



UNITED STATES  
 NUCLEAR REGULATORY COMMISSION  
 REGION II  
 101 MARIETTA STREET, N.W., SUITE 2900  
 ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-269/93-22, 50-270/93-22 and 50-287/93-22

Licensee: Duke Power Company  
 422 South Church Street  
 Charlotte, NC 28242-0001

Docket Nos.: 50-269, 50-270, 50-287, 72-4

License Nos.: DPR-38, DPR-47, DPR-55, SNM-2503

Facility Name: Oconee Nuclear Station

Inspection Conducted: July 25 - August 28, 1993

Inspector: *P. E. Harmon* FOR  
 P. E. Harmon, Senior Resident Inspector

9/16/93  
 Date Signed

*L. A. Keller* FOR  
 L. A. Keller, Resident Inspector

9/16/93  
 Date Signed

*W. K. Poertner* FOR  
 W. K. Poertner, Resident Inspector

9/16/93  
 Date Signed

Approved by: *M. S. Lesser*  
 M. S. Lesser, Section Chief  
 Projects Section 3A  
 Division of Reactor Projects

9/16/93  
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SUMMARY

Scope: This routine, resident inspection was conducted in the areas of plant operations, surveillance testing, maintenance activities, Keowee issues, inspection of open items and review of licensee event reports.

Results: One Deviation from commitments was identified. The Deviation involved a failure to calibrate the Unit 1, 125 VDC ground detector circuitry annually as committed in response to a previous violation (paragraph 2.d).

One Unresolved Item (URI) was identified. The URI involved the past operability of load shed channel 1 when powered from a 120 VAC power supply instead of 125 VDC control power (paragraph 2.c).

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- H. Barron, Station Manager
- S. Benesole, Safety Review Manager
- D. Coyle, Systems Engineering Manager
- \*J. Davis, Safety Assurance Manager
- T. Coutu, Operations Support Manager
- B. Dolan, Manager, Mechanical/Nuclear Engineering
- W. Foster, Superintendent, Mechanical Maintenance
- J. Hampton, Vice President, Oconee Site
- D. Hubbard, Component Engineering Manager
- C. Little, Superintendent, Instrument and Electrical (I&E)
- \*M. Patrick, Regulatory Compliance Manager
- B. Peele, Engineering Manager
- \*S. Perry, Regulatory Compliance
- \*G. Rothenberger, Work Control Superintendent
- \*R. Sweigart, Operations Superintendent

Other licensee employees contacted included technicians, operators, mechanics, security force members, and staff engineers.

#### NRC Resident Inspectors

- P. Harmon
- \*W. Poertner
- \*L. Keller

#### NRC Personnel

\*Attended exit interview.

### 2. Plant Operations (71707)

#### a. General

The inspectors reviewed plant operations throughout the reporting period to verify conformance with regulatory requirements, Technical Specifications (TS), and administrative controls. Control room logs, shift turnover records, temporary modification log and equipment removal and restoration records were reviewed routinely. Discussions were conducted with plant operations, maintenance, chemistry, health physics, instrument & electrical (I&E), and engineering personnel.

Activities within the control rooms were monitored on an almost daily basis. Inspections were conducted on day and night shifts, during weekdays and on weekends. Some inspections were made during shift change in order to evaluate shift turnover performance. Actions observed were conducted as required by the

licensee's Administrative Procedures. The complement of licensed personnel on each shift inspected met or exceeded the requirements of TS. Operators were responsive to plant annunciator alarms and were cognizant of plant conditions.

Plant tours were taken throughout the reporting period on a routine basis. During the plant tours, ongoing activities, housekeeping, security, equipment status, and radiation control practices were observed.

b. Plant Status

Unit 1 operated at power for most of the reporting period. On August 23, the Unit experienced a turbine/reactor trip from full power on loss of DC power to a panelboard during testing activities. The loss of power occurred due to an improperly wired circuit breaker. Refer to paragraph 2.e for details. The Unit was returned to power operation on August 26.

