November 18, 1996

Mr. J. W. Hampton
Vice President, Oconee Site
Duke Power Company
P.O. Box 1439
Seneca, SC 29679

SUBJECT: TECHNICAL SPECIFICATION 3.7 BASES REVISION - OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

Dear Mr. Hampton:

By letter dated October 30, 1996, you informed the staff of a change to the Oconee Nuclear Station, Units 1, 2, and 3 Technical Specifications (TS) that only affected the Bases of TS 3.7. The change removes criteria for battery and battery charger specific service tests. Pages beyond the page containing the actual change are included in order to consolidate the remaining information.

The purpose of this letter is to acknowledge receipt of this change and to distribute it to all appropriate addresses of TS changes. Since this change affects the Bases only, no safety evaluation or amendment has been prepared.

Sincerely,

Original signed by:

David E. LaBarge, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure: Bases change

cc w/encl: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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"Alternate power systems shall be provided and designed with adequate independency, redundancy, capacity and testability to permit the functions required of the engineered safety features of each unit."

The auxiliary power system meets the above criteria and the intent of Criterion 17 of Appendix A to 10 CFR Part 50. The adequacies of the AC and DC systems are discussed below as are the bases for permitting degraded conditions for AC power.

Capacity of AC Systems

The 4kV auxiliaries of two units in hot shutdown (6.2MVa each) plus the auxiliaries of the one unit with a LOCA (7.8MVa) require a total AC power capacity of 20.2 MVa. The continuous AC power capacity available from the on-site power systems (Keowee Hydro Units) is 22.4 MVa (limited by transformer CT4) if furnished by the underground circuit or 30 MVa (limited by CT1, CT2, or CT3) if furnished through the 230kV off-site transmission lines. Capacity available from the backup 100 kV off-site transmission line (Lee Station Gas Turbine Generator) is 22.4 MVa (limited by CT5).

Thus, the minimum available capacity from any one of the multiple sources of AC power, 22.4 MVa, is adequate.

The adequacy of the Oconee electrical distribution system voltages has been evaluated. Under the conservative assumptions of the analysis, it has been established that a single startup transformer should not be shared between two operating units. In the event a startup transformer becomes inoperable, it effectively causes one onsite emergency power path to the affected unit to become inoperable. The time frames for the degraded mode of an inoperable startup transformer are thus consistent with those for an inoperable onsite emergency power path. Because the preferred mode of unit shutdown is with reactor coolant pumps providing forced circulation and because of the low likelihood of an accident during a 72 hour period, the unit which is being shut down is allowed to share a startup transformer with another unit until the unit is in cold shutdown with loads being powered from the standby buses.

Capacity of DC Systems

Normally, for each unit AC power is rectified and supplies the DC system buses as well as keeping the storage batteries on these buses in a charged state. Upon loss of this normal AC source of power, each unit's DC auxiliary systems important to reactor safety have adequate stored capacity (ampere-hours) to independently supply their required emergency loads for at least one hour. One hour is considered to be conservative since there are redundant sources of AC power providing energy to these DC auxiliary systems. The loss of all AC power to any DC system is expected to occur very infrequently, and for very short periods of time.

A single string or component of the 125 VDC safety related distribution system may be inoperable for periods not exceeding 24 hours as described in Specification 3.7.2(e). In the case of the annual discharge test required by Specification 4.6.10 and the battery performance test (per IEEE Standard 450), a longer time period of up to 72 hours is allowed for the required equalizing charge.

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dated November 18, 1996

In addition to the service test, the battery performance test may be conducted every 5 years (per IEEE standard 450), unless there are signs of degradation. Degradation is indicated when the battery capacity drops more than 10 percent of rated capacity from its average on previous performance tests, or is below 90 percent of manufacturer's rating. If there is degradation per above definition, the test should be conducted annually until the battery is replaced or until tests prove the battery is not in a degraded state.

Redundancy of AC Systems

There are three 4160 V engineered safety feature switchgear buses per unit. Each bus can receive power from either of the two 4160 V main feeder buses per unit. Each feeder bus in turn can receive power from the 230 kV switchyard through the start-up transformers, through the unit auxiliary transformer by backfeeding through the main step-up transformer, or from the 4160 V standby buses. Another unit's start-up transformer serving as an alternate supply can be placed in service in one hour.

Under normal unit auxiliary power system alignment, the main feeder buses shall be capable of receiving power automatically from:

1. The Keowee Unit aligned to the underground, through transformer CT-4, and through both standby buses; and

2. The redundant Keowee Unit, aligned through the overhead path; and through the respective Unit's startup transformer.

The standby buses can receive power from the hydro station through the underground feeder circuit or from a combustion turbine generator at the Lee Steam Station over an isolated 100 kV transmission line. The 230 kV switchyard can receive power from the on-site Keowee hydro station or from several off-site sources via transmission lines which connect the Oconee Station with the Duke Power system power distribution network.

