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DUKE POWER

July 25, 1994

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

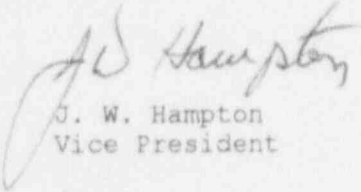
Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 269/94-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is a supplement to Licensee Event Report (LER) 269/94-03, concerning a postulated single failure that would result in the loss of the emergency power system.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(ii)(B). This event is considered to be of no significance with respect to the health and safety of the public. We expect to submit a supplement on August 31, 1994 to address further corrective action and include additional information.

Very truly yours,


J. W. Hampton
Vice President

/rwv

Attachment

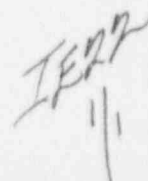
xc: Mr. S. D. Ebnetter
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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNRB 7714) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Oconee Nuclear Station, Unit 1										DOCKET NUMBER (2) 05000 269		PAGE (3) 1 OF 11			
TITLE (4) Postulated Single Failure Could Result In The Loss Of Emergency Power System Due To A Design Deficiency															
EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)						
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME		DOCKET NUMBER				
06	23	94	94	03	00	07	25	94	Oconee, Unit 2		05000	270			
									Oconee, Unit 3		05000	287			
OPERATING MODE (9)		N		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)											
POWER LEVEL (10)		000		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)					
				20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)					
				20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vi)		OTHER					
				20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract Below and in Text, NRC Form 365a)					
				20.405(a)(1)(iv)		X 50.73(a)(2)(iii) (B)		50.73(a)(2)(viii)(B)							
				20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)							
LICENSEE CONTACT FOR THIS LER (12)															
NAME L. V. Wilkie, Safety Review Manager										TELEPHONE NUMBER (Include Area Code) (803) 885-3518					
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)															
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPPDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPPDS					
SUPPLEMENTAL REPORT EXPECTED (14)															
YES X (If yes, complete EXPECTED SUBMISSION DATE)						NO						EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
													08	31	94
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)															

On June 14, 1994, at approximately 1318 hours, Oconee Unit 1 was shutdown for refueling and Units 2 and 3 were operating at 100% Full Power. Keowee Hydro (KH) Unit 2 was generating to the system grid through its associated Air Circuit Breaker (ACB-2). KH Unit 1 was tied to the underground emergency power path through its associated ACB (ACB-3). A failure of an air pressure regulator and air leakage from ACB-3 resulted in KH main transformer lockout relay actuation. This condition disabled the overhead emergency power path to Oconee Nuclear Station and tripped KH Unit 2. The underground path was not affected. Oconee Engineering determined that, following a design basis event, a single failure of the underground path and a low air pressure ACB lockout would result in the loss of the emergency power to Oconee. The root cause of this event is Design Deficiency (Unanticipated interaction of Systems or Components-Design Oversight). Corrective actions included repairing the affected air system components and modifying the circuitry to prevent the lockout associated with low air pressure during emergency operation.

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		94	- 03 -	00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

BACKGROUND

In the event of an accident and the simultaneous loss of the external transmission grid, the Keowee Hydro (KH) Units [EIIS:EK] become the primary power source.

The KH Station contains two generating units. Power from KH to the Oconee units can be supplied through two separate and independent paths.

One path is an overhead 230 Kv transmission line to the 230 Kv switchyard yellow bus [EIIS:FK] which supplies each Oconee Unit's start-up transformers. The overhead transmission line is arranged with double air circuit breakers (ACB 1 & ACB 2) so that it can be connected to either KH Unit.

The second path is an underground cable feeder to the Oconee transformer CT-4 [EIIS:XFMR] which supplies the redundant standby power buses. The underground feeder is arranged with double air circuit breakers (ACB-3 & ACB-4) so that it, too, can be connected to either KH Unit (See Attachment 1). This underground feeder is connected, at all times, to one KH generator [EIIS:GEN] on a predetermined basis. The underground feeder and associated transformer (CT-4) are sized to carry full engineered safeguards loads of one Oconee unit plus the auxiliary loads required for safe shutdown of the other two Oconee units.

