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AUTH.NAME AUTHOR AFFILIATION
LOWERY,H.R. Duke Power Co.
BARRON,H.B. Duke Power Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 91-003-00:on 910411,tech inoperability of Oconee backup electrical power sources results for deficiently designed circuit breaker arrangement of Keowee Hydro auxiliary loads. Caused by design deficiency.Design review.W/910513 ltr.

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

(803)885-3000

DUKE POWER

May 13, 1991

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 269/91-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/91-03 concerning an inoperability of Oconee backup 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,

H. B. Barron
Station Manager

RSM/ftr

Attachment

xc: Mr. S. D. Ebneter
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

NRC Resident Inspector
Oconee Nuclear Station

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

M&M Nuclear Consultants
1221 Avenue of the Americas
New York, NY 10020

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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)
Oconee Nuclear Station, Unit 1

DOCKET NUMBER (2)
0 5 0 0 0 2 6 9

PAGE (3)
1 OF 1 4

TITLE (4)
Technical Inoperability of Oconee Backup Electrical Power Sources Results From Deficiently Designed Circuit Breaker Arrangement of Keowee Hydro Auxiliary Loads

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR
0 4	1 1	9 1	9 1	0 0 3	0 0	0 5	1 3	9 1

OTHER FACILITIES INVOLVED (8)

FACILITY NAMES	DOCKET NUMBER(S)
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

POWER LEVEL (10): 1 0 0

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

	20.402(b)		20.405(c)
	20.405(a)(1)(i)		50.36(c)(1)
	20.405(a)(1)(ii)		50.36(c)(2)
	20.405(a)(1)(iii)		50.73(a)(2)(i)
	20.405(a)(1)(iv)		50.73(a)(2)(ii)
	20.405(a)(1)(v)		50.73(a)(2)(iii)

	50.73(a)(2)(iv)
X	50.73(a)(2)(v)(d)
	50.73(a)(2)(vii)
	50.73(a)(2)(viii)(A)
	50.73(a)(2)(viii)(B)
	50.73(a)(2)(x)

	73.71(b)
	73.71(c)
X	OTHER (Specify in Abstract below and in Text, NRC Form 366A)

50.72(b)(2)(iii)(d)

LICENSEE CONTACT FOR THIS LER (12)

NAME: Henry R. Lowery, Chairman Oconee Safety Review Group

TELEPHONE NUMBER
AREA CODE: 8 0 3
8 8 5 - 3 0 3 4

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)

On April 12, 1991 at 1350 hours, with all three Oconee units at 100% full power, an ongoing review of breaker and relay trip setpoints by Duke Design Engineering found that a problem with Keowee Hydroelectric Station auxiliary load power distribution equipment made both Keowee units technically inoperable. The two Keowee units serve as an emergency electrical power supply to Oconee. This placed all three Oconee units in a Limiting Condition for Operation (LCO) per Technical Specifications. The Keowee units were removed from service individually and corrective actions initiated which defeated ground fault protective relays, changed overcurrent trip setpoints, or removed from circuitry Keowee auxiliary load breakers. The Keowee units were then declared operable and the Oconee units exited the LCO on April 13, 1991. The root cause was Design Deficiency, unanticipated interaction of components. Design Engineering will continue their review of safety related breaker trip setpoints.

BACKGROUND

Each unit at Oconee Nuclear Station has several sources of electrical power available to supply essential station equipment (see Attachment 1). 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) transformer [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). CT-5 is normally energized from the Central switchyard which does not have degraded grid protection.

The operability of the Keowee Hydro units depends on the ability to supply power to its own essential safety related auxiliary loads (see Attachment 2). 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 can be used as a backup. 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 [EIIS:EC]. 1XA and 2XA supply most safety related loads at the Keowee Hydro station and also some non-safety related loads. The safety related Standby Battery Charger [EIIS:EJ], a backup component for the Keowee DC power distribution system, is supplied from 1XS.

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). Also, some breakers which protect Keowee auxiliaries have internal, solid state, instantaneous ground fault protection.

