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 FACIL: 50-269 Oconee Nuclear Station, Unit 1, Duke Power Co.
 AUTH. NAME: BENESOLE, S.G. AUTHOR AFFILIATION: Duke Power Co.
 HAMPTON, J.W. Duke Power Co.
 RECIP. NAME: RECIPIENT AFFILIATION

DOCKET #
05000269

SUBJECT: LER 92-011-00: on 920827, failure of Keowee Hydro (KH) underground feeder air circuit breaker (ACB) could cause KH overhead feeder ACB to close, resulting in EP loss. Caused by design deficiency. KH units declared inoperable. W/920924 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 8
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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Duke Power Company
Oconee Nuclear Generation Department
P.O. Box 1439
Seneca, SC 29679

J.W. HAMPTON
Vice President
(803)885-3499 Office
(704)373-5222 FAX



DUKE POWER

September 24, 1992

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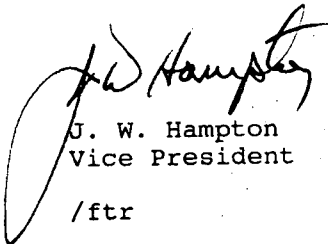
Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
LER 269/92-11

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/92-11, concerning potential single failure during a LOCA/LOOP event may result in the loss of emergency power.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(v)(D). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,


J. W. Hampton
Vice President

/ftr

Attachment

xc: Mr. S. D. Ebnetter
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
101 Marietta St., NW, Suite 2900
Atlanta, Georgia 30323

Mr. L. A. Wiens
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, Georgia 30339

Mr. P. E. Harmon
NRC Resident Inspector
Oconee Nuclear Site

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EXPIRES: 4/30/92

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, 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)

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PAGE (3)

1 OF 0 7

TITLE (4)

Potential Single Failure During A LOCA/LOOP Event May Result In The Loss
Of Emergency Power Due To Design Deficiency

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)											
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)										
0	8	2	7	9	2	9	2	0	1	1	0	0	0	9	2	4	9	2	Oconee, Unit 2	0 5 0 0 0 2 7 0
0	8	2	7	9	2	9	2	0	1	1	0	0	0	9	2	4	9	2	Oconee, Unit 3	0 5 0 0 0 2 8 7

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

OPERATING MODE (9)	20.402(b)	20.405(a)(1)(i)	20.405(a)(1)(ii)	20.405(a)(1)(iii)	20.405(a)(1)(iv)	20.405(a)(1)(v)	20.405(c)	50.73(a)(1)	50.73(a)(2)	50.73(a)(2)(i)	50.73(a)(2)(ii)	50.73(a)(2)(iii)	50.73(a)(2)(iv)	50.73(a)(2)(v)	50.73(a)(2)(vi)	50.73(a)(2)(vii)	50.73(a)(2)(viii)	50.73(a)(2)(ix)	50.73(a)(2)(x)	73.71(b)	73.71(c)	OTHER (Specify in Abstract, below and in Text, NRC Form 366A)
N																						
POWER LEVEL (10)	1	0	0																			

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
S. G. Benesole, Safety Review Group	8 0 3 8 8 5 - 3 5 1 8

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	X				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

ABSTRACT

At 2255 hours on August 27, 1992, Oconee Units 1 and 2 were at 100% Full Power and Oconee Unit 3 was shutdown for refueling. During follow-up on a Self Initiated Technical Audit recommendation, Oconee Engineering (OE) identified a scenario that could result in the loss of both on site emergency power sources. OE determined that a postulated failure of the Keowee Hydro (KH) underground feeder air circuit breaker (ACB) could cause the KH overhead feeder ACB of the unit which is aligned to the underground to close. This could tie both KH units together through the main step up transformer, possibly out of phase. The root cause of this event is Design Deficiency: Unanticipated Interaction of Systems, (Design Oversight). Corrective actions are to open and remove from service the overhead feeder ACB for the unit aligned to the underground feeder and perform a modification which precludes the postulated failure.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 386A's) (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 emergency 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] at Oconee which supplies each unit's start-up transformer. 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 and is energized along with CT-4 whenever the associated KH unit is in service. 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 automatic start on a loss of the grid, an engineered safeguards actuation on any of the three Oconee units or an extended loss of voltage on any unit's main feeder bus. On an emergency automatic start-up, 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.