Unit 2 operated at power for most of the reporting period. On August 25, the Unit experienced a reactor trip from full power when an operator inadvertently pulled a Unit 2 "Z" phase relaying potential drawer during Unit 1 tagging activities. Refer to paragraph 2.f for details. The Unit was returned to power operation on August 26.

Unit 3 operated at power the entire reporting period.

c. Unit 3 Load Shed Channel 1

On August 3, the Licensee determined that Unit 3 load shed relay 374LSD1, located in switchgear 3TD, was fed from 120 volt AC power instead of 125 volt DC control power as required by the wiring diagrams. The licensee discovered this error as the result of an ongoing wiring verification program. The licensee declared load shed channel 1 inoperable at 4:00 p.m. and initiated a work request to correct the wiring deficiency. The licensee also initiated the problem investigation process (PIP) to determine how the wiring error had occurred. The wiring was returned to normal and load shed channel 1 was declared operable at 7:40 p.m. on August 3.

Subsequent to this event, the licensee determined that a modification had been performed in 1987 to provide a dedicated fuse block for the load shed initiate coils contained in the associated 4160 volt switchgear on all three units. During the implementation of this modification the channel 1 load shed relay for switchgear 3TD was connected to a 120 volt AC fuse block located in the same breaker cubicle as the 125 volt DC fuse block which was identified in the modification package as the proper termination point.

The 120 volt AC power that was connected to the load shed relay is supplied from a 4160V/120V transformer connected to switchgear 3TD and used for indication and relaying on the 3TD switchgear. The effect of supplying the 374LSD1 relay from its associated 4160 volt switchgear would be that the channel 1 load shed signal for switchgear 3TD would not occur until after power was restored to the switchgear following a loss of offsite power event.

The inspectors reviewed modification procedure, TN/3/A/1426/00/0, that implemented the design change to install the dedicated fuse block, and determined that the procedure had required that the wiring be verified by two electricians and a QC inspector during the installation process. The inspectors also identified that the post modification testing performed after the modification had been completed had not identified that the modification was wired incorrectly and that subsequent load shed testing had also not identified the incorrect wiring.

The inspectors held discussions with the licensee throughout the inspection period concerning the past operability of load shed channel 1. The licensee had not completed the past operability evaluation by the end of the inspection period but stated that the preliminary review indicated that the channel was operable when connected to the 120 volt AC power supply. The inspectors expressed concern about the operability of relay 374LSD1 when powered from the 120 volt AC supply and requested that the operability evaluation be provided for review when completed. This item is identified as Unresolved Item 287/93-22-01: Load Shed Channel 1 Operability, pending completion of the licensee's past operability determination and review by the inspectors.

d. DC Ground on Switchgear 1TA

On August 9, the inspector noted that the "DC System Trouble" annunciators were in alarm for both trains of all three units. The licensee indicated that the cause of the annunciator alarm was a low resistance or "hard" ground (approximately 180 ohms) on the positive leg from panelboard DIA, located downstream of breaker 31 (OEE-117-31) which is the feeder breaker for control power to reactor coolant pump (RCP) 1B1. This portion of the DC control system is non-safety related, but is directly tied to the safety-related 125 volt DC panelboard. At Oconee, numerous non-safety loads are powered from the safety-related DC bus. The ground had been present since July 17, 1993. On July 22, I&E technicians were able to trace the ground to the 1B1 RCP switchgear. After narrowing the general location of the ground to the feeder for the 1B1 RCP switchgear, the licensee deferred further work on correcting or isolating the ground due to the perceived risk of tripping the RCP. The licensee indicated that it was consistent with the design of the vital DC system for a single ground to show up on all three units due to all the units' DC systems being interconnected through the auctioneering diode assemblies. The

inspector noted that these alarms would not reflash if another positive ground occurred anywhere in the DC distribution systems for all three units. The inspector was also concerned that there were no compensatory actions to monitor for further positive grounds.

The inspector noted that the control room annunciators that were locked into alarm were shared annunciators which also provided alarms for other conditions such as battery charger trouble, charger output breaker tripped, and DC bus voltage low. These other potential alarm conditions would have been masked in the control room due to the continued presence of the ground. There were no compensatory measures established to check for these conditions other than normal operator rounds once a shift to check local alarm panels.

