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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 92-010-00:on 920819,determined that under postulated LOCA,coincident w/LOP,fault on nonsafety load could trip upstream Keowee auxiliary load ctr breaker.Caused by design defect.Breakers modified.W/920916 ltr.

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DUKE POWER

September 16, 1992

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

Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
LER 269/92-10

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/92-10, concerning the technical inoperability of the Oconee emergency electrical power sources.

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

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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH 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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, All Units	0 5 0 0 0 2 6 9	1 OF 0 9

TITLE (4) Design Deficiency Results In Technical Inoperability Of Oconee Emergency Electrical Power Sources

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	1 9	9 2	9 2	0 1 0	0 0	0 9	1 6	9 2	Oconee, Unit 2	0 5 0 0 0 2 7 0
									Oconee, Unit 3	0 5 0 0 0 2 8 7

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)		
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v) (D)	73.71(c)		
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)		
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)			
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	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	TELEPHONE NUMBER
S. G. Benesole, Safety Review Manager	AREA CODE 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 NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

ABSTRACT

At 1755 hours on August 19, 1992, Oconee Units 1 and 2 were at 100% Full Power and Oconee Unit 3 was shutdown for refueling. As part of an Operating Experience Program evaluation, Oconee Site Engineering determined that, due to the presence of a discriminator feature in a breaker, a breaker coordination problem existed which affected both emergency power sources (Keowee Hydro Units). Under a postulated Loss of Coolant Accident coincident with a Loss of Offsite Power, a fault on a non-safety load could trip the upstream Keowee auxiliary load center breaker removing power to essential safety related equipment on the affected Keowee Unit. The effect of the discriminator circuit had not previously been recognized. The root cause of this event is Design Deficiency: Deficient Documentation (incomplete documentation). Corrective actions included modifying the breakers to disable the discriminator circuit and adding the discriminator information to the vendor manuals.

BACKGROUND

Each unit at Oconee Nuclear Station has several sources of electrical power available to supply emergency loads. The sources are listed below in the order of preferred choice:

1. The 230 kilovolt (KV) transmission network [EIIS:SK] through the Oconee units' normal (1,2,3T) or startup (CT-1,2,3) transformers [EIIS:EA].

2. One of two Keowee Hydro units [EIIS:EK] (located on the Oconee site) through the 230 KV circuit.

3. The other Keowee Hydro unit through an underground circuit and transformer CT-4 [EIIS:EK].

4. A dedicated 100 KV line from gas turbines at Lee Steam Station (located 30 miles from Oconee Nuclear Station) through transformer CT-5.

5. The startup transformer of another Oconee unit.

6. The CT-5 transformer from the Central Switchyard.

Both CT-4 and CT-5 supply standby buses which can be connected to each unit's 4160V Main Feeder Buses (MFBs).

The operability of the Keowee Hydro units depends on the ability to supply power to its own essential safety related auxiliary loads (see Attachment 1). These loads are normally supplied from the 230 KV transmission network or Keowee generator output via the Keowee main transformer and transformers 1X and 2X [EIIS:EC]. The CX transformer, powered from Oconee Unit 1, is required for the unit aligned to the underground path to be operable. The auxiliary transformers (1X, 2X or CX) supply the 1X and 2X load centers [EIIS:EC] which, in turn, supply motor control centers 1XA, 2XA, 1XS, and 2XS. 1XA and 2XA supply safety related loads at the Keowee Hydro station and also some non-safety related loads.

Keowee auxiliary switchgear and loads all have circuit breaker protection. Overcurrent relays can be classified according to the time required to trip the breaker once an overcurrent condition has been detected: instantaneous (approximately 0.06 seconds), short time (approximately .15 to .50 seconds) and long time (several seconds).

Amptectors are used to monitor current flow through the circuit and send a signal to open the breaker on overcurrent. All Westinghouse Amptectors which do not have instantaneous trip elements are provided with discriminator circuitry. This is a feature that protects against closing the breaker into a fault. The discriminator is controlled by a threshold current level in the primary circuit. For currents below the threshold level, the discriminator is activated. For currents above the threshold level, the discriminator is disabled. If current flow previous to a fault is below the threshold level, the breaker trip will occur instantaneously on a fault of at least 12 times the rating of the Amptector sensor.

The Duke Power test procedure used to perform breaker periodic testing is a generic procedure for breaker testing based on Westinghouse instructions. These instructions clearly require the discriminator to be jumpered for the test. However, they do not clearly explain the reason for jumpering the discriminator.