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 if the other Keowee unit is tied to the underground power path and proven operable. 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.

EVENT DESCRIPTION

During the preparation of the Design Basis Document (DBD) associated with the Oconee 230 Kilovolt (KV) switchyard, an action item was initiated concerning breaker trip setpoints (Licensee Event Report 269/90-05). Duke Design Engineering committed to review the basis of safety related breaker trip and relay setpoints at Oconee. On April 11, 1991 at 1500 hours, Design Engineer A (DE A), as part of this review, was performing calculations involving the trip setpoints of breakers associated with Keowee load centers 1X and 2X. He identified a potential problem with the coordination of these breakers.

DE A notified his supervisor (DE Supervisor A) of this problem. DE Supervisor A contacted the Oconee Station Manager and Operations Superintendent at 1600 hours on April 11, 1991 and told them that a problem with Keowee auxiliaries may exist and that further calculations would be performed.

On April 12, 1991 from 0600 to 1350, Duke Design Engineering, under the supervision of DE Supervisor A, continued calculations associated with Keowee auxiliary breaker logic (OSC-4328). Several breaker coordination problems were at issue. Instantaneous ground fault protection was present on 1X and 2X switchgear breakers (Attachment 2: breakers 5, 6, 7, 8, 2A, 2B, 2C, 2D, 2A2, and 2D2). Instantaneous overcurrent relay setpoints were present on 1XA and 2XA motor control center normal feeder breakers (Attachment 2: breakers 2B and 2C). Molded-case incoming breakers with instantaneous overcurrent trips existed on 1XA and 2XA motor control centers (Attachment 2: breakers 1A and 4A). These calculations and research were done to determine if a single failure in a non-safety related load powered by 1XA or 2XA could cause the loss of the entire safety related motor control center (1XA or 2XA) or load center (1X or 2X). Under these conditions the Keowee unit would start but its governor oil pressure would not be maintained, resulting in a trip of that Keowee unit. Since this problem would exist on both Keowee units, both units would be technically inoperable.

Design Engineering continued their analysis of the problem. They analyzed the breaker logic using time versus current plots based on breaker trip setpoints. The existence of a breaker coordination problem depended on the actual postulated fault current that could exist. Below a certain minimum current rating, breaker coordination would not be a problem. Additionally, the limiting impedance in the neutral of the 1X and 2X transformers was being investigated. Design Engineering felt that this could have resolved the ground fault device problem.

At 0800, a meeting was held with Oconee Operations, Project Services, Keowee, and Transmission personnel. It was decided to improve the breaker coordination, whether or not the Keowee units were declared inoperable as a result of the Design Engineering calculation. Preparations were made to correct this problem using the station modification program.

On April 12, 1991 at 1208 hours, Operations energized the Oconee standby buses using the dedicated line from Lee Steam Station and CT-5 transformer. At 1350 hours, DE Supervisor A notified the Shift Manager that results of their calculations and research showed that both Keowee Hydro Stations were technically inoperable based on unpredictable breaker coordination of the Keowee auxiliaries. All three Oconee units were operating at 100 percent full power. They entered a 72 hour Limiting Condition for Operation (LCO) per Technical Specification 3.7.6. This condition was reported to the Nuclear Regulatory Commission per 10CFR50.72 as a four hour non-emergency event at 1705 hours. The NRC resident inspector was also notified.

At 1545, Keowee Unit 1 was removed from service and necessary tagging performed to correct the problems with the breaker logic. The breakers associated with Keowee Unit 1 auxiliary loads were modified under Oconee Exempt Change 3854. The ground fault trip devices were defeated on the following breakers: the incoming breaker to load center 1X from transformer 1X (Attachment 2: breaker 5), the alternate incoming breaker to load center 1X from transformer CX (Attachment 2: breaker 7), the normal feeder breaker to 1XA (Attachment 2: breaker 2C), and the alternate feeder breaker to 2XA (Attachment 2: breaker 2A2). The alternate feeder breaker to 2XA (Attachment 2: breaker 2A2) was opened and tagged to prevent closure. The instantaneous overcurrent trip installed on the normal feeder breaker to 1XA (Attachment 2: breaker 2C) was changed to a short time trip device. The motor control center incoming breaker (Attachment 2: breaker 4A) was electrically bypassed.

