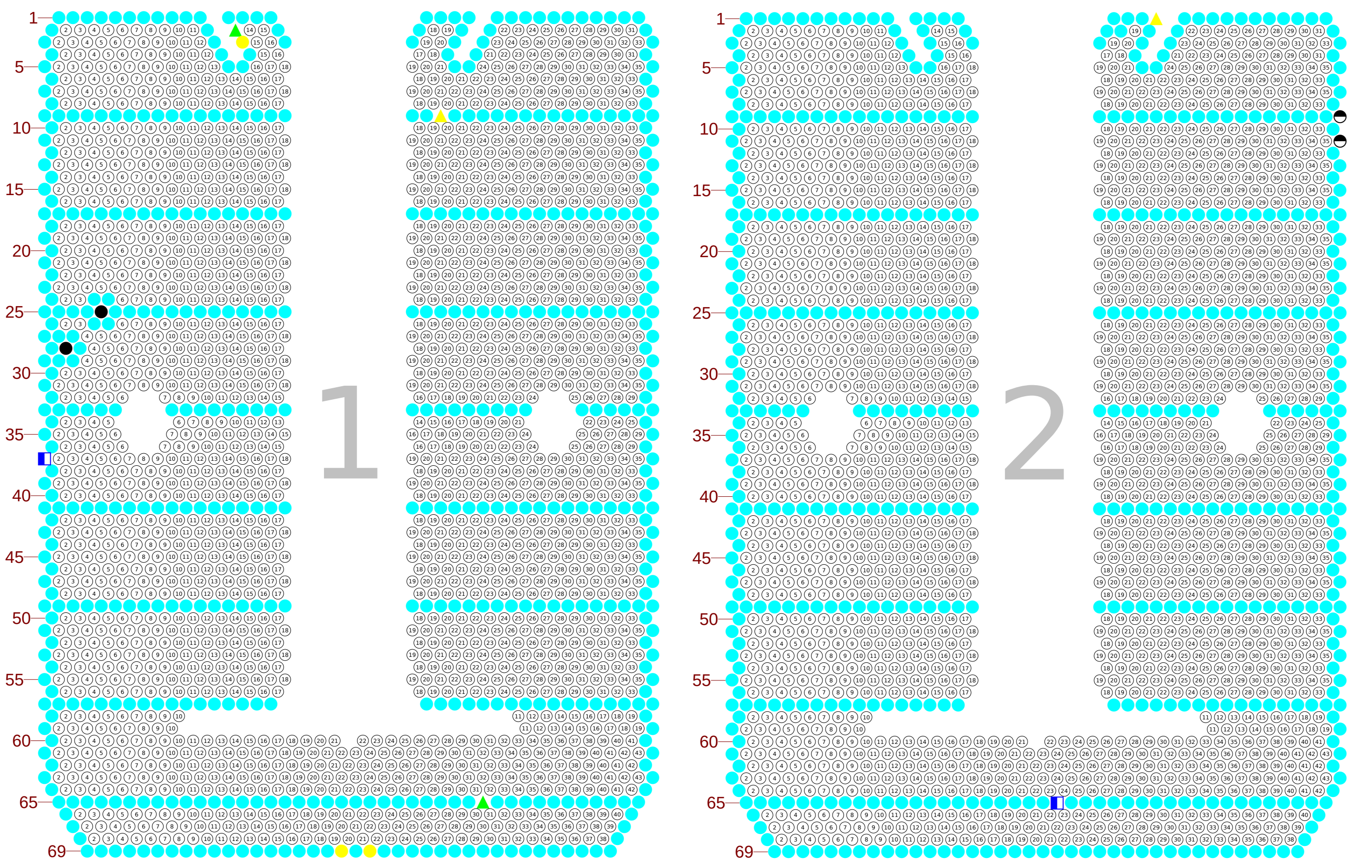
DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	69	13				NDD				CTE	IO
2	69	14				NDD				CTE	IO
2	69	15				NDD				CTE	IO
2	69	16				NDD				CTE	IO
2	69	17				NDD				CTE	IO
2	69	18				NDD				CTE	IO
2	69	19				NDD				CTE	IO
2	69	20				NDD				CTE	IO
2	69	21				NDD				CTE	IO
2	69	22				NDD				CTE	IO
2	69	23				NDD				CTE	IO
2	69	24				NDD				CTE	IO
2	69	25				NDD				CTE	IO
2	69	26				NDD				CTE	IO
2	69	27				NDD				CTE	IO
2	69	28				NDD				CTE	IO
2	69	29				NDD				CTE	IO
2	69	30				NDD				CTE	IO
2	69	31				NDD				CTE	IO
2	69	32				NDD				CTE	IO
2	69	33				NDD				CTE	IO
2	69	34				NDD				CTE	IO
2	69	35				NDD				CTE	IO
2	69	36				NDD				CTE	IO
2	69	37				NDD				CTE	IO

HISTORY MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER
09-2022

VIEW FROM: INLET/OUTLET END



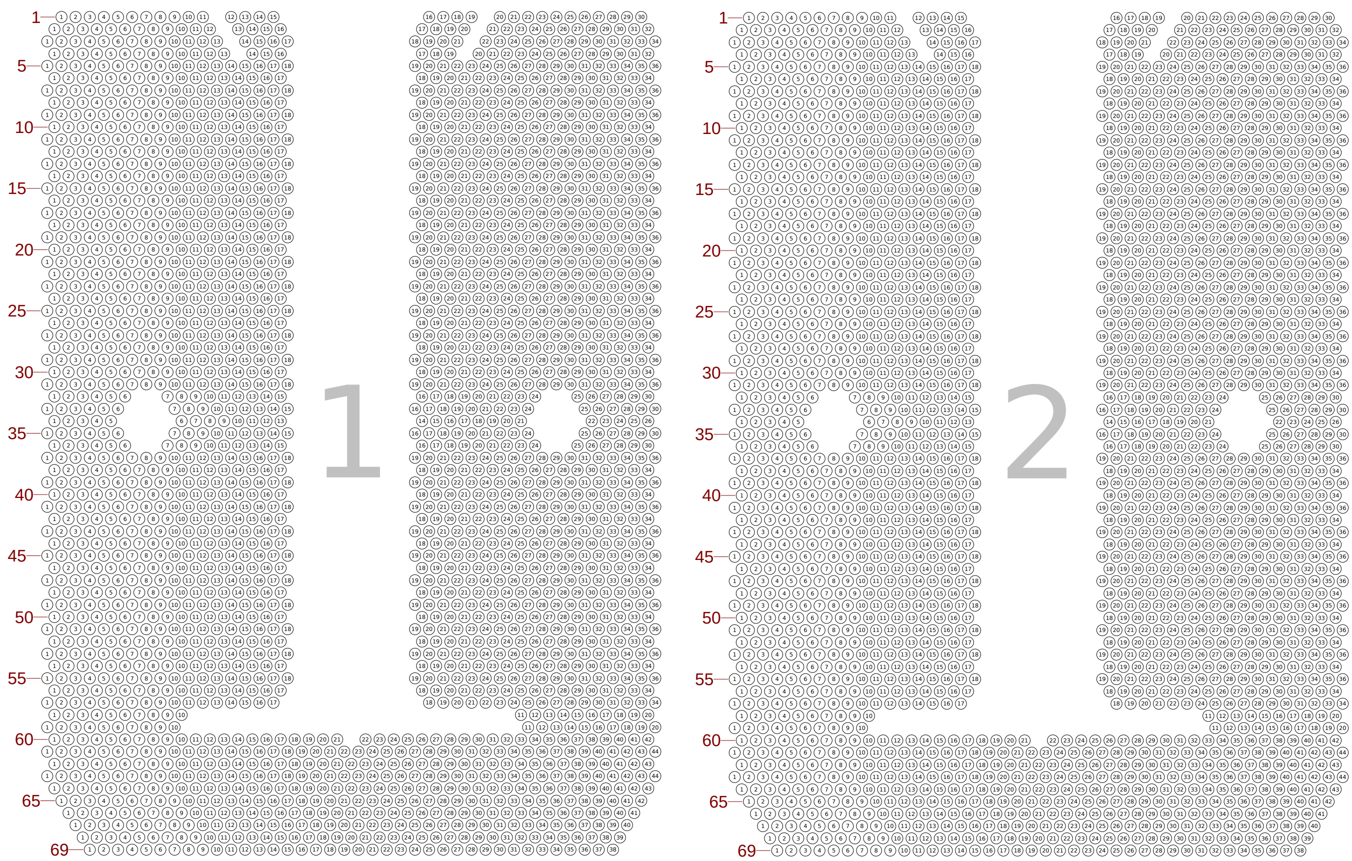
SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_HISTORY.qry
	2	2	2	QUERY	RES_HISTORY.qry
	982	982	982	QUERY	NDD_HISTORY.qry
	0	0	0	QUERY	PVN_HISTORY.qry
	2	2	2	QUERY	DNT_HISTORY.qry
	0	0	0	QUERY	20-29%_HISTORY.qry
	2	2	2	QUERY	30-39%_HISTORY.qry
	6	5	3	QUERY	40-49%_HISTORY.qry
	2	2	2	QUERY	50-59%_HISTORY.qry
	0	0	0	QUERY	60-69%_HISTORY.qry
	0	0	0	QUERY	70-79%_HISTORY.qry
	0	0	0	QUERY	80-89%_HISTORY.qry
	0	0	0	QUERY	90-100%_HISTORY.qry
	4	2	2	QUERY	PLUG_HISTORY.qry
	1,000	997	995		

Model default
4,820 tubes
3,825 open tubes

TUBE SHEET LAYOUT MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
WEST LOWER

VIEW FROM: INLET/OUTLET END



Model default
4,820 tubes
4,820 open tubes

Conco Services LLC

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

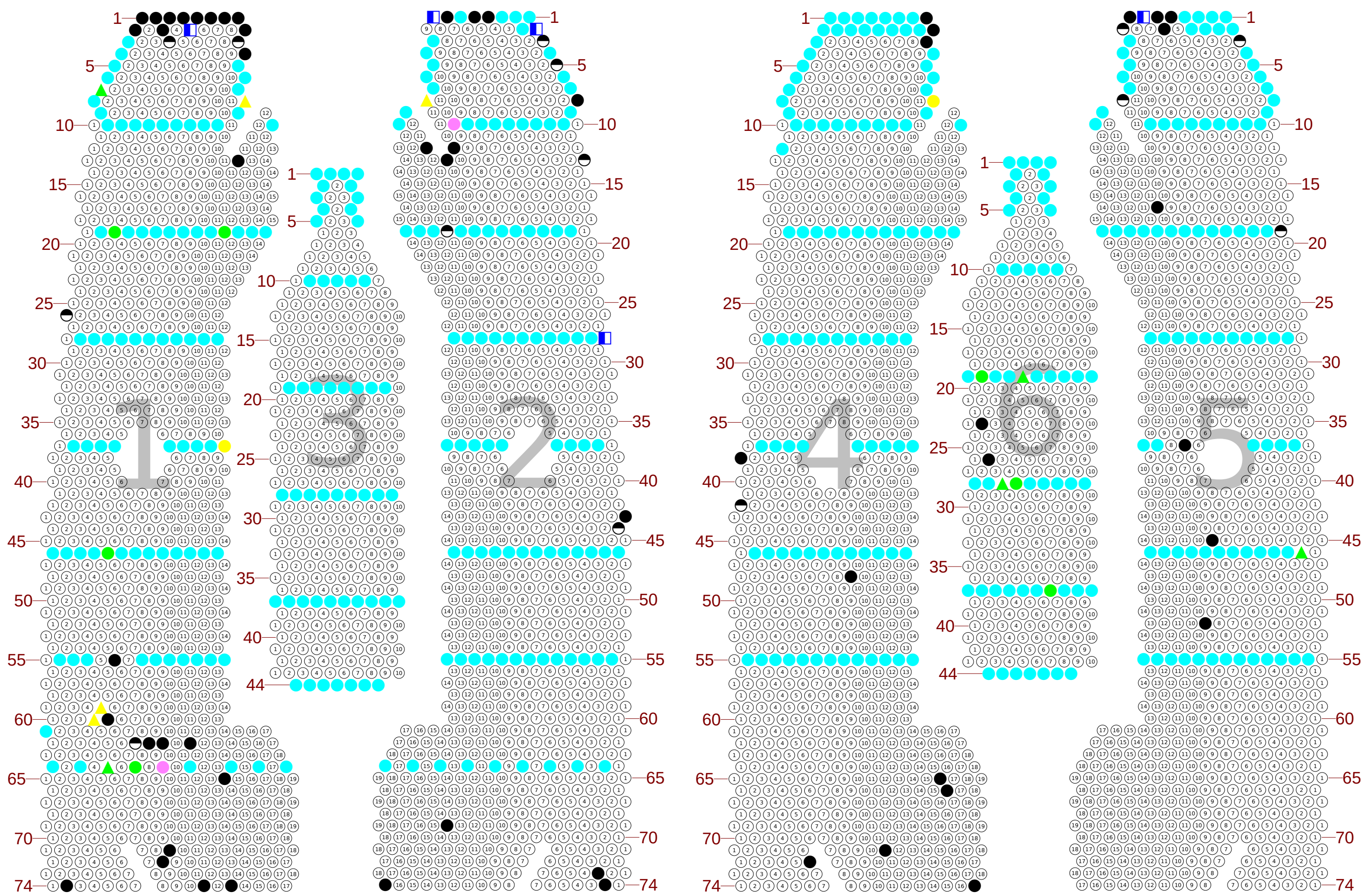
Results Summary
Kentucky Power
Big Sandy
Unit 1
Main Condenser
East Lower

	09-2022 Inspection
Total Tubes in Component (Straight Lengths)	**4,728**
Total Tubes Inspected (Straight Lengths)	**488**
Tubes Recording Damage:	Totals
Approx. Wall Loss 90% & Greater	0
Approx. Wall Loss 80% to 89%	0
Approx. Wall Loss 70% to 79%	0
Approx. Wall Loss 60% to 69%	2
Approx. Wall Loss 50% to 59%	4
Approx. Wall Loss 40% to 49%	2
Approx. Wall Loss 30% to 39%	5
Approx. Wall Loss 20% to 29%	7
Tubes Recording Dents	4
Restricted Tubes (Complete Inspection Not Possible)	5
Obstructed Tubes (No Test Possible)	0
Previously Plugged Tubes (Section 2)	56
Tubes Recommended for Plugging	0
Total of Previously Plugged Tubes & Tubes Recommended for Plugging	56

RESULTS MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

VIEW FROM: INLET/OUTLET END



SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
red half-filled square	0	0	0	QUERY	OBS_RESULTS.qry
blue half-filled square	5	5	5	QUERY	RES_RESULTS.qry
cyan circle	449	449	449	QUERY	NDD_RESULTS.qry
green square	0	0	0	QUERY	PVN_RESULTS.qry
half-filled circle	14	14	14	QUERY	DNT_RESULTS.qry
green circle	7	7	7	QUERY	20-29%_RESULTS.qry
green triangle	5	5	5	QUERY	30-39%_RESULTS.qry
yellow circle	2	2	2	QUERY	40-49%_RESULTS.qry
yellow triangle	4	4	4	QUERY	50-59%_RESULTS.qry
pink circle	2	2	2	QUERY	60-69%_RESULTS.qry
pink triangle	0	0	0	QUERY	70-79%_RESULTS.qry
red circle	0	0	0	QUERY	80-89%_RESULTS.qry
red triangle	0	0	0	QUERY	90-100%_RESULTS.qry
black circle	56	56	56	QUERY	PLUG_RESULTS.qry
	544	544	544		

Model default
4,728 tubes
4,184 open tubes

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	1	1				PLG					
1	1	2				PLG					
1	1	3				PLG					
1	1	4				PLG					
1	1	5				PLG					
1	1	6				PLG					
1	1	7				PLG					
1	1	8				PLG					
1	2	1				PLG					
1	2	3				PLG					
1	2	5				RES		SP06	0.00	SP06	IO
1	2	9				PLG					
1	3	1				NDD				CTE	IO
1	3	4	41.00	184	0%	DNT	3	SP08	35.44	CTE	IO
1	3	9	24.55	184	0%	DNT	3	CTE	-0.73	CTE	IO
1	4	1				NDD				CTE	IO
1	4	10				PLG					
1	5	1				NDD				CTE	IO
1	5	10				NDD				CTE	IO
1	6	1				NDD				CTE	IO
1	6	11				NDD				CTE	IO
1	7	1	2.63	14	35%	IDI	3	SP04	31.70	CTE	IO
1	7	11				NDD				CTE	IO
1	8	1				NDD				CTE	IO
1	8	12	0.68	118	55%	ODI	3	SP05	4.00	CTE	IO
1	9	1				NDD				CTE	IO
1	9	11				NDD				CTE	IO
1	10	2				NDD				CTE	IO
1	10	3				NDD				CTE	IO
1	10	4				NDD				CTE	IO
1	10	5				NDD				CTE	IO
1	10	6				NDD				CTE	IO
1	10	7				NDD				CTE	IO
1	10	8				NDD				CTE	IO
1	10	9				NDD				CTE	IO
1	10	10				NDD				CTE	IO
1	10	13				NDD				CTE	IO
1	13	12				PLG					
1	19	2				NDD				CTE	IO
1	19	3	2.17	11	28%	IDI	3	SP05	11.51	CTE	IO
1	19	4				NDD				CTE	IO
1	19	5				NDD				CTE	IO
1	19	6				NDD				CTE	IO
1	19	7				NDD				CTE	IO
1	19	8				NDD				CTE	IO
1	19	9				NDD				CTE	IO
1	19	10				NDD				CTE	IO
1	19	11	3.35	9	23%	IDI	3	SP02	8.09	CTE	IO
1	19	12				NDD				CTE	IO
1	19	13				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	19	14				NDD				CTE	IO
1	26	1	41.33	179	0%	DNT	3	SP08	24.00	CTE	IO
1	28	2				NDD				CTE	IO
1	28	3				NDD				CTE	IO
1	28	4				NDD				CTE	IO
1	28	5				NDD				CTE	IO
1	28	6				NDD				CTE	IO
1	28	7				NDD				CTE	IO
1	28	8				NDD				CTE	IO
1	28	9				NDD				CTE	IO
1	28	10				NDD				CTE	IO
1	28	11				NDD				CTE	IO
1	28	12				NDD				CTE	IO
1	37	2				NDD				CTE	IO
1	37	3				NDD				CTE	IO
1	37	4				NDD				CTE	IO
1	37	5				NDD				CTE	IO
1	37	6				NDD				CTE	IO
1	37	7				NDD				CTE	IO
1	37	8				NDD				CTE	IO
1	37	9				NDD				CTE	IO
1	37	10	6.68	16	40%	IDI	3	IO	11.50	CTE	IO
1	46	1				NDD				CTE	IO
1	46	2				NDD				CTE	IO
1	46	3				NDD				CTE	IO
1	46	4				NDD				CTE	IO
1	46	5	6.83	9	23%	IDI	3	IO	6.09	CTE	IO
1	46	6				NDD				CTE	IO
1	46	7				NDD				CTE	IO
1	46	8				NDD				CTE	IO
1	46	9				NDD				CTE	IO
1	46	10				NDD				CTE	IO
1	46	11				NDD				CTE	IO
1	46	12				NDD				CTE	IO
1	46	13				NDD				CTE	IO
1	55	2				NDD				CTE	IO
1	55	3				NDD				CTE	IO
1	55	4				NDD				CTE	IO
1	55	6				PLG					
1	55	8				NDD				CTE	IO
1	55	9				NDD				CTE	IO
1	55	10				NDD				CTE	IO
1	55	11				NDD				CTE	IO
1	55	12				NDD				CTE	IO
1	55	13				NDD				CTE	IO
1	55	14				NDD				CTE	IO
1	59	5	7.48	20	50%	IDI	3	SP01	24.00	CTE	IO
1	60	4	3.54	21	53%	IDI	3	IO	12.53	CTE	IO
1	60	5				PLG					
1	61	1				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	62	7	26.59	179	0%	DNT	3	SP02	12.69	CTE	IO
1	62	8				PLG					
1	62	9				PLG					
1	62	11				PLG					
1	64	1				NDD				CTE	IO
1	64	3				NDD				CTE	IO
1	64	5	4.11	14	35%	IDI	3	IO	13.40	CTE	IO
1	64	7	1.59	9	23%	IDI	3	SP02	13.40	CTE	IO
1	64	9	3.94	26	65%	IDI	3	SP01	24.91	CTE	IO
1	64	11				NDD				CTE	IO
1	64	14				NDD				CTE	IO
1	64	16				NDD				CTE	IO
1	64	18				NDD				CTE	IO
1	65	14				PLG					
1	71	9				PLG					
1	72	8				PLG					
1	74	2				PLG					
1	74	11				PLG					
1	74	13				PLG					
2	1	1				NDD				CTE	IO
2	1	2				NDD				CTE	IO
2	1	3				NDD				CTE	IO
2	1	4				PLG					
2	1	5				PLG					
2	1	6				NDD				CTE	IO
2	1	7				PLG					
2	1	8				RES		SP04	9.39	SP04	IO
2	2	1				RES		SP04	7.71	SP04	IO
2	2	2				NDD				CTE	IO
2	3	1	62.33	182	0%	DNT	1	SP04	14.63	CTE	IO
2	3	9				NDD				CTE	IO
2	4	1				NDD				CTE	IO
2	4	10				NDD				CTE	IO
2	5	1	39.25	180	0%	DNT	1	SP05	25.64	CTE	IO
2	5	10				NDD				CTE	IO
2	6	1				NDD				CTE	IO
2	6	11				NDD				CTE	IO
2	7	1				NDD				CTE	IO
2	7	11				NDD				CTE	IO
2	8	1				PLG					
2	8	12	2.61	116	57%	ODI	3	SP08	29.41	CTE	IO
2	9	1				NDD				CTE	IO
2	9	12				NDD				CTE	IO
2	10	2				NDD				CTE	IO
2	10	3				NDD				CTE	IO
2	10	4				NDD				CTE	IO
2	10	5				NDD				CTE	IO
2	10	6				NDD				CTE	IO
2	10	7				NDD				CTE	IO
2	10	8				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	10	9				NDD				CTE	IO
2	10	10	3.23	105	65%	ODI	3	SP08	2.27	CTE	IO
2	10	13				NDD				CTE	IO
2	12	10				PLG					
2	12	11				PLG					
2	13	1	29.78	174	0%	DNT	3	SP08	33.33	CTE	IO
2	13	11				PLG					
2	19	2				NDD				CTE	IO
2	19	3				NDD				CTE	IO
2	19	4				NDD				CTE	IO
2	19	5				NDD				CTE	IO
2	19	6				NDD				CTE	IO
2	19	7				NDD				CTE	IO
2	19	8				NDD				CTE	IO
2	19	9				NDD				CTE	IO
2	19	10				NDD				CTE	IO
2	19	11	30.75	174	0%	DNT	3	SP08	36.17	CTE	IO
2	19	12				NDD				CTE	IO
2	19	13				NDD				CTE	IO
2	19	14				NDD				CTE	IO
2	28	1				RES		SP03	4.53	SP03	IO
2	28	2				NDD				CTE	IO
2	28	3				NDD				CTE	IO
2	28	4				NDD				CTE	IO
2	28	5				NDD				CTE	IO
2	28	6				NDD				CTE	IO
2	28	7				NDD				CTE	IO
2	28	8				NDD				CTE	IO
2	28	9				NDD				CTE	IO
2	28	10				NDD				CTE	IO
2	28	11				NDD				CTE	IO
2	28	12				NDD				CTE	IO
2	37	2				NDD				CTE	IO
2	37	3				NDD				CTE	IO
2	37	4				NDD				CTE	IO
2	37	5				NDD				CTE	IO
2	37	6				NDD				CTE	IO
2	37	7				NDD				CTE	IO
2	37	8				NDD				CTE	IO
2	37	9				NDD				CTE	IO
2	37	10				NDD				CTE	IO
2	43	1				PLG					
2	44	1	32.19	177	0%	DNT	3	SP05	-0.92	CTE	IO
2	46	1				NDD				CTE	IO
2	46	2				NDD				CTE	IO
2	46	3				NDD				CTE	IO
2	46	4				NDD				CTE	IO
2	46	5				NDD				CTE	IO
2	46	6				NDD				CTE	IO
2	46	7				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	46	8				NDD				CTE	IO
2	46	9				NDD				CTE	IO
2	46	10				NDD				CTE	IO
2	46	11				NDD				CTE	IO
2	46	12				NDD				CTE	IO
2	46	13				NDD				CTE	IO
2	55	2				NDD				CTE	IO
2	55	3				NDD				CTE	IO
2	55	4				NDD				CTE	IO
2	55	5				NDD				CTE	IO
2	55	6				NDD				CTE	IO
2	55	7				NDD				CTE	IO
2	55	8				NDD				CTE	IO
2	55	9				NDD				CTE	IO
2	55	10				NDD				CTE	IO
2	55	11				NDD				CTE	IO
2	55	12				NDD				CTE	IO
2	55	13				NDD				CTE	IO
2	55	14				NDD				CTE	IO
2	64	2				NDD				CTE	IO
2	64	4				NDD				CTE	IO
2	64	6				NDD				CTE	IO
2	64	8				NDD				CTE	IO
2	64	10				NDD				CTE	IO
2	64	12				NDD				CTE	IO
2	64	14				NDD				CTE	IO
2	64	16				NDD				CTE	IO
2	64	18				NDD				CTE	IO
2	69	14				PLG					
2	73	3				PLG					
2	74	2				PLG					
2	74	17				PLG					
3	1	1				NDD				CTE	IO
3	1	2				NDD				CTE	IO
3	1	3				NDD				CTE	IO
3	1	4				NDD				CTE	IO
3	2	1				NDD				CTE	IO
3	2	3				NDD				CTE	IO
3	3	1				NDD				CTE	IO
3	3	4				NDD				CTE	IO
3	4	1				NDD				CTE	IO
3	4	3				NDD				CTE	IO
3	5	1				NDD				CTE	IO
3	5	4				NDD				CTE	IO
3	10	2				NDD				CTE	IO
3	10	3				NDD				CTE	IO
3	10	4				NDD				CTE	IO
3	10	5				NDD				CTE	IO
3	10	6				NDD				CTE	IO
3	19	2				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
3	19	3				NDD				CTE	IO
3	19	4				NDD				CTE	IO
3	19	5				NDD				CTE	IO
3	19	6				NDD				CTE	IO
3	19	7				NDD				CTE	IO
3	19	8				NDD				CTE	IO
3	19	9				NDD				CTE	IO
3	28	1				NDD				CTE	IO
3	28	2				NDD				CTE	IO
3	28	3				NDD				CTE	IO
3	28	4				NDD				CTE	IO
3	28	5				NDD				CTE	IO
3	28	6				NDD				CTE	IO
3	28	7				NDD				CTE	IO
3	28	8				NDD				CTE	IO
3	28	9				NDD				CTE	IO
3	37	1				NDD				CTE	IO
3	37	2				NDD				CTE	IO
3	37	3				NDD				CTE	IO
3	37	4				NDD				CTE	IO
3	37	5				NDD				CTE	IO
3	37	6				NDD				CTE	IO
3	37	7				NDD				CTE	IO
3	37	8				NDD				CTE	IO
3	37	9				NDD				CTE	IO
3	37	10				NDD				CTE	IO
3	44	1				NDD				CTE	IO
3	44	2				NDD				CTE	IO
3	44	3				NDD				CTE	IO
3	44	4				NDD				CTE	IO
3	44	5				NDD				CTE	IO
3	44	6				NDD				CTE	IO
3	44	7				NDD				CTE	IO
4	1	1				NDD				CTE	IO
4	1	2				NDD				CTE	IO
4	1	3				NDD				CTE	IO
4	1	4				NDD				CTE	IO
4	1	5				NDD				CTE	IO
4	1	6				NDD				CTE	IO
4	1	7				NDD				CTE	IO
4	1	8				PLG					
4	2	1				NDD				CTE	IO
4	2	2				NDD				CTE	IO
4	2	3				NDD				CTE	IO
4	2	4				NDD				CTE	IO
4	2	5				NDD				CTE	IO
4	2	6				NDD				CTE	IO
4	2	7				NDD				CTE	IO
4	2	8				NDD				CTE	IO
4	2	9				PLG					