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 (CT). The power is provided through a 100 Kv transmission line from the Lee CT's 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 CT's can be started and supply power within one hour.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 386A's) (17)

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 underground 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 CT's. This last 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 CT within 1 hour.

EVENT DESCRIPTION

On May 15, 1992 a Self-Initiated Technical Audit was completed for the Electrical Distribution System at Oconee Nuclear Station. A section of this audit covered Emergency Hydro Generators at Keowee. A recommendation was made that engineering develop a formal single failure analysis of the Keowee Hydro (KH) Units operating in parallel with the off site network to ensure that all possible scenarios are reviewed and properly evaluated with formal calculations.

On August 25, 1992, engineering was in the process of performing the single failure analysis. Engineer-A (E-A) concluded that during a design basis event of a Loss of Coolant Accident/Loss of Off site Power, a single failure could cause the overhead path Air Circuit Breaker (ACB) 1 or 2, for the unit aligned to the underground, to close. This would tie the two KH Units together, possibly out of phase. At approximately 1000 hours, E-A contacted Engineering Supervisor A (ES-A), who was in a training class, and informed him of the postulated single failure. ES-A believed that this event had been previously documented. ES-A began a search for the documentation, after completion of the training.

On August 26, 1992, at approximately 1400 hours, ES-A located a response to an INPO Operation and Maintenance Reminder for a similar but not identical scenario. ES-A initiated a Problem Investigation Process to document the problem and determine if the KH units were operable. Discussions were held with other engineers and technicians to analyze the scenario. The conclusion that both KH Units were inoperable was made at 2255 hours.

The KH Units were declared inoperable at 2255 hours and a 24 hour Limiting Condition for Operation (LCO) was entered (per Technical Specification (TS) 3.7).

The Lee Combustion Turbines were started and the dedicated line was aligned to the Standby Bus at 2340 hours, which was in accordance with TS requirements.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 386A's) (17)

An existing key switch interlock was used to inhibit the closure of the overhead ACB of the unit tied to the underground. The LCO was exited and KH Unit 1 and 2 were declared operable at 0954 hours on August 27, 1992.

CONCLUSIONS

A design deficiency in the logic of the Keowee Hydro (KH) Air Circuit Breakers (ACB) resulted in both KH Units being technically inoperable. The design of the KH generating units considered and included safety provisions to ensure its reliability as the emergency power source for Oconee. It is not apparent that the design considered a single failure which would cause an underground feeder ACB to trip as a creditable failure. Therefore, the root cause of this event is Design Deficiency: Unanticipated Interaction of Systems or Components (Design Oversight).

A review of the LERs generated over the last two years revealed that two LERs (269/90-12 and 269/91-01) reported similar postulated failures of ACB's on the KH Station. LER 269/90-12 reported on two accident scenarios that would prevent KH from providing adequate emergency power to Oconee due to overloading the KH generators. LER 269/91-01 involved a Loss Of Coolant Accident/Loss Of Off site Power (LOCA/LOOP) Design Basis Event when one KH unit is in operation and the other unit shutdown concurrent with a single failure, simultaneously connecting the two KH generators together.

The event described in this report involved a LOCA/LOOP Design Basis Event with the unit tied to the underground experiencing a single failure of its underground feeder ACB, causing it to trip, allowing the overhead ACB's to close, thus tying both KH units together. Therefore, this event is considered recurring. Since this problem originated with the initial design of the KH units, the corrective actions for subsequently identified problems could not be expected to have prevented this situation.

This event did not involve actual equipment failure and therefore was not NPRDS reportable. There were no radiological over exposures, radioactive releases or personnel injuries associated with this event.

CORRECTIVE ACTIONS

Immediate

- 1) Both Keowee Hydro (KH) units were declared inoperable, a Lee Combustion Turbine was started, aligned to the standby bus and a 24 hour Limiting Condition for Operation was entered.

LICENSEE EVENT REPORT (LER)
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TEXT (If more space is required, use additional NRC Form 388A's) (17)

Subsequent

- 1) The appropriate overhead Air Circuit Breaker (ACB) 1 or 2 was opened by locking an existing key switch interlock and is to remain open until completion of a modification.