On April 13, 1991 at 1224, Keowee Unit 1 was verified operable and returned to service. This removed the Technical Specification requirement of a dedicated power source to the standby buses but still kept the Oconee Units in a 72 hour LCO under Technical Specification 3.7.2. At 1246, the standby buses were deenergized. At 1303, Keowee Unit 2 was removed from service. The same breaker modifications described above for Keowee Unit 1 equipment were performed for the corresponding equipment on Keowee Unit 2. A summary of the breaker modifications can be found in Attachment 3. On April 13,

1991 at 2114, Keowee Unit 2 was verified operable and returned to service. The three Oconee units were no longer operating under the associated LCO.

An Operability Evaluation of Problem Investigation Report 4-091-0039 by Duke Design Engineering was performed which showed that the breaker coordination logic of motor control centers 1XS and 2XS is not an operability concern.

Keowee personnel researched previous operating records and found that during normal loaded operation, pressure is lost in the governor oil system at a rate which would conservatively allow operation without the 1XA or 2XA load centers for approximately 1 hour.

CONCLUSIONS

An error in the coordination logic of the breakers protecting safety related auxiliary loads at the Keowee Hydro Station resulted in the Keowee units being technically inoperable. This problem had been in existence since the original design of the Keowee auxiliaries. It placed all three Oconee units in a Limiting Condition for Operation (LCO) per Technical Specifications. The breaker trip circuitry was modified and appropriate administrative controls installed to correct the problem. The Keowee units were individually removed from service to make the required modifications.

A search of the available records and conversations with the Keowee Plant Supervisor (who has been stationed at Keowee since 1971) indicate that the miscoordination of Keowee auxiliary power supplies has not actually caused a loss of a safety related motor control center or load center.

The root cause of the event is a design deficiency. A design oversight occurred regarding the unanticipated interaction of breakers in the original design of the Keowee auxiliary power supplies. Duke Design Engineering designed the Keowee auxiliary power system in the late 1960s. Since that time, procedures for the design of electrical systems have changed. Checklists are now required to be completed with every electrical Nuclear Station Modification (NSM) which specifically look at breaker coordination. The checklist is prepared by an engineer, independently reviewed, and then approved by Supervision. The Electrical Engineering Criteria Manual also gives specific directions for establishing protective settings for equipment when designing auxiliary system power supplies. These procedures should prevent future coordination problems resulting from new modifications.

A review of Oconee problem investigation reports over the last two years indicate several problems which resulted in Oconee electrical power distribution inoperability. Several of these problems involved design deficiencies from a failure to anticipate interaction of components. This problem is therefore considered recurring. Many of these events were

discovered as a result of the ongoing review by Design Engineering of electrical systems at Oconee Nuclear Station.

On March 1, 1990 a postulated degraded switchyard voltage (LER 269/90-04) was identified which could have lead to the loss of offsite power and Keowee overhead power path. The root cause of this event was design deficiency, unanticipated interaction of systems. The problem was identified as a result of the design basis study of the 230 KV switchyard. On April 24, 1990, undervoltage relay settings on the startup transformer (CT-1,2,3) feeder breakers were found to be set non-conservatively (LER 269/90-05) resulting in a situation similar to the event of March 1, 1990. A corrective action to this latter Licensee Event Report (LER) was to "implement a program that will assure that proper controls of relay setpoints will be administered." It was this program which identified the Keowee auxiliaries breaker coordination problem of this report.

Several other problems have been identified with the electrical power supply to Oconee which have resulted from design deficiencies, unanticipated interaction of systems:

> On July 31, 1990, time delay relays on Keowee overhead power path breakers (Attachment 2, breakers 1,2) and reactor coolant pumps [EIIS:AC] were set in such a manner that a Keowee overload could occur (LER 269/90-12).
>
> On January 8, 1991, it was found that errors in the design of the control circuitry for the Keowee underground feeder breakers (Attachment 2, breakers 3,4) could lead to an unsynchronized simultaneous closing of these breakers and subsequent failure of both Keowee units (LER 269/091-001).