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
4	3	1				NDD				CTE	IO
4	3	9				PLG					
4	4	1				NDD				CTE	IO
4	4	10				NDD				CTE	IO
4	5	1				NDD				CTE	IO
4	5	10				NDD				CTE	IO
4	6	1				NDD				CTE	IO
4	6	11				NDD				CTE	IO
4	7	1				NDD				CTE	IO
4	7	11				NDD				CTE	IO
4	8	1				NDD				CTE	IO
4	8	12	1.41	136	40%	ODI	3	SP04	15.14	CTE	IO
4	9	1				NDD				CTE	IO
4	9	11				NDD				CTE	IO
4	10	2				NDD				CTE	IO
4	10	3				NDD				CTE	IO
4	10	4				NDD				CTE	IO
4	10	5				NDD				CTE	IO
4	10	6				NDD				CTE	IO
4	10	7				NDD				CTE	IO
4	10	8				NDD				CTE	IO
4	10	9				NDD				CTE	IO
4	10	10				NDD				CTE	IO
4	10	13				NDD				CTE	IO
4	12	1				NDD				CTE	IO
4	19	2				NDD				CTE	IO
4	19	3				NDD				CTE	IO
4	19	4				NDD				CTE	IO
4	19	5				NDD				CTE	IO
4	19	6				NDD				CTE	IO
4	19	7				NDD				CTE	IO
4	19	8				NDD				CTE	IO
4	19	9				NDD				CTE	IO
4	19	10				NDD				CTE	IO
4	19	11				NDD				CTE	IO
4	19	12				NDD				CTE	IO
4	19	13				NDD				CTE	IO
4	19	14				NDD				CTE	IO
4	28	2				NDD				CTE	IO
4	28	3				NDD				CTE	IO
4	28	4				NDD				CTE	IO
4	28	5				NDD				CTE	IO
4	28	6				NDD				CTE	IO
4	28	7				NDD				CTE	IO
4	28	8				NDD				CTE	IO
4	28	9				NDD				CTE	IO
4	28	10				NDD				CTE	IO
4	28	11				NDD				CTE	IO
4	28	12				NDD				CTE	IO
4	37	2				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
4	37	3				NDD				CTE	IO
4	37	4				NDD				CTE	IO
4	37	5				NDD				CTE	IO
4	37	6				NDD				CTE	IO
4	37	7				NDD				CTE	IO
4	37	8				NDD				CTE	IO
4	37	9				NDD				CTE	IO
4	37	10				NDD				CTE	IO
4	38	1				PLG					
4	42	1	22.99	172	0%	DNT	3	SP05	15.69	CTE	IO
4	46	2				NDD				CTE	IO
4	46	3				NDD				CTE	IO
4	46	4				NDD				CTE	IO
4	46	5				NDD				CTE	IO
4	46	6				NDD				CTE	IO
4	46	7				NDD				CTE	IO
4	46	8				NDD				CTE	IO
4	46	9				NDD				CTE	IO
4	46	10				NDD				CTE	IO
4	46	11				NDD				CTE	IO
4	46	12				NDD				CTE	IO
4	46	13				NDD				CTE	IO
4	48	9				PLG					
4	55	2				NDD				CTE	IO
4	55	3				NDD				CTE	IO
4	55	4				NDD				CTE	IO
4	55	5				NDD				CTE	IO
4	55	6				NDD				CTE	IO
4	55	7				NDD				CTE	IO
4	55	8				NDD				CTE	IO
4	55	9				NDD				CTE	IO
4	55	10				NDD				CTE	IO
4	55	11				NDD				CTE	IO
4	55	12				NDD				CTE	IO
4	55	13				NDD				CTE	IO
4	55	14				NDD				CTE	IO
4	65	16				PLG					
4	66	16				PLG					
4	71	11				PLG					
4	72	6				PLG					
4	74	17				PLG					
5	1	1				NDD				CTE	IO
5	1	2				NDD				CTE	IO
5	1	3				NDD				CTE	IO
5	1	4				NDD				CTE	IO
5	1	5				PLG					
5	1	6				PLG					
5	1	7				RES		SP06	22.23	SP06	IO
5	1	8				PLG					
5	2	1				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
5	2	2				NDD				CTE	IO
5	2	3				NDD				CTE	IO
5	2	4				NDD				CTE	IO
5	2	6				PLG					
5	2	9	46.74	172	0%	DNT	3	SP06	34.49	CTE	IO
5	3	1	33.90	181	0%	DNT	3	IO	7.44	CTE	IO
5	3	9				NDD				CTE	IO
5	4	1				NDD				CTE	IO
5	4	10				NDD				CTE	IO
5	5	1				NDD				CTE	IO
5	5	10				NDD				CTE	IO
5	6	1				NDD				CTE	IO
5	6	11				NDD				CTE	IO
5	7	1				NDD				CTE	IO
5	7	11				NDD				CTE	IO
5	8	1				NDD				CTE	IO
5	8	12	45.62	178	0%	DNT	3	SP05	29.93	CTE	IO
5	9	1				NDD				CTE	IO
5	9	12				NDD				CTE	IO
5	10	2				NDD				CTE	IO
5	10	3				NDD				CTE	IO
5	10	4				NDD				CTE	IO
5	10	5				NDD				CTE	IO
5	10	6				NDD				CTE	IO
5	10	7				NDD				CTE	IO
5	10	8				NDD				CTE	IO
5	10	9				NDD				CTE	IO
5	10	10				NDD				CTE	IO
5	10	13				NDD				CTE	IO
5	17	10				PLG					
5	19	1	63.78	182	0%	DNT	3	IO	5.38	CTE	IO
5	19	2				NDD				CTE	IO
5	19	3				NDD				CTE	IO
5	19	4				NDD				CTE	IO
5	19	5				NDD				CTE	IO
5	19	6				NDD				CTE	IO
5	19	7				NDD				CTE	IO
5	19	8				NDD				CTE	IO
5	19	9				NDD				CTE	IO
5	19	10				NDD				CTE	IO
5	19	11				NDD				CTE	IO
5	19	12				NDD				CTE	IO
5	19	13				NDD				CTE	IO
5	19	14				NDD				CTE	IO
5	28	2				NDD				CTE	IO
5	28	3				NDD				CTE	IO
5	28	4				NDD				CTE	IO
5	28	5				NDD				CTE	IO
5	28	6				NDD				CTE	IO
5	28	7				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
5	28	8				NDD				CTE	IO
5	28	9				NDD				CTE	IO
5	28	10				NDD				CTE	IO
5	28	11				NDD				CTE	IO
5	28	12				NDD				CTE	IO
5	37	2				NDD				CTE	IO
5	37	3				NDD				CTE	IO
5	37	4				NDD				CTE	IO
5	37	5				NDD				CTE	IO
5	37	7				PLG					
5	37	9				NDD				CTE	IO
5	37	10				NDD				CTE	IO
5	45	9				PLG					
5	46	2	10.31	13	33%	IDI	3	IO	14.79	CTE	IO
5	46	3				NDD				CTE	IO
5	46	4				NDD				CTE	IO
5	46	5				NDD				CTE	IO
5	46	6				NDD				CTE	IO
5	46	7				NDD				CTE	IO
5	46	8				NDD				CTE	IO
5	46	9				NDD				CTE	IO
5	46	10				NDD				CTE	IO
5	46	11				NDD				CTE	IO
5	46	12				NDD				CTE	IO
5	46	13				NDD				CTE	IO
5	52	9				PLG					
5	55	2				NDD				CTE	IO
5	55	3				NDD				CTE	IO
5	55	4				NDD				CTE	IO
5	55	5				NDD				CTE	IO
5	55	6				NDD				CTE	IO
5	55	7				NDD				CTE	IO
5	55	8				NDD				CTE	IO
5	55	9				NDD				CTE	IO
5	55	10				NDD				CTE	IO
5	55	11				NDD				CTE	IO
5	55	12				NDD				CTE	IO
5	55	13				NDD				CTE	IO
5	55	14				NDD				CTE	IO
6	1	1				NDD				CTE	IO
6	1	2				NDD				IO	IO
6	1	3				NDD				CTE	IO
6	1	4				NDD				CTE	IO
6	2	1				NDD				CTE	IO
6	2	3				NDD				CTE	IO
6	3	1				NDD				CTE	IO
6	3	4				NDD				CTE	IO
6	4	1				NDD				CTE	IO
6	4	3				NDD				CTE	IO
6	5	1				NDD				CTE	IO

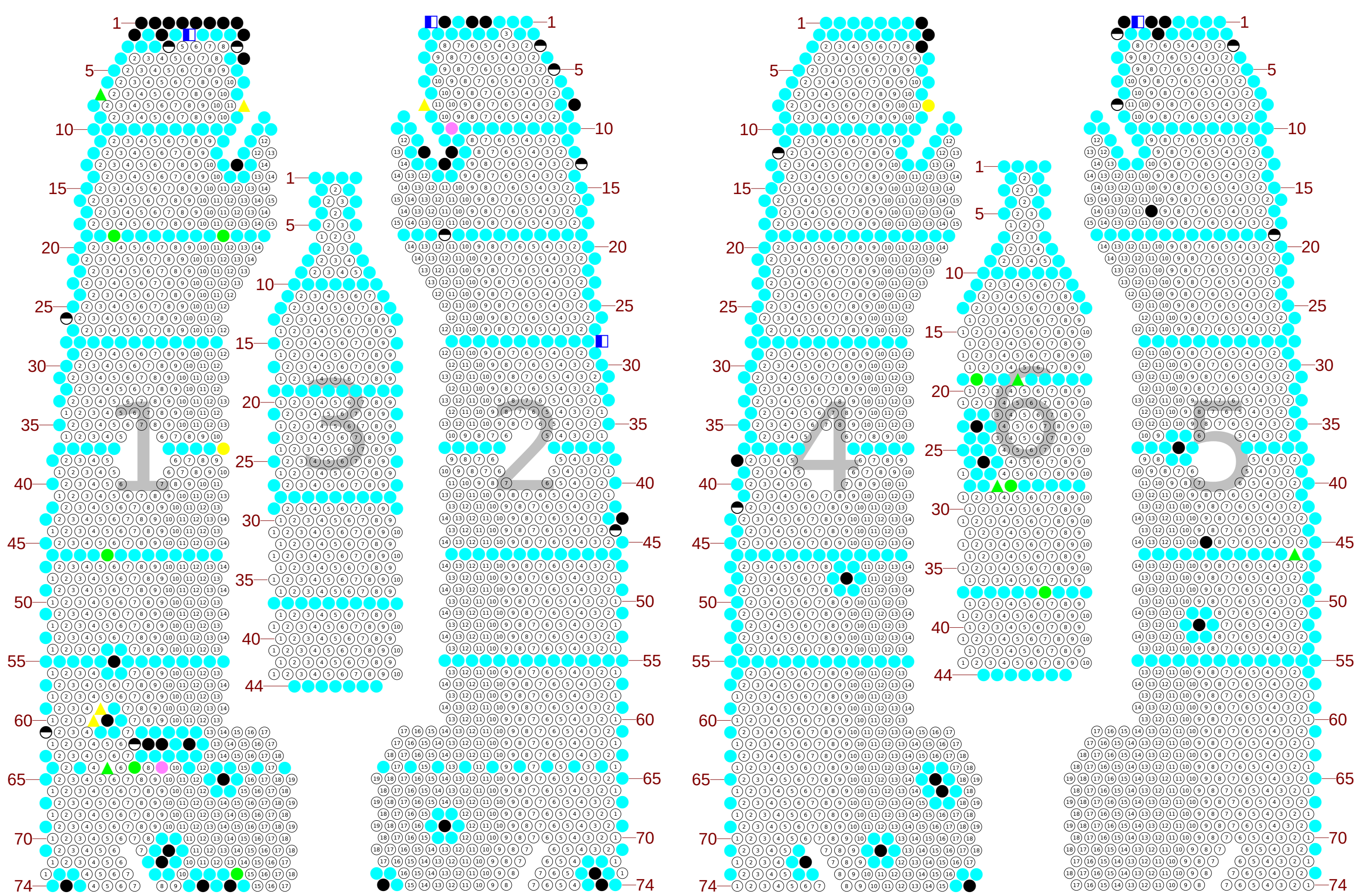
DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
6	5	4				NDD				CTE	IO
6	10	2				NDD				CTE	IO
6	10	3				NDD				CTE	IO
6	10	4				NDD				CTE	IO
6	10	5				NDD				CTE	IO
6	10	6				NDD				CTE	IO
6	19	1				NDD				CTE	IO
6	19	2	2.12	11	28%	IDI	3	IO	113.86	CTE	IO
6	19	3				NDD				CTE	IO
6	19	4				NDD				CTE	IO
6	19	5	4.34	12	30%	IDI	3	SP01	145.30	CTE	IO
6	19	6				NDD				CTE	IO
6	19	7				NDD				CTE	IO
6	19	8				NDD				CTE	IO
6	19	9				NDD				CTE	IO
6	19	10				NDD				CTE	IO
6	23	2				PLG					
6	26	2				PLG					
6	28	1				NDD				CTE	IO
6	28	2				NDD				CTE	IO
6	28	3	2.16	15	38%	IDI	3	SP01	-1.80	CTE	IO
6	28	4	2.65	9	23%	IDI	3	SP01	33.23	CTE	IO
6	28	5				NDD				CTE	IO
6	28	6				NDD				CTE	IO
6	28	7				NDD				CTE	IO
6	28	8				NDD				CTE	IO
6	28	9				NDD				CTE	IO
6	37	1				NDD				CTE	IO
6	37	2				NDD				CTE	IO
6	37	3				NDD				CTE	IO
6	37	4				NDD				CTE	IO
6	37	5				NDD				CTE	IO
6	37	6				NDD				CTE	IO
6	37	7	9.33	8	20%	IDI	3	IO	7.75	CTE	IO
6	37	8				NDD				CTE	IO
6	37	9				NDD				CTE	IO
6	37	10				NDD				CTE	IO
6	44	1				NDD				CTE	IO
6	44	2				NDD				CTE	IO
6	44	3				NDD				CTE	IO
6	44	4				NDD				CTE	IO
6	44	5				NDD				CTE	IO
6	44	6				NDD				CTE	IO
6	44	7				NDD				CTE	IO

