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SEP 27 1973

Docket Nos. 50-438
and 50-439

Tennessee Valley Authority
ATTN: Mr. James E. Watson
Manager of Power
818 Power Building
Chattanooga, Tennessee 37401

Gentlemen:

In order that we may continue our review of your application for a license to construct the Bellefonte Nuclear Plant, Units 1 and 2, additional information is required. The information requested is described in the enclosure and pertains to Chapters 7 and 8 of the Preliminary Safety Analysis Report.

In order to maintain our licensing review schedule, we will need a completely adequate response to all enclosed questions by November 1, 1973. Please inform us within 7 days after receipt of this letter of your confirmation of the schedule date or the date you will be able to meet. If you cannot meet our specified date or if your reply is not fully responsive to our request, it is highly likely that the overall schedule for completing the licensing review for the project will have to be extended. Since reassignment of the staff's efforts will require completion of the new assignment prior to returning to this project, the extension will most likely be greater than the delay in your response.

Please contact us if you have any questions regarding the information requested.

Sincerely,

Original Signed

A. Schwencer, Chief
Pressurized Water Reactors Branch 4
Directorate of Licensing

Enclosure:
Request for Additional Information

cc: Mr. R. H. Marquis
General Counsel
629 New Sprakle Building
Knoxville, Tennessee 37902

OFFICE ▶	x7548/L:PWR-4	L:PWR-4				
SURNAME ▶	DDavis:cjr	ASchwencer				
DATE ▶	9/26/73	9/27/73				

REQUEST FOR ADDITIONAL INFORMATION
TENNESSEE VALLEY AUTHORITY
BELLEFONTE NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NOS. 50-438 AND 50-439

7.0 INSTRUMENTATION AND CONTROLS

7.6 The Reactor Protection System (RPS) had been modified as compared to the design used in the Rancho Seco plant. The following concerns are addressed to these modifications.

a) Section 7.3 of the PSAR states that safety injection is initiated by either the low reactor coolant pressure or high containment pressure. Initiation by either of these diverse signals, assuming failure of the other signal, assures satisfactory ECCS performance. Since the analysis of the effectiveness of the ECCS performance design assumes a reactor trip, discuss the bases for not using high building pressure to trip the reactor as indicated in Section 7.2.1.1.1 of the PSAR.

b) Discuss replacing the Power/Imbalance/Flow trip with the Multi-variable Power Envelope Trip. Include in your response the degree of protection of this new trip as compared with that used in Rancho Seco. Supplement the description in Section 7.2 to illustrate the design advantages as compared to that used in Rancho Seco.

c) Provide the design basis criteria for the Power/Delta T (or startup) trip.

7.7 The Bellefonte CRDCS trip circuit design utilizes solid state switches (SCR's) in the rod motor power supplies and in the motor return circuits as one means of interrupting power to the control rod drive mechanisms. The Rancho Seco design utilizes a combination of d-c breakers and SCRs to perform this function. Provide an analysis verifying that your design will give an equivalent degree of reliability as the Rancho Seco design. Your response should state if the SCR's in the motor return circuits can be themselves effect a reactor trip, i.e., without the other SCR's reverting to the open state.

7.8 The materials for the electrical penetration assemblies are selected on the basis of a 40 year design life. Discuss the feasibility of the penetrations withstanding a LOCA environment during the end of their service life. Support your conclusions by analysis or appropriate qualification testing that simulates this condition.

7.9 Provide the design criteria for the electrical control, instrumentation, and power systems associated with the carbon adsorber bank heaters used in the containment air purification system and referenced in Section 6.2.3.3.2.1. Include the heater system power requirements and the safety significance of their failure to perform their function during an accident condition.

7.10 Safety-related display instrumentation is discussed in Section 7.5. It is noted that no criteria were stated that required redundant monitoring channels, with at least one channel of each variable recorded, and meeting the intent of IEEE 279-1971. This has been required in recently reviewed plants. We will require this capability. Supplement Section 7.5 to indicate the design modifications to comply with this requirement.

7.11 Incidents involving the inadvertent disabling of a component by racking out the circuit breaker for a different component have occurred in nuclear power plants. In view of these occurrences, provide your design criterion that assures disabling of one component does not, through incorporation in other interlocking or sequencing controls, render other redundant components inoperable. All modes of test, operation, and failure must be considered. It appears that in the cases cited above, the racked out position of breakers had not been included in the failure mode analysis of those control circuits.

Also, procedures should be developed to ensure, whenever part of a redundant system is removed from service, the portion remaining in service is functionally tested immediately after the disabling of the affected portion and, if possible, before disabling of the affected portion.

7.12 Define the degree of conformance of the safety systems to Regulatory Guides 1.40, 1.41, 1.47, and 1.53. With regard to Regulatory Guide 1.47:

a) The conditions of positions 3(b) and 3(c) are interpreted to include bypasses that result from manipulation of permanently installed electrical control devices located in any accessible area of the plant.

b) The design criteria for the indication systems should reflect the importance of both providing accurate information for the operator and reducing the possibility for the indicating equipment to adversely affect the monitored safety systems. In discussing the Bellefonte design criteria, the following should be considered;

(1) The bypass indicators should be arranged to enable the operator to assess readily the operating status of each safety system and determine whether continued reactor operation is permissible.

(2) Means by which the operator can cancel erroneous bypass indications, if provided, should be justified by demonstrating that the postulated causes of erroneous indications cannot be eliminated by another practical design.