Both of these events were identified from design basis document reviews.

LER 269/89-11 describes an event in which both Keowee units were briefly technically inoperable on June 18, 1989 as a result of a deficient test procedure.

The technical inoperability of Oconee electrical distribution equipment has been a recurring problem over the last two years. All but one of the problems were identified from planned design basis document reviews or as a result of ongoing corrective action programs. The previous corrective actions could not be expected to correct original design errors.

Breaker coordination problems have also occurred at Oconee Nuclear Station. Nuclear Station Modification 0650 (NSM-0650) was completed on November 29, 1977. This NSM moved the power supply of the Reactor Building Cooling Unit [EIIS:VA] fans from safety related motor control centers to load centers to prevent tripping the entire motor control center due to excessive amperage from the fans. Breaker trip setpoints in this power path were also changed by NSM-0650.

A similar problem was resolved in November, 1985 under NSM-1668. Welding receptacles [EIIS:EC] throughout the station were found to be improperly fused. A fault on a welding machine would sometimes trip an entire motor control center. Station welding receptacles were supplied with fusible switches to prevent this from recurring.

In the course of the investigation and implementation of both of these NSMs, the general problem of breaker coordination was not extended to Keowee Hydro Station. However, the current program for investigating and documenting relay and breaker trip setpoints encompasses all safety related breakers at Keowee, the 230 KV switchyard, and Oconee Nuclear Station down to the 600V load centers. Circuit breakers below this level do not have adjustable setpoints. Safety related 600V breakers at Oconee do not have ground fault protection. Therefore, instantaneous ground fault protection cannot lead to a breaker coordination failure for these load centers.

This event did not involve equipment malfunction and is therefore not NPRDS reportable. No radioactive releases or radiation exposures occurred as a result of this event.

CORRECTIVE ACTIONS

Immediate

1. The Oconee standby buses were energized through CT-5 from Lee Steam Station.

2. Both Keowee Units were declared technically inoperable.

Subsequent

1. Keowee Units were removed from service individually and breakers modified as follows:

   a. Ground fault protection was removed from all 1X and 2X load center incoming breakers and normal and alternate feeder breakers to 1XA and 2XA Motor Control Centers.

   b. Overcurrent devices on 1XA and 2XA MCC Normal Feeder breakers were changed to short time devices.

   c. 1XA and 2XA MCC Alternate Feeder breakers were opened, racked out, and administratively controlled.

   d. 1XA and 2XA MCC Incoming breakers were electrically bypassed.

2. Upon completion of the breaker modifications above, each Keowee unit was individually tested for operability and returned to service.

Planned

1. The ongoing review of safety related breaker trip setpoints at Oconee, Keowee, and the 230 KV Switchyard will continue.

2. Instantaneous overcurrent devices will be changed to short time devices on the 1XA and 2XA MCC alternate feeder breakers prior to removing administrative controls.

3. Alternate incoming breakers to 1XA and 2XA MCC will be replaced with suitable alternatives to remove coordination problems. Similar modifications will be performed on 1XS and 2XS MCCs.

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 poor breaker coordination has not actually occurred. The time from the declaration of technical inoperability of both Keowee units to the time that the first Keowee unit was declared operable was 22 hours and 34 minutes.

The existence of a breaker coordination problem makes both Keowee units technically inoperable. If a fault were to occur on a non-safety related load powered from 1XA or 2XA, the previously existing breaker setpoints could not guarantee that the load center would not be isolated before isolation of the individual load. 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. Available data suggests that this time would be on the order of one hour. 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 simultaneous failure of both Keowee units by the same mechanism is much more remote. Nevertheless, since both Keowee units were technically inoperable, it must be assumed for purposes of this analysis that these failures do occur following the Keowee starts and that another single failure (Final Safety Analysis Report, Section 8.3.1.2, AC Power Systems Analysis) also occurs during accident conditions. The following accident conditions have been analyzed:

1. LOCA/LOOP

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). In this event, the Oconee units will 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, a loss of governor oil pressure will trip both units after approximately one hour. This will be sufficient time for ES systems to reflood the core and establish containment integrity on the Oconee unit with the LOCA. The Emergency Power Switching Logic (EPSL) [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 logic 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 is required.