HISTORY MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER
09-2022

VIEW FROM: INLET/OUTLET END



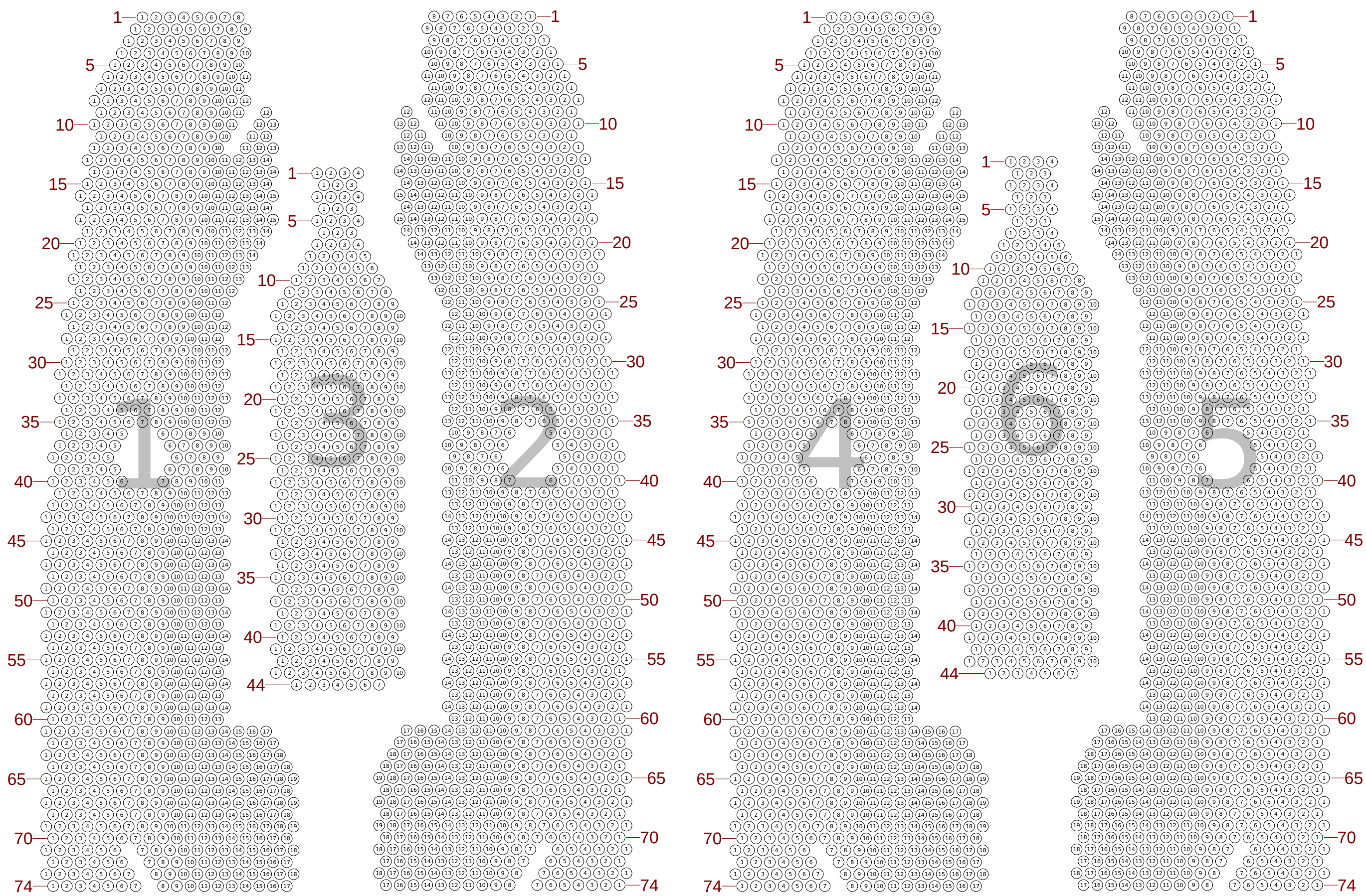
SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_HISTORY.qry
	10	6	4	QUERY	RES_HISTORY.qry
	932	860	856	QUERY	NDD_HISTORY.qry
	0	0	0	QUERY	PVN_HISTORY.qry
	29	17	16	QUERY	DNT_HISTORY.qry
	8	8	8	QUERY	20-29%_HISTORY.qry
	7	7	5	QUERY	30-39%_HISTORY.qry
	5	5	2	QUERY	40-49%_HISTORY.qry
	10	8	4	QUERY	50-59%_HISTORY.qry
	5	5	2	QUERY	60-69%_HISTORY.qry
	5	5	0	QUERY	70-79%_HISTORY.qry
	4	4	0	QUERY	80-89%_HISTORY.qry
	1	1	0	QUERY	90-100%_HISTORY.qry
	95	56	56	QUERY	PLUG_HISTORY.qry
	1,111	982	953		

Model default
4,728 tubes
3,775 open tubes

TUBE SHEET LAYOUT MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST UPPER

VIEW FROM: INLET/OUTLET END



Model default
4,728 tubes
4,728 open tubes

Conco Services LLC

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www.conco.net

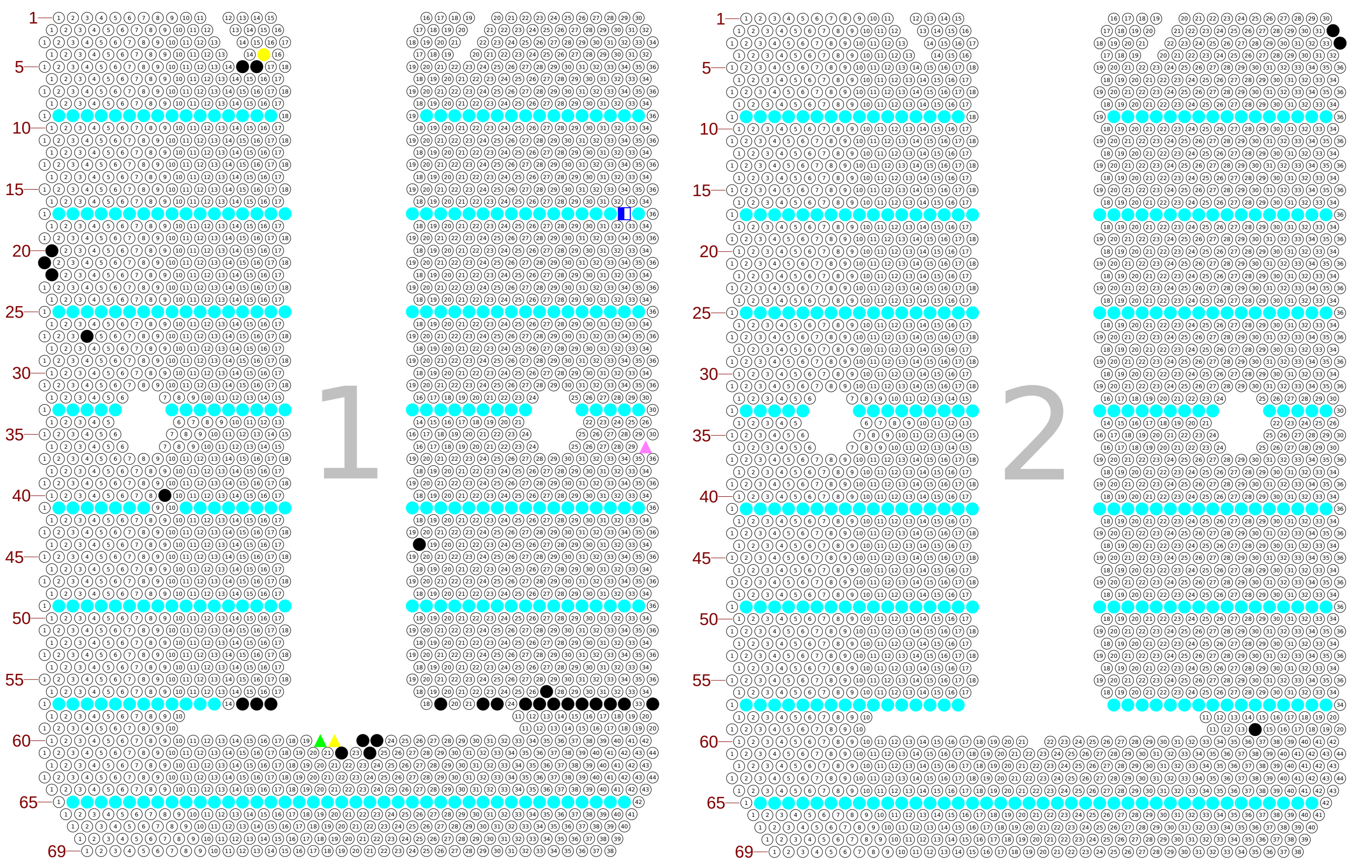
Results Summary
Kentucky Power
Big Sandy
Unit 1
Main Condenser
East Lower

	09-2022 Inspection
Total Tubes in Component (Straight Lengths)	**4,820**
Total Tubes Inspected (Straight Lengths)	**518**
Tubes Recording Damage:	Totals
Approx. Wall Loss 90% & Greater	0
Approx. Wall Loss 80% to 89%	0
Approx. Wall Loss 70% to 79%	1
Approx. Wall Loss 60% to 69%	0
Approx. Wall Loss 50% to 59%	1
Approx. Wall Loss 40% to 49%	1
Approx. Wall Loss 30% to 39%	1
Approx. Wall Loss 20% to 29%	0
Tubes Recording Dents	0
Restricted Tubes (Complete Inspection Not Possible)	1
Obstructed Tubes (No Test Possible)	0
Previously Plugged Tubes	31
Tubes Recommended for Plugging	0
Total of Previously Plugged Tubes & Tubes Recommended for Plugging	31

RESULTS MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

VIEW FROM: INLET/OUTLET END



SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_RESULTS.qry
	1	1	1	QUERY	RES_RESULTS.qry
	513	513	513	QUERY	NDD_RESULTS.qry
	0	0	0	QUERY	PVN_RESULTS.qry
	0	0	0	QUERY	DNT_RESULTS.qry
	0	0	0	QUERY	20-29%_RESULTS.qry
	1	1	1	QUERY	30-39%_RESULTS.qry
	2	2	1	QUERY	40-49%_RESULTS.qry
	1	1	1	QUERY	50-59%_RESULTS.qry
	0	0	0	QUERY	60-69%_RESULTS.qry
	1	1	1	QUERY	70-79%_RESULTS.qry
	0	0	0	QUERY	80-89%_RESULTS.qry
	0	0	0	QUERY	90-100%_RESULTS.qry
	31	31	31	QUERY	PLUG_RESULTS.qry
	550	550	549		

Model default
4,820 tubes
4,271 open tubes

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	4	15	1.38	129	46%	ODI	3	SP06	6.48	CTE	IO
1	5	15				PLG					
1	5	16				PLG					
1	9	2				NDD				CTE	IO
1	9	3				NDD				CTE	IO
1	9	4				NDD				CTE	IO
1	9	5				NDD				CTE	IO
1	9	6				NDD				CTE	IO
1	9	7				NDD				CTE	IO
1	9	8				NDD				CTE	IO
1	9	9				NDD				CTE	IO
1	9	10				NDD				CTE	IO
1	9	11				NDD				CTE	IO
1	9	12				NDD				CTE	IO
1	9	13				NDD				CTE	IO
1	9	14				NDD				CTE	IO
1	9	15				NDD				CTE	IO
1	9	16				NDD				CTE	IO
1	9	17				NDD				CTE	IO
1	9	20				NDD				CTE	IO
1	9	21				NDD				CTE	IO
1	9	22				NDD				CTE	IO
1	9	23				NDD				CTE	IO
1	9	24				NDD				CTE	IO
1	9	25				NDD				CTE	IO
1	9	26				NDD				CTE	IO
1	9	27				NDD				CTE	IO
1	9	28				NDD				CTE	IO
1	9	29				NDD				CTE	IO
1	9	30				NDD				CTE	IO
1	9	31				NDD				CTE	IO
1	9	32				NDD				CTE	IO
1	9	33				NDD				CTE	IO
1	9	34				NDD				CTE	IO
1	9	35				NDD				CTE	IO
1	17	2				NDD				CTE	IO
1	17	3				NDD				CTE	IO
1	17	4				NDD				CTE	IO
1	17	5				NDD				CTE	IO
1	17	6				NDD				CTE	IO
1	17	7				NDD				CTE	IO
1	17	8				NDD				CTE	IO
1	17	9				NDD				CTE	IO
1	17	10				NDD				CTE	IO
1	17	11				NDD				CTE	IO
1	17	12				NDD				CTE	IO
1	17	13				NDD				CTE	IO
1	17	14				NDD				CTE	IO
1	17	15				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	17	16				NDD				CTE	IO
1	17	17				NDD				CTE	IO
1	17	18				NDD				CTE	IO
1	17	19				NDD				CTE	IO
1	17	20				NDD				CTE	IO
1	17	21				NDD				CTE	IO
1	17	22				NDD				CTE	IO
1	17	23				NDD				CTE	IO
1	17	24				NDD				CTE	IO
1	17	25				NDD				CTE	IO
1	17	26				NDD				CTE	IO
1	17	27				NDD				CTE	IO
1	17	28				NDD				CTE	IO
1	17	29				NDD				CTE	IO
1	17	30				NDD				CTE	IO
1	17	31				NDD				CTE	IO
1	17	32				NDD				CTE	IO
1	17	33				NDD				CTE	IO
1	17	34				RES		SP08	18.38	SP08	IO
1	17	35				NDD				CTE	IO
1	20	1				PLG					
1	21	1				PLG					
1	22	1				PLG					
1	25	2				NDD				CTE	IO
1	25	3				NDD				CTE	IO
1	25	4				NDD				CTE	IO
1	25	5				NDD				CTE	IO
1	25	6				NDD				CTE	IO
1	25	7				NDD				CTE	IO
1	25	8				NDD				CTE	IO
1	25	9				NDD				CTE	IO
1	25	10				NDD				CTE	IO
1	25	11				NDD				CTE	IO
1	25	12				NDD				CTE	IO
1	25	13				NDD				CTE	IO
1	25	14				NDD				CTE	IO
1	25	15				NDD				CTE	IO
1	25	16				NDD				CTE	IO
1	25	17				NDD				CTE	IO
1	25	18				NDD				CTE	IO
1	25	19				NDD				CTE	IO
1	25	20				NDD				CTE	IO
1	25	21				NDD				CTE	IO
1	25	22				NDD				CTE	IO
1	25	23				NDD				CTE	IO
1	25	24				NDD				CTE	IO
1	25	25				NDD				CTE	IO
1	25	26				NDD				CTE	IO
1	25	27				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	25	28				NDD				CTE	IO
1	25	29				NDD				CTE	IO
1	25	30				NDD				CTE	IO
1	25	31				NDD				CTE	IO
1	25	32				NDD				CTE	IO
1	25	33				NDD				CTE	IO
1	25	34				NDD				CTE	IO
1	25	35				NDD				CTE	IO
1	27	4				PLG					
1	33	2				NDD				CTE	IO
1	33	3				NDD				CTE	IO
1	33	4				NDD				CTE	IO
1	33	5				NDD				CTE	IO
1	33	6				NDD				CTE	IO
1	33	7				NDD				CTE	IO
1	33	8				NDD				CTE	IO
1	33	9				NDD				CTE	IO
1	33	10				NDD				CTE	IO
1	33	11				NDD				CTE	IO
1	33	12				NDD				CTE	IO
1	33	13				NDD				CTE	IO
1	33	14				NDD				CTE	IO
1	33	15				NDD				CTE	IO
1	33	16				NDD				CTE	IO
1	33	17				NDD				CTE	IO
1	33	18				NDD				CTE	IO
1	33	19				NDD				CTE	IO
1	33	20				NDD				CTE	IO
1	33	21				NDD				CTE	IO
1	33	22				NDD				CTE	IO
1	33	23				NDD				CTE	IO
1	33	24				NDD				CTE	IO
1	33	25				NDD				CTE	IO
1	33	26				NDD				CTE	IO
1	33	27				NDD				CTE	IO
1	33	28				NDD				CTE	IO
1	33	29				NDD				CTE	IO
1	36	30	1.03	95	72%	ODI	3	SP04	37.38	CTE	IO
1	40	9				PLG					
1	41	2				NDD				CTE	IO
1	41	3				NDD				CTE	IO
1	41	4				NDD				CTE	IO
1	41	5				NDD				CTE	IO
1	41	6				NDD				CTE	IO
1	41	7				NDD				CTE	IO
1	41	8				NDD				CTE	IO
1	41	11				NDD				CTE	IO
1	41	12				NDD				CTE	IO
1	41	13				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	41	14				NDD				CTE	IO
1	41	15				NDD				CTE	IO
1	41	16				NDD				CTE	IO
1	41	17				NDD				CTE	IO
1	41	18				NDD				CTE	IO
1	41	19				NDD				CTE	IO
1	41	20				NDD				CTE	IO
1	41	21				NDD				CTE	IO
1	41	22				NDD				CTE	IO
1	41	23				NDD				CTE	IO
1	41	24				NDD				CTE	IO
1	41	25				NDD				CTE	IO
1	41	26				NDD				CTE	IO
1	41	27				NDD				CTE	IO
1	41	28				NDD				CTE	IO
1	41	29				NDD				CTE	IO
1	41	30				NDD				CTE	IO
1	41	31				NDD				CTE	IO
1	41	32				NDD				CTE	IO
1	41	33				NDD				CTE	IO
1	41	34				NDD				CTE	IO
1	41	35				NDD				CTE	IO
1	44	18				PLG					
1	49	2				NDD				CTE	IO
1	49	3				NDD				CTE	IO
1	49	4				NDD				CTE	IO
1	49	5				NDD				CTE	IO
1	49	6				NDD				CTE	IO
1	49	7				NDD				CTE	IO
1	49	8				NDD				CTE	IO
1	49	9				NDD				CTE	IO
1	49	10				NDD				CTE	IO
1	49	11				NDD				CTE	IO
1	49	12				NDD				CTE	IO
1	49	13				NDD				CTE	IO
1	49	14				NDD				CTE	IO
1	49	15				NDD				CTE	IO
1	49	16				NDD				CTE	IO
1	49	17				NDD				CTE	IO
1	49	18				NDD				CTE	IO
1	49	19				NDD				CTE	IO
1	49	20				NDD				CTE	IO
1	49	21				NDD				CTE	IO
1	49	22				NDD				CTE	IO
1	49	23				NDD				CTE	IO
1	49	24				NDD				CTE	IO
1	49	25				NDD				CTE	IO
1	49	26				NDD				CTE	IO
1	49	27				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	49	28				NDD				CTE	IO
1	49	29				NDD				CTE	IO
1	49	30				NDD				CTE	IO
1	49	31				NDD				CTE	IO
1	49	32				NDD				CTE	IO
1	49	33				NDD				CTE	IO
1	49	34				NDD				CTE	IO
1	49	35				NDD				CTE	IO
1	56	27				PLG					
1	57	2				NDD				CTE	IO
1	57	3				NDD				CTE	IO
1	57	4				NDD				CTE	IO
1	57	5				NDD				CTE	IO
1	57	6				NDD				CTE	IO
1	57	7				NDD				CTE	IO
1	57	8				NDD				CTE	IO
1	57	9				NDD				CTE	IO
1	57	10				NDD				CTE	IO
1	57	11				NDD				CTE	IO
1	57	12				NDD				CTE	IO
1	57	13				NDD				CTE	IO
1	57	15				PLG					
1	57	16				PLG					
1	57	17				PLG					
1	57	19				PLG					
1	57	22				PLG					
1	57	23				PLG					
1	57	25				PLG					
1	57	26				PLG					
1	57	27				PLG					
1	57	28				PLG					
1	57	29				PLG					
1	57	30				PLG					
1	57	31				PLG					
1	57	32				PLG					
1	57	34				PLG					
1	60	20	1.55	138	38%	ODI	3	SP07	10.09	CTE	IO
1	60	21	1.39	121	53%	ODI	3	SP08	6.50	CTE	IO
1	60	21	1.43	129	46%	ODI	3	SP08	8.04	CTE	IO
1	60	22				PLG					
1	60	23				PLG					
1	61	22				PLG					
1	61	24				PLG					
1	65	2				NDD				CTE	IO
1	65	3				NDD				CTE	IO
1	65	4				NDD				CTE	IO
1	65	5				NDD				CTE	IO
1	65	6				NDD				CTE	IO
1	65	7				NDD				CTE	IO

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BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
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SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
1	65	8				NDD				CTE	IO
1	65	9				NDD				CTE	IO
1	65	10				NDD				CTE	IO
1	65	11				NDD				CTE	IO
1	65	12				NDD				CTE	IO
1	65	13				NDD				CTE	IO
1	65	14				NDD				CTE	IO
1	65	15				NDD				CTE	IO
1	65	16				NDD				CTE	IO
1	65	17				NDD				CTE	IO
1	65	18				NDD				CTE	IO
1	65	19				NDD				CTE	IO
1	65	20				NDD				CTE	IO
1	65	21				NDD				CTE	IO
1	65	22				NDD				CTE	IO
1	65	23				NDD				CTE	IO
1	65	24				NDD				CTE	IO
1	65	25				NDD				CTE	IO
1	65	26				NDD				CTE	IO
1	65	27				NDD				CTE	IO
1	65	28				NDD				CTE	IO
1	65	29				NDD				CTE	IO
1	65	30				NDD				CTE	IO
1	65	31				NDD				CTE	IO
1	65	32				NDD				CTE	IO
1	65	33				NDD				CTE	IO
1	65	34				NDD				CTE	IO
1	65	35				NDD				CTE	IO
1	65	36				NDD				CTE	IO
1	65	37				NDD				CTE	IO
1	65	38				NDD				CTE	IO
1	65	39				NDD				CTE	IO
1	65	40				NDD				CTE	IO
1	65	41				NDD				CTE	IO
2	2	32				PLG					
2	3	34				PLG					
2	9	2				NDD				CTE	IO
2	9	3				NDD				CTE	IO
2	9	4				NDD				CTE	IO
2	9	5				NDD				CTE	IO
2	9	6				NDD				CTE	IO
2	9	7				NDD				CTE	IO
2	9	8				NDD				CTE	IO
2	9	9				NDD				CTE	IO
2	9	10				NDD				CTE	IO
2	9	11				NDD				CTE	IO
2	9	12				NDD				CTE	IO
2	9	13				NDD				CTE	IO
2	9	14				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	9	15				NDD				CTE	IO
2	9	16				NDD				CTE	IO
2	9	17				NDD				CTE	IO
2	9	20				NDD				CTE	IO
2	9	21				NDD				CTE	IO
2	9	22				NDD				CTE	IO
2	9	23				NDD				CTE	IO
2	9	24				NDD				CTE	IO
2	9	25				NDD				CTE	IO
2	9	26				NDD				CTE	IO
2	9	27				NDD				CTE	IO
2	9	28				NDD				CTE	IO
2	9	29				NDD				CTE	IO
2	9	30				NDD				CTE	IO
2	9	31				NDD				CTE	IO
2	9	32				NDD				CTE	IO
2	9	33				NDD				CTE	IO
2	9	34				NDD				CTE	IO
2	9	35				NDD				CTE	IO
2	17	2				NDD				CTE	IO
2	17	3				NDD				CTE	IO
2	17	4				NDD				CTE	IO
2	17	5				NDD				CTE	IO
2	17	6				NDD				CTE	IO
2	17	7				NDD				CTE	IO
2	17	8				NDD				CTE	IO
2	17	9				NDD				CTE	IO
2	17	10				NDD				CTE	IO
2	17	11				NDD				CTE	IO
2	17	12				NDD				CTE	IO
2	17	13				NDD				CTE	IO
2	17	14				NDD				CTE	IO
2	17	15				NDD				CTE	IO
2	17	16				NDD				CTE	IO
2	17	17				NDD				CTE	IO
2	17	18				NDD				CTE	IO
2	17	19				NDD				CTE	IO
2	17	20				NDD				CTE	IO
2	17	21				NDD				CTE	IO
2	17	22				NDD				CTE	IO
2	17	23				NDD				CTE	IO
2	17	24				NDD				CTE	IO
2	17	25				NDD				CTE	IO
2	17	26				NDD				CTE	IO
2	17	27				NDD				CTE	IO
2	17	28				NDD				CTE	IO
2	17	29				NDD				CTE	IO
2	17	30				NDD				CTE	IO
2	17	31				NDD				CTE	IO