Westinghouse DB and DS breakers are metal enclosed, low voltage, switchgear type breakers.

Breaker coordination refers to the aspect of serial breaker design which, when a fault occurs on a load, allows breakers to open in a sequence where the individual load is isolated prior to the entire load center or motor control center being isolated.

Technical Specification 3.7 requires both Keowee units and both power paths from Keowee to be operable. One Keowee unit may be removed from service for 72 hours. Both Keowee units may be inoperable for up to 72 hours for planned reasons if the standby buses are first energized from CT-5 using the dedicated line from the Lee gas turbines. This last limiting condition for operation is reduced to 24 hours if both Keowee units are inoperable for unplanned reasons and the Lee Gas Turbine is aligned to the Standby Bus within 1 hour.

EVENT DESCRIPTION

On April 12, 1991, a breaker coordination problem was discovered affecting Keowee Units 1 and 2. The problem was documented on LER 269/91-03. Corrective action included modifying the breakers to remove the instantaneous feature in the load center breakers and replace it with a short time feature to assure that individual loads are isolated before the motor control center is isolated.

On November 7, 1991, a breaker coordination problem was discovered at Sequoyah Unit 1. During testing, instantaneous breaker trips were discovered for breakers not thought to be equipped for the instantaneous trip. A subsequent investigation determined the problem was due to a discriminator circuit in a DS type Westinghouse breakers. This event was entered into the INPO Nuclear Network.

This was entered into Duke Power's Operating Experience Program (OEP) and evaluated for relevance to Oconee. The OEP addresses Westinghouse DS type breakers which are not used at Oconee or Keowee. The engineering evaluation of the OEP item determined that the cause of the problem was the Amptector device within the DS type breakers. The same type Amptector is also used in Westinghouse DB type breakers which are used at Keowee. Testing was performed and it was determined that the Keowee circuits normally carried current above the threshold level to disable the discriminator circuitry.

On April 17, 1992, The Nuclear Regulatory Commission issued an Information Notice (92-29) which discussed the event at Sequoyah and discriminator circuitry in Westinghouse breakers.

On June 16, 1992, Westinghouse issued a Technical Bulletin (NSD-TB-92-06-RO) which discussed the discriminator circuitry. The recommendations provided by the Information Notice and Westinghouse were to insure the breakers normally carry enough current to disable the discriminator circuit.

On August 19, 1992, Engineer A was reviewing the Westinghouse Technical Bulletin when he recognized that the recommendation provided by Westinghouse and the Information Notice did not adequately consider the affects of a Loss of Offsite Power (LOOP). During a LOOP event, current through the load centers would not be present to disable the discriminator circuitry. Thus, if a fault were present on a non-safety related load when the load center re-energized, the discriminator could cause instantaneous trip of the breaker and possibly cause the loss of the entire motor control center. Both Keowee units were declared inoperable at 1755 hours and a 24 hour Limiting Condition for Operation (LCO) was entered (per Technical Specification (TS) 3.7.7). Oconee Units 1 and 2 were operating at 100% Full Power and Oconee Unit 3 was shutdown for refueling.

The dedicated line from the Lee Gas Turbines was aligned and dedicated to the Standby Bus at 1828 hours which was in accordance with TS requirements.

A modification was issued to disable the discriminator. This work was completed and Keowee Unit 1 was declared operable at 1226 hours on August 20, 1992. The 24 hour LCO was exited and a 72 hour LCO per TS 3.7.2 was entered (retroactive to 1755 hours on August 19, 1992). The Standby Bus was de-energized at 1245 hours. Keowee Unit 2 was modified and declared operable at 1815 hours and the LCO was exited.

CONCLUSIONS

The root cause of this event is Design Deficiency: Deficient Documentation (incomplete documentation). When the breakers were modified to correct the breaker coordination problem (reference LER 269/91-03), the Engineer was not aware of the discriminator circuitry. The information on the discriminator circuit was not included in the Time versus Current Characteristic curves provided by the manufacturer and used to design the modification. While the vendor manual gives some guidance on the discriminator circuit, the description in the vendor manual does not clearly specify the operational mode of the discriminator circuit.

The problem was discovered during the OEP review process.

The Amptector (and consequently the discriminator circuit) is not used anywhere else at the station.

The Problem Investigation Report Database was reviewed and no problems with the same root cause were identified. This problem was determined to be a non-recurring problem.

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

CORRECTIVE ACTIONS

Immediate

1) Both Keowee units were declared inoperable and a 24 hour Limiting Condition for Operation (LCO) was entered.