To mitigate the consequences of this scenario, the 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. This power source lacks degraded grid protection but is allowed as a last resort by AP/A/1700/11. 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 is 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 has not done so already, he should be able to diagnose the cause of the failure and eventually restore loads to one or both of the Keowee units.

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. A Design Engineering 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 if unit power is restored within this time frame.

2. LOCA

During a LOCA, the Oconee unit will trip and the switchyard will be automatically aligned to provide power from the system grid through that unit's startup transformers (CT-1,2,3). An ES signal will be generated which starts the Keowee units. As in the LOCA/LOOP scenario, the Keowee units are assumed to trip approximately one hour after starting. However, they would not be needed and the LOCA would be mitigated as designed and be bounded by FSAR Section 15.14.

If a single failure is present that prevents the affected unit from receiving power from the system grid through the startup transformer during the LOCA, the result would be that power would be automatically supplied to the Main Feeder Buses (MFB) from CT-4 until the Keowee unit tied to this power path tripped. After the assumed loss of the Keowee underground power path, manual action would be required to restore power to the MFBs. As in the LOCA/LOOP scenario above, the operator would perform the same manual operations to power the standby buses to CT-5 from either the Central switchyard or Lee Steam Station and restore power from the Keowee units. The operator could also provide power from the switchyard through another units startup transformer. This is a manual operation but a procedure is available to make this alignment. Again, the time required to perform these actions are not easily determined. Due to the guidance of AP/A/1700/11 and the available voltage indications in the control room, it is believed that the time required to energize the standby buses from CT-5 using the Central switchyard is no more than 10 minutes. The Lee Steam Station power source would require a maximum of one hour for alignment.

In the event that power is not available immediately from CT-5 transformer following the loss of the Keowee units, some fuel damage may result from the loss of emergency core cooling system loads as described in the LOCA/LOOP scenario.

3. LOOP

A Loss of Offsite Power would cause the Oconee units to trip and initiate a startup of the Keowee units after a twenty second

sustained undervoltage condition on the MFBs. The Keowee unit tied to the overhead power path would supply power for approximately one hour before both Keowee units are assumed to trip. Again, no automatic transfer of power to the standby buses would occur once both Keowee units become unavailable. Manual action is required as in the LOCA scenario. If the CT-5 transformer is unavailable for any reason, the Oconee units will be without power until at least one power source is returned to operable status.