In order to meet the single failure criteria for certain design basis scenarios, both standby buses (for the underground flow path), and both E_1 and E_2 breakers (for the overhead path) must be operable for the respective flow path to be considered operable.

Redundancy of DC System

A. 125 VDC Instrumentation and Control Power System

The 125 VDC Instrumentation and Control (I&C) Power System consists of two batteries, three battery chargers, and two I&C distribution centers per unit. All reactor protection and engineered safety features loads on this system can be powered from either the Unit 1 and Unit 2 or Unit 2 and Unit 3 or Unit 3 and Unit 1 125 VDC I&C distribution centers. The 125 VDC I&C distribution centers are normally supplied from their associated battery and charger. For one unit, in the event that only one of its batteries and associated chargers are operable, both I&C distribution centers will be tied together allowing operation of the DC loads from the unit's operable battery and charger. As shown above, one I&C battery (e.g., 1CA) can supply both I&C distribution centers (e.g., 1DCA and 1DCB) and their associated panelboard loads. Also, one of the three battery chargers for each unit can supply all connected ESF and reactor protection loads.

In order to find and correct a DC ground on the 125 VDC Instrumentation and Control system each unit's DC system must be separated from the other two units. This is due to the interconnected design of the system. With the backup function disabled, the units would be in a degraded mode but would in fact have all of its own DC system available if needed. Each unit's batteries either XCA or XCB is capable of carrying all the 125 VDC Instrumentation and Control loads on that unit.

B. 125 VDC Switching Station Power System

There are two essentially independent subsystems each complete with an AC/DC power supply (battery charger), a battery bank, a battery charger bus, motor control center (distribution panel). All safety-related equipment and the relay house in which it is located are seismic Category I design. Each sub-system provides the necessary DC power to:

a. Continuously monitor operations of the protective relaying,

b. Isolate Oconee (including Keowee) from all external 230 kV grid faults.

c. Connect on-site power to Oconee from a Keowee hydro unit or,

d. Restore off-site power to Oconee from non-faulted portions of the external 230 kV grid.

Provisions are included to manually connect a standby battery charger to either battery/charger bus.

C. 125 VDC Keowee Station Power System

There are essentially two independent physically separated seismic Category I subsystems, each complete with an AC/DC power supply (charger), a battery bank, a battery/charger bus and a DC distribution center. Each subsystem provides the necessary power to automatically or manually start, control and protect one of the hydro units.

An open or short in any one battery, charger, or DC distribution center, cannot cause loss of both hydro units.

The 230 KV sources, while expected to have excellent availability, are not under the direct control of the Oconee station and, based on past experience, cannot be assumed to be available at all times. However, the operation of the onsite hydro-station is under the direct control of the Oconee Station and requires no offsite power to start up. Therefore, an onsite backup source of auxiliary power is provided in the form of twin hydro-electric turbine generators powered through a common penstock by water taken from Lake Keowee. The use of a common penstock is justified on the basis of past hydro plant experience of the Duke Power Company (since 1919) which indicates that the cumulative need to dewater the penstock can be expected to be limited to about one day a year, principally for inspection, plus perhaps four days every tenth year.

Operation with one Keowee Hydro unit out of service for periods less than 72 hours is permitted. The operability of the remaining Keowee hydro unit is verified within one hour by starting the unit and energizing the standby buses through the underground feeder circuit. This action is repeated once every eight hours thereafter until the Keowee hydro unit is restored to service and will provide additional assurance of the operability of the remaining unit.

Provisions have been established for those conditions in which long term preventative maintenance of a Keowee Hydro unit are necessary. The primary long term maintenance items are expected to be hydro turbine runner and discharge ring welding repairs which are estimated to be necessary every six to eight years. Also, generator thrust and guide bearing replacements will be necessary. Other items which manifest as failures are expected to be extremely rare and could possibly be performed during the permitted maintenance periods. Time periods of up to 45 days for each Keowee Hydro unit are permitted every three years. During these outages the remaining Keowee Hydro unit will be verified to be operable within one hour and weekly thereafter by starting the unit and energizing the underground feeder circuit to CT-4. Credit can be taken for the operability of the SK and S breakers per the routine surveillance test. The remaining Keowee hydro unit will also be available through the overhead transmission path and will not be used for system peaking. Additionally, the standby buses will be energized continuously by one of the Lee gas turbines through the 100 kV transmission circuits.