Planned

- 1) Modify the ACB's control circuitry to preclude the postulated failure as described in this report.
- 2) Complete the single failure analysis of KH Units' power system.

SAFETY ANALYSIS

The postulated event described in this report requires a single failure which causes a Keowee Hydro (KH) underground feeder Air Circuit Breaker (ACB) to trip due to a fault. This would allow the overhead ACB's to close simultaneously, tying the two KH units together. This could result in the potential damage of both KH units, rendering them inoperable. This event could result in the loss of all automatic emergency power sources for Oconee Nuclear Station.

The scenario for this postulated event requires the following events to occur simultaneously:

- 1) a Loss of Coolant Accident (LOCA) on one of the three Oconee units in progress,
- 2) a Loss of Off site Power (LOOP) event where the 230 Kv switchyard is separated from the grid,
- 3) a failure within the breaker or the control circuit of a closed Keowee Hydro generator underground feeder ACB (either ACB-3 or ACB-4).
- 4) the overhead feeder breaker time delay relays would have to time out within 200 milliseconds or less of each other.

Final Safety Analysis Report (FSAR) Section 8.1 describes an alternate power alignment for emergency off site power which would be to connect the 100 Kv transmission line from Lee Steam Station's combustion turbines (CT) to Oconee's standby power buses. If the CT's are not running when they are needed, a period of about 15 to 60 minutes would elapse before power could be obtained from the CT's. Otherwise, the alternate power alignment would be from the Central Switchyard.

EXPIRES: 4/30/92

LICENSEE EVENT REPORT (LER)
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TEXT (If more space is required, use additional NRC Form 368A's) (17)

Two of Oconee's three units would experience a simultaneous LOOP during this postulated event. FSAR Section 15.8.3 addresses a simultaneous LOOP event on all three units. This analysis shows that natural circulation of the reactor coolant system [EIIS:AB], turbine driven emergency feedwater system [EIIS:BA], condenser circulating water gravity induced flow, and gravity insertion of the control rods [EIIS:ROD] are among the design features provided to ensure the removal of decay heat from the reactor coolant system without off site power being available. Additionally, FSAR Section 15.8.3 states that "Each reactor can sustain a complete electrical power loss without emergency cooling for about 23 minutes before the steam volume in the pressurizer is filled with reactor coolant" and that "beyond this time reactor coolant will boil off, and an additional 83 minutes will have elapsed before the boil off will start to uncover the core". Therefore, the 106 minutes given in the FSAR for core uncovering is well beyond the 60 minute time frame for establishing emergency power from the CT's.

Another alternative for mitigating the consequences of the loss of power on these two units would be the Standby Shutdown Facility (SSF). The SSF has the capability to bring the units to hot shutdown without off site power. Therefore, the two units would be brought to and maintained in hot shutdown by using the SSF and natural recirculation.

The remaining Oconee unit is assumed to experience a LOCA/LOOP event concurrent with the postulated single failure. If power could not be restored to the unit within a reasonable period of time, then the emergency core coolant flow would have been delayed beyond what was assumed in the accident analyses. Given this situation, fuel damage resulting in a radioactive release to the containment would occur on the unit. The FSAR states that without Reactor Building Spray [EIIS:BE] and Reactor Building Cooling Systems [EIIS:BK] the reactor building pressure would not exceed the design pressure for the containment following the LOCA. Given the 60 minute duration for the restoration of power, it is expected that the reactor building leak rate would not exceed the LOCA analysis rate, but dose rates may be higher due to the loss of filtered ventilation until unit power is restored. A containment response evaluation has shown that equipment qualification conditions would not be exceeded in under two hours for the expected temperature and pressure resulting from this event. Therefore, reactor building equipment should be operable when unit power is restored.

The frequency of a LOCA/LOOP scenario with a simultaneous failure of a KH ACB is considered to be extremely low, well below the 1.0 E-07 threshold considered in Probability Risk Assessments. The ACB's at KH have been very reliable. This type of failure has not occurred with these breakers or their control circuits.

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.

LICENSEE EVENT REPORT (LER)
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TEXT (If more space is required, use additional NRC Form 388A's) (17)

ATTACHMENT 1