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KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	17	32				NDD				CTE	IO
2	17	33				NDD				CTE	IO
2	17	34				NDD				CTE	IO
2	17	35				NDD				CTE	IO
2	25	2				NDD				CTE	IO
2	25	3				NDD				CTE	IO
2	25	4				NDD				CTE	IO
2	25	5				NDD				CTE	IO
2	25	6				NDD				CTE	IO
2	25	7				NDD				CTE	IO
2	25	8				NDD				CTE	IO
2	25	9				NDD				CTE	IO
2	25	10				NDD				CTE	IO
2	25	11				NDD				CTE	IO
2	25	12				NDD				CTE	IO
2	25	13				NDD				CTE	IO
2	25	14				NDD				CTE	IO
2	25	15				NDD				CTE	IO
2	25	16				NDD				CTE	IO
2	25	17				NDD				CTE	IO
2	25	18				NDD				CTE	IO
2	25	19				NDD				CTE	IO
2	25	20				NDD				CTE	IO
2	25	21				NDD				CTE	IO
2	25	22				NDD				CTE	IO
2	25	23				NDD				CTE	IO
2	25	24				NDD				CTE	IO
2	25	25				NDD				CTE	IO
2	25	26				NDD				CTE	IO
2	25	27				NDD				CTE	IO
2	25	28				NDD				CTE	IO
2	25	29				NDD				CTE	IO
2	25	30				NDD				CTE	IO
2	25	31				NDD				CTE	IO
2	25	32				NDD				CTE	IO
2	25	33				NDD				CTE	IO
2	25	34				NDD				CTE	IO
2	25	35				NDD				CTE	IO
2	33	2				NDD				CTE	IO
2	33	3				NDD				CTE	IO
2	33	4				NDD				CTE	IO
2	33	5				NDD				CTE	IO
2	33	6				NDD				CTE	IO
2	33	7				NDD				CTE	IO
2	33	8				NDD				CTE	IO
2	33	9				NDD				CTE	IO
2	33	10				NDD				CTE	IO
2	33	11				NDD				CTE	IO
2	33	12				NDD				CTE	IO

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KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	33	13				NDD				CTE	IO
2	33	14				NDD				CTE	IO
2	33	15				NDD				CTE	IO
2	33	16				NDD				CTE	IO
2	33	17				NDD				CTE	IO
2	33	18				NDD				CTE	IO
2	33	19				NDD				CTE	IO
2	33	20				NDD				CTE	IO
2	33	21				NDD				CTE	IO
2	33	22				NDD				CTE	IO
2	33	23				NDD				CTE	IO
2	33	24				NDD				CTE	IO
2	33	25				NDD				CTE	IO
2	33	26				NDD				CTE	IO
2	33	27				NDD				CTE	IO
2	33	28				NDD				CTE	IO
2	33	29				NDD				CTE	IO
2	41	2				NDD				CTE	IO
2	41	3				NDD				CTE	IO
2	41	4				NDD				CTE	IO
2	41	5				NDD				CTE	IO
2	41	6				NDD				CTE	IO
2	41	7				NDD				CTE	IO
2	41	8				NDD				CTE	IO
2	41	9				NDD				CTE	IO
2	41	10				NDD				CTE	IO
2	41	11				NDD				CTE	IO
2	41	12				NDD				CTE	IO
2	41	13				NDD				CTE	IO
2	41	14				NDD				CTE	IO
2	41	15				NDD				CTE	IO
2	41	16				NDD				CTE	IO
2	41	17				NDD				CTE	IO
2	41	18				NDD				CTE	IO
2	41	19				NDD				CTE	IO
2	41	20				NDD				CTE	IO
2	41	21				NDD				CTE	IO
2	41	22				NDD				CTE	IO
2	41	23				NDD				CTE	IO
2	41	24				NDD				CTE	IO
2	41	25				NDD				CTE	IO
2	41	26				NDD				CTE	IO
2	41	27				NDD				CTE	IO
2	41	28				NDD				CTE	IO
2	41	29				NDD				CTE	IO
2	41	30				NDD				CTE	IO
2	41	31				NDD				CTE	IO
2	41	32				NDD				CTE	IO
2	41	33				NDD				CTE	IO

DATA REPORT
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BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	41	34				NDD				CTE	IO
2	41	35				NDD				CTE	IO
2	49	2				NDD				CTE	IO
2	49	3				NDD				CTE	IO
2	49	4				NDD				CTE	IO
2	49	5				NDD				CTE	IO
2	49	6				NDD				CTE	IO
2	49	7				NDD				CTE	IO
2	49	8				NDD				CTE	IO
2	49	9				NDD				CTE	IO
2	49	10				NDD				CTE	IO
2	49	11				NDD				CTE	IO
2	49	12				NDD				CTE	IO
2	49	13				NDD				CTE	IO
2	49	14				NDD				CTE	IO
2	49	15				NDD				CTE	IO
2	49	16				NDD				CTE	IO
2	49	17				NDD				CTE	IO
2	49	18				NDD				CTE	IO
2	49	19				NDD				CTE	IO
2	49	20				NDD				CTE	IO
2	49	21				NDD				CTE	IO
2	49	22				NDD				CTE	IO
2	49	23				NDD				CTE	IO
2	49	24				NDD				CTE	IO
2	49	25				NDD				CTE	IO
2	49	26				NDD				CTE	IO
2	49	27				NDD				CTE	IO
2	49	28				NDD				CTE	IO
2	49	29				NDD				CTE	IO
2	49	30				NDD				CTE	IO
2	49	31				NDD				CTE	IO
2	49	32				NDD				CTE	IO
2	49	33				NDD				CTE	IO
2	49	34				NDD				CTE	IO
2	49	35				NDD				CTE	IO
2	57	2				NDD				CTE	IO
2	57	3				NDD				CTE	IO
2	57	4				NDD				CTE	IO
2	57	5				NDD				CTE	IO
2	57	6				NDD				CTE	IO
2	57	7				NDD				CTE	IO
2	57	8				NDD				CTE	IO
2	57	9				NDD				CTE	IO
2	57	10				NDD				CTE	IO
2	57	11				NDD				CTE	IO
2	57	12				NDD				CTE	IO
2	57	13				NDD				CTE	IO
2	57	14				NDD				CTE	IO

DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	57	15				NDD				CTE	IO
2	57	16				NDD				CTE	IO
2	57	17				NDD				CTE	IO
2	57	18				NDD				CTE	IO
2	57	19				NDD				CTE	IO
2	57	20				NDD				CTE	IO
2	57	21				NDD				CTE	IO
2	57	22				NDD				CTE	IO
2	57	23				NDD				CTE	IO
2	57	24				NDD				CTE	IO
2	57	25				NDD				CTE	IO
2	57	26				NDD				CTE	IO
2	57	27				NDD				CTE	IO
2	57	28				NDD				CTE	IO
2	57	29				NDD				CTE	IO
2	57	30				NDD				CTE	IO
2	57	31				NDD				CTE	IO
2	57	32				NDD				CTE	IO
2	57	33				NDD				CTE	IO
2	59	14				PLG					
2	65	2				NDD				CTE	IO
2	65	3				NDD				CTE	IO
2	65	4				NDD				CTE	IO
2	65	5				NDD				CTE	IO
2	65	6				NDD				CTE	IO
2	65	7				NDD				CTE	IO
2	65	8				NDD				CTE	IO
2	65	9				NDD				CTE	IO
2	65	10				NDD				CTE	IO
2	65	11				NDD				CTE	IO
2	65	12				NDD				CTE	IO
2	65	13				NDD				CTE	IO
2	65	14				NDD				CTE	IO
2	65	15				NDD				CTE	IO
2	65	16				NDD				CTE	IO
2	65	17				NDD				CTE	IO
2	65	18				NDD				CTE	IO
2	65	19				NDD				CTE	IO
2	65	20				NDD				CTE	IO
2	65	21				NDD				CTE	IO
2	65	22				NDD				CTE	IO
2	65	23				NDD				CTE	IO
2	65	24				NDD				CTE	IO
2	65	25				NDD				CTE	IO
2	65	26				NDD				CTE	IO
2	65	27				NDD				CTE	IO
2	65	28				NDD				CTE	IO
2	65	29				NDD				CTE	IO
2	65	30				NDD				CTE	IO

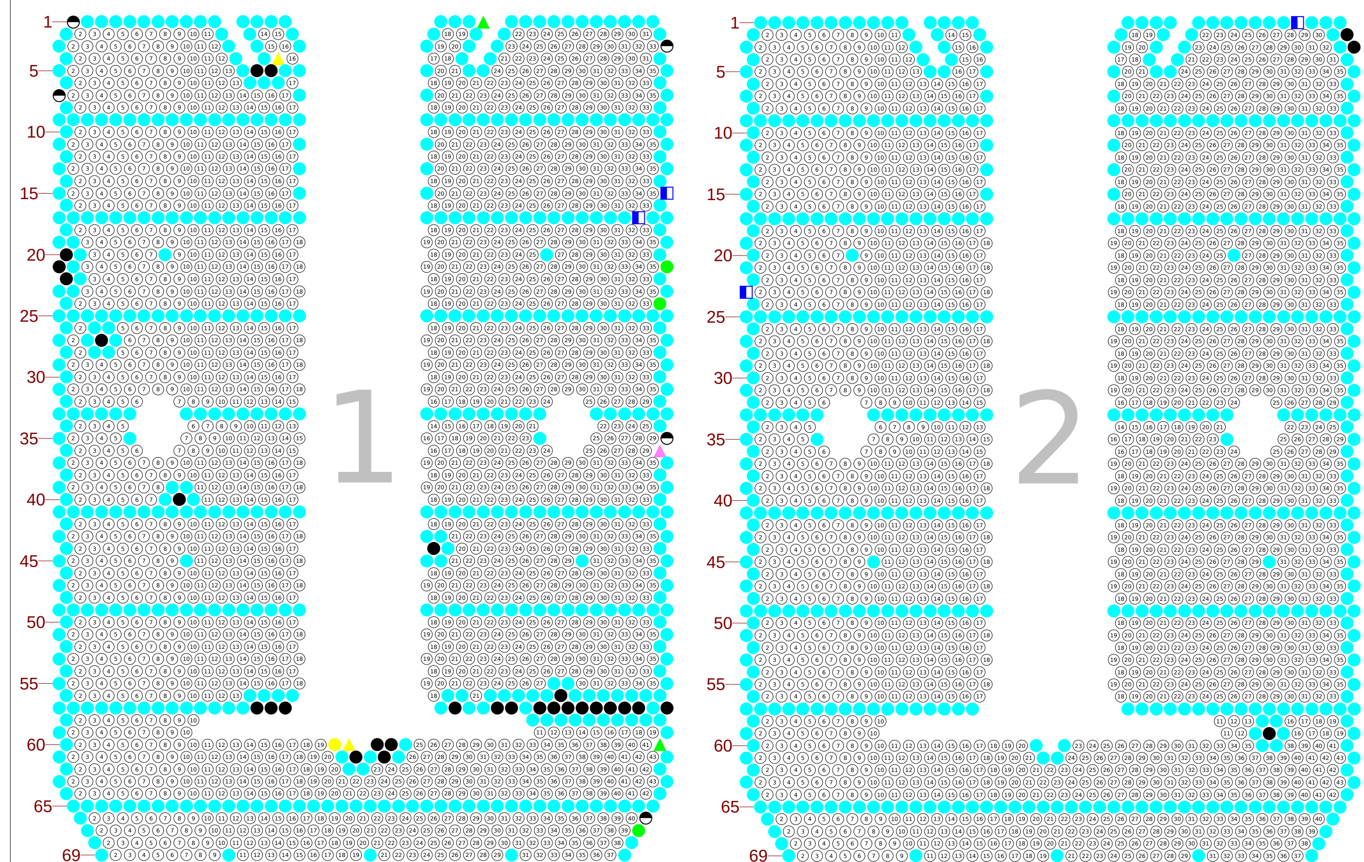
DATA REPORT
KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

SEC	ROW	COL	VOLTS	PHASE	PCNT	DEFECT	CHAN	LOC_LAND	LOC_OFF	BEG_TEST	END_TEST
2	65	31				NDD				CTE	IO
2	65	32				NDD				CTE	IO
2	65	33				NDD				CTE	IO
2	65	34				NDD				CTE	IO
2	65	35				NDD				CTE	IO
2	65	36				NDD				CTE	IO
2	65	37				NDD				CTE	IO
2	65	38				NDD				CTE	IO
2	65	39				NDD				CTE	IO
2	65	40				NDD				CTE	IO
2	65	41				NDD				CTE	IO

HISTORY MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER
09-2022

VIEW FROM: INLET/OUTLET END



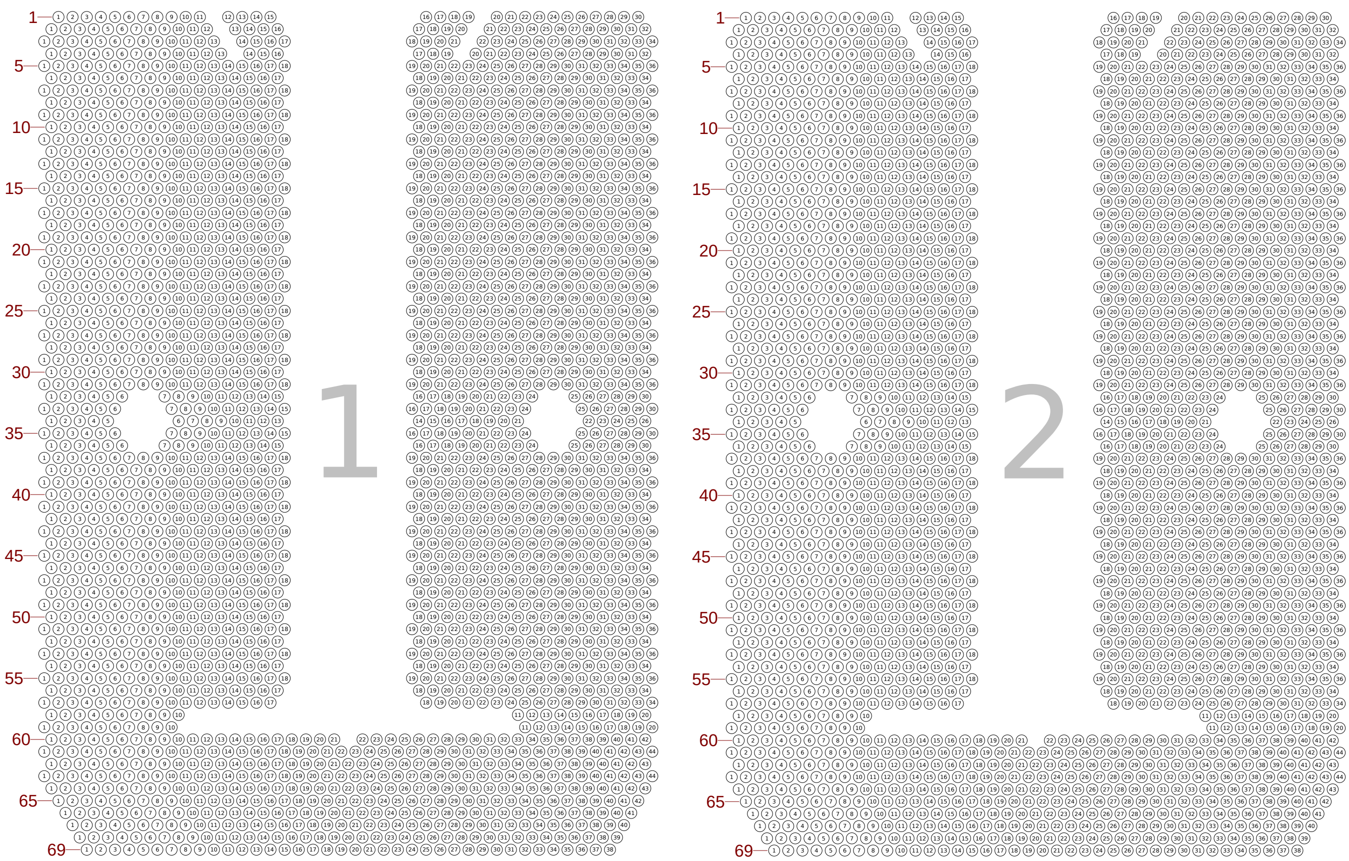
SYM	HITS	TUBES	VIS	TYPE	DESCRIPTION
	0	0	0	QUERY	OBS_HISTORY.qry
	4	4	4	QUERY	RES_HISTORY.qry
	985	985	984	QUERY	NDD_HISTORY.qry
	0	0	0	QUERY	PVN_HISTORY.qry
	5	5	5	QUERY	DNT_HISTORY.qry
	3	3	3	QUERY	20-29%_HISTORY.qry
	3	3	2	QUERY	30-39%_HISTORY.qry
	2	2	1	QUERY	40-49%_HISTORY.qry
	4	3	2	QUERY	50-59%_HISTORY.qry
	2	2	0	QUERY	60-69%_HISTORY.qry
	2	2	1	QUERY	70-79%_HISTORY.qry
	1	1	0	QUERY	80-89%_HISTORY.qry
	0	0	0	QUERY	90-100%_HISTORY.qry
	58	31	31	QUERY	PLUG_HISTORY.qry
	1,069	1,041	1,033		

Model default
4,820 tubes
3,787 open tubes

TUBE SHEET LAYOUT MAP

KENTUCKY POWER
BIG SANDY
UNIT 1
MAIN CONDENSER
EAST LOWER

VIEW FROM: INLET/OUTLET END



Model default
4,820 tubes
4,820 open tubes

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

3.0 INSPECTION PROCEDURE

Technicians

Conco EC technicians are certified to CSC-QAP-9.1 (SNT-TC-1A guidelines, CP-189) and also trained in confined space, first aid, and CPR. All Conco Analysts have passed an industry recognized Data-Analysis level IIA or level IIIA class.

Process

All inspections are performed in accordance with CSC-NDE-11.0 Rev 4 Data Acquisition and Analysis. Conco will use CoreStar equipment recording data with 4 frequencies and on 8 channels (4-differential channels and 4-absolute channels). The data will be recorded on medium consistent with the tester used (Magnetic Optical disk, compact flash disk, or USB flash drive). The data will be interpreted by qualified data analyst using the CoreStar analysis software. The results will be stored in the CoreStar DBMS software. This will enable future trending and inspection planning of the unit. While on site, Conco will visually inspect the tube sheet and they will generate a list of plugged tubes to be included on the tube sheet maps. All test equipment will be visually inspected prior to use to ensure the equipment is suitable for the inspection. All test equipment will also be within calibration as per manufacture specifications.

Eddy Current probes are purchased to conform to specific metallurgical characteristics, inside diameter and wall thickness of the tubes in this proposal. The probe diameter is calculated to achieve a fill-factor of approximately 85% between the probe head diameter and the tube ID.

We propose to use our services on a "best effort" basis. The detection of particular defect or variable in the material tested cannot be guaranteed.