This transmission circuit would be electrically separated from the system grid and all off-site non-safety-related loads. This arrangement provides a high degree of reliability for the emergency power systems.

Operation with both Keowee Hydro units out of service is permitted for planned or unplanned outages for periods of 72 or 24 hours respectively. Planned outages are necessary for the inspection of common underwater areas such as the penstock and to enable the removal of one Keowee unit from service. This would be a controlled evolution in which the availability and condition of the offsite grid, startup transformers and weather would be evaluated and a Lee gas turbine would be placed in operation on the isolated 100 kV transmission line prior to commencement of the outage.

A time period of 24 hours for unplanned outages of both Keowee units is acceptable since a Lee gas turbine will be started within one hour and will energize the standby buses through the dedicated 100 kV transmission line. This period of time is reasonable to determine and rectify the situation which caused the loss of both Keowee units.

If the overhead power path from Keowee is inoperable for more than 72 hours due to an extended outage of the Keowee main step-up transformer, both Keowee Auxiliary Transformers (1X and 2X), or Keowee Backup Auxiliary Transformer (CX) operation is permitted provided that certain actions are taken to ensure the quick availability of emergency power. These actions include: continuous energization of the standby buses by a Lee gas turbine through the 100kV transmission circuits; connection of a Keowee unit to the underground feeder path and periodic verification of its operability; and, availability of the remaining Keowee unit to the underground feeder path. Operation in this mode is permitted for a maximum of 28 days.

which allows a reasonable period of time to remove the existing transformer and install a replacement.

In the event that none of the sources of off-site power are available and it is considered important to continue to maintain an Oconee reactor critical or return it to criticality from a hot shutdown condition, one of the Lee gas turbines can be made available as an additional backup source of power, thus assuring continued availability as an auxiliary power to perform an orderly shutdown of a unit should a problem develop requiring shutdown of both hydro units.

The power system of the Keowee Hydro station is designed to allow the alignment of each of the two units to the Oconee emergency power systems through either the underground feeder or the overhead path via the main step-up transformer. During an emergency start one of the Keowee units will be aligned to the underground feeder and the other to the overhead path. Each Keowee unit's 600VAC auxiliaries are powered from the unit's generator through a 750KVA auxiliary transformer. Each auxiliary transformer is capable of handling auxiliary loads of both units. Unit's auxiliaries can be aligned to receive power from either transformer by a manual transfer capability at the load center level. A backup 750KVA auxiliary transformer (CX) is provided and powered from Oconee 4KV switchgear 1TC through an underground feeder.

Transformer CX is capable of backing up one or both unit's auxiliary transformers.

Each Keowee unit has a generation capacity of 87.5 MVA and the main step up transformer is rated for 230 MVA. This power capacity exceeds the Oconee emergency power requirements.

Emergency Power Switching Logic Circuits

The Emergency Power Switching Logic (EPSL) in conjunction with its associated circuits, is designed with sufficient redundancy to assure that power is supplied to the unit Main Feeder Buses and, hence, to the unit's essential loads, under accident conditions. The logic system monitors the normal and emergency power sources and, upon loss of the normal power source (the unit auxiliary transformer), the logic will seek an alternate source of power.

Operation of the unit with certain circuits or channels of the EPSL inoperable for test or maintenance is permitted for periods of up to 24 hours, provided that the inoperable circuits/channels are in only one portion, or functional unit, of the EPSL and provided that a sufficient number of circuits/channels in the affected functional unit remain operable such that the functional unit does not lose its ability to perform its designed safety function. These provisions ensure that only one portion of the EPSL is degraded at a time for test or maintenance on the EPSL and that the affected portion remains operable although degraded.

Emergency power system components (transformers, buses, Keowee Hydro Units, etc.) which become inoperable for testing or maintenance cause their associated circuitry (functional units) of the EPSL to become ineffective. Therefore, the operability of these associated functional units is irrelevant and not required. In these cases the controlling Technical Specification for the LCO will be the one associated with the inoperability of the emergency power system component(s). However, all other functional units unaffected by the inoperability of the emergency power system component(s) must meet the requirements of Table 3.7-1 to ensure the operability of the remaining emergency power system.

In the event a 125 VDC instrumentation and control power panelboard becomes inoperable (for planned or unplanned reasons) as allowed by Technical Specification 3.7.2(e) (4), circuits or channels of more than one functional unit of EPSL may become inoperable. In this case, continued operation is allowed under the LCO of T.S. 3.7.2(e) (4), provided that no functional units' circuits, etc., addressed by Table 3.7.1 are out of service, which would not have been out of service due to inoperability of the panelboard. This assures that no functional unit of Table 3.7.1 is degraded beyond the requirements for degraded operation, and that the EPSL is capable of performing its intended function.