Each KH Unit is provided with its own automatic start-up equipment. Both units undergo a simultaneous emergency start on a loss of the grid, an engineered safeguards actuation on any of the three Oconee Units, or on extended loss of voltage on any unit's main feeder bus. On an emergency start, the unit connected to the underground feeder supplies that feeder. If there is a grid disturbance, the other unit is automatically connected to the Oconee 230 Kv switchyard yellow bus only after the yellow bus is automatically isolated from the grid. Therefore, in the event of a Loss of Coolant Accident and the simultaneous loss of the grid, emergency power is available from either KH Unit through the underground feeder or the overhead transmission line.

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TEXT (If more space is required, use additional copies of NRC Form 365A) (17)

If power is not available from the grid or the KH units, power can be made available to the standby power buses from one of the Lee Steam Station combustion turbines. The power is provided through a 100 Kv transmission line from the Lee Combustion Turbines via the Central switchyard to Oconee's CT-5 transformer. If an emergency occurs that would require the use of this 100 Kv line, it can be isolated from the balance of the transmission system in order to supply power to Oconee. One of the Lee Combustion Turbines can be started and supply power within one hour.

The ACB's at KH utilize compressed air for breaker operation (open and closing) as well as extinguishing the arc upon tripping. ACB 1 and 3 (KH Unit 1) have a common air compressor and receiver tank. ACB 2 and 4 (KH Unit 2) also have a common compressor and tank. Except during periods of maintenance and testing, the two systems are normally tied together. Each ACB has it's own air storage system, including an accumulator and check valve which isolates it from the air supply system (Attachment 2). The air supply system is classified as Non-Nuclear Safety Related up to the check valve on each ACB.

Each ACB's accumulator pressure is maintained at 150 psi. The air storage system of each ACB has a leakage acceptance criteria, per the breaker manufacturer, of no more than 5 psi per hour. Pressure switches on each ACB's accumulator provide an alarm on detection of 118 psi decreasing. Also, at 118 psi, if the associated breaker is closed with its disconnects closed, the breaker tripping relay (94GB) will energize and actuate the main transformer lockout relay (86T), trip the overhead path ACBs, and Power Circuit Breakers 8 and 9. This will prevent either KH Unit from supplying Oconee loads via the overhead path but has no affect on the underground path. At air pressure levels below 112 psi electrical control of the ACBs is lost and the breaker will remain in its present state.

Technical Specification 3.7 requires both KH Units and both power paths from KH to be operable. One KH Unit may be removed from service for 72 hours if the other KH Unit is tied to the alternate power path and proven operable. Both KH Units may be inoperable for up to 72 hours for planned reasons if the standby buses are first energized from CT-5 transformer using the dedicated line from the Lee Combustion Turbines. This last

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limiting condition for operation is reduced to 24 hours if both KH Units are inoperable for unplanned reasons and the Standby Bus is energized from a dedicated Lee Combustion Turbines within 1 hour.

EVENT DESCRIPTION

On June 14, 1994, at approximately 0830 hours, Oconee Unit 1 was shutdown for refueling and Units 2 and 3 were operating at 100% Full Power. Air Circuit Breaker number 1 (ACB-1) was tagged out for annual preventive maintenance (PM). KH Unit 1 was connected to the underground feeder via ACB-3. The air supply interconnect valve between the two air supply systems was closed for performing the PM on ACB-1.

At approximately 1318 hours, KH Unit 2 tripped while generating to the system electrical grid via ACB-2. A Technical Specification (TS) Limiting Condition for Operation (LCO), due to the loss of the overhead path, was entered at 1318 hours. A Problem Investigation Process Report was initiated to document and evaluate the problem with KH Unit 2. The investigation revealed a breaker tripping relay (94 GB) had picked up, based on low ACB-3 air pressure, and activated the main transformer lockout relay (86T). The 86T lockout tripped ACB-2 which resulted in a KH Unit 2 trip. The initial conclusion was that the air pressure had reached the alarm and lockout points simultaneously. Assuming the air loss in ACB-3 was large, Engineering believed that the check valve had failed. The low air pressure was due to the inability of the KH Unit 1 air regulator valve to supply the leakage. The air supply interconnect valve was reopened and ACB-1 and 3 pressurized. The underground feeder was satisfactorily tested through ACB-3 at 1350 hours. KH Unit 2 was aligned to the underground path at 1745 hours and operability tested, in preparation for work on ACB-3. Operability testing was performed on the overhead path and the LCO was exited at 1753 hours.