CONCO ESTABLISHED 1923

CONCO SERVICES LLC
530 JONES STREET·VERONA, PA 15147
(412) 828-1166 · FAX: (412) 826-8255

Form No	1085
Title	Examination Technique Specification Sheet OMNI
Revision:	2
Date:	January 3, 2017
Page 1 of 4	

Utility/Site/Unit: Kentucky Power/Big Sandy/Unit 1	ETSS Version: 1 Date: 09/22/2022
Component: Main Condenser	Component ID: West- Upper/Lower, East- Upper/Lower
Examination Scope	
Applicability: This technique is for the examination of .875" x .042" 90/10 CuNi and 70/30 CuNi tubes.	
Instrument	**Tubing**
Manufacturer/Model: CoreStar OMNI 200/100	Material Type: 90/10 CuNi, 70/30 CuNi
	# Of Tubes Both materials: ~2300
	OD/Wall (inch): 0.875" x 0 .042"
Data Recording Equipment	Length: 30'
Manuf./Media: Hard drive / Network or Equiv.	**Calibration Standard(s)**
Software	Type/SN: ASME CSC-526 Type/SN: Wall Thinning CSC-527 Type/SN: Internal Reference
Manufacturer: Corestar	**Analog Signal Path**
Version/Revision: 9.0	Probe Shaft /Length: Corestar 80'
Examination Procedure	Extension Type & Length N/A
Number/Revision: CSC-NDE-11.0 Rev 4	Slip Ring Model Number: N/A

Scan Parameters				
Scan Direction: Pull				
Digitization Rate, Samples Per Inch (minimum): ≥ 30 SPI	Axial Direction: Pull	N/A	Circ. Direction	N/A

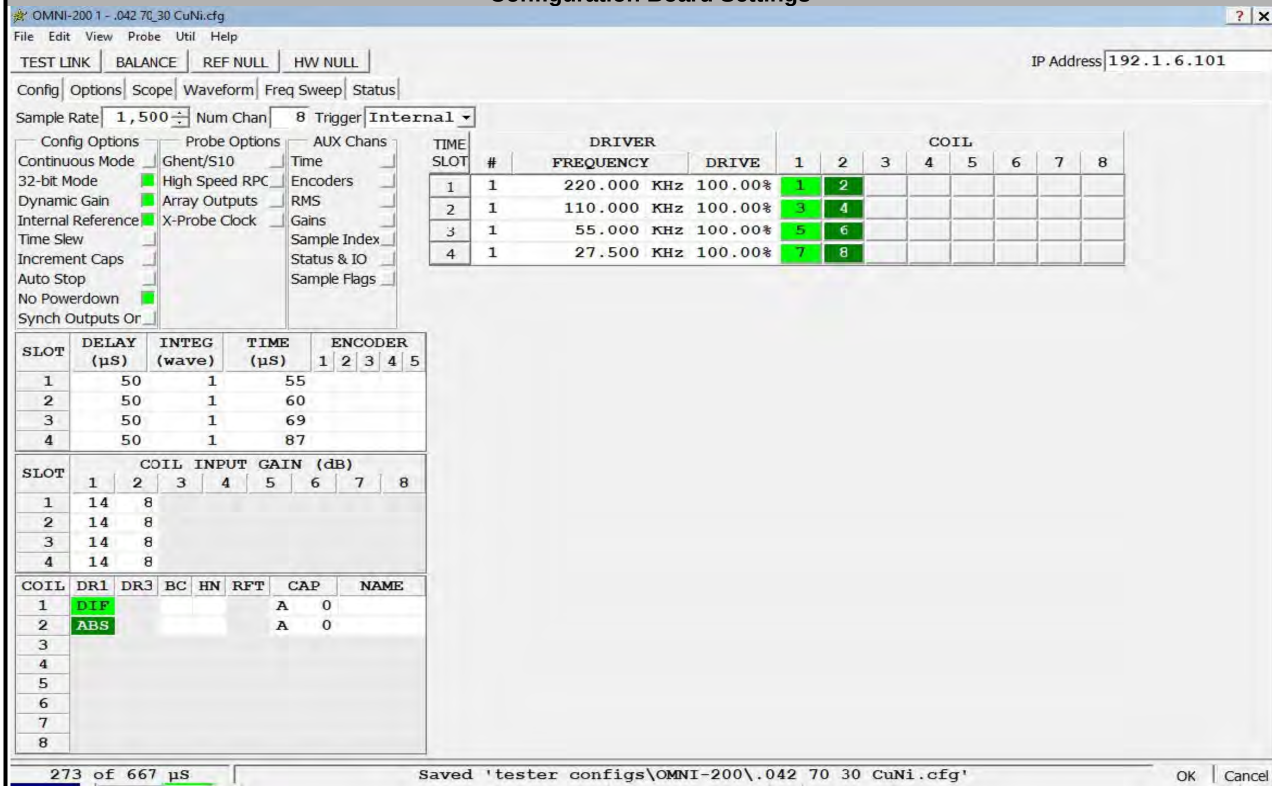
Probe Speed	Sample Rate	RPM Set	RPM Min	RPM Max
46 inches / second	2000 (Max.)	N/A	N/A	N/A
30 inches / second	1200 (Min.)	N/A	N/A	N/A

Probe/Motor Unit		
Description (Model/Diameter/Frequency/Coil Dimensions)	Manufacturer	Length
730 ESH/MF	Corestar	N/A

Data Acquisition				
Calibration Coil 1 Channels				
Channel & Frequency	Channel #1 220 kHz	Channel #3 110 kHz	Channel #5 55 kHz	Channel #7 27.5 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions
Drive Voltage	75%	75%	75%	75%
Gain Setting	14	14	14	14
Calibration Coil 2 Channels				
Channel & Frequency	Channel #2 220 kHz	Channel #4 110 kHz	Channel #6 55 kHz	Channel #8 27.5 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions
Drive Voltage	75%	75%	75%	75%
Gain setting	8	8	8	8

Examination Technique Specification Sheet

Configuration Board Settings



Special Instructions for Data Acquisition

1. Probes should be pulled @ 30 inches/second or less.
2. Review each data channel and ensure that adequate/expected signal responses are achieved before recording the calibration. Do not record data until the proper spans and rotations have been set.
3. Monitor the data by setting the left strip chart to channel 1 vertical, right strip chart to channel 6 vertical and the lissajous display set to channel 1 as a minimum. The operator will determine the specific strip chart settings and lissajous display to verify the system is functioning properly and that data quality is acceptable.
4. Follow the Conco NDE procedure CSC-NDE-11.0 Rev 4.
5. Encode the tube ID's as per map for respective sections.
6. The initial exam attempt shall be performed with the .730 ESH/MF probe.
7. Tubes that will not allow the probe to enter, report as "Obstructed".
8. Tubes unable to be examine the desired extent, report as "Restricted".
9. Write a message for all tubes that are unable to be examined full length explaining the reason.
10. Encode the ASME Std. as "999", Thinning Std as "999" with a message.
11. Perform "System Null" only if "Display Null" is ineffective in balancing the signal.

Examination Technique Specification Sheet

Data Analysis				
Calibration Differential Channels				
Channel & Frequency	Channel #1 220 kHz	Channel #3 110 kHz	Channel #5 55 kHz	Channel #7 27.5 kHz
Phase Rotation	100% TWH 40 degrees + 3	100% TWH 40 degrees + 3	100% TWH 40 degrees + 3	100% TWH 40 degrees + 3
Span Setting Minimum	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions
Calibration Absolute Channels				
Channel & Frequency	Channel #2 220 kHz	Channel #4 110 kHz	Channel #6 55 kHz	Channel #8 27.5 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions
Calibration Process and Other Channels				
Channel & Frequency	M-1 1/3 Diff	M-2 4/6 Abs.	M-3 / Diff.	M-4 / Diff.
Phase Rotation	100% TWH 40 degrees + 3	Probe Motion Horiz. Flaws Up		
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions		
Suppress On	Support Ring	Support Ring		

Voltage Normalization				Calibration Curves		
CH	Signal	Set	Normalize	Type	CH	Set Points
1	4x20% FBH	4 Vp-p	Save/Store to all	Phase Curve	1, 3, 5, M1	100,60,20%
1	4x20% FBH	4 Vp-p	Save/Store to all	Magnitude Curve	6,M2	75, 50,25%

Data Screening				
Left Strip Chart	Center Strip Chart	Right Strip Chart	Left Lissajous	Right Lissajous
Channel P1 Vertical	Channel 1 Vertical	Channel 6 Vertical	Channel 1	Channel 3

Special Instructions for Analysis

1. Calibration curves shall be constructed using the "As-Built" dimensions from the calibration standard drawings.
2. Normalize to 4 volts on the 4 X 20% flat bottom holes using channel #1 differential and store to all channels.
3. All Quantifiable indications of tube wall degradation ≥ 20% TW and 1 Volt shall be reported (however, not to exceed 6 reportable ID defects).
4. Locate all defect indications in inches measured from the test end.
5. Previously reported indications shall be addressed by the primary analyst. Report previously reported Inds. In same channel as history. Report previous indications that are not found as "INF" and indications not recordable as "INR".
6. If test data appears to be un-interpretable shall be report as "RBD".

Job Lead Approval	Customer Approval (if required)
Signature /Date James Halloran ET IIIA 9/22/2022	Signature /Date N/A

Additional Component Information

Examination Technique Specification Sheet

Reporting Requirements							
Code	**Description**	**Meas.**	**%**	**Volts**	**Ch**	**Loc**	**Ext.**
ADR	Absolute Drift	Y	N	Any	6	Y	Y
CRK	Crack-Like Indication	Y	N	Any	5, 6	Y	Y
DNT	Dent	Y	N	20 >	1, M1, 3	Y	Y
DTS	Distorted Support Indication	Y	N	Any	M1	Y	Y
ERI	Erosion With Indication	Y	20% >	Any	6	Y	Y
ERO	Erosion	Y	20% >	Any	6	Y	Y
GEN	General Pitting / Wall Loss	N	N	N	N	N	Y
IDC	ID Chatter	Y	N	20 >	1, 3	Y	Y
IDI	ID Indication	Y	20% >	Any	1, M1, 3	Y	Y
INA	Inaccessible	N	N	N	N	N	N
INF	Indication Not Found	N	N	N	N	Y	Y
INR	Indication Not Recordable	N	N	N	N	Y	Y
NDD	No Degradation Detected	N	N	N	N	N	Y
NQI	Non Quantifiable Indication	Y	N	Any	1, M1, 3	Y	Y
OBS	Obstructed	N	N	N	N	N	N
ODI	OD Indication	Y	20% >	Any	1, M1, 3	Y	Y
PID	Positive Identification	Y	N	Y	Y	Y	Y
PLG	Plug	N	N	N	N	N	N
PVN	Permeability Variation	Y	N	20 >	1, M1, 3	Y	Y
RAD	Retest Analyst Discretion	N	N	N	N	N	N
RBD	Retest Bad Data	N	N	N	N	N	N
RES	Restricted	N	N	N	N	Y	Y
RIC	Retest Incomplete	N	N	N	N	N	N
STC	Stuck Cleaner	N	N	N	N	N	N
WAR	Wear	Y	20% >	Any	6, M2	Y	Y

Refer to the Data Management Code list in the report for landmark abbreviations.

Site

Owner: KENTUCKY POWER
Site Code: BIGSANDY | Unit: 1
Comp: MAINCONDENSER | Model: default
Outage: 09-2022 | Date: 09/19/2022

Cal

Cal Num: 2 | Disk: | Leg: INLET
Material: | ID: 0.750 | OD: 0.800

Operators

Operator ID: L8969 | Level: IT
Operator ID: K0383 | Level: IIA

Standards

Type: ASME | SN: CSC-025
Type: W/T | SN: CSC-527
Type: ASME | SN: CSC-025

Probe

Model: .730 ESH/MF | Vendor: CORESTAR
Ext Type: 4-PIN | Vendor: CORESTAR
Head Size: 730 | Head SN:
Shaft Length: 80 | Shaft SN:
Ext Length: 50 | Ref Head SN:
Slip SN: | Ref Shaft SN:

Tester Config

IDX	TYPE	CHAN	FREQ	SPAN	Y/X	ROT	COIL	CTX
1	DATA32	1	220 KHz	136		77°	1 DIF	1
2	DATA32	2	220 KHz	90		110°	2 ABS	1
3	DATA32	3	110 KHz	90		6°	1 DIF	2
4	DATA32	4	110 KHz	40		0°	2 ABS	2
5	DATA32	5	55 KHz	40		298°	1 DIF	3
6	DATA32	6	55 KHz	203		313°	2 ABS	3
7	DATA32	7	27.5 KHz	40		262°	1 DIF	4
8	DATA32	8	27.5 KHz	40		266°	2 ABS	4

Config: CUNI BIG SANDY
Auto Mode: Manual
Sample Rate: 1,500 | Num Char: 8 | Offset: 1,906
Acq Speed: 24.00 | RPC RPM: | Acq Dir: PULL

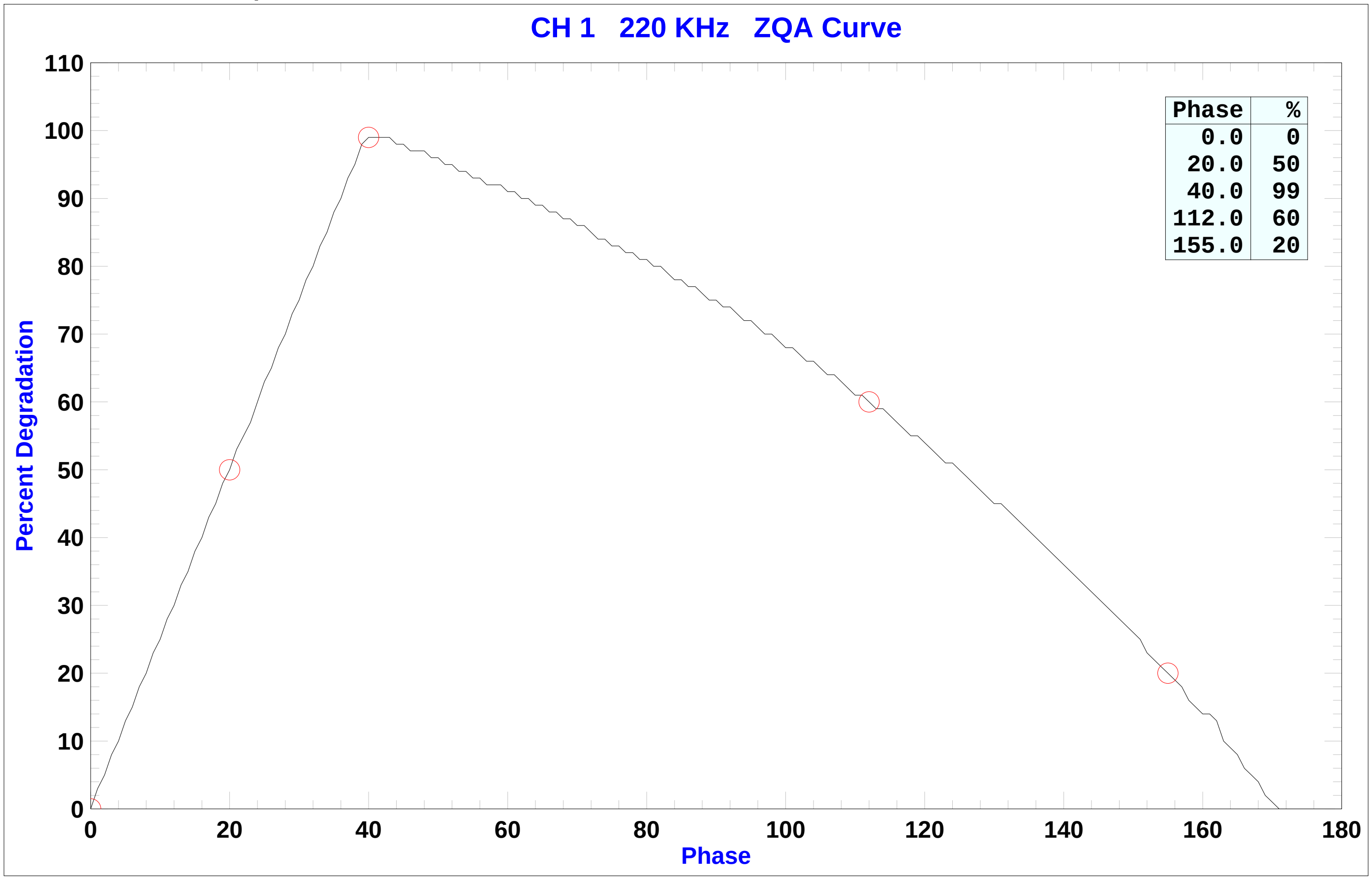
File

Source: CoreStar | Samples: 2,280
Procedure:
Software: CoreStar EddyVision 9.0

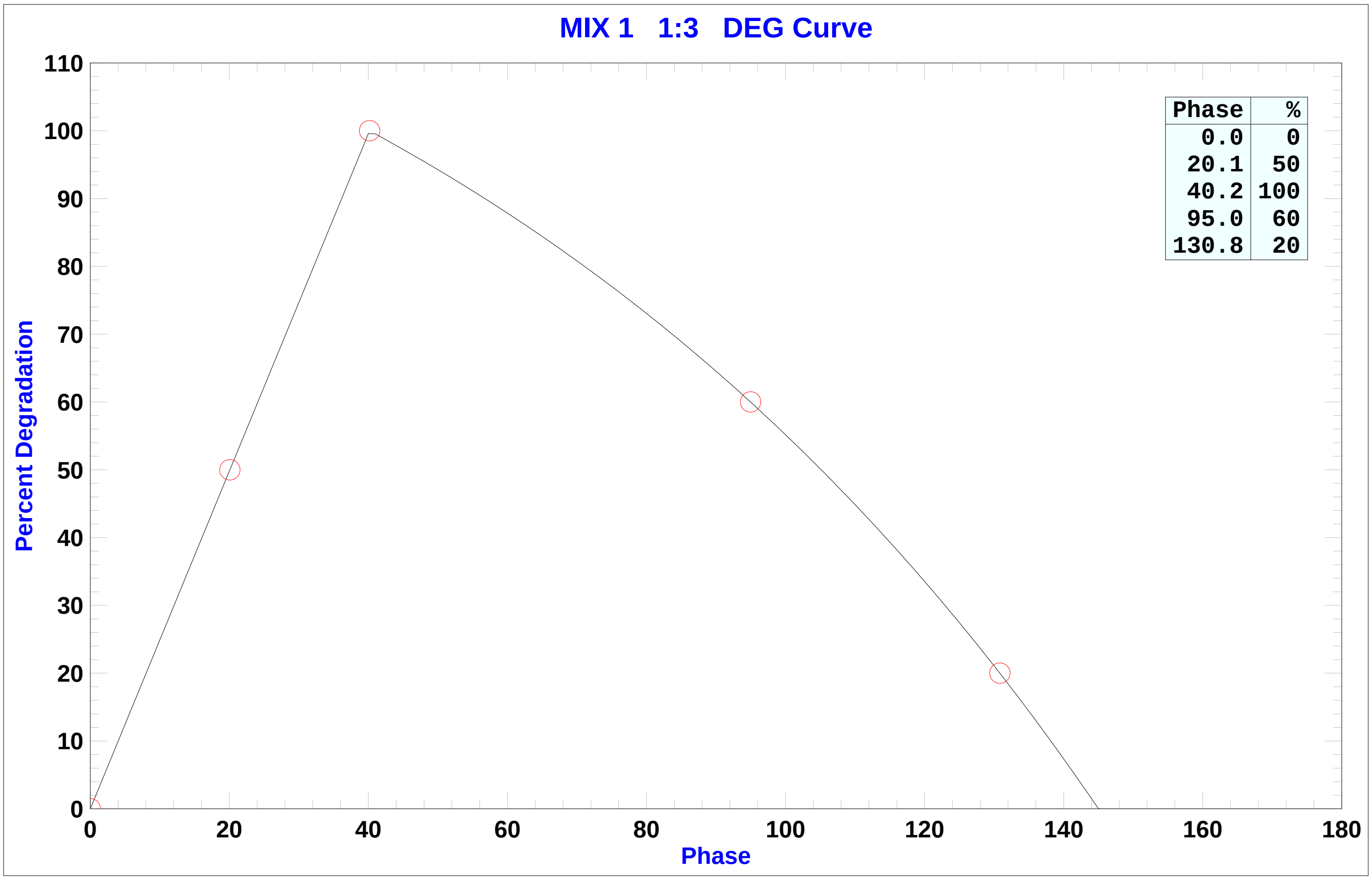
Equipment

Tester: OMNI-200 | SN: 0301-0611
Pusher: | SN:
Fixture: | SN:

Site: BIGSANDY Comp: MCEASTLOWER Cal: 1 Date: 09/27/2022 09:15:49



Phase	%	Phase	%	Phase	%	Phase	%	Phase	%	Phase	%
0.0	0	33.0	83	66.0	88	99.0	69	132.0	44	165.0	8
1.0	3	34.0	85	67.0	88	100.0	68	133.0	43	166.0	6
2.0	5	35.0	88	68.0	87	101.0	68	134.0	42	167.0	5
3.0	8	36.0	90	69.0	87	102.0	67	135.0	41	168.0	4
4.0	10	37.0	93	70.0	86	103.0	66	136.0	40	169.0	2
5.0	13	38.0	95	71.0	86	104.0	66	137.0	39	170.0	1
6.0	15	39.0	98	72.0	85	105.0	65	138.0	38	171.0	0
7.0	18	40.0	99	73.0	84	106.0	64	139.0	37	172.0	0
8.0	20	41.0	99	74.0	84	107.0	64	140.0	36	173.0	0
9.0	23	42.0	99	75.0	83	108.0	63	141.0	35	174.0	0
10.0	25	43.0	99	76.0	83	109.0	62	142.0	34	175.0	0
11.0	28	44.0	98	77.0	82	110.0	61	143.0	33	176.0	0
12.0	30	45.0	98	78.0	82	111.0	61	144.0	32	177.0	0
13.0	33	46.0	97	79.0	81	112.0	60	145.0	31	178.0	0
14.0	35	47.0	97	80.0	81	113.0	59	146.0	30	179.0	0
15.0	38	48.0	97	81.0	80	114.0	59	147.0	29		
16.0	40	49.0	96	82.0	80	115.0	58	148.0	28		
17.0	43	50.0	96	83.0	79	116.0	57	149.0	27		
18.0	45	51.0	95	84.0	78	117.0	56	150.0	26		
19.0	48	52.0	95	85.0	78	118.0	55	151.0	25		
20.0	50	53.0	94	86.0	77	119.0	55	152.0	23		
21.0	53	54.0	94	87.0	77	120.0	54	153.0	22		
22.0	55	55.0	93	88.0	76	121.0	53	154.0	21		
23.0	57	56.0	93	89.0	75	122.0	52	155.0	20		
24.0	60	57.0	92	90.0	75	123.0	51	156.0	19		
25.0	63	58.0	92	91.0	74	124.0	51	157.0	18		
26.0	65	59.0	92	92.0	74	125.0	50	158.0	16		
27.0	68	60.0	91	93.0	73	126.0	49	159.0	15		
28.0	70	61.0	91	94.0	72	127.0	48	160.0	14		
29.0	73	62.0	90	95.0	72	128.0	47	161.0	14		
30.0	75	63.0	90	96.0	71	129.0	46	162.0	13		
31.0	78	64.0	89	97.0	70	130.0	45	163.0	10		
32.0	80	65.0	89	98.0	70	131.0	45	164.0	9		



Phase	%	Phase	%	Phase	%	Phase	%	Phase	%	Phase	%
0.0	0	33.0	82	66.0	84	99.0	56	132.0	18	165.0	0
1.0	2	34.0	85	67.0	83	100.0	55	133.0	17	166.0	0
2.0	5	35.0	87	68.0	82	101.0	54	134.0	16	167.0	0
3.0	7	36.0	90	69.0	82	102.0	53	135.0	14	168.0	0
4.0	10	37.0	92	70.0	81	103.0	52	136.0	13	169.0	0
5.0	12	38.0	95	71.0	80	104.0	51	137.0	12	170.0	0
6.0	15	39.0	97	72.0	79	105.0	50	138.0	10	171.0	0
7.0	17	40.0	100	73.0	79	106.0	49	139.0	9	172.0	0
8.0	20	41.0	100	74.0	78	107.0	48	140.0	7	173.0	0
9.0	22	42.0	99	75.0	77	108.0	47	141.0	6	174.0	0
10.0	25	43.0	98	76.0	76	109.0	46	142.0	4	175.0	0
11.0	27	44.0	98	77.0	75	110.0	45	143.0	3	176.0	0
12.0	30	45.0	97	78.0	75	111.0	44	144.0	2	177.0	0
13.0	32	46.0	97	79.0	74	112.0	43	145.0	0	178.0	0
14.0	35	47.0	96	80.0	73	113.0	42	146.0	0	179.0	0
15.0	37	48.0	95	81.0	72	114.0	40	147.0	0		
16.0	40	49.0	95	82.0	71	115.0	39	148.0	0		
17.0	42	50.0	94	83.0	71	116.0	38	149.0	0		
18.0	45	51.0	94	84.0	70	117.0	37	150.0	0		
19.0	47	52.0	93	85.0	69	118.0	36	151.0	0		
20.0	50	53.0	92	86.0	68	119.0	35	152.0	0		
21.0	52	54.0	92	87.0	67	120.0	34	153.0	0		
22.0	55	55.0	91	88.0	66	121.0	32	154.0	0		
23.0	57	56.0	90	89.0	65	122.0	31	155.0	0		
24.0	60	57.0	90	90.0	65	123.0	30	156.0	0		
25.0	62	58.0	89	91.0	64	124.0	29	157.0	0		
26.0	65	59.0	89	92.0	63	125.0	27	158.0	0		
27.0	67	60.0	88	93.0	62	126.0	26	159.0	0		
28.0	70	61.0	87	94.0	61	127.0	25	160.0	0		
29.0	72	62.0	87	95.0	60	128.0	24	161.0	0		
30.0	75	63.0	86	96.0	59	129.0	22	162.0	0		
31.0	77	64.0	85	97.0	58	130.0	21	163.0	0		
32.0	80	65.0	84	98.0	57	131.0	20	164.0	0		

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Title: Data Acquisition & Analysis

	Name	Date	Initials
Written	Frank Jerina	June 15, 2010	On File
Revised	James Kocher	January 7, 2021	[signature]
Reviewed	James Halloran	January 8, 2021	[signature]
Approved	Regina Godish	Jan 8, 2021	[signature]
Approved	Edward Saxon	JAN 8, 2021	EJS
LIII Approval	Jeff Pomarico	1/8/2021	[signature]

1. Purpose/ Scope
This procedure establishes the techniques for performing multi-frequency eddy current (ET) examination of non-ferromagnetic heat exchanger tubing. This includes magnetic saturation techniques for mildly ferritic thin walled tubing. All personnel utilizing the procedure shall follow each manufacturer's instructions and operations of the applicable instrumentation used.

