



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

OCT. 19 1977

MEMORANDUM FOR: K. R. Goller, Assistant Director for Operating Reactors, Division of Operating Reactors

FROM: W. R. Butler, Chief, Plant Systems Branch  
Division of Operating Reactors

SUBJECT: SAFETY EVALUATION ON PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS RELATING TO THE ELECTRICAL SYSTEM FOR OCONEE NUCLEAR STATION (TAC 6313)

Plant Name: Oconee Nuclear Station, Units 1, 2, and 3  
License Numbers: DPR-38, 47, and 55  
Docket Numbers: 50-269, 270, and 287  
Responsible Branch: ORB-1  
Project Manager: J. Neighbors  
Reviewing Branch: Plant Systems Branch  
Review Status: Complete

The Duke Power Company, by letter dated September 29, 1977, submitted its proposed revision to the Oconee Nuclear Station's Technical Specifications relating to the electric power systems.

The licensee's proposed revision to the Technical Specifications include the Limiting Conditions of Operation (LCO), Surveillance Requirements, and Bases for the electrical system. The changes requested were designed to: (1) provide increased flexibility of operation and maintenance of the Oconee electrical system including the Keowee Hydroelectric Station; and (2) update the specifications to be in conformance with the Commission's current requirements as defined in Regulatory Guide 1.93, "Availability of Electric Power Sources," and the Standard Technical Specifications.

We have completed our review of the Duke Power Company's submittal, and have concluded that the proposed changes to the Oconee Nuclear Station's Technical Specifications are in conformance with the Commission's current requirements and are acceptable, subject to the requirement that the licensee amend its proposal to include the following:

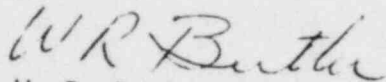
- (1) Section 3.7.5 shall include a requirement for reporting the LCO (as defined in Section 3.7.6(b) of the current specifications);

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- (2) Section 3.7.5 shall include provisions which are in conformance with Regulatory Guide 1.93, Position C-2, when the offsite power sources cannot be restored within 24 hours; and
- (3) Section 3.7.6 and 3.7.7 shall include a provision for hot restart of a reactor from a tripped condition (as defined in Section 3.7.7(c) of the current specifications).

We have had telephone discussions with the licensee regarding the need for revising the Oconee Technical Specifications to include the above listed items in addition to the above cited proposed changes, the LCOs, and surveillance requirements for the d.c. power systems. The licensee indicated agreement with the above listed conditions and plans to submit appropriate documentation by January 1, 1978 for staff evaluation. We find the licensee's time table for these changes acceptable. The details of our evaluation of the proposed changes to the Technical Specifications of September 29, 1977 and the bases for our conclusions are provided in the enclosed report.



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Enclosure: As stated

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Enclosure

SAFETY EVALUATION OF THE  
PROPOSED CHANGES TO THE OCONEE  
NUCLEAR POWER STATION TECHNICAL SPECIFICATIONS

I. INTRODUCTION AND BACKGROUND

The offsite power system for Oconee Nuclear Power Station, Units 1, 2, and 3 consists of six 230 kV transmission lines to the 230 kV station switchyard and two 500 kV transmission lines to a 500 kV switchyard. The 500 kV switchyard is connected to the 230 kV switchyard via an auto transformer. Offsite power is available to each of the three Oconee units via 230/4.16 kV startup transformers. The switchyards are arranged in breaker-and-a-half configuration and each circuit breaker is provided with dual trip coils supplied from 125-V dc station switching power systems which are independent from the Oconee units' Class IE d.c. systems. The circuit protection is provided by redundant relaying.

Onsite power is provided by two 87.5 MVA hydroelectric generators. This power is available either through the 230 kV switchyard and the 45/60 MVA startup transformers or through a 13.8 kV underground feeder which utilizes its own 12/16/20 MVA transformer and supplies the 4160 V safety-related buses of the three units. The maximum emergency power demand upon initiation of accident conditions would be 4.8 MVA per unit. Each hydrounit has generation capacity well in excess of this 4.8 MVA requirement, via either circuit, for operation of the engineered safety feature loads.