The inspector reviewed open work requests for the vital DC system and found that for all three units there were ten (10) open work requests dealing with grounds (both positive and negative) and/or the inability to calibrate ground detectors. The ground detectors cannot be calibrated while grounds exist in the circuit. With the exception of the hard ground discussed above, the grounds were intermittent in nature and therefore the licensee was unable to identify the location of the grounds. Some of the open work requests dated back to November 1992.

A conference call between the licensee, Region II, and NRR on Wednesday, August 12, 1993 discussed potential DC system vulnerabilities due to the prolonged presence of the hard positive ground and the unresolved intermittent grounds (both positive and negative), and the licensee's schedule for corrective action. It was the licensee's position that the ground did not present an immediate operability concern, and that any subsequent single failures were bounded by the single failure analysis outlined in the FSAR. That is, the plant was designed to withstand the total failure of a single 125 volt DC control bus. Therefore, even if a second ground developed, causing the loss of the DC bus, that event was bounded by the design. The licensee indicated that troubleshooting efforts to eliminate the ground would resume on Monday, August 16, 1993. Subsequent to the conference call, the inspector learned that the delay in resolving the ground was due to high load demand on the utility grid, and technicians being on vacation. Several members of the licensee's staff had expressed concerns with technicians going into the RCP breaker cubicles in search of the ground. The concern was that work in a RCP breaker cubicle was high risk and could cause a plant trip. The inspectors asked the licensee why power reductions during off-peak periods were not considered which would have allowed the 1B1 RCP to be taken off line. The licensee conceded that miscommunication among the staff had occurred, and a power reduction to aid the ground hunt was not fully explored. The inspectors were not able to find evidence of any licensee planned action to resolve the

existing ground from July 22, when the 1B1 RCP breaker was identified as the ground location, until the August 12 conference call, initiated by the NRC. The licensee was apparently willing to allow the ground to exist until an indeterminant point at which a perceived lower risk existed. The inspectors remained concerned with the presence of prolonged grounds in the DC system in that the system's importance to safety requires a high degree of reliability.

On Monday, August 16, I&E crews resumed the ground hunt. On August 17, one full month after the ground first appeared, I&E technicians found a short length of multi-strand copper wire in the 1B1 RCP pump breaker cubicle. The wire had fallen into a position which shorted a DC connection block to the cubicle frame. The wire was removed and the ground alarm cleared. This evolution did not challenge the RCP.

The inspector noted that the Unit 1 ground detectors were outside their grace period for recalibration required by Procedure IP/O/B/3000/024. The surveillance is scheduled on an annual basis, with the last scheduled date being September, 1992. The grace period for calibrating the Unit 1 ground detectors ended May 21, 1993. This procedure was originally written in response to NRC Violation 269, 270, 287/88-17-01, Maintenance Procedure Deficiencies. In the response to this violation the licensee committed to perform an annual recalibration of the ground detectors. The technicians responsible for this surveillance were not able to calibrate the detectors due to the presence of small, high resistance grounds on the bus. The technicians requested a deferral or hold of the surveillance. The surveillance was placed on hold until conditions allowed the calibration. In accordance with the licensee's policy, a surveillance can be placed on hold (except for TS required surveillances) by the responsible technical group. Commitment mandated surveillances are not controlled as carefully. There was no recognition that the ground detector calibration was a NRC commitment item. This demonstrated a lack of controls to ensure compliance with NRC commitments.

The failure to perform an annual recalibration of the Unit 1 ground detectors is identified as Deviation 269/93-22-02: Failure to calibrate Unit 1 ground detectors annually. The licensee indicated that they had been unable to calibrate the ground detectors due to the continued existence of grounds on the vital DC system.

Following removal of the ground, technicians were able to successfully calibrate the Unit 1 ground detectors.

e. Unit 1 Reactor Trip

At 11:17 a.m. on August 23, Unit 1 tripped from approximately 100 percent power during performance of a peak inverse voltage test on

the 1ADA isolating diodes for DC panelboard 1DIA. During performance of the peak inverse voltage test, power was lost to DC panelboard 1DIA resulting in a main turbine trip and a reactor trip. The loss of power to panelboard 1DIA resulted from reversed leads (reversed polarity) in the 2DCA supply breaker to isolating transfer diode cabinet 1ADA that prevented DC power from passing through the transfer diodes when the power supply from 1DCA was isolated.