2. Attachments
2.1. Sample Examination Technique Specification Sheet (ETSS)

3. References
3.1. ASME Boiler and Pressure Vessel Code, Section XI (2007 edition, through 2009 addenda).

3.2. ASME Boiler and Pressure Vessel Code, Section V, Article 8 (2007 edition, through 2009 addenda).

3.3. CSC-QAP-9.1 – "Certification of NDE Personnel"

3.4. CSC-QAP-12.1 – "Control of M&TE"

3.5. CSC-NDE-3.4 – "Optimum Test Frequency Manual"

4. Definitions
4.1. ASME – American society of Mechanical Engineers.

4.2. Absolute Test (external-reference) – An eddy current test utilizing one inspection coil in the test material, which references against another single coil in a reference material.

4.3. Differential Test (self-comparison) – An eddy current test arrangement utilizing, two or more inspection coils electrically connected in series opposition, which compares a section of the test specimen against another section of the same test specimen.

4.4. ASME Calibration Standard – A specimen of the same material, size, wall thickness, and heat treatment, as the material being inspected. This standard may contain artificial discontinuities used for system set-up.

4.5. Reference Standard – A material of the same size, wall thickness, and heat treatment, as the material being inspected. This standard shall be free from defects and used for comparison purposes.

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4.6. Examination Technique Specification Sheet (ETSS) – Documentation completed by the Lead Analyst (or designee), that outlines the eddy current parameters for a particular inspection. The ETSS contains specific information regarding the test subject, frequency selection, setup parameters, proper probes and test equipment required to complete the inspection. The ETSS also outlines the analysis parameters such as voltage settings, reporting channels, curves (phase or magnitude), reporting thresholds and applicable codes for defects and other conditions encountered.

5. Responsibilities

5.1. Level IT personnel may operate equipment under the direct supervision of a Level II or Level III. Level IT personnel shall not evaluate or accept the results of a nondestructive examination.

5.2. Level I personnel shall use written procedures when performing specific setups, calibrations, and examinations and when recording data. The activities shall be conducted under the direct guidance of Level II or Level III personnel. Level I NDE personnel shall not evaluate or accept the results of a nondestructive examination.

5.3. Level II personnel shall be familiar with the operation of the equipment, applicable examination techniques, and recording or the examination data. Level II personnel shall be familiar with the codes, standards, and specifications of any inspection being performed.

5.4. Level IIA personnel shall be responsible for data interpretation or evaluation and give guidance to Level II personnel as needed. The Data Analyst has the right to request a retest on any tube with an unusual condition. The Lead Analyst may alter the original inspection technique or plans to address any special condition encountered. The Lead Analyst is responsible for the correct inspection probes, calibration standards, and any other information on the ETSS sheet.

5.5. Level III personnel shall hold the same responsibilities as Level IIA. The Level III, with approval of the customer, may alter the original inspection technique or plans to address any special condition encountered. The Level III is responsible for the correct inspection probes, calibration standards, and any other information on the ETSS sheet.

6. Procedure

6.1. Code and Procedure Requirements – All Eddy Current technicians shall be familiar with this procedure and examination program prior to the start of the examination.

6.2. Personnel Criteria – Personnel performing Eddy Current examinations shall be certified in accordance with the Quality Assurance Procedure CSC-QAP-9.1, “Certification of NDE Personnel” or their employers, written practice that has been approved by Conco Services Corporation.

6.3. Heat Exchangers under inspection must be shut down or isolated and the system drained. Manways shall be opened and sufficient time should be allowed for cool down prior to the start of the job.

6.4. All personnel engaging in eddy current at operating nuclear facilities shall receive instructions and understand radiation rules and guidelines in effect at the plant site.

6.5. Equipment

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6.5.1. Eddy current test instrument

6.5.1.1. The eddy current test instrument shall be capable of multi-frequency inspection in multiplexed mode, simultaneous injection mode and operation in the differential and/or absolute mode.

6.5.1.2. The eddy current test instrument shall be capable of recording and playing back data, real time, in a format suitable for evaluation and archival storage.

6.5.1.3. The test instrument outputs shall provide phase and amplitude information.

6.5.1.4. The eddy current inspection system shall be capable of detecting and recording dimensional changes, metallurgical changes, deposits and determine if discontinuities are ID or OD initiated.

6.5.1.5. Testing equipment shall hold current calibration in accordance with CSC-QAP-12.1 and the interval shall not exceed one year or whenever the equipment has been overhauled or repaired as a result of malfunction or damage.

6.5.2. The acceptable eddy current probes for an inspection shall be listed on the ETSS and may include bobbin coil, cross-wound and pancake coil designs from various manufacturers. The sensitivity for the differential bobbin probes technique shall be sufficient to produce a response from the 20% flat bottom holes with a minimum peak to peak response of 30% screen height of the Lissajous. A minimum fill factor of 80% should be used. For special interest regions (i.e. obstructions and restrictions), a lower fill factor may be used. If the minimum sensitivity requirements can not be met, the test will be considered a best effort examination. Customer approval shall be obtained prior to examination. Customer requirements for higher fill factor values will be followed and documented on the ETSS.

6.5.3. ASME Calibration Standards

6.5.3.1. The ASME calibration standard shall be manufactured in accordance with the specifications of the ASME Boiler and Pressure Vessel Code, Section V, Article 8. The standard shall contain the following artificial discontinuities at a minimum: 100% through wall hole, 60% through wall flat bottom hole, and four 20% through wall flat bottom holes spaced 90 degrees apart in a single plane around the tube circumference.

6.5.3.2. A simulated support ring should be used to simulate a support plate in the unit being inspected. If an “artificial” ring cannot be obtained, a support plate in the unit can be used for mixing/process channels.

6.5.3.3. Each standard shall be identified by a unique serial number and have an associated drawing or data sheet showing the actual flaw depths. The eddy current system response shall become part of the permanent record of the standard.

6.5.3.4. Other calibration standards may be used in addition to the ASME standard for unique applications.

6.5.4. Digital Data Analysis System

6.5.4.1. The eddy current data analysis system shall be capable of displaying and evaluating the recorded data from all frequency channels.

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6.5.4.2. The system shall have multi-parameter mixing capability.

6.5.4.3. The system shall have a minimum resolution of 12 bits per data point.

6.5.4.4. The Lissajous display shall have a minimum resolution of 7 bits full scale.

6.5.4.5. The strip chart display shall have a minimum resolution of 6 bits full scale.

6.5.4.6. The strip chart display shall be selectable to display either the X or Y component of the raw or processed (mixed) data.

6.5.4.7. In addition, the system shall meet the "General System Requirements", stated in ASME Boiler and Pressure Vessel Code, Section V, Article 8, II-830.5.1.

6.6. System Set-up

6.6.1. Preparation

6.6.1.1. Review all safety and radiological procedures with plant personnel as applicable (i.e. air sample, radiation surveys, confined space requirements, etc.)

6.6.1.2. Review all Foreign Material Exclusion (FME) procedures with plant personnel as necessary.

6.6.1.3. Examine work area for any potential hazards or interference and resolve any problems.

6.6.1.4. Establish location of the test station and placement of the test instrument.

6.6.1.5. Locate 110 VAC power source. (Clean power source)

6.6.1.6. Establish location of cable routing.

6.6.1.7. Acquire copies of the ETSS and all applicable procedures from the Lead Analyst (or designee). Verify the probes and standards listed on the ETSS are appropriate for the component or material to be examined.

6.6.1.8. Acquire copies of the inspection plan and tubesheet maps if available. Verify that the tubesheet map is correct for the component and the view or test end is correct.

6.6.2. Equipment Set-up

6.6.2.1. Connect and power-up eddy current system per owners manual

6.6.2.2. Attach probe extensions, of equal length, and probes to the test instrument

6.6.2.3. Establish communication for personnel engaging in the examination

6.6.2.4. Set configurations for channels and gain setting on test instrument.

6.6.2.5. Verify recording path

6.6.2.6. Set and verify pull speed (if a probe pusher is being used).

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6.6.3. Acquisition Set-Up (Configuration)

6.6.3.1. Test Parameters

6.6.3.1.1. Set the frequencies, drives, and gains in the configuration of the test instrument, per the ETSS. The primary frequency shall be set to obtain a response of the 4X20% FBH's to fall within 90º to 120º from the 100% thruwall hole set at 40º.

6.6.3.1.2. Set the proper sample rate, in the test instrument, per the ETSS. The sample rate should meet the minimum of 30 samples per inch of tubing per ASME Section V, Article 8.

6.6.3.1.3. With the proper settings, a signal-to-noise ratio of 3:1 or higher shall be obtained.

6.6.3.1.4. Assure the reference probe has been placed in the reference tubing or the component. Test systems with internal reference capabilities can be used in lieu of a reference probe.

6.6.3.1.5. Place the test probe in the end of the ASME Calibration standard assuring that none of the coils are influenced by the flaws in the standard and perform a hardware null.

6.6.3.1.6. Open a calibration group, with the proper recording path, to allow the calibration standard data to be recorded.

6.6.3.1.7. Turn on the acquire function of the tester and assure data is in the strip charts, on the left of the acquisition screen.

6.6.3.1.8. Assure both the reference, and test probes are in good metal and center the data in the Lissajous.

6.6.3.1.9. Push the test probe out of the end of the ASME Calibration standard.

6.6.3.1.10. Start recording the data and pull the probe back through the calibration. (If a probe pusher is being used for the inspection, it should be used to pull the calibration standards also. If this is the case, care should be taken to minimize snap of the probe as it is retracted through the calibration standard.)

6.6.3.1.11. Stop recording data and review the calibration standard to ensure compliance with the ETSS.

6.6.3.1.12. Set spans and rotations on all absolute and differential channels for the ASME standard, identified on the approved ETSS.

6.6.3.1.13. Store the set-up with the new values for the spans and rotations of the calibration standard.

6.6.3.1.14. Repeat steps from above, (6.6.3.1 – (6.6.3.1.6) through (6.6.3.1.9)) for all calibration standards being used for the inspection.

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Note: If Wear Scar and/or Thinning Standards are being used, check all channels to assure that none of the signals are saturated. If any signals are saturated, adjust the gains in the configuration screen, notify the Level IIA/III of changes needed to ETSS, and repeat the entire calibration process with the updated ETSS settings.

6.7. Examination

6.7.1. Summary Form

6.7.1.1. Select the "Summary Form" and complete all designated input areas. The summary form shall be written to the storage media and contain the following information as a minimum:

Owner
Plant site and unit number
Heat Exchanger identification and test end
Recording media identification (i.e. calibration group)
Date of examination
Serial number of the calibration standard(s)
Operator's identification and certification level
Examination frequencies
Lengths of probe and probe extension cables
Size and type of probes
Probe manufacturer's name and manufacturer's part number or probe description
Serial number of the eddy current test instrument
Calibration "Due Date", from the test instrument being used

6.7.2. Record Calibration Standards

6.7.2.1. Identify the ASME standard run as Row 999 Tube 999 or as stated on the ETSS. If other standards are utilized refer to the ETSS for identification.

6.7.2.2. Place the test probe in a defect-free portion of the standard and balance the tester.

6.7.2.3. Record a minimum of three standard runs in the direction and at the speed that the inspection will be performed.

6.7.2.4. Retrieve a standard run from the storage media to verify proper system operation.

6.7.2.5. Calibration standard runs shall be recorded for the following conditions:

6.7.2.5.1. At the beginning and end of a directory/cal group or when changing storage media

6.7.2.5.2. At the beginning and end of a work shift

6.7.2.5.3. When changing equipment, including probes and cables

6.7.2.5.4. When four hours time has elapsed since the last calibration verification

6.7.2.5.5. When a power failure or system lockup has occurred

6.7.2.5.6. At anytime the operator deems it necessary to check the system integrity

6.7.2.6. A written message to the data disk should precede or follow a calibration run stating

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the reason the calibration run is being performed.

6.7.2.7. If a system is found out of tolerance, recalibration is required. This should be noted by recording an updated summary and message to the recording media. In addition to this, if any part of the test system is changed, due to damage or any other issue, recalibration is required.

6.7.2.8. The analyst will determine if any or all tubes need to be retested.

6.7.2.9. The "End of Calibration" standard run shall be performed at the same pull speed used during the examination.

6.7.2.10. If a calibration run cannot be performed at the four-hour interval, a detailed message shall be recorded on the recording media stating the reason for the "missed" standard run and the site lead shall be notified. A calibration standard run shall then be performed at the first opportunity and prior to the continuation of the inspection.

6.7.3. Typical examination process

6.7.3.1. Identify and encode the tube identification using the appropriate identification/numbering scheme.

6.7.3.2. Insert the probe into the tube to be examined, check balance of the data and rebalance if required.

6.7.3.3. Insert the Probe to the intended examination extent.

6.7.3.4. Initiate data recording.

6.7.3.5. Withdraw the probe at the speed noted on the ETSS.

6.7.3.6. Monitor the data quality during the recording process. Ensure that acceptable data is being acquired in all channels.

6.7.3.7. Stop recording data when the examination is complete.

6.7.4. If the probe cannot traverse the entire length of the scheduled examination and the tube is considered restricted, record a message identifying the tube number or group of tubes. Include an explanation as to why the tubes(s) cannot be examined over the entire length (if known).

6.7.5. When an error in tube identification occurs, the operator shall clearly identify which tube entries are incorrect with a recorded message.

6.8. Data Analysis and Reporting

6.8.1. Evaluate the recorded digital data from the acquisition process.

6.8.2. Evaluate any indications. Indication types that must be reported shall be characterized using the frequencies or frequency mixes and analysis curves (Phase or Magnitude) appropriate for the damage mechanism as identified in the Examination Technique Specification Sheet (ETSS).

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6.8.3. Provide a preliminary report following the examination. Include in the report a record indicating the tube(s) examined, any scanning limitations, the location and depth (or descriptive code) of each reported flaw, and any specific reporting requirements identified by the customer.

6.8.4. Unless otherwise requested by the customer, only the deepest flaw in each tube will be identified.

6.8.5. Graphic printouts of typical and questionable defect types shall be added at the customer's request.

6.8.6. Report all obstructions restrictions, or conditions known to limit the desired extent of test for all tubes on the examination plan (e.g. dents, tube cleanliness, foreign material).

6.8.7. Report any addition conditions deemed necessary.

7. Records
   7.1. Records and documentation are handled in accordance to CSC-QAP-17.1.

   7.2. A copy of this procedure, personnel certifications and equipment certifications shall be submitted to the customer upon request.

   7.3. The examination results and technical information regarding test parameters and inspection requirements shall be included in the final report.

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Attachment 2.1 Sample ETSS

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Form No	1085
Title	Examination Technique Specification Sheet OMNI
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Utility/Site/Unit: **Sample ETSS**	ETSS Version: Date:
Component:	Component ID:
Examination Scope	
Applicability:	
Instrument	**Tubing**
Manufacturer/Model: CoreStar OMNI 200/100	Material Type:
	# Of Tubes:
	OD/Wall (inch):
Data Recording Equipment	Length:
Manuf./Media: Hard drive / Network or Equiv	**Calibration Standard(s)**
Software	Type/SN: ASME Type/SN: Wall Thinning Type/SN: Reference
Manufacturer: Corestar	**Analog Signal Path**
Version/Revision: 8.0	Probe Shaft /Length:
Examination Procedure	Extension Type & Length N/A
Number/Revision: CSC-NDE-11.0 Rev 3	Slip Ring Model Number: N/A

Scan Parameters			
Scan Direction: Pull			
Digitization Rate, Samples Per Inch (minimum): ≥ 30 SPI	Axial Direction: Pull	N/A	Circ. Direction: N/A

Probe Speed	Sample Rate	RPM Set	RPM Min	RPM Max
46 inches / second	2000 (Max.)	N/A	N/A	N/A
30 inches / second	1200 (Min.)	N/A	N/A	N/A

Probe/Motor Unit

Description (Model/Diameter/Frequency/Coil Dimensions)	Manufacturer	Length

Data Acquisition

Calibration Coil 1 Channels

Channel & Frequency	Channel #1 kHz	Channel #3 kHz	Channel #5 kHz	Channel #7 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions	4 x 20% FBH's @ 3 divisions
Drive Voltage	75%	75%	75%	75%
Gain Setting	14	14	14	14

Calibration Coil 2 Channels

Channel & Frequency	Channel #2 kHz	Channel #4 kHz	Channel #6 kHz	Channel #8 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions	4 x 20% FBH's @ 1.5 divisions
Drive Voltage	75%	75%	75%	75%
Gain setting	8	8	8	8

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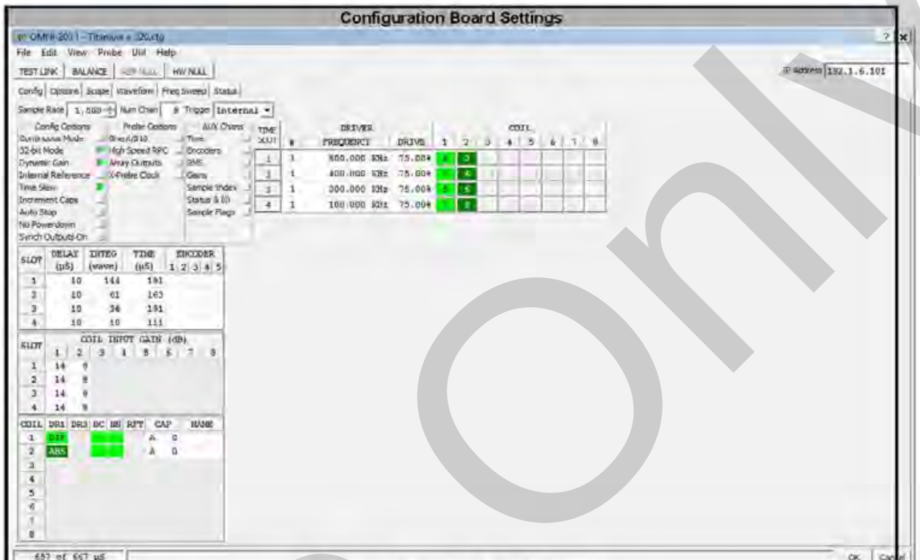
Configuration Board Settings



Special Instructions for Data Acquisition

1. Probes should be pulled @ 40 inches/second or less.
2. Review each data channel and ensure that adequate/expected signal responses are achieved before recording the calibration. Do not record data until the proper spans and rotations have been set.
3. Monitor the data by setting the left strip chart to channel 1 vertical, right strip chart to channel 6 vertical and the lissajous display set to channel 1 as a minimum. The operator will determine the specific strip chart settings and lissajous display to verify the system is functioning properly and that data quality is acceptable.
4. Follow the Conco NDE procedure CSC-NDE-11.0 Rev 3.
5. Encode the tube ID's as per map for respective sections.
6. The initial exam attempt shall be performed with the XXX ESH/HF probe.
7. Tubes that will not allow the probe to enter report as "Obstructed".
8. Tubes that are unable to examine the desired extent report as "Restricted".
9. Write a message for all tubes that are unable to be examined full length explaining the reason.
10. Encode the ASME Std. as "999", Thinning Std as "999" with a message.
11. Perform "System Null" only if "Display Null" is ineffective in balancing the signal.

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Data Analysis				
Calibration Differential Channels				
Channel & Frequency	Channel #1 kHz	Channel #3 kHz	Channel #5 kHz	Channel #7 kHz
Phase Rotation	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3	100% TWH 40 degrees ± 3
Span Setting Minimum	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions	100% TWH @ 4 divisions
Calibration Absolute Channels				
Channel & Frequency	Channel #2 kHz	Channel #4 kHz	Channel #6 kHz	Channel #8 kHz
Phase Rotation	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up	Probe Motion Horiz. Flaws Up
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions
Calibration Process and Other Channels				
Channel & Frequency	M-1 / Diff	M-2 / Abs	P-3 / Diff	P-4 / Diff.
Phase Rotation	100% TWH 40 degrees ± 3	Probe Motion Horiz. Flaws Up		
Span Setting Minimum	100% TWH @ 1.5 divisions	100% TWH @ 1.5 divisions		
Suppress On	Support Ring	Support Ring		

Voltage Normalization				Calibration Curves		
CH	Signal	Set	Normalize	Type	CH	Set Points
1	4x20% FBH	4 Vp-p	Save/Store to all	Phase Curve	1, 3, 5, M1	100,60,20%
1	4x20% FBH	4 Vp-p	Save/Store to all	Magnitude Curve	6,M2	75, 50,25%

Data Screening				
Left Strip Chart	Center Strip Chart	Right Strip Chart	Left Lissajous	Right Lissajous
Channel P1 Vertical	Channel 1 Vertical	Channel 6 Vertical	Channel 1	Channel 3

Special Instructions for Analysis

1. Calibration curves shall be constructed using the "As-Built" dimensions from the calibration standard drawings.
2. Normalize to 4 volts on the 4 X 20% flat bottom holes using channel #1 differential and store to all channels.
3. All Quantifiable indications of tube wall degradation ≥ 20% TW and 1 Volt shall be reported (however, not to exceed 6 reportable ID defects)
4. Locate all defect indications in inches measured from the test end.
5. Previously reported indications shall be addressed by the primary analyst. Report previously reported Inds. In same channel as history. Report previous indications that are not found as "INF" and indications not recordable as "INR".
6. If test data appears to be un-interpretable shall be report as "RBD".