Three 4.16 kV buses per unit are provided for engineered safety feature loads. The safety buses of each unit are connected to both of their respective 4.16 kV main feeder buses for each unit. The sources of power which are automatically connected to the main feeder buses, in the order that they are connected, are:

- (1) the 230 kV switchyard via each unit's startup transformer;
- (2) the preselected hydrounit via the 13.8 kV underground feeder and the station's standby buses; and
- (3) the other hydrounit via a 230 kV overhead line, the 230 kV switchyard and each unit's startup transformer.

Also, the following sources of power or startup transformers can be made available manually:

- (1) One of the gas turbines located 30 miles away at the Lee Steam Station via an independent overhead 100 kV transmission system and the station's standby buses;

- (2) The three startup transformers can be manually cross-connected via the stations' emergency startup buses; and
- (3) The three main generators can be manually cross-connected via the standby buses.

The use of the onsite hydro-station which is under the direct control of the Oconee Nuclear Power Station was originally reviewed and found acceptable as the onsite source of power for the Oconee Station. During this evaluation, the staff considered the Lee Station's gas turbines and the dedicated 100 kV transmission circuit as a temporary substitute power source for use primarily during a period when the onsite hydrounits are not available. The estimated periods of unavailability of the hydrounits were approximately 24 hours each year and four days once every ten years when the common penstock will be drained for inspection and maintenance.

The existing Technical Specifications reflected the above considerations and the times allowed for Limiting Conditions of Operation (LCOs) and surveillance when the specifications were issued. The proposed changes will update the specifications to be in conformance with the provisions of Regulatory Guide (R. G.) 1.93, "Availability of Electrical Power Sources" and the Standard Technical Specifications.

In addition to the update changes, the licensee has identified an additional requirement for single unit outage of the Keowee hydro-units for performance of major maintenance functions. This major maintenance outage was not identified during the initial review.

The major long-term maintenance items are expected to include: (1) hydro turbine runner and discharge ring welding repairs; and (2) the generator thrust and guide bearing replacement. These major maintenance items are expected to occur about every six to eight years. These two items can be performed concurrently and require a maintenance outage period of about six weeks.

## II. EVALUATION

In the following eight sections, we identify those portions of the Oconee Nuclear Station's Technical Specifications where the licensee has proposed changes. We address the details of our evaluation and the bases for our conclusion on each of the proposed changes.

### A. Specification

- 3.7.2 During hot standby or power operation, provisions of Section 3.7.1 may be modified to allow any one of the following conditions to exist:

- (b) One Keowee hydrounit may be inoperable for periods not exceeding 72 hours for test or maintenance provided the operable Keowee hydrounit is connected to the underground feeder circuit and is verified operable within one hour of the loss and every eight hours thereafter.
- (c) The underground feeder circuit may be inoperable for periods not exceeding 72 hours for test and maintenance.

The original requirement for one Keowee hydrounit or the underground feeder circuit inoperable was for 24 hours. The original specifications required that the operable Keowee unit be connected to the underground feeder circuit which is operable.

The time required, 72 hours, proposed by the licensee is in conformance with Regulatory Guide 1.93, Position C-1. The time constraints for verifying the operability and periodic verification one hour and eight hours, respectively, for the operable hydrounit satisfy position C-4 of Regulatory Guide 1.93, which allows continued operation for two hours if no onsite power is available.

The typical onsite power sources and distribution systems are protected from natural phenomena. When the protected underground circuit is unavailable, the remaining sources of power are subjected to weather conditions. However, as we have indicated, the Oconee design exceeds the minimum requirements for both onsite and offsite power sources. The six 230 kV circuits, two 500 kV circuits and the dedicated gas turbines via the 100 kV circuit (physically independent of the other power circuits and on its separate right-of-way) provide reasonable assurance that a power source will be available to the nuclear station for the 72-hour period.

We conclude that the proposed changes satisfy the provisions of Regulatory Guide 1.93 and are, therefore, acceptable.