Subsequent

1) A modification was performed to jumper out the discriminator circuitry. After the installation of the modification, the LCO was exited.

Planned

1) Westinghouse Bulletin (NSD-TB-92-06-R0) is being added to the vendor manual for the breakers.

SAFETY ANALYSIS

This event describes a technical inoperability problem. The loss of a safety related load center at either of the Keowee units due to the lack of breaker coordination has not actually occurred.

The existence of a breaker coordination problem made both Keowee units technically inoperable. After a Loss of Offsite Power (LOOP), if a fault were to occur on a non-safety related load powered from 1XA or 2XA, the discriminator circuit may isolate the load center before the individual load can be isolated. Under these conditions, the Keowee units would start when required. The amount of time that they would run prior to tripping due to low governor oil pressure depends on the initial governor oil pressure, the amount of load supplied by the unit, and the rate at which load is increased. The Keowee operators have local indication of the loss of the load center and various alarms due to the loss of motor control center loads. It is possible that the loss of Keowee auxiliary power might be diagnosed and corrected prior to the Keowee unit trip.

Therefore, the likelihood of failure of a Keowee unit to operate due to its auxiliary load breaker coordination problem is considered remote. The likelihood of a failure of one Keowee unit by this problem and a single failure of the other Keowee unit is much more remote. Nevertheless, since both Keowee units were technically inoperable, it must be assumed for purposes of this analysis that these failures result in the loss of both Keowee units.

The event which represents the most significant impact of both Keowee units being simultaneously out of service is the Loss of Coolant Accident (LOCA) scenario on one Oconee unit concurrent with a Loss of Offsite Power (LOOP) affecting all three units. In this event, the Oconee units may trip on loss of power. Grid protection logic [EIIS:FK] will align the Keowee unit tied to the overhead power path to the startup transformers for the non-LOCA units. Simultaneously, the Oconee unit with the LOCA will generate an Engineered Safeguards (ES) [EIIS:JE] signal which starts the Keowee units. The Keowee unit tied to the underground power path will supply power to the LOCA unit. However, due to the postulated loss of auxiliary power for both Keowee units, a loss of governor oil pressure will trip both Keowee units after approximately one hour. This will be sufficient time for ES systems to re-flood the core and establish containment integrity on the Oconee unit with the LOCA. Upon the loss of Keowee units, the Emergency Power Switching Logic [EIIS:EK] would then seek to power the Main Feeder Buses (MFBs) from alternate sources. Normally, this would be accomplished by retransfer to the startup bus which would use the Keowee unit tied to the overhead power path and the startup transformer. Since this Keowee unit is also assumed to have failed, no further automatic actions would occur to supply Oconee MFB power. Manual action would be required.

To mitigate the consequences of this scenario, the Oconee operator must recognize the loss of voltage condition and take appropriate actions to align an acceptable power source to the standby bus. He is given guidance to do this in AP/A/1700/11, "Loss of Power" procedure. The operator would manually close in the breakers supplying the standby buses from CT-5, thus supplying power to the standby bus from the Central switchyard, if available. A dedicated line from the Lee gas turbines could be aligned to CT-5 within one hour. If the CT-5 transformer fails for any reason, then no electrical power would be available to the station until one of the normal or emergency power supplies is regained.

The operator, on seeing that both Keowee units had failed, would contact Keowee to investigate the cause of the failures. The Keowee operator is on duty continuously and has alarms indicating the loss of a load center. If he had not done so already, he should be able to diagnose the cause of the failure and eventually restore auxiliary power for one or both of the Keowee units prior to the loss of governor oil pressure.

The time required to perform these manual operations cannot be accurately predicted. The emergency core coolant flow could have been interrupted. Given this situation, fuel damage resulting in a radioactive release to the containment could occur. 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. If power could be restored within 60 minutes of its loss, it is expected that the reactor building leak rate would not exceed the LOCA analysis rate. Dose rates may be higher due to the loss of filtered ventilation until unit power is restored. An Engineering evaluation of containment response 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 if unit power is restored within this time frame.