Job Lead Approval	Customer Approval (if required)
Signature /Date	Signature /Date

Additional Component Information

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Examination Technique Specification Sheet

Reporting Requirements

Code	Description	Meas.	%	Volts	Ch	Loc	Ext.
ADR	Absolute Drift	Y	N	Any	6	Y	Y
CRK	Crack-Like Indication	Y	N	Any	5, 6	Y	Y
DNT	Dent	Y	N	20 >	1, M1	Y	Y
DTS	Distorted Support Indication	Y	N	Any	M1	Y	Y
ERI	Erosion With Indication	Y	20% >	Any	6	Y	Y
ERO	Erosion	Y	20% >	Any	6	Y	Y
GEN	General Pitting / Wall Loss	N	N	N	N	N	Y
IDC	ID Chatter	Y	N	20 >	1	Y	Y
IDI	ID Indication	Y	20% >	Any	1, M1	Y	Y
INA	Inaccessible	N	N	N	N	N	N
INF	Indication Not Found	N	N	N	N	Y	Y
INR	Indication Not Recordable	N	N	N	N	Y	Y
NDD	No Degradation Detected	N	N	N	N	N	Y
NQI	Non Quantifiable Indication	Y	N	Any	1, M1	Y	Y
OBS	Obstructed	N	N	N	N	N	N
ODI	OD Indication	Y	20% >	Any	1, M1	Y	Y
PID	Positive Identification	Y	N	Y	Y	Y	Y
PLG	Plug	N	N	N	N	N	N
PVN	Permeability Variation	Y	N	20 >	1, M1	Y	Y
RAD	Retest Analyst Discretion	N	N	N	N	N	N
RBD	Retest Bad Data	N	N	N	N	N	N
RES	Restricted	N	N	N	N	Y	Y
RIC	Retest Incomplete	N	N	N	N	N	N
STC	Stuck Cleaner	N	N	N	N	N	N
WAR	Wear	Y	20% >	Any	6, M2	Y	Y

Refer to the Data Management Code list in the report for landmark abbreviations.

Conco Services LLC

530 Jones Street
Verona, PA 15147 U.S.A.
Tel: 1-800-345-3476
Fax: 412-826-8255
www.conco.net

4.0 CERTIFICATIONS

The following personnel were involved with this inspection:

James Halloran	ET IIIA	Conco Services
Tim Kearns	ECT IIA	Conco Services
Edgar Ledee	PH	Conco Services

The following testers were used on this inspection:

Corestar OMNI 200 S/N	0301-0611

The following calibration standards were used on this inspection:

ASME	CSC-025
Wall Thinning	CSC-637
ASME	CSC-526
Wall Thinning	CSC-527

Note: see following pages for a copy of all certifications and standard drawings

CONCO ESTABLISHED 1923

NDE CERTIFICATION

Name: Halloran, James SSN: XXX-XX-9274 Method / Level: ET-IIIA

EDUCATION & TRAINING

Date(s)	School / Facility	Location	Subject	Term	Certification
9-5-96	PIA	Pittsburgh, PA	N/A	N/A	Diploma
9-18-06	Conco Services Corp.	Verona, PA	ET-I	40 Hours	Attn. Record
6-21-07	Conco Services Corp.	Verona, PA	ET-II	40 Hours	Attn. Record
12-10-07	Zetec	Verona, PA	ET-IIA	80 Hours	Attn. Record
7-2-10	JECNDT, LLC	Verona, PA	ET-IIIA	80 Hours	Certificate
7-7-14	JECNDT, LLC	Verona, PA	ET-IIIA	80 Hours	Attn. Record
6-10-19	Conco Services Corp.	Verona, PA	ET-III	40 Hours	Attn. Record

NDE EXPERIENCE

Date(s)	Company	NDE Method / Highest Level
12/2006	Conco Services Corp.	ET-I
9/2007	Conco Services Corp.	ET-II
12/2007	Conco Services Corp.	ET-IIA
2/2011	Conco Services Corp.	ET-IIIA

EXAMINATION GRADES

General: N/A	Date:	Basic: Waived	Date:	Specific: 96.6%	Date: 6-11-19
Method: 91.6	Date: 6-11-19	Practical 94.4%	Date: 6-13-19	LIII Practical: S	Date: 6-14-19
Demonstration 100%	Date: 6-12-19	ASNT: N/A	Date:	ASNT No.	
Composite Grade: 92.5%					

LIMITATIONS / REMARKS:
Demonstration/Practical exam is the L-II acquisition practical and L-IIIA analysis practical for field inspections.
J. Halloran is a qualified NDE Instructor and a qualified Receipt Inspector
S = Satisfactory 80%

This certifies that above named individual has satisfactorily completed the physical and technical qualifications required by the current Conco Procedure CSC-QAP-9.1 Rev.13, Certification of NDE Personnel.

CERTIFICATION DATE: 6-14-2019 EXPIRATION DATE: 6-11-2024

Certified By: [signature] Title: ET Level III-A

Printed Name: James A. Kocher

☐ Initial Certification X Re-Certification

Form No	1049
Title	NDE Certification
Revision:	4
Date:	8/11/2015
	Page 1 of 1

EDUCATION & TRAINING

Date(s)	School / Facility	Location	Subject	Term	Certification
5-25-95	Terrell High School	Terrell, TX	N/A	N/A	Transcript
8-6-12	Conco Services Corp.	Verona, PA	ECT-I	40 Hours	Attn. Record
1-5-15	Conco Services Corp.	Verona, PA	ECT-II	40 Hours	Attn. Record
12-6-17	Conco Services Corp.	Verona, PA	ECT-II	24 Hours	Attn. Record
6-30-20	Conco Services LLC	Verona, PA	ECT-II	24 Hours	Attn. Record
7-11-22	Conco Services LLC	Verona, PA	ECT-IIA	80 Hours	Attn. Record

NDE EXPERIENCE

Date(s)	Company	NDE Method / Highest Level
8-10-12	Conco Services Corp.	ECT-IT
8-6-13	Conco Services Corp.	ECT-I
1-9-15	Conco Services Corp.	ECT-II
7-25-22	Conco Services LLC	ECT-IIA

EXAMINATION GRADES

General: 98%	Date: 7-13-22	Basic: N/A	Date:	Specific: 92%	Date: 7-15-22
Method: N/A	Date:	Practical 86%	Date: 7-15-22	LIII Practical:N/A	Date:
Demonstration: 93.7	Date: 7-13-22	ASNT: N/A	Date:	ASNT No.	
Composite Grade: 92.4%					

LIMITATIONS / REMARKS:
Tim Kearns is a qualified receipt inspector.
The demonstration exam is the level II acquisition practical required for data collection in the field.

This certifies that the above-named individual has satisfactorily completed the physical and technical qualifications required by the current Conco Procedure CSC-QAP-9.1 Rev.13, Certification of NDE Personnel.

CERTIFICATION DATE: 07-25-2022 EXPIRATION DATE: 07-13-2025

Certified By: [signature] Title: ET Level III-A

Printed Name: James A. Kocher

X Initial Certification ☐ Re-Certification

Form No	1049
Title	NDE Certification
Revision:	4
Date:	8/11/2015
	Page 1 of 1

CORESTAR INTERNATIONAL CORPORATION
EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT **LAB TEMP: 73.4 °F**

Certificate Number:	CB-210264	**Instrument S/N:**	**0301-0611**
Instrument:	OMNI-200™ AM201R1-10	**Calibration Date:**	**01-Nov-2021**
Customer:	**Conco**	**Calibration Due:**	31-Oct-2022
Instruction Number:	CIC-HI002, Rev 5	**Calibration Interval:**	1 Year

VOLTAGE SPECIFICATION

Instrument:	Agilent Model 34401A Digital Multimeter	**Instrument S/N:**	US36141491
		Calibration Date:	**05-Feb-2021**
Calibration Interval:	1 year	**Calibration Due:**	05-Feb-2022

Voltage (Vdc)	Measured Value (Vdc)	Tolerance
+3.3	**+3.319**	+/- 0.100
+15.0	**+15.006**	+/- 0.200
-15.0	**-15.019**	+/- 0.200

FREQUENCY SPECIFICATION

Instrument:	Agilent Model 53131A Universal Counter	**Instrument S/N:**	MY40003653
		Calibration Date:	**05-Feb-2021**
Calibration Interval:	1 year	**Calibration Due:**	05-Feb-2022

Frequency (Hz)	Measured Value (Hz)	Tolerance
100	**100**	+/- 5
2,000	**2,000**	+/- 100
30,000	**30,000**	+/- 1,500
400,000	**400,001**	+/- 20,000
2,000,000	**2,000,005**	+/- 100,000

COIL GAIN CALIBRATION SPECIFICATION

Calibration Frequencies: 5 kHz to 1 MHz **Calibration Module SN:** 0269-0307
Test Parameters: See instructions

NOTE: The complete table of measured values for each frequency, gain setting, and coil number is permanently stored in the instrument hardware. To view and print the report, go to the Calibration menu in the Tester Config screen.

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	Pass	Fail
-22 db	0.088	.087 ±.002 V/V	X	
-16 db	0.173	.173 ±.005 V/V	X	
-10 db	0.338	.337 ±.010 V/V	X	
-4 db	0.666	.664 ±.019 V/V	X	

CORESTAR INTERNATIONAL CORPORATION
EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT

Certificate Number:	CB-210264	**Instrument S/N:**	**0301-0611**

COIL GAIN CALIBRATION SPECIFICATION (continued)

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	Pass	Fail
2 db	1.315	1.312 ±.039 V/V	X	
8 db	2.654	2.652 ±.079 V/V	X	
14 db	5.140	5.141 ±.154 V/V	X	
20 db	10.000	10.000 V/V Reference	n/a	n/a

COIL FUNCTIONAL CHECK

Test Frequency: 400 kHz **Probe SN:** 0045-0806
Test Parameters: See instructions **Standard SN:** AS-034-03

Coil	TSP Volt	Measured	Tolerance	TSP Phase	Measured	Tolerance
1	4.58 V	4.88	± .45 V	21°	20	± 2.0°
2	4.58 V	4.88	± .45 V	21°	20	± 2.0°
3	4.58 V	4.87	± .45 V	21°	21	± 2.0°
4	4.58 V	4.86	± .45 V	21°	21	± 2.0°
5	4.80 V	5.03	± .48 V	23°	23	± 2.0°
6	4.80 V	5.10	± .48 V	23°	24	± 2.0°
7	4.80 V	5.10	± .48 V	23°	24	± 2.0°
8	4.80 V	5.06	± .48 V	23°	23	± 2.0°

QA RELEASE

All measurement ratios between the standards referenced on this certificate and the M&TE calibrated are greater than or equal to 4:1. _X_ Yes ____ No

All of the equipment used in the calibration of this instrument is traceable to NIST. _X_ Yes ____ No

All test requirements have been met and the checklist is complete. _X_ Yes ____ No

Technician Signature: David Thomas David Thomas Date: 11-1-2021

QA Signature: Rebecca Casario Rebecca Casario Date: 11-1-2021

CORESTAR INTERNATIONAL CORPORATION
AS FOUND EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT

LAB TEMP: 71.6 °F

Certificate Number:	CB-210263	**Instrument S/N:**	**0301-0611**
Instrument:	OMNI-200™ AM201R1-10	**Date:**	**01-Nov-2021**
Customer:	**Conco**		
Instruction Number:	CIC-HI002, Rev. 5		

VOLTAGE SPECIFICATION

Instrument:	Agilent Model 34401A Digital Multimeter	**Instrument S/N:**	US36141491
		Calibration Date:	**05-Feb-2021**
Calibration Interval:	1 year	**Calibration Due:**	05-Feb-2022

Voltage (Vdc)	Measured Value (Vdc)	Tolerance (Vdc)	As Found (Vdc)
+3.3	**+3.334**	+/- 0.100	**+3.319**
+15.0	**+15.010**	+/- 0.200	**+15.006**
-15.0	**-15.020**	+/- 0.200	**-15.019**

FREQUENCY SPECIFICATION

Instrument:	Agilent Model 53131A Universal Counter	**Instrument S/N:**	MY40003653
		Calibration Date:	**05-Feb-2021**
Calibration Interval:	1 year	**Calibration Due:**	05-Feb-2022

Frequency (Hz)	Measured Value (Hz)	Tolerance (Hz)	As Found (Hz)
100	**100**	+/- 5	**100**
2,000	**2,000**	+/- 100	**2,000**
30,000	**30,000**	+/- 1,500	**30,000**
400,000	**400,001**	+/- 20,000	**400,001**
2,000,000	**2,000,006**	+/- 100,000	**2,000,005**

COIL GAIN CALIBRATION SPECIFICATION

Calibration Frequencies:	5 kHz to 1 MHz	**Calibration Module SN:**	0269-0307
Test Parameters:	See instructions		

NOTE: The complete table of measured values for each frequency, gain setting, and coil number is permanently stored in the instrument hardware. To view and print the report, go to the Calibration menu in the Tester Config screen.

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	As Found (Volt/Volt)
-22 db	0.088	.087 ±.002 V/V	0.088
-16 db	0.173	.173 ±.005 V/V	0.173
-10 db	0.338	.337 ±.010 V/V	0.338
-4 db	0.666	.664 ±.019 V/V	0.666

CORESTAR INTERNATIONAL CORPORATION
AS FOUND EQUIPMENT CALIBRATION CERTIFICATE

INSTRUMENT

Certificate Number: CB-210263	**Instrument S/N: 0301-0611**

COIL GAIN CALIBRATION SPECIFICATION (continued)

Gain Step (decibels)	Average Value (Volt/Volt)	Tolerance	As Found (Volt/Volt)
2 db	1.315	1.312 ±.039 V/V	1.315
8 db	2.654	2.652 ±.079 V/V	2.654
14 db	5.140	5.141 ±.154 V/V	5.140
20 db	10.000	10.000 V/V Reference	10.000

COIL FUNCTIONAL CHECK

Test Frequency: 400 kHz
Test Parameters: See instructions
Probe SN: 0045-0806
Standard SN: AS-034-03

Coil	TSP Volt	Measured	As Found	Tolerance	TSP Phase	Measured	As Found	Tolerance
1	4.58 V	4.84	4.88	± .45 V	21°	21	20	± 2.0°
2	4.58 V	4.84	4.88	± .45 V	21°	21	20	± 2.0°
3	4.58 V	4.85	4.87	± .45 V	21°	21	21	± 2.0°
4	4.58 V	4.84	4.86	± .45 V	21°	20	21	± 2.0°
5	4.80 V	5.01	5.03	± .48 V	23°	22	23	± 2.0°
6	4.80 V	5.07	5.10	± .48 V	23°	22	24	± 2.0°
7	4.80 V	5.07	5.10	± .48 V	23°	22	24	± 2.0°
8	4.80 V	5.04	5.06	± .48 V	23°	22	23	± 2.0°

All measurement ratios between the standards referenced on this certificate and the M&TE calibrated are greater than or equal to 4:1. __X__ Yes ____ No

All of the equipment used in the calibration of this instrument is traceable to NIST. __X__ Yes ____ No

All test requirements have been met and the checklist is complete. __X__ Yes ____ No

Technician Signature: Ronald Thomas Ronald Thomas Date: 11-1-2021

QA Signature: Rebecca Casario Rebecca Casario Date: 11-1-2021

CSC- 025

ZETEC INC

1370 N.W. Mall, P.O. Box 140, Issaquah, WA 98027-0140 (206) 392-5316 Telex 15 2592 Telecopy (206) 392-2086

TEST CERTIFICATE

DATE: SEPTEMBER 5, 1990

MATERIAL: 70-30 COPPER NICKEL ALLOY 715 BARE TUBING ASTM ASME B-111

HEAT NO.	DESCRIPTION
LC9552	7/8"OD X .049"WT

CHEMICAL ANALYSIS

C	SI	MN	P	S	NI	CR	MO	AL	ZN
		.47	.006	.017	29.6				.48
PB	**B**	**CA**	**CD**	**CO**	**CU**	**FE**	**NB**	**TI**	**OTHER**
.003					68.8	.58			

TENSILE PROPERTIES

Yield Strength PSI	Ultimate Strength PSI	% Elongation	Rb Hardness
29,900	69,400		

MECHANICAL TESTS

Hardness	Flattening	Hydrostatic	Surface	Flaring	SPEC
					ASTM/ASME B-111

We certify that the above data is as furnished by the producing mill or supplier.

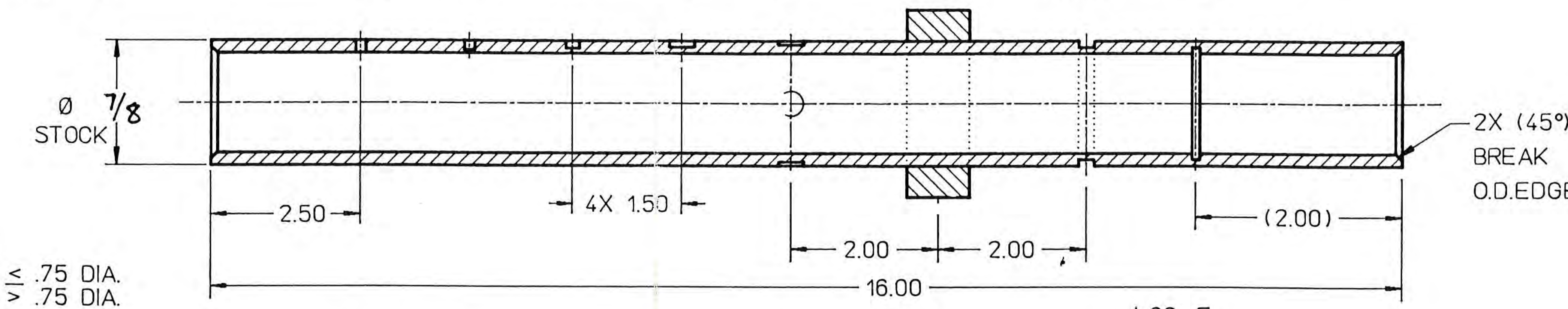
ZETEC, INC.

S. H. von Tuchen DATE: SEP 1 3 1990

REVISIONS

LTR	DATE	DESCRIPTION	APVD	CK	DR
(H)	8/16/90	REDRAWN ADDED TOL.,CHANGED TOL.BLOCK	KRW	[illegible]	KZ

LOCATION	A	B	C	D	E	F	G	H
PHYSICALLY MEAS. DEPTH IN INCHES (DIM."Y")	THRU	.0405	.0310	.0200	.0105		.0045	.0105
DEPTH (DIM."Y")AS A % OF WALL	100%	79%	61%	39%	21%		9%	21%
ET PHASE ANGLE MEAS.	40°	74	101°	120°	153°		148°	9°
DIA OF DEFECT ±.003 (H)	[1]	5/64	7/64	3/16	3/16		O.D. GROOVE 1/8 ±.010 WIDE	I.D. GROOVE 1/16 ±.010 WIDE (H)

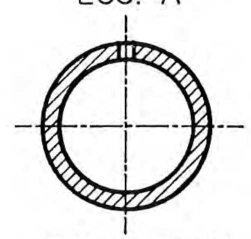


NOTES:

[1] Ø.052 IN STD. ≤ .75 DIA.
Ø.067 IN STD. > .75 DIA.

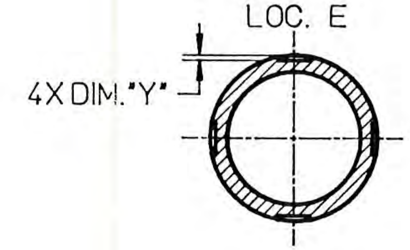
MATERIAL 70-30 COPPER NICKEL
AVERAGE MEAS. WALL THK. .051
NOMINAL WALL THK. .049
HEAT LOT NO. REF # LC9552
TEST FREQ. USED 150 KHz
SERIAL NO. Z-9664
P.O. NO. 091991-RAB-B
REL. NO. NA
QUALITY REL. NO. NA
DATE MFG. 9.23.91
Q.A. INSPECTION [signature]
CUSTOMER CONCO SYSTEMS
RECORDED 34
PROBE USED A750LC #53742
REVIEWED BY [signature]

LOC. A



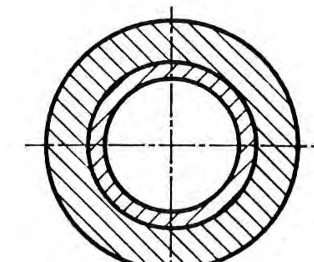
SHOWS 100% DEFECT

LOC. E



SHOWS 4 20% DEFECTS (90°) APART

LOC. F



SHOWS SIMULATED TUBE SUPPORT RING

NOTE: (H)

CSC-025

UNL. OTHERWISE SPECIFIED DIM. ARE IN INCHES TOLERANCES	DRAWN R.MAYER	DATE 12/9/82	ZETEC INC P.O. BOX 140 ISSAQUAH,WASHINGTON 98027 U.S.A. TELEPHONE 206 392-5316
DECIMAL FRACT.+/- 1/16 .XXXX ±.003 .XXX ±.015 .XX ±.050 % ±.003	CHECK T.O DELL	12/9/82	TITLE ASME CALIBRATION STD. WITH SUPPORT RING
	DESIGN		DWG NO 2-4013
ANGULAR+/- 3°	APVD. QA A.LUCERO	12/9/82	
FINISH			SCALE NONE | REL.DATE 12/9/82 | SHT 2

MACHINIST INTL.
QUALITY CONTROL INTL. Daniel Maner

REV. 03 - DATE: 07/19/2013
TRAVEL DOCUMENT
DOCUMENT NUMBER: DOC-001

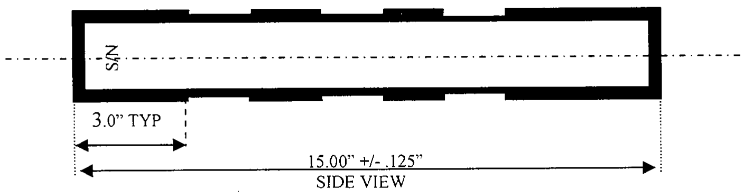
ECUTEC

CALIBRATION STANDARD CERTIFICATION CSC-6

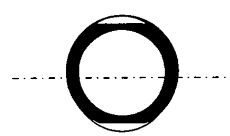
PERMISSIBLE TOLERANCES OF WALL THICKNESS ACCORDING TO ASTM STANDARDS CAN BE UP TO 25% OR MORE DEPENDING ON TYPE OF MATERIAL

37

SPECIFIED DEPTH	20%	50%	75%							
LOCATION	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
ACTUAL DEPTH	**.0103"**	**.0263"**	**.0388"**							
% OF WALL LOSS	**19.8%**	**50.6%**	**74.6%**							
FLAW WIDTH/DIA. +/- .005"	1.00"	1.00"	1.00"							



LOCATIONS A, B & C SHOW OD FLATS X 1.00" LONG AT 0 DEGREES AND 180 DEGREES.