#### B. Specification

3.7.4 In the event that all conditions in specification 3.7.1 are met except that one of the two Keowee hydrounits is expected to be unavailable for longer than the test or maintenance period of 72 hours, the reactor may be heated above 200°F if previously shutdown or be permitted to remain critical or be restarted provided the following restrictions are observed.

- (a) Prior to heating the reactor above 200°F or prior to the restart of a shutdown reactor or within 72 hours of the loss of one Keowee hydrounit, the 4160 volt standby buses shall be energized by a Lee Station

gas turbine through the 100 kV circuit. The Lee Station gas turbine and 100 kV transmission circuit shall be electrically separated from the system grid and non-safety-related loads.

- (b) The remaining Keowee hydrounit shall be connected to the underground feeder circuit and this path shall be verified operable within one hour and weekly thereafter.
- (c) The remaining Keowee hydrounit shall be available to the overhead transmission circuit but generation to the system grid shall be prohibited except for periods of test.
- (d) Operation in this mode is restricted to periods not to exceed 45 days and the provisions of this specification may be utilized without prior NRC approach only once in three years for each Keowee hydrounit. The Office of Inspection and Enforcement, Region II, will be notified within 24 hours.

The original requirements for one of the Keowee hydrounits were: (1) for longer than the test and maintenance period of 24 hours; (2) the remaining hydrounits connected to the underground cable and Lee Station gas turbine available within 30 minutes; (3) I&E notified within 24 hours; (4) a written report to I&E if the outage exceeded 24 hours; and (5) no provision for extended maintenance outage was provided. The time period change, from 24 to 72 hours, proposed by the licensee is in conformance with Regulatory Guide 1.93 as identified in our evaluation of 3.7.2-b and -c. The additional conservatism for extended outages, in excess of 72 hours, is provided by requiring that: (1) the remaining Keowee hydrounit shall be connected to the underground circuit and the path verified operable within one hour and weekly thereafter and; (2) the overhead transmission circuit be available but generation to the grid be prohibited except for periods of test.

Proposed specification 3.7.4(d) provides a 45-day period for major maintenance to one of the Keowee hydrounits. The expected interval for the maintenance is every six to eight years. The performance of the major maintenance items, identified in the introduction, can be performed concurrently. The licensee has indicated that the six week time frame is based on double shift operations and will likely be completed in less than the six-week period.

This scheduled period can be utilized only once, in each three-year period for each hydrounit without the Commission's approval and the Regional Office of Inspection and Enforcement will be notified within 24 hours after the end of the initial 72 hour maintenance period.

Prior to the planned major maintenance outages, the licensee will consider the 30 day national weather service forecast for the area. As we have previously indicated, the existing design exceeds the minimum requirements for power sources and paths available to the plant. In addition, Section 14.1.2.8.3 of the Final Safety Analysis Report (FSAR) provides the results of an analysis of a complete loss of all station power. The analysis indicates that the turbine-driven emergency feedwater pump without either offsite electric power or the hydrounits, provides an adequate heat sink for a period of 20 hours.

The licensee has indicated that in the event of loss of all offsite power in conjunction with the loss of the Lee Station gas turbine during a planned outage of the Keowee hydrounits, the hydrounits could be restored to service in a time considerably less than the 20 hours analyzed and documented in the FSAR at Section 14.1.2.8.3.

We conclude that the above described time intervals of one hour and 72 hours satisfy the provisions of Regulatory Guide 1.93 and that any scheduled extended outage (six weeks) for major maintenance of a Keowee hydrounit is acceptable. This determination relative to scheduled extended outages is based on: (1) the design features of the Oconee Station's power system; (2) the use of the Lee Station gas turbine and (3) the inclusion of all restrictions identified in Section 3.7.4 of the proposed Technical Specifications.