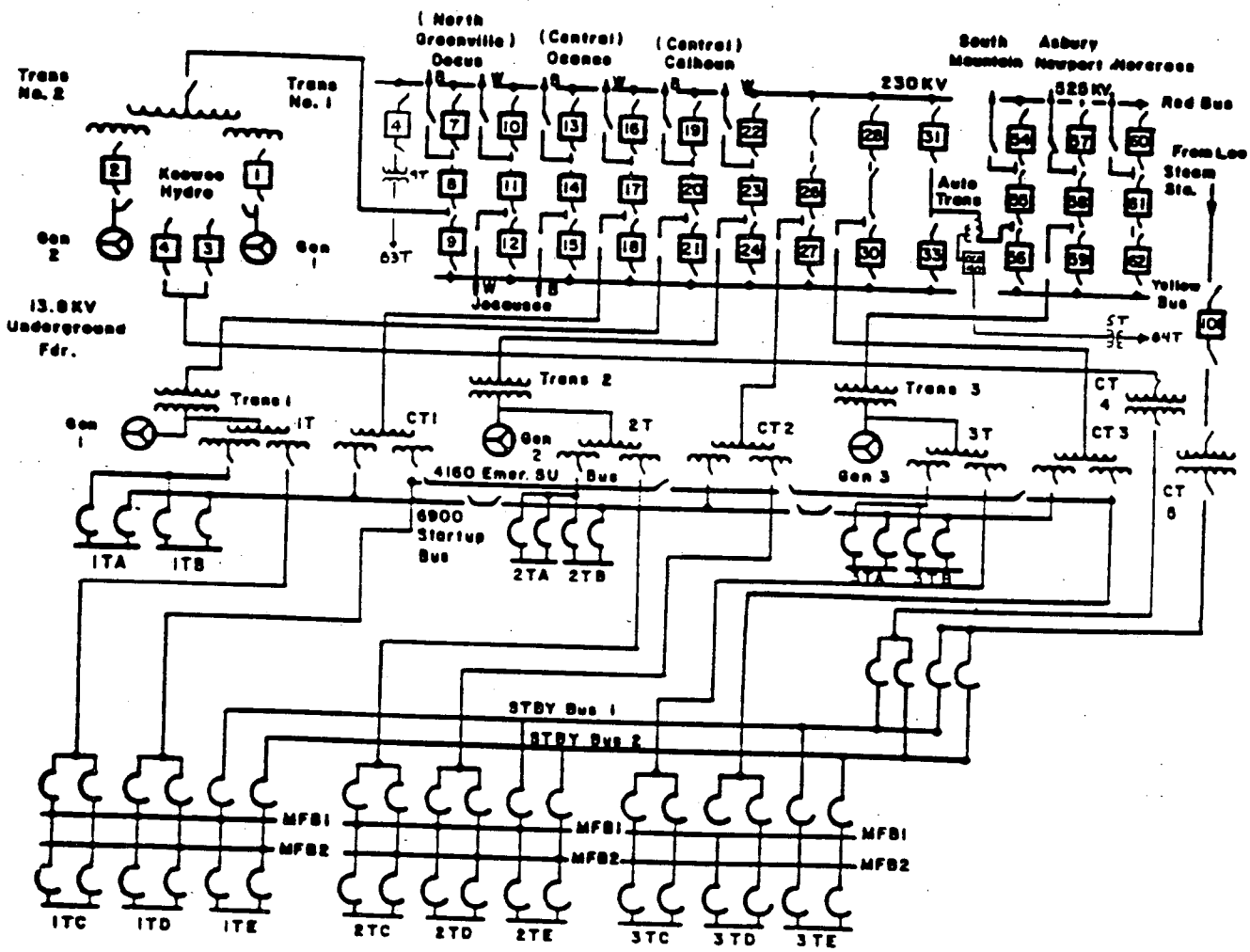
However, unlike the previous scenarios, the design of the Emergency Feedwater System [EIIS:BA] and the Emergency Condenser Cooling Water System [EIIS:SG] provide for extended core cooling ability as outlined in FSAR section 15.8.3., "Loss of All Station Power Analysis". This will allow the operator at least 20 hours 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 both Keowee units failed due to non-safety related load faults, 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.