MATERIAL	70/30 COPPER NICKEL
O D CONFIGURATION	PRIME
I D CONFIGURATION	PRIME
O D DIAMETER	.875"
MANUFACTURER'S STATED WALL	.049"
*ACTUAL MEASURED WALL	.052"
F P I	N/A
MEASUREMENT	INCH
DATE MACHINED	9/3/19
Q A APPROVAL	DCM

NOTE: MEASUREMENT GIVEN FOR O D FLATS IS AN AVERAGE TAKEN FROM BOTH SIDES.
*NOTE: ACTUAL MEASURED WALL IS AN AVERAGE TAKEN FROM 4 MEASUREMENTS 90 DEGREES APART AROUND THE TUBE CIRCUMFERENCE.

UNLESS OTHERWISE SPECIFIED
DIM. ARE AS FOLLOWS:

DECIMAL	FRACT. +/- 1/16
XXXX	+/- .003
XXX	+/- .015
XX	+/- .05
ANGULAR	+/- 5 DEGREES

DEFECT DEPTHS ARE +/- .003 OR 20% WHICH EVER IS LESS

SCALE:
NONE
DRAWN BY:

T MCNABB

ECUTEC INC.
2 SIDED OD FLATS

DRAWN FOR:
CONCO
PO: 006037
S/N EU029965
ALL MEASURING DEVICES ARE NIST CERTIFIED

CSC-526

MACHINIST INTL.

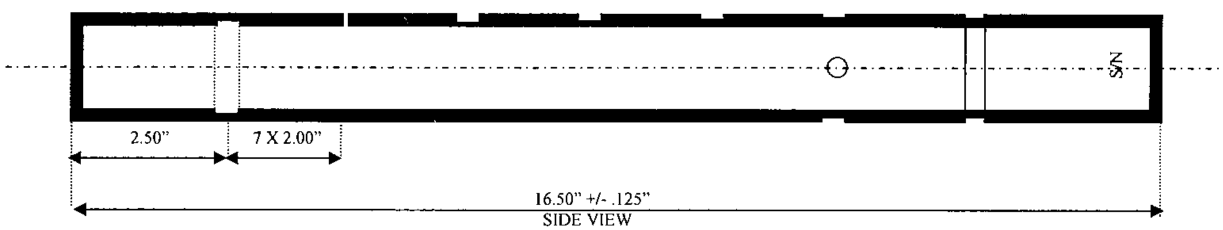
QUALITY CONTROL INTL.

REV. 02
DATE: 09/02/11
CONTROL NUMBER
TRAVELER DOC-001

ECUTEC

CALIBRATION STANDARD CERTIFICATION

SPECIFIED DEPTH	20%	100%	80%	60%	40%	20%	10%			
LOCATION	A	B	C	D	E	F	G	H	I	J
ACTUAL DEPTH	.010"	THRU	.0415"	.030"	.0205"	.010"	.005"			
% OF WALL LOSS	20%	100%	81.4%	58.8%	40%	20%	10%			
DIA OF DEFECT +/- .005	.062"	see note	.078"	.109"	.187"	.187"	.125"			



MATERIAL	90/10 CUNI
O D CONFIGURATION	PRIME
I D CONFIGURATION	PRIME
O D DIAMETER	.875"
NOMINAL WALL	.051"
F P I	N/A
MEASURMENT	INCH
DATE MACHINED	11/18/11
Q A APPROVAL	T MC

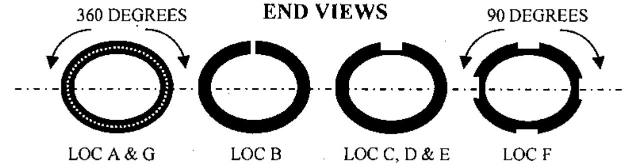
NOTE: HOLE DIAMETER AT LOCATION B IS .052" IN TUBES .750" IN DIAMETER AND LESS, .067" IN TUBES ABOVE .750" IN DIAMETER.

NOTE: DUE TO TUBE GEOMETRY 360 DEGREE O D & I D GROOVES MAY BE LESS THAN 360 DEGREES ON SHALLOW DEPTHS AND ARE AS MACHINED

NOTE: MEASURMENT GIVEN FOR 4 FLAT BOTTOM HOLES 90 DEGREES APART IS AN AVERAGE TAKEN FROM ALL 4 MEASURMENTS

LOCATION A SHOWS AN I D GROOVE X 360 DEGREES
LOCATION B SHOWS A THRU WALL HOLE
LOCATIONS C, D, & E SHOW O D FLAT BOTTOM HOLES
LOCATION F SHOWS 4 OD FLAT BOTTOM HOLES 90 DEGREES APART
LOCATION G SHOWS AN O D GROOVE X 360 DEGREES

END VIEWS



UNLESS OTHERWISE SPECIFIED
DIM. ARE AS FOLLOWES:

DECIMAL	FRACT. +/- 1/16
XXXX	+/- .003
XXX	+/- .015
XX	+/- .05
ANGULAR	+/- 5 DEGREES

DEFECT DEPTHS ARE +/- .003 OR 20% WHICH EVER IS LESS

SCALE:
NONE
DRAWN BY:
T MCNABB

ECUTEC INC.
ASME CODE CAL. STD.

DRAWN FOR:

S/N EU013512
ALL MEASURING DEVICES ARE NIST CERTIFIED

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TROJAN TUBE COMPANY, INC.

SEAMLESS BRASS
COPPER AND CUPRO-NICKEL

P.O. BOX 496
FARMINGDALE, N.J. 07727
TEL: (908) 938-5687
FAX: (908) 938-2363

TEST REPORT

Customer: Hillman Brass & Copper Inc.
P.O. Box 'R'
Willow Grove, PA 19090

Customer Order No. 1-14526
Our Order No. DB-26921
File No. M1073/26921

Material: 90/10 Cupro-Nickel Seamless Condenser Tube - Annealed

Size: 7/8" O.D. x .049 (Min) Wall x 20' Long

Shipped: 9/3/99 Pieces: 45 Lbs. 469

Specification: ASME SB-111 Alloy: C70600 No. of Lots Tested: 1

CHEMICAL ANALYSIS: (% Composition)

Copper	Remainder
Aluminum	-
Tin	-
Nickel	10.0
Lead	.009
Iron	1.50
Zinc	.101
Manganese	.320
Arsenic	-
Phosphorus	.000
Sulphur	.009
Carbon	.002

H. M. HILLMAN BRASS & COPPER, INC.
ECUTEC INC
P.O. NO. VERBAL/MAC
ITEM NO. 2
P/N
QTY. 5 x 96"ea

PHYSICAL TESTS:

Expansion	Satisfactory	Tensile Strength, M psi	49.5
Flattening	Satisfactory	Yield Strength, N psi	33.2
Elec. Conductivity		Rockwell Hardness	
Mercurous Nitrate		Eddy Current	
Bend Tests		Hydrostatic	
Grain Size, mm	.030	Pneumatic	Satisfactory

Elongation in 2"=42.5%

QA APPROVED by
RCV
9-8-99
H.M. Hillman
Brass & Copper

This is to certify that samples of the tubes manufactured on the above order were tested and the results of the samples tested show that they were manufactured and tested in accordance with specification.
"This material is FREE from Mercury contamination."
"This materal is weldable"

TROJAN TUBE COMPANY, INC.

Lawrence P. Fayereisen

In Charge of Tests

CSC-527

MACHINIST INTL.

QUALITY CONTROL INTL.

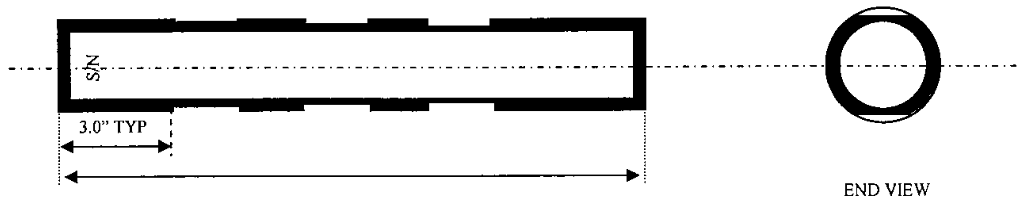
ECUTEC
CALIBRATION STANDARD CERTIFICATION

REV. 02
DATE: 10/26/2011

TRAVEL DOCUMENT
DOCUMENT NUMBER DOC-001

SPECIFIED DEPTH 25% 50% 75%

LOCATION	A	B	C	D	E	F	G	H	I	J
ACTUAL DEPTH	.013"	.026"	.039"							
% OF WALL LOSS	25%	50%	75%							
FLAW WIDTH/DIA. +/- .005"	1.0"	1.0"	1.0"							



15.00" +/- .125"
SIDE VIEW

ALL LOCATIONS SHOW O D FLATS 1.00" IN LENGTH AXIALLY MILLED @ 0 DEG. & 180 DEG.

MATERIAL	90/10 COPPER NICKEL
O D CONFIGURATION	PRIME
I D CONFIGURATION	PRIME
O D DIAMETER	.875"
NOMINAL WALL	.052"
F P I	N/A
MEASURMENT	INCH
DATE MACHINED	3/4/13
Q A APPROVAL	T MC

NOTE: MEASUREMENT GIVEN FOR O D FLATS IS AN AVERAGE TAKEN FROM BOTH SIDES

UNLESS OTHERWISE SPECIFIED
DIM. ARE AS FOLLOWES:

DECIMAL	FRACT. +/- 1/16
XXXX	+/- .003
XXX	+/- .015
XX	+/- .05
ANGULAR	+/- 5 DEGREES

DEFECT DEPTHS ARE +/- .003 OR 20% WHICH EVER IS LESS

SCALE:
NONE
DRAWN BY:

T MCNABB

ECUTEC INC.
180 DEGREE THINNING STD.

DRAWN FOR:
CONCO

S/N EU016072
ALL MEASURING DEVICES ARE NIST CERTIFIED
340

TROJAN TUBE COMPANY, INC.

SEAMLESS BRASS
COPPER AND CUPRO-NICKEL

P.O. BOX 496
FARMINGDALE, N.J. 07727
TEL: (908) 938-5687
FAX: (908) 938-2363

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H. M. HILLMAN BRASS & COPPER, INC.
ECUTEC INC
P.O. NO. VERBAL/MAC
ITEM NO. 2
P/N
QTY. 5 ea X 96" cq

PHYSICAL TESTS:

Expansion	Satisfactory
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Grain Size, mm	.030
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Lawrence P. Feyereisen
Lawrence P. Feyereisen
In Charge of Tests

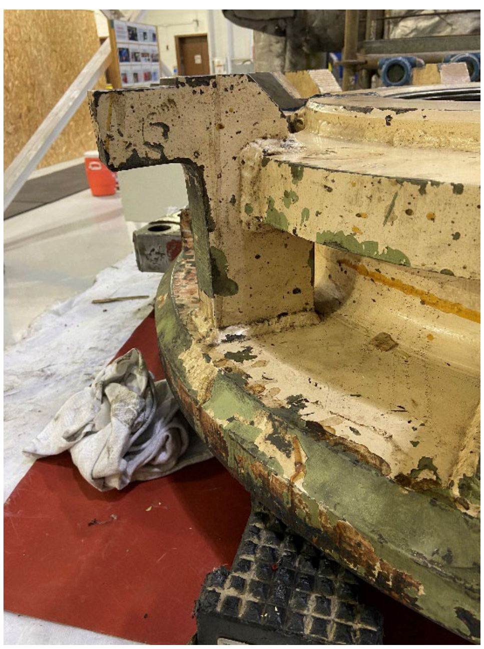
Big Sandy Unit #1 (BSU122)
September 06, 2022 to January 09, 2023

Generator Hydrogen Seals

To allow removal of the end shields and generator field, the turbine end and generator end H_2 seals were removed, cleaned, and inspected. Dimensional checks were completed and recorded.

The inner oil deflector mounted to the turbine end hydrogen seal housing was found heavily rubbed. The housing was shipped to CMS where the oil deflector teeth were replaced with new then machined for clearance. Upon reinstallation of the housing the oil deflector clearances were found acceptable. The as found oil deflector clearances on the collector end hydrogen seal housing were found acceptable.

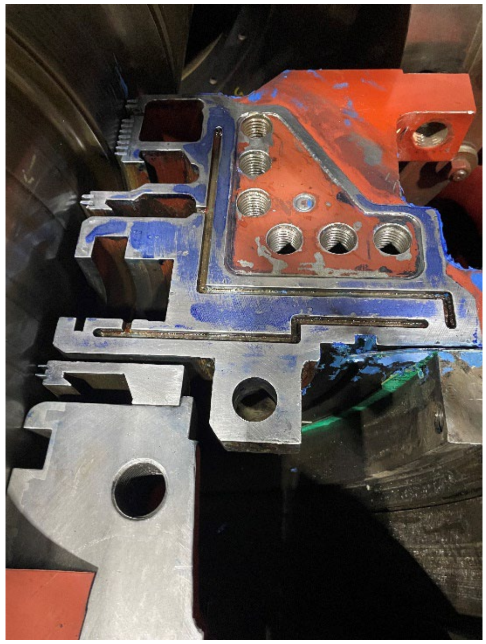
Visual inspections of the housings after removal revealed loose and flaking paint. Lead containing dust, believed to be paint chips, were found inside the generator stator. Due to the above, the existing lead paint was removed from the hydrogen seal housing by laser ablation. Both hydrogen seal housings were repainted with Red Glyptal prior to reassembly.



During an air test the collector end hydrogen seal housing was found leaking on the left side horizontal joint. The gland seal housing and seal rings were shipped to CMS for inspections and repairs. The following picture shows the lower left

Big Sandy Unit #1 (BSU122)
September 06, 2022 to January 09, 2023

side horizontal joint bluing prior to repairs. As can be seen the contact on the outboard side (middle of photo) was found insufficient. Blue checks after repairs showed good contact. RTV60 was applied to the horizontal joint during reassembly. Subsequent stator air tests revealed no further leaks at the hydrogen seal.



A brass bolt used to secure the top and bottom seal rings was found cracked/broken. A new bolt was fabricated Dillon Machine and installed during reassembly.

Big Sandy Unit #1 (BSU122)
September 06, 2022 to January 09, 2023

During reassemble the gland seal housings were installed with new gaskets and checked for grounds with a 500 volt megger. Insulated bolt sleeves and washers were replaced as needed. The seal housing bolts were locked wired.

Generator Stator Air Test

Prior to releasing the unit for operation, a successful stator air test was completed. Several leaks were identified and repaired as needed such as the collector end hydrogen seal housing as discussed above.

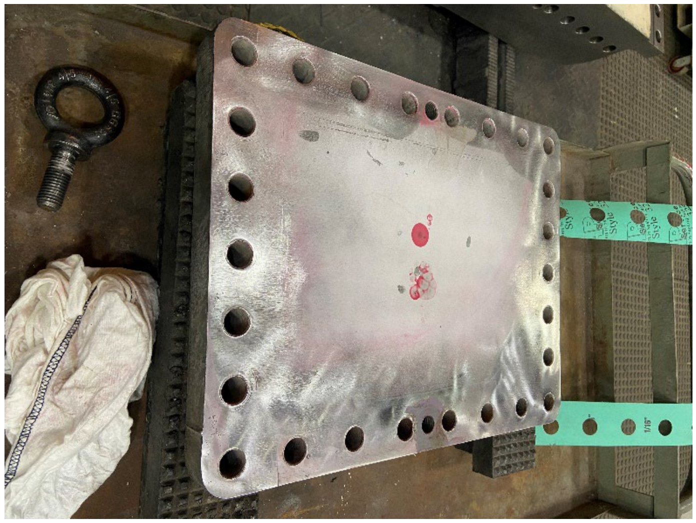
Both hydrogen coolers were reinstalled with new gaskets. The coolers were repaired and tested at National Heat Exchange. During the air test CO2 was mixed with the air and a camera was employed to check for leaks. The lower inlet and outlet water heads were not installed for the air test so that the tubes could be monitored for leaks. No leaks were found at the coolers joint and tube. The water heads were later installed.

Bearing brackets on both ends of the stator were reinstalled with a thin layer of Tite-Seal on the joints and the sealing channel pumped with Dow Corning Sealant. A small bead of blue RTV was placed at the 4-way joins. The inspection/access doors were installed with new gaskets. No leaks were detected during the air tests.

A generator belly drain was found leaking during an air test. The threaded pipe nipple was removed, cleaned, and reinstalled. Subsequent test revealed the leak was repaired.

A manway door bolted to the belly of the stator was found to be leaking. The leaks appeared to be from a previous weld repair. Attached is the NDE report and pictures of the leaking area. A new door was fabricated at the AEP Fab Shop and installed with a new gasket. No further leaks were noted.

Big Sandy Unit #1 (BSU122)
September 06, 2022 to January 09, 2023



Big Sandy Unit #1 (BSU122)
September 06, 2022 to January 09, 2023

MAGNETIC PARTICLE INSPECTION REPORT

AMERICAN ELECTRIC POWER
CENTRAL MACHINE SHOP
3100 Maccorkle Avenue, Building 309
South Charleston, WV 25303

WORK ORDER NO.: E10520557 **CMS #** ______ **DATE:** 12/21/2022

☐ In Plant ☐ In Shop

1 IDENTIFICATION:
Facility: Big Sandy
PC/SN:
Item: Stator Access Door

2 TECHNIQUE:
☐ Dry Powder [X] Wet Flourescent
☐ Non Fluorescent

3 Equipment: **Central Conductor**
☐ Coil ☐ Prods [X] Yoke ☐ Clamps

4 Current Type: [X] AC ☐ DC

5 AMP TURNS - Parker Probe

6 INSPECTION PROCEDURE: M1-1-5-2-3

7 INSPECTION SPECIFICATIONS: M1-1-5-2-3

8 TYPE OF INDICATION FOUND:
[X] 1. Crack ☐ 2. Linear Surface ☐ 3. Linear Subsurface ☐ 4. Undercut ☐ 5. Non Relevant

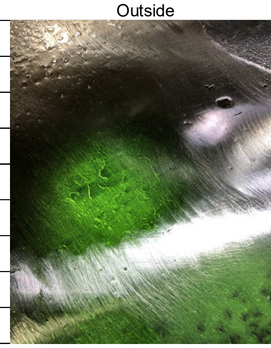
9 SKETCH / DESCRIPTION:

a VT and MT inspection was performed on the above listed item. During the mag testt crack indications were present on the inside and outer surface.

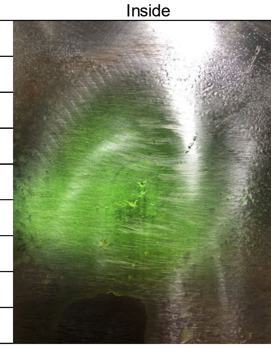
Access Door - MT/Crack

Door

Outside



Inside



INSPECTION PERFORMED BY: *Jonathan Bailey* 12/21/2022
Level II Inspector Signature DATE

APPROVED BY:
NDE Supervisor Signature DATE

VERIFICATION

The undersigned, Timothy C. Kerns, being duly sworn, deposes and says he is the Vice President of Generating Assets, for Appalachian Power Company and Wheeling Power Company, that he has personal knowledge of the matters set forth in the foregoing responses and the information contained therein is true and correct to the best of his information, knowledge, and belief.

Timothy C. Kerns

Commonwealth of Kentucky)
) Case No. 2021-00370
County of Boyd)

Subscribed and sworn to before me, a Notary Public in and before said County and State, by Timothy C. Kerns, on 11/8/2023.

Notary Public

SCOTT E. BISHOP
Notary Public
Commonwealth of Kentucky
Commission Number KYNP32110
My Commission Expires Jun 24, 2025

My Commission Expires June 24, 2025

Notary ID Number KYNP 32110

VERIFICATION

The undersigned, Alex E. Vaughan, being duly sworn, deposes and says he is the Managing Director for Renewables and Fuel Strategy for American Electric Power Service Corporation, that he has personal knowledge of the matters set forth in the foregoing responses and the information contained therein is true and correct to the best of his information, knowledge, and belief.

Alex E. Vaughan

State of Ohio)
)
County of Franklin)

Case No. 2021-00370

Subscribed and sworn to before me, a Notary Public in and before said County and State, by Alex E. Vaughan, on 11/8/2023.

Notary Public

My Commission Expires Never

Notary ID Number No ID

NOTARIAL SEAL STATE OF OHIO

Paul D. Flory
Attorney At Law
Notary Public, State of Ohio
My commission has no expiration date
Sec. 147.03R.C.

VERIFICATION

The undersigned, Brian K. West, being duly sworn, deposes and says he is the Vice President, Regulatory & Finance for Kentucky Power, that he has personal knowledge of the matters set forth in the foregoing responses and the information contained therein is true and correct to the best of his information, knowledge, and belief..

Brian K. West

Commonwealth of Kentucky)
) Case No. 2021-00370
County of Boyd)

Subscribed and sworn to before me, a Notary Public in and before said County and State, by Brian K. West, on November 6, 2023.

Mary Neal
Notary Public

My Commission Expires June 28, 2027

Notary ID Number KYNP74667

MARY NEAL
Notary Public
Commonwealth of Kentucky
Commission Number KYNP74667
My Commission Expires Jun 28, 2027