### C. Specification

- 3.7.5 In the event that all conditions of Specification 3.7.1 are met except that all 230 kV transmission lines are lost, the reactor shall be permitted to remain critical or be restarted provided the following restrictions are observed:
- (a) Prior to the restart of a shutdown reactor or within one hour of losing all 230 kV transmission lines for an operating reactor, the 4160 volt standby buses shall be energized by one of the Lee Station gas turbines through the 100 kV transmission circuit. The Lee Station gas turbine and the 100 kV transmission circuit shall be completely separated from the system grid and non-safety-related loads.
  - (b) The reactor coolant  $T_{avg}$  shall be above 525°F. Reactor coolant pump power may be used to elevate the temperature from 500° to 525°F in the case of restart. If  $T_{avg}$  decreases below 500°F, restart is not permitted by this specification.

The original specifications required that the 4160 volt standby buses be energized by one of the Lee Station gas turbines within 1/2 hour. The proposed one hour time satisfies the provision of Regulatory Guide 1.93, Position C-2, which allows 24 hours of continued operation if no immediate source of offsite power is available. However, Regulatory Guide 1.93 does not address the restart of a reactor under these conditions. The original Technical Specifications allowed the restart of a shutdown reactor based on the evaluation of the Oconee power system design.

We require that Section 3.7.5 be amended to include a reporting requirement to the Regional Office, Office of Inspection and Enforcement as included in the original specifications. In addition, we require that Section 3.7.5 also include provisions that conform with Regulatory Guide 1.93, Position C-2, if the offsite power sources cannot be restored within 24 hours.

We conclude that the proposed changes are acceptable, conditioned on satisfying the above described requirements.

#### D. Specification

3.7.6 In the event that all conditions of Specification 3.7.1 are met, and planned tests or maintenance is required which will make both Keowee units unavailable, the 4160 volt standby buses shall first be energized by a Lee Station gas turbine through the 100 kV transmission circuit and shall be separated from the system grid and non-safety-related loads. The reactor shall then be permitted to remain critical for periods not to exceed 72 hours with both Keowee units unavailable.

3.7.7 In the event that all conditions of Specification 3.7.1 are met except that both Keowee hydrounits become unavailable for unplanned reasons, the reactor shall be permitted to remain critical for periods not to exceed 24 hours provided the 4160 volt standby buses are energized within one hour by a Lee Station gas turbine through the 100 kV transmission circuit and it shall be separate from the system grid and all offsite non-safety-related loads.

The original specifications did not include the time limit restrictions on the unavailability of both Keowee units for the conditions stated above (3.7.6 and 3.7.7). Regulatory Guide 1.93, Position C-4, allows two hours with no restrictions for the unavailability of both onsite sources and if one source is restored operation can continue for a total time of 72 hours.

The design of the Oconee system which allows one of the Lee Station gas turbines to provide power prior to planned outage or within one hour of unplanned outage and the 72 hour and 24 hour restrictions



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for the planned and unplanned outages of both Keowee hydrounits satisfy the provisions of Regulatory Guide 1.93. For the planned outages, the licensee has provided details of the requirements for securing the common penstock of the Keowee hydrounits to prepare one of the hydros for major maintenance. Since the 24-hour period would provide a reasonable time to implement corrective actions for an unplanned outage and since the offsite power system would be available in conjunction with the Lee Station gas turbines, we find that there is reasonable assurance that a power source will be available for the 24-hour time period. The licensee has also provided an analysis of the complete loss of all station power in Section 14.1.2.8 of the FSAR.

The original Technical Specifications included a provision for hot restart of a reactor from a tripped condition. We require that this provision be reinstated in the proposed changes to the Technical Specifications.

We conclude that the proposed changes are in conformance with Regulatory Guide 1.93 and are, therefore, acceptable, provided that the provisions for hot restart (Section 3.7.7(c) of the original specifications) are reinstated.

#### E. Specification

4.1.1 Monthly, a test of the Keowee Hydrounits shall be performed to verify proper operation of these emergency power sources and associated equipment. This test shall assure that:

- d. The 4160 volt startup transformer main feeder bus breakers and standby bus breaker shall be exercised.