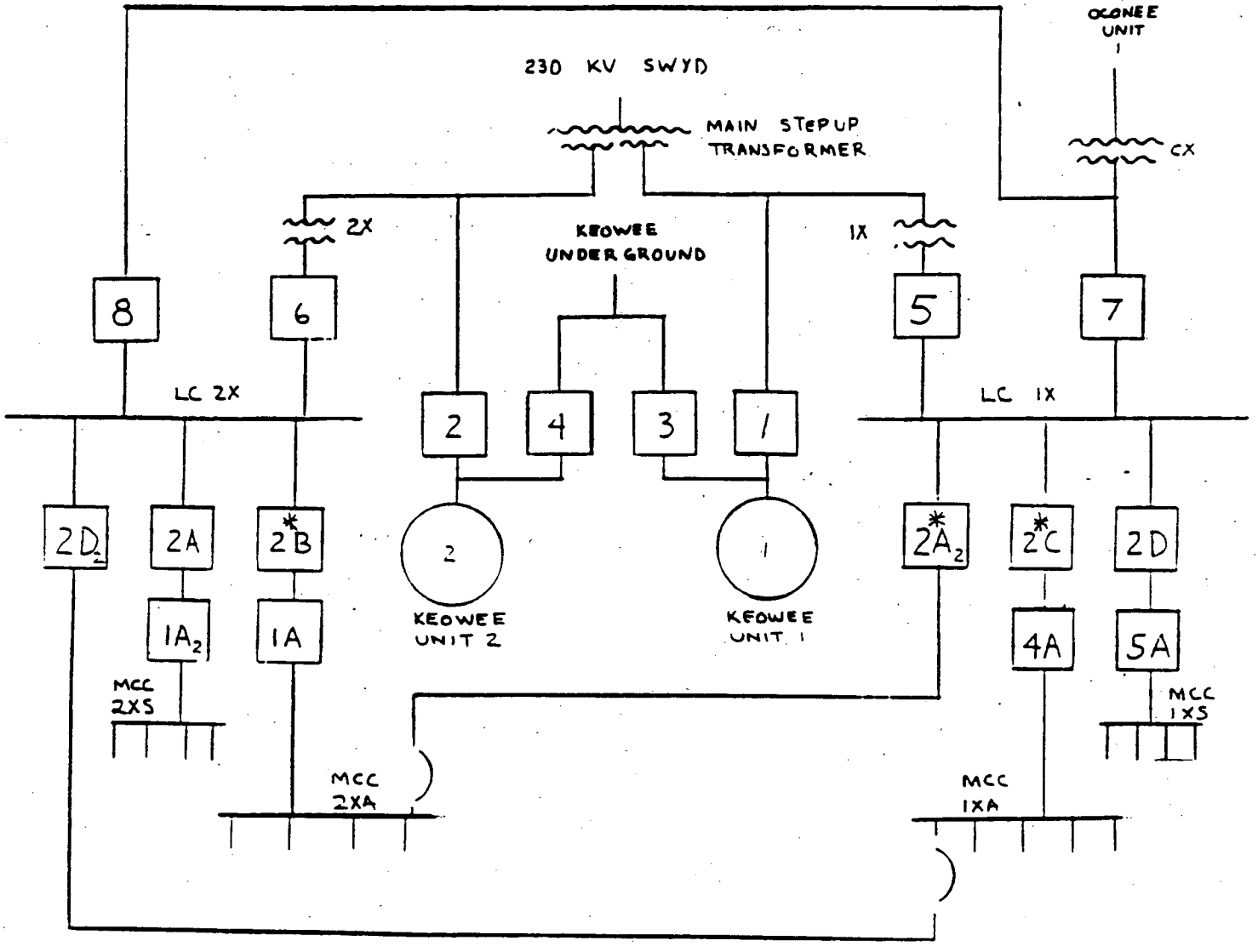
For the LOOP units, the design of the Emergency Feedwater System [EIIS:BA] and the Emergency Condenser Cooling Water System [EIIS:SG] provide for extended core cooling ability as outlined in FSAR section 15.8.3., "Loss of All Station Power Analysis". This will allow the operator time to return a power source to operable status before core uncovery. This is sufficient time to regain one of the Keowee Hydro units as a power source. Furthermore, the Standby Shutdown Facility [EIIS:BA], which has its own safety related diesel generator, is capable of maintaining hot shutdown conditions with a loss of offsite power on all three Oconee units for seventy two hours.

It is concluded that the most limiting scenario is the LOCA/LOOP event. This event would lead to core melt only in the very unlikely event that one Keowee unit failed due to non-safety related load fault with a single failure on the other Keowee unit, combined with a failure in the emergency power source through the CT-5 transformer, and a failure of Keowee and Oconee operators to take adequate corrective measures.

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.

ATTACHMENT 1

KEOWEE HYDROELECTRIC STATION AUXILIARY POWER SYSTEM



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