During the transient, the main feedwater (MFW) pumps continued to run but adequate pump discharge pressure could not be maintained to actually feed the steam generators. The motor driven emergency feedwater pumps started on a steam generator dryout protection signal when steam generator levels dropped below 21 inches for greater than 30 seconds. Approximately 7.5 minutes after the reactor trip, power was restored to DC panelboard 1DIA. When power was restored to the panelboard the 1A1 and 1B1 reactor coolant pumps attempted to restart. The 1A1 and 1B1 reactor coolant pumps had not automatically transferred to the startup transformer due to loss of control power to the supply breaker feeding the reactor coolant pump bus from the startup transformer. When control power was restored, the startup transformer supply breaker to the 1A1 and 1B1 reactor coolant pumps closed in. The 1A1 and 1B1 reactor coolant pump supply breaker subsequently tripped on overcurrent.

As a result of the complications experienced during the reactor trip, NRC Region II dispatched an electrical inspector from the Division of Reactor Safety to assist the resident staff in conducting a special inspection into the circumstances surrounding the event. This reactor trip is discussed in greater detail in NRC Inspection Report 50-269,270,287/93-23.

Unit 1 was returned to power operation on August 26, 1993.

f. Unit 2 Reactor Trip

At 11:30 p.m. on August 25, 1993, Unit 2 tripped from approximately 100 percent power due to a turbine trip/reactor trip signal. The turbine generator trip resulted from a loss of load indication and generator lockout when a non licensed operator pulled the Z phase relaying potential drawer to the disconnect position on the Unit 2 generator. The non licensed operator was in the process of tagging out the Unit 1 generator for replacement of the Unit 1 generator bus bar disconnect links and pulled the Unit 2 drawers instead of the Unit 1 drawers.

The Senior Resident Inspector responded to the site when informed by the licensee that Unit 2 had tripped. The trip response was normal and the Unit stabilized in hot shutdown. The inspectors reviewed the post trip review report prior to restart of the Unit

and noted no discrepancies. Unit 2 was returned to power operation on August 26, 1993.

Within the areas reviewed, one Deviation was identified.

3. Surveillance Testing (61726)

a. Rod Drop Test

The following surveillance test was reviewed by the inspectors to verify procedural and performance adequacy. The completed test reviewed was examined for necessary test prerequisites, instructions, acceptance criteria, technical content, authorization to begin work, data collection, independent verification where required, handling of deficiencies noted, and review of completed work.

- IP/O/A/0330/003A, Control Rod Drive Rod Drop Time Test. The purpose of this surveillance is to ensure that rod drop times are within technical specification requirements. This surveillance test is normally accomplished during refueling outages but was performed on the Unit 1 Group 1 and 2 control rods prior to returning the Unit to service after the reactor trip on August 23. Group 1 rod 8 and group 2 rod 5 had experienced slow drop times during the previous refueling outage and an emergency technical specification change had been issued by the NRC to allow the drop times of these two rods to be increased to 2 seconds. The licensee had committed to test these rods at the next Unit shutdown to verify that the drop times were acceptable. The inspectors witnessed the rod drop time testing conducted. The rod drop times were less than 2 seconds but the rod drop times were significantly slower than the other rods in the groups and were slower than the last recorded rod drop time tests conducted in January 1993. Group 1 rod 8 dropped in 1.876 seconds and group 2 rod 5 dropped in 1.989 seconds. The licensee intends on replacing the drive mechanisms of these rods at the next refueling outage.

b. Missed Emergency Feedwater Surveillance

During the inspection period the licensee identified that the Technical Specification required monthly safety-related functional test of the motor driven emergency feedwater pumps initiation pressure switches had not been performed since Unit 2 returned from its scheduled refueling outage on June 24, 1993. The surveillance had not been performed because the procedure had been suspended for the duration of the refueling outage and had not been removed from this status prior to returning the Unit to service. The Technical Specification required surveillance was performed successfully subsequent to identifying that the allowed grace period had been exceeded. This item will be tracked and

evaluated by review of the Licensee Event Report (LER) required to be submitted to the NRC in accordance with 10 CFR 50.73.