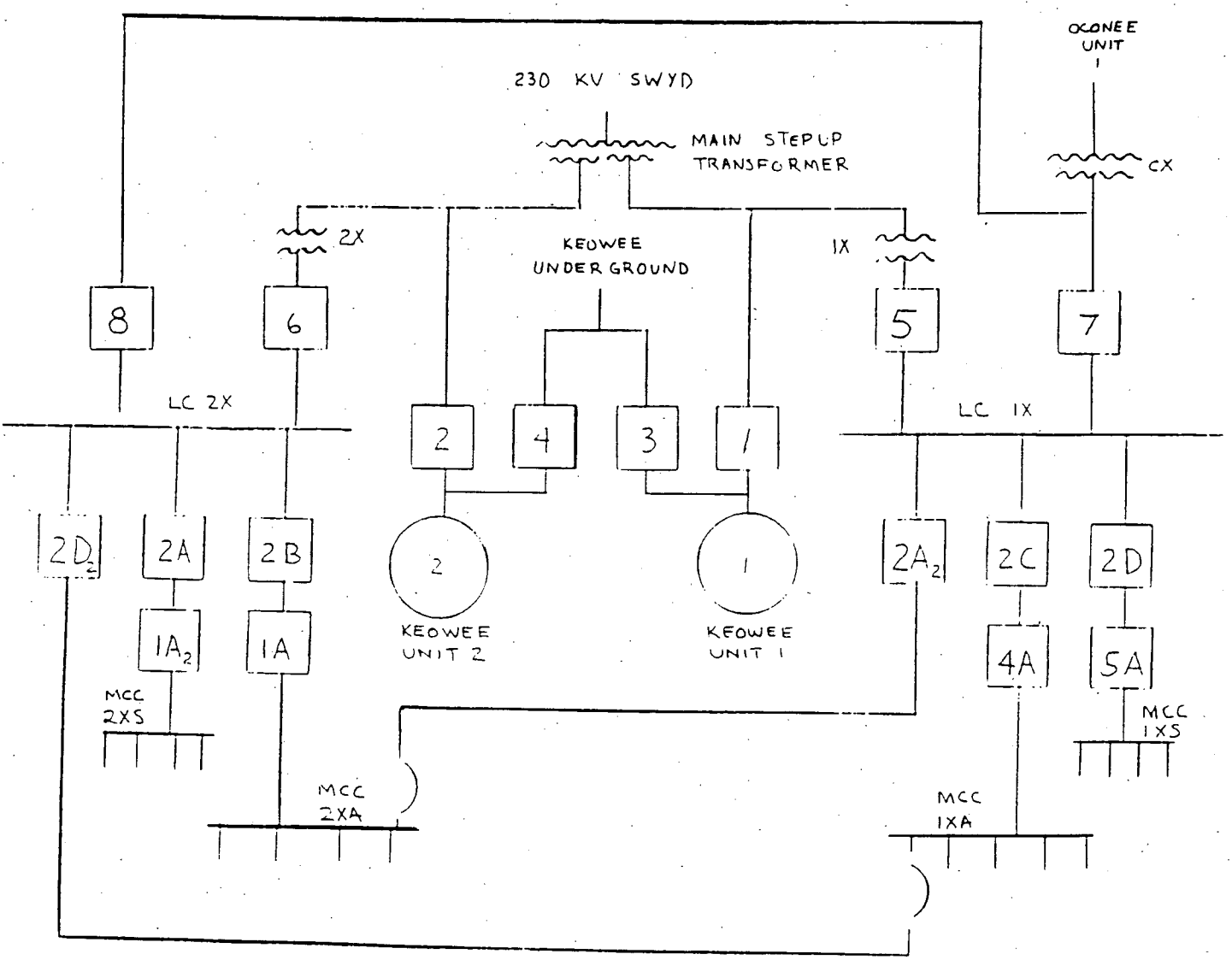
ATTACHMENT 1

OCONEE NUCLEAR STATION ELECTRICAL POWER SYSTEM



ATTACHMENT 2

KEOWEE HYDROELECTRIC STATION AUXILIARY POWER SYSTEM



ATTACHMENT 3

SUMMARY OF BREAKER MODIFICATIONS

Breaker Number	Name	Corrective Action Code
	LOAD CENTER 1X	
7	Incoming Breaker from Transformer CX	1
5	Incoming Breaker from Transformer 1X	1
2C	1XA MCC Normal Feeder Breaker	1,3
2A2	2XA MCC Alternate Feeder Breaker	1,2
4A	1XA MCC Incoming Breaker	4
	LOAD CENTER 2X	
8	Incoming Breaker from Transformer CX	1
6	Incoming Breaker from Transformer 2X	1
2D2	1XA MCC Alternate Feeder Breaker	1,2
2B	2XA MCC Normal Feeder Breaker	1,3
1A	2XA MCC Incoming Breaker	4

Corrective Actions:

1. Instantaneous Ground Fault Protection defeated.
2. Breaker opened and administratively maintained open.
3. Instantaneous overcurrent device changed to short time trip device.
4. Breakers electrically bypassed.