On June 15, 1994, PM was performed on ACB-3 and several air leaks were detected and repaired. Also, a new check valve was installed on ACB-3 because of suspected leakage. Oconee Station Management and the NRC Resident Inspector were advised of the situation and the current status.

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On June 16, 1994, the regulator valve was removed, inspected and a new valve installed. The regulator valve failure was due to age and lubrication. The application of lubricant had hardened and contributed to the improper operation of the valve. ACB-3 was leak tested by an improved method that challenged the air supply check valve. The air leakage was less than 5 psi per hour. KH Unit 1 was connected to the underground path and operability tested after completing the work on ACB-3. KH Unit 1 was left connected to the underground path. Engineering had no indications that would suggest that the problems encountered on ACB-3 existed on ACBs 1, 2, or 4. The PMs remaining for the Unit 2 ACBs were scheduled for the next week. At this time both emergency power paths were considered operable.

On Monday, June 20, 1994, in discussions between Engineering and the NRC Resident Inspector, it was postulated that the air supply check valves might have a leakage problem. They had not previously been tested using the improved methods that were applied on June 16, 1994. While engineering was continuing to review the situation, the PM was performed on ACB-4. ACB-4 was leak tested, utilizing the improved method, when a leak rate greater than 5 psi per hour was detected. ACB-1 was also retested and its leak rate was less than 5 psi per hour.

On June 21, 1994, further investigation and testing was performed on the check valve that had been removed from ACB-3. It was determined that the check valve seals needed to be replaced. A meeting with Engineering and Safety Assurance was held to discuss the current status and concerns. A question was brought up about the adequacy of the air supply as it relates to the calculations for the 5 psi per hour acceptance criteria. It was indicated that acceptance criteria was obtained from the vendor manual and no Test Acceptance Criteria (TAC) calculation existed. Engineering began a review of the criteria to determine the proper TAC and to determine the operability of the emergency power system.

On June 22, 1994, a refurbished air supply check valve was installed in the ACB-4 air system. ACB-4 was leak tested, utilizing the improved method, and the leak rate was less than 5 psi per hour. Engineering was evaluating the air system as it affects the electrical operation of the ACBs at KH. A meeting

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was convened to discuss the current status and the system operation as it should relate to the TAC. As a conservative measure the decision was made to enter TS LCO at 1515 hours, for the overhead emergency power path out of service due to possible system inoperability. ACB-2 was leak tested, utilizing the improved method, and the leak rate was less than 5 psi per hour.

On June 23, 1994, Engineering completed the operability evaluation of the KH ACB air supply system. The evaluation determined that if the air supply to the ACB check valves were reduced to less than 112 psi, electrical control of the ACBs is lost and the breaker will remain in its present state. Should the air supply to the ACB check valve be removed, the 150 psi air in the accumulator is sufficient to allow the ACB to operate as designed during a design basis event (overhead breaker trips and recloses if previously generating to the system grid). Thus, for this scenario assuming the Design Basis Event and a single failure of the underground path, emergency power would be available via the overhead path. However, due to the allowed leakage of the ACB's air system (less than 5 psi per hour) and the designed breaker actuations, if the air supply system is lost, pressure in the ACB accumulator would drop. After a period of time, the 118 psi pressure switch setpoint would be reached, resulting in a 94GB relay actuation and lockout of the KH overhead path. This condition removes power from the Oconee auxiliary electrical loads. Engineering determined that this lockout condition would render the emergency power system for Oconee vulnerable to single failure due to the reliance on a Non-Safety Related air system. This condition has existed for an indeterminate period of time. A meeting was convened to convey this condition to Oconee Station Management and a one hour red phone notification to the NRC was made. A Temporary Station Modification to prevent the lockout condition was implemented. Testing was completed, the Overhead Emergency Power Path was declared operable and the TS LCO exited at 1752 hours.

CONCLUSIONS

The design of the Keowee Hydro (KH) Station included safety provisions to ensure its reliability as the emergency power source for Oconee Nuclear Station. The Air Circuit Breakers (ACBs) air supply system at KH is a standard design used for ACBs. However, the function of the low air pressure lockout and

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the allowed leakage specified by the manufacturer had not been properly analyzed, particularly with respect to current interpretations of the single failure criteria. The root cause of this event is classified as Design Deficiency; Unanticipated Interaction of Systems or Components; Design Oversight.