No violations or deviations were identified.

4. Maintenance Activities (62703)

Maintenance activity was observed and reviewed during the reporting period to verify that work was performed by qualified personnel and that approved procedures in use adequately described work that was not within the skill of the trade. Activities, procedures, and the work request were examined to verify proper authorization to begin work, provisions for fire, cleanliness, and exposure control, proper return of equipment to service, and that limiting conditions for operation were met.

- TN/4/A/2078/00/BK1, Keowee Generator Air Break Interlock. This modification package provided an interlock to prevent the air brakes from being applied manually or automatically during unit operation or a unit start. The modification consisted of installing a three way solenoid valve in the air line to the air brakes to ensure that the air system was vented during unit operation. The inspectors observed work in progress and reviewed the work package for completeness.

No violations or deviations were identified.

5. Keowee Issues

On August 17, 1993 Keowee Unit 2 failed to start manually from the Oconee control room during the performance of PT/O/A/620/17, Keowee Manual Sync Test. A second attempt was made to start the Keowee unit manually from the Oconee control room without success. Keowee Unit 2 was returned to its normal automatic alignment and the surveillance test was repeated this time from the Keowee control room. This time the Unit responded to the manual start signal and the performance test was completed. The operators performed an operability check of Keowee Unit 2 after the manual sync test was completed to verify that Keowee Unit 2 would automatically start from the Oconee control room. The licensee does not consider that the Keowee unit is inoperable if the manual start circuitry in the Oconee control room is inoperable. This position is based on the fact that the emergency start circuitry in the Oconee control room is separate from the manual start circuitry, and under normal circumstances the Keowee units can not be manually started from the Oconee control room because control of the Keowee Units is maintained in the Keowee control room. The licensee initiated the problem investigation process to develop a plan to troubleshoot and locate the problem with the manual start circuitry.

No violations or deviations were identified.

6. Inspection of Open Items (92701) (92702)

The following open item was reviewed using licensee reports, inspection record review, and discussions with licensee personnel, as appropriate.

(Closed) Unresolved Item 269,270,287/92-13-01: RCS Hot Leg Draindown and Loop Drop Problems. This item addressed problems experienced with venting the reactor coolant system hot leg high point vents during efforts to lower or drop the level in the hot legs. Procedure OP/1A/1103/11, Enclosure 3.1 was revised to provide guidance to vent nitrogen into the hot legs and provide a specific valve lineup to establish nitrogen flow. The licensee also replaced the valves in the vent header with the valves that would pass flow in both directions.

7. Review of Licensee Event Reports (92700)

The below listed Licensee Event Report (LER) was reviewed to determine if the information provided met NRC requirements. The determination included: adequacy of description, verification of compliance with Technical Specification and regulatory requirements, corrective actions taken, existence of potential generic problems, reporting requirements satisfied, and the relative safety significance of the event. The following LER is closed:

- LER 269/92-04, Reactor Trip Results from Low Main Feedwater Pump Discharge Pressure Due to Management Deficiency. This LER describes a reactor trip that occurred during a Unit startup when operators attempted to decrease hotwell level due to a high hotwell level alarm condition during the startup. This item was discussed in NRC Inspection Report 269,270,287/92-11. As a result of this trip the licensee revised Procedure OP/0/A/1106/02, Condensate and Feedwater, to add Enclosure 3.22 which provides written instructions to reduce hotwell level and revised the annunciator response to high hotwell level to reference the Operating Procedure for lowering hotwell level.

No violations or deviations were identified.

8. Exit Interview

The inspection scope and findings were summarized on August 31, 1993, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

<u>Item Number</u>	<u>Description/Reference Paragraph</u>
URI 50-287/93-22-01	Load Shed Channel 1 Operability (paragraph 2.c).
DEV 50-269/93-22-02	Failure to Calibrate Unit 1 Ground Detectors Annually (paragraph 2.d)