In the event that the EPSL is in a degraded mode while the reactor is subcritical, a return to criticality may not be made unless the return to criticality is permitted by a controlling Technical Specification for an emergency power system component(s). However, all functional units of the EPSL not affected by the inoperability of the emergency power system component(s) must be operable prior to return to criticality. This ensures the availability of the EPSL during all reactor startups.

The normal source breakers (N_1 and N_2) provide power to the main feeder buses from the auxiliary transformer under normal power operation of the plant. Under accident conditions the normal breakers open to allow an emergency power flowpath to the main feeder buses. Since there is no emergency closing function, the N_1 and N_2 breakers may be opened and control circuitry deenergized without degrading the capability of the EPSL to perform its intended safety function. Therefore, while the N_1 and N_2 breakers are open, Technical Specification 3.7.2(b) is considered to be satisfied with respect to N_1 and N_2 functional units of the EPSL.

120 VAC Vital Instrumentation Power Panelboards

For each unit, four redundant 120 VAC vital instrument power panelboards are provided to supply power in a predetermined arrangement to vital power, instrumentation, and control loads under all operating conditions. Each panelboard is supplied power separately from a static inverter connected to one of the four 125 VDC instrumentation and control power panelboards. In addition, a tie with breakers is provided to each of the 120 VAC vital panelboards from the alternate 120 VAC regulated bus to provide backup for each vital panelboard and to permit servicing of the inverters.

For each unit, each of the four redundant channels of the nuclear instrumentation and reactor protective system (RPS) equipment is supplied power from a separate 120 VAC vital panelboard. Also for each unit, each of the three redundant engineered safety features actuation system (ESFAS) analog channels and each of the two redundant ESFAS digital channels are powered from separate vital panelboards.

The period allowed for corrective action on an inoperable vital panelboard depends on the loads carried by the affected panelboard. For example, panelboards KVIA and KVIB are allowed to be inoperable for only four hours because they provide power to the digital ESFAS channels, which are in turn allowed to be inoperable for only four hours by Technical Specification 3.5.1. In contrast, panelboards KVIC and KVID carry loads which do not necessarily become inoperable upon loss of power (e.g., RPS channels and ESFAS analog channels go to a tripped state upon loss of power) and thus do not necessitate immediate corrective action. Thus, these panelboards have been limited to a period of inoperability which does not exceed that allowed for their normal source of power. the 125 VDC instrumentation and control panelboards.

In the event that failure of a static inverter results in the inoperability of its associated vital panelboard, the affected panelboard may be tied to the 240/ 120 VAC regulated power system and unit operation may continue for seven days. This specification allows sufficient time for the inverter to be repaired without penalizing unit operation by permitting the use of alternate power sources.

Reporting Requirements

Specification 3.7.9 includes reporting requirements in the event there is degradation beyond Specifications 3.7.2, 3.7.4, 3.7.5, 3.7.6, 3.7.7, or 3.7.8. The 24 hour report to Region II is accomplished by 10 CFR 50.72 notification of the NRC operations center. The 5 day written report has been established to provide the NRC the results of safety evaluations in the event the degraded condition will be ongoing.

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dated November 18, 1996

TABLE 3.7-1

OPERABILITY REQUIREMENTS FOR THE EMERGENCY POWER SWITCHING LOGIC CIRCUITS

Functional Unit		Minimum Operable Circuits/Channels	
		Normal Operation Per Spec 3.7.1(c)	Degraded Operation Per Spec 3.7.2(b)
1.	Normal Source Voltage Sensing Circuits (One per Phase)	3	3
2.	Startup Source Voltage Sensing Circuits (One per Phase)	3	2
3.	Standby Bus Voltage Sensing Circuits (One per Phase on each bus)	6	4[a]
4.	Main Feeder Bus Undervoltage Relays (Three per bus)	6	4[a]
5.	Load Shed and Transfer to Standby Circuits (Channels A and B)	2	1
6.	Keowee Emergency Start Circuit (Channels A and B)	2	1
7.	Retransfer to Startup Circuits (Channels A and B)	2	1
8.	Normal Source Breakers N_1* and N_2 Control Circuitry	4[b]	2[c]

Notes:
a. 2 per bus
b. 2 trip coils and associated trip circuitry for each breaker
c. 1 trip coil and associated trip circuitry for each breaker.

*The trip coils and associated trip circuitry for the N_1 and/or N_2 breaker(s) are not required to be operable if the breaker(s) are in the tripped position.

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