A review of the LERs generated over the last two years revealed that five LERs (269/92-11, 269/92-16, 269/92-18, 269/92-19 and 269/93-01 reported KH design deficiencies associated with unanticipated interaction of systems or components. These deficiencies were discovered during the single failure analysis of KH electrical systems, as recommended by a Self-Initiated Technical Audit completed in May 1992. This event was not discovered as a part of that single failure analysis.

Because this event is classified as a design deficiency associated with the failure to anticipate interaction of systems or components, it is considered recurring. Because the problem originated with the original design of the KH Units, the corrective actions for subsequently identified problems could not be expected to have prevented this situation. The single failure analysis for KH, that was recently completed, could have identified this event if it had been more extensive in scope.

Evaluation of this event is continuing with additional corrective actions being considered. A supplement to this LER will be submitted to document the results of the evaluation.

The failure of the air supply regulator valve is not NPRDS reportable.

CORRECTIVE ACTIONS

Immediate

- 1) Opened the interconnect valve to tie the Keowee Hydro (KH) Unit 2 Air Circuit Breaker (ACB) air system to KH Unit 1 ACB air system.
- 2) Tested and verified the underground feeder was operable through ACB-3 per Technical Specification 3.7 Limiting Condition for Operation.

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Subsequent

- 1) Replaced the KH Unit 1 ACB air system regulator valve and satisfactorily tested all four ACB's air systems.
- 2) Implemented a Temporary Modification to prevent the 94GB relay from energizing the 86T lockout relay.

Planned

- 1) Implement a Permanent Modification to isolate the overhead path from the lockout on an emergency start of KH.

SAFETY ANALYSIS

Keowee Hydro (KH) Station provides an emergency power source to Oconee Nuclear Station for scenarios which involve a loss of offsite power. In this event, the design deficiency produced a potential failure that could have made the overhead emergency power path inoperable. This, coupled with a single failure of the underground power path could result in both emergency power paths being inoperable. If both power paths are inoperable, an alternate power alignment for emergency offsite power is through the 100 KV transmission line from Lee Steam Station's gas turbines within 60 minutes.

Two scenarios warrant consideration in this situation. The first is a Loss of Offsite Power/Seismic event with a single failure of the underground power path. This event is bounded by the Station Blackout Event analysis described in the Final Safety Analysis Report Section 8.3.2.2.4. In this analysis, the Standby Shutdown Facility (SSF) is used to reach and maintain hot shutdown conditions.

The SSF has the capability of maintaining hot shutdown conditions on all three units for approximately three days following a loss of normal AC power. The SSF is a separate seismically qualified building which houses the systems and components necessary to provide an alternate and independent means to achieve and

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maintain hot shutdown conditions for one or more of the three Oconee Units. The SSF was designed to resolve the safe shutdown requirement for fire protection, turbine building flooding, and physical security.

The second scenario is the Loss of Coolant Accident/Loss of Offsite Power event. In this scenario, a seismic event is not postulated, and therefore no mechanism for air system pipe failure exists. To lose the Air Circuit Breaker (ACB) air system in this scenario would require loss of either the air compressor or regulator valve in both air supply trains. With the loss of the air supply system, air storage system leakage becomes a concern. When the ACB pressure decays to the point of relay (94GB) actuation, the overhead power path would lockout. Since air system leakage tests have been periodically performed, it would be expected that the overhead power path would be operable for a period of time. If the overhead power path is subsequently lost and a loss of the underground power path occurs, then power would be restored via CT-5, which is normally energized from Central Switchyard. If the Loss of Offsite Power event disabled the entire grid and Central Switchyard were not available, then Operators would energize CT-5 from the Lee Steam Station's gas Turbines and dedicated line per Abnormal Procedure guidance.

As shown above, several failures are required to put the station into a Loss of Coolant Accident with no power available. The frequency of a Loss of Coolant Accident/Loss of Offsite Power scenario and a simultaneous single failure of the underground path with the overhead path locked out due to the ACB air supply failure, is considered to be extremely low. The frequency is well below the 1.0 E-07 threshold considered in Probability Risk Assessments.