(3) Unless the indication system is designed in conformance with criteria established for safety systems, it should not be used to perform functions that are essential to the health and safety of the public. Neither should administrative procedures require immediate operator action based solely on the bypass indications.

(4) The indication system should be designed and installed in a manner which precludes the possibility of adverse effects on the plant's safety systems. Failure or bypass of a protection function should not be a credible consequence of failures occurring in the indication equipment and the bypass indication should not reduce the required independence between redundant safety systems.

(5) The indication system should include a capability of assuring its operable status during normal plant operation to the extent that indicating and annunciating functions can be verified.

7.13 The shared facilities and equipment are discussed in Section 1.2.4.3 and Section 3.1 to show compliance with General Design Criterion 5. There appear to be several omissions in Section 1.2.4.3 that are listed in Section 3.1. Correct these omissions and provide your design criteria that insure a fault or accident occurring in one unit will not be propagated through the shared system to the other unit's electrical, instrumentation, control or power systems.

7.14 Identify any trip or activation set point of the reactor protection system and engineered safety feature system which are within 5% of the high or low end of the calibrated range. Provide an error analysis for each such case that verifies that the required output signal is always conservative when viewed from a safety standpoint. Provide the design criteria governing this aspect of your design.

8.0 ELECTRIC POWER

8.1 The standby diesel generators described in Section 8.3.1.1.7 will be in a size range (inferred from data in Table 8.3-1) that has not been previously qualified for use in nuclear power plants. We will require qualification testing for these units similar to that performed on the Zion Nuclear Plant's 4000 KW diesel generators. An acceptable test program would include the following requirements:

a. At least two tests acceptable to the Regulatory staff should be performed on each diesel to demonstrate the start and load capability of these units with some margin in excess of the design requirements.

b. Prior to initial criticality of Bellefonte, performance of at least 300 valid start and load tests, with no more than three failures allowed should be completed. This would include all valid tests performed offsite. (A valid start and load test is defined as a start from design cold ambient conditions with loading to at least 50% of the continuous rating within the required time interval, and continued operation until temperature equilibrium is attained.)

c. A failure rate in excess of one per hundred will require further testing as well as a review of the system design adequacy.

State your intent with regard to meeting these requirements and provide a detailed description of your test program.

8.2 Provide the design criteria governing battery charger capacity. Your criteria should specify battery charger capacity in terms of the time required to fully charge a battery from the design minimum charge condition while simultaneously supplying all connected loads.

8.3 Supplement the information in Section 8 with your design criteria for equipment location to insure compliance with General Design Criterion 17. Your response should cover the criteria for the location of any structure (such as microwave towers or hydrogen trailer ports) to assure independence of offsite power sources.

8.4 We interpret General Design Criterion 18 to require testability of the onsite emergency power sources (diesel generators) during power operation of the plant, including the starting logic and load sequencing which is required to operate during emergency conditions. Supplement Section 8.3.1.1.8 to include a description verifying the required testability or a commitment that this testability will be provided.

8.5 Supplement the information in Section 8.3.1.1.7 to provide a complete description of the equipment protection trips associated with the emergency diesel generators. Your response should describe the number and type of trips; the number, type and location of alarm and indications; and the equipment protection bypasses provided during emergency operation. Your response should also include an analysis that demonstrates that your design provides minimum probability of false trip without unduly exposing the diesel generators to destructive hazards.

8.6 Under the discussion of the 480 Volt Class IE Power Distribution Systems in Section 8.3.1.1.2 it is mentioned that two Unit 1 motor control centers are provided to supply safety related loads shared by both units. List the safety related loads that are referenced and explain the apparent discrepancy that exists between this section and Section 8.1.2 which states none of the shared components are required for safe shutdown.

8.7 With regard to the 161 KV switchyard, Section 8.2.1.1 states that bus 1 feeds reserve station transformers 1A and 1B and bus 2 feeds reserve station transformers 2A and 2B. This does not agree with the connections shown on Figures 8.1-2 and 8.2-13. Correct this inconsistency.

8.8 The following is not addressed in Section 8.3.1.4.2, Criteria for Design and Installation of Electrical Cables:

a) Identify the criteria used for cable derating by title and publication number and provide an explicit description of the application of the criteria.

b) Provide the criteria for cable splices, including their location in the cable raceway system. It is noted that in recent incidents faulty cable splices have been identified as the cause of fire in cable trays. We will require that no cable splices be located in cable trays.

8.9 The physical identification of safety related equipment is discussed in Section 7.1.2.3 with reference to Sections 8.3.1.5 and 8.3.1.4.5. Section 8.3.1.5 refers to Section 8.3.1.4.2 (5) which discusses alphanumeric identification only and Section 8.3.1.4.5 is non-existent. Correct and supplement the PSAR as follows:

a. We interpret Paragraph 4.22 of IEEE Std 279-1971 as requiring distincitive color coding of cables, cable trays, conduits, ducts, control cabinents, and other major electrical components including pump motors. Supplement your criteria to include color coding of cable to differentiate between cables of redundant safety divisions, between safety and non-safety cables, and between non-safety cables which have been routed with cables of a safety division.

Supplement your criteria to include marking of cables in a sufficient number of points to facilitate initial verification by visual inspection that the cable installation is in conformance with the separation criteria. These cable markings should be applied prior to or during installation.

b. Supplement the criteria for alphanumeric cable identification to provide cable identifications which differentiate between safety-related cable of different channels or divisions, non safety-related cable which is run in trays of a specific safety division, and non safety-related cable which is not associated physically with any safety divisions.

c. Correct the referenced PSAR sections as required for consistency.