The original specifications did not include provisions for testing of the circuit breakers identified above. The verification of the operability of these circuit breakers provide a greater degree of assurance that the offsite power sources will be available when required. We, therefore, conclude that the above proposed addition is acceptable.

#### F. Specification

4.6.2 Annually, the Keowee hydrounits shall be started using the emergency start circuits in each control room to verify that such hydrounits and associated equipment will carry the equivalent of the maximum safeguards load of one Ocone unit within 25 seconds of a simulated requirement for engineered safety features.

The original specifications did not require the maximum safeguards load be included in the test. The requirement was that the availability of the hydrounit to carry the load be verified. The inclusion of a load test requirement provides a greater degree of assurance that the unit will not only be available, but capable of supplying the required safety loads. We, therefore, conclude that the proposed additional requirements are acceptable.

#### G. Specification

- 4.6.6 Annually and prior to planned extended Keowee outages, it shall be demonstrated that a Lee Station gas turbine can be started and connected to the 100 kV line. It shall be demonstrated that the 100 kV line can be separated from the rest of the system and supply power to the 4160 volt main feeder buses.

The change to this original requirement is that the test be performed not only annually but that is also be performed prior to a planned extended Keowee outage. We find that the proposed test provides additional assurance that the Lee Station gas turbine will be available and capable of performing its safety function and is, therefore, acceptable.

#### H. Specification

- 4.6.7 Annually, it shall be demonstrated that a Lee Station gas turbine can be started and connected to the isolated 100 kV line and carry the equivalent of the maximum safeguards load of one Oconee unit (4.8 MVA) within one hour.
- 4.6.8 Annually, it shall be demonstrated that a Lee Station gas turbine can be started and can carry the equivalent of the maximum safeguards load of one Oconee unit plus the safe shutdown loads of two Oconee units on the system grid.

The original specifications did not include the requirement to demonstrate the Lee Station gas turbine's capability to supply the required safety loads as identified above. These proposed additional tests provide assurance that the units will be capable of performing their function when required. We, therefore, conclude that the proposed changes are acceptable.

### III. CONCLUSION

Based on our review of: (1) the information provided by the licensee; (2) the functional capability of the offsite power system; and (3) the functional capability of onsite power system, we conclude that the proposed changes to the Technical Specifications are in conformance with the Commission's requirements and are acceptable.

The acceptability of the proposed changes is conditioned on the requirement that the licensee amend the proposed changes to include the following:

- (1) Section 3.7.5 must include a reporting requirement (as defined in Section 3.7.6(b) of the current specifications);
- (2) Section 3.7.5 must also include provisions in conformance with Regulatory Guide 1.93, Position C-2 to address the case where the offsite power sources cannot be restored within 24 hours; and
- (3) Section 3.7.6 and 3.7.7 must include a provision for hot restart of a reactor from a tripped condition (as defined in Section 3.7.7(c) of the current specifications).

#### IV. REFERENCES

1. 10 CFR 50, Code of Federal Regulations, General Design Criterion 17.
2. IEEE Std 308-1974 IEEE Standard Criteria for Class IE Power Systems for Nuclear Power Generating Stations.
3. Regulatory Guide, 1.93, Availability of Electric Power Sources, dated December 1974.
4. Standard Technical Specifications.
5. Oconee Nuclear Station Technical Specifications, Section 3.7 and 4.6, dated July 19, 1974.
6. Letter from Mr. W. O. Parker, Jr. (Duke Power Company) to Mr. E. G. Case (NRC) Proposed Revisions to Oconee Nuclear Station, dated September 19, 1977.
7. Safety Evaluation of the Duke Power Company Oconee Nuclear Power Station, Unit 1, including Supplements 1, 2, and 3 dated December 29, 1970.
8. Safety Evaluation of the Duke Power Company Oconee Nuclear Power Station, Units 2 and 3 including Supplements 1, 2, and 3, dated July 6, 1973.
9. Final Safety Analysis Report Oconee, Units 2 and 3, Section 14.1.2.8.3, Revision 24, dated November 15, 1972.