This event did not lead to the release of radioactive material, exposure to radiation, or personnel injury. It did not compromise the health and safety of the public.

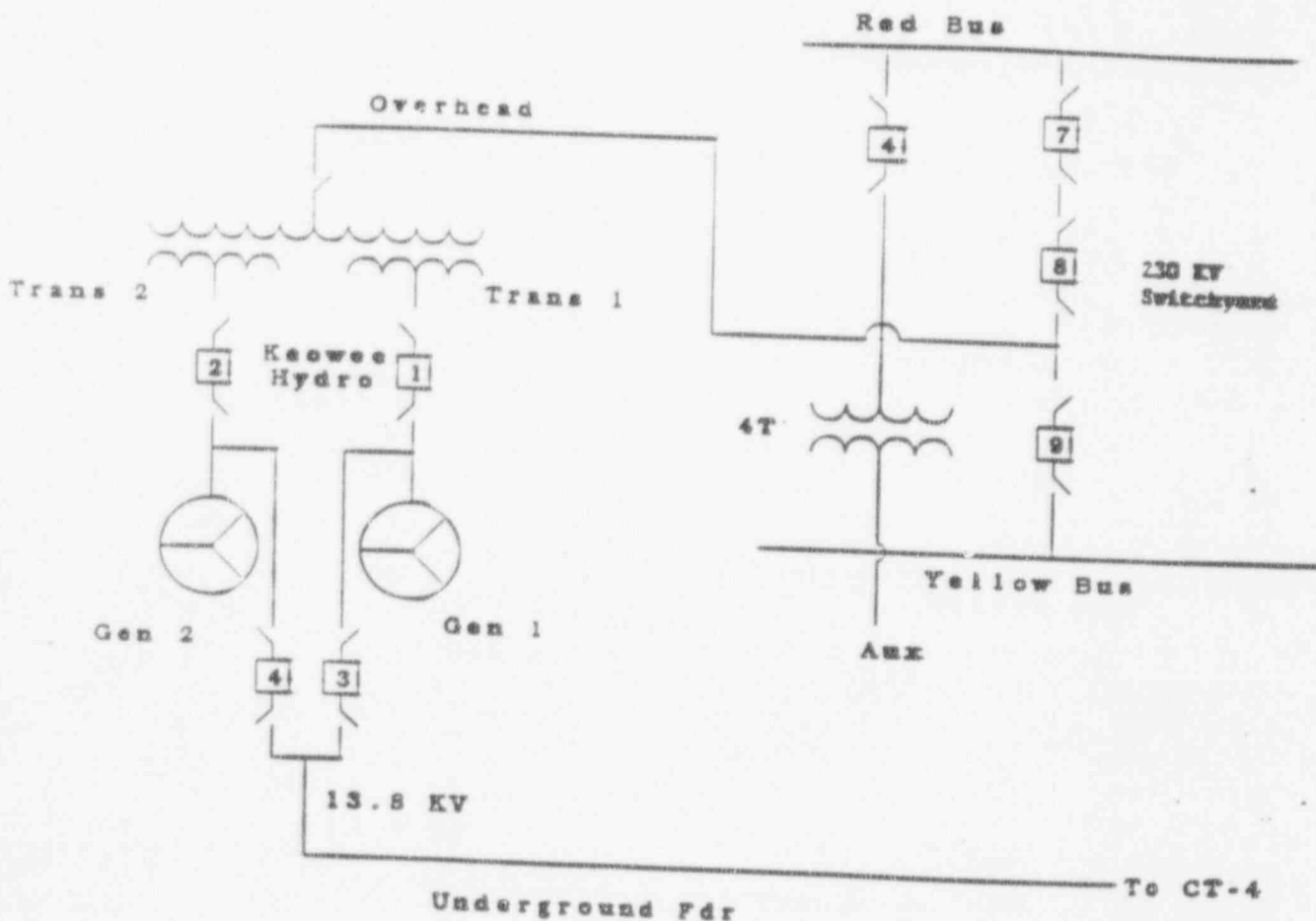
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ATTACHMENT 1



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TEXT CONTINUATION

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TEXT (If more space is required, use additional copies of NRC Form 365A) (17)

ATTACHMENT 2