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MEMORANDUM FOR: J. F. Stolz, Chief, Light Water Reactors Branch 1, DPM

FROM: FEust Rosa, Chief, Power Systems Branch, DSS

SUBJECT: ACCEPTANCE REVIEW - GRAND GULF NUCLEAR STATION UNITS NOS. 1 & 2

Plant Name: Grand Gulf 1 & 2
Docket Nos: 50-416/417
Licensing Stage: Acceptance Review - OL
Milestone No: 010
Responsible Branch: LWR-1
& Project Manager: C. Thomas
Requested Completion Date: May 22, 1978
Review Status: Complete

The enclosed acceptance review requests for additional information covers those portions of Grand Gulf Nuclear Station for which the Power Systems Branch has primary responsibility. Our review was based on guidelines provided by Regulatory Guide 1.70 "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants", Revision 2, and the Standard Review Plans. Based on this review we conclude that the Grand Gulf FSAR is approximately 90% complete and therefore recommend that it should be accepted for docketing.

The enclosed requests identify specific areas where additional information is needed. These areas are: The offsite and onsite emergency power systems, equipment qualification, diesel generator auxiliary systems, and the turbine generator.

/s/

Faust Rosa, Chief
Power Systems Branch
Division of Systems Safety

Enclosure:
As stated

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cc: S. Hanauer, J. Knox, R. Mattson, C. Thomas, R. Boyd, R. Tedesco, R. Hartfield, J. Glynn, M. Fields, D. Vassallo

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Acceptance Review Requests
for Additional Information
Grand Gulf Nuclear Station 1&2
50-416/417

040. (8.3) Diesel generator alarms in the control room: A review of malfunction reports of diesel generators at operating nuclear plants has uncovered that in some cases the information available to the control room operator to indicate the operational status of the diesel generator may be imprecise and could lead to misinterpretation. This can be caused by the sharing of a single annunciator station to alarm conditions that render a diesel generator unable to respond to an automatic emergency start signal and to also alarm abnormal, but not disabling, conditions. Another cause can be the use of wording of an annunciator window that does not specifically say that a diesel generator is inoperable (i.e., unable at the time to respond to an automatic emergency start signal) when in fact it is inoperable for that purpose.

Review and evaluate the alarm and control circuitry logic for the diesel generators at your facility to determine how each condition that renders a diesel generator unable to respond to an automatic emergency start signal is alarmed in the control room. These conditions include not only the trips that lock out the diesel generator start and require manual reset, but also control switch or mode switch positions that block automatic start, loss of control voltage, insufficient starting air pressure or battery voltage, etc. This

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review should consider all aspects of possible diesel generator operational conditions for example, test conditions and operation from local control stations. One area of particular concern is the unreset condition following a manual stop at the local station which terminates a diesel generator test and prior to reseting the diesel generator controls for enabling subsequent automatic operation.

Provide the details of your evaluation, the results and conclusions, and a tabulation of the following information:

(a) all conditions that render the diesel generator incapable of responding to an automatic emergency start signal for each operating mode as discussed above;

(b) the wording on the annunciator window in the control room that is alarmed for each of the conditions identified in (a);

(c) any other alarm signals not included in (a) above that also cause the same annunciator to alarm;

(d) any condition that renders the diesel generator incapable of responding to an automatic emergency start signal which is not alarmed in the control room; and

(e) any proposed modifications resulting from this evaluation.

040.x (8.2) In regard to the physical separation between the preferred power sources from the service transformers and ESF Transformer to the onsite Class 1E power system, sufficient information has not been provided in the FSAR to demonstrate compliance with NRC General Design Criteria 1, 3, 4, 17, and 18. Provide this information.

040. (3.11) (8.0) The staff requires that the following qualification test program information be provided for all Class 1E equipment:

1. Identification of Equipment including,
   a) Manufacturer
   b) Manufacturer's type model
   c) Manufacturer's model number
   d) All Class 1E equipment should be identified including the following, as applicable:
      1) Switchgear
      2) Motor control centers,
      3) Valve operators
      4) Motors
      5) Logic equipment
      6) Cable
      7) Diesel generator control equipment
      8) Sensors
      9) Limit Switches
      10) Heaters

11) Fans

12) Control Boards

13) Instrument racks and panels

14) Connectors

15) Electrical penetrations

16) Splices

17) Terminal blocks

2. Equipment design specification requirements, including,

a) The system safety function requirements

b) An environmental envelope as a function of time which includes all extreme parameters, both maximum and minimum values, expected to occur during plant shutdown, normal operation, abnormal operation, and any design basis event including LOCA and MSLB.

c) Time required to fulfill its safety function when subjected to any of the extremes of the environmental envelope specified above.

3. The qualification test plan, test set-up, test procedures, and acceptability goals and requirements.

4. For equipment subject to a design basis accident environment, the actual qualification envelope simulated during testing (defining the duration of the hostile environment and the margin in excess of the design requirements).

5. A summary of test results (or schedule for submission) that demonstrates the adequacy of the qualification program. If analysis is used for qualification justification must be provided.

6. Identification of the qualification documents which contain detailed supporting information, including test data, for items 3, 4 and 5.

The information requested in items 1, 2, 4, 5 and 6 shall be provided for all items of Class 1E equipment. The information in item 3 shall be provided for at least one of each group of equipment of item 1d (as applicable) which is subject to a design basis accident environment. The information in item 3 shall also be provided for representative major equipment of item 1d which is not subject to a design basis accident environment.

In addition, in accordance with the requirements of Appendix B of 10 CFR 50, the staff requires a statement verifying: 1) that all Class 1E equipment has been (OL) or will be (CP) qualified to the program described above, and 2) that the detailed qualification information is (or will be) available for an NRC audit.

040 (8.3) (3.11) Qualification of Safety Related Cable

The Regulatory staff is currently requesting, of all plants in OL review, information on the use of poleythelen type cable in safety systems. These type cables were found to have degraded considerably after many years of installed operation at the Savannah fuel processing plant.

Identify all safety related cable used in your design that has polyethelene in its construction. Provide the following information for each type of cable identified:

a) Type of cable by name and Cat. No.
b) Manufacturer
c) Type of polyethelene used
d) How is the polyethelene used in the cables construction, i.e., insulation and/or jacket.
e) Results of environmental qualification tests performed.

040.4 (8.3) Qualification of Penetrations

Describe how your design meets the recommendations of Regulatory Guide 1.63, Revision 1.

Identify each type of electrical circuit that penetrates containment. Describe the primary and backup over current protection systems provided for each type of circuit. Describe the fault-current-versus-time for which the primary and backup protection systems and the penetrations are designed and qualified.

Provide coordinated curves which demonstrate, for each circuit identified, that the maximum fault-current-versus-time condition to which the penetration and cable were qualified will not be exceeded.

Describe the provision for periodic testing under simulated fault conditions.

040.5 (3.11) (8.3) Potential Problem with Containment Electrical Penetration Assemblies

Recent operating experience at Millstone Unit No. 2 has shown that the deterioration of the epoxy insulation between splices has caused electrical shorts between conductors within a containment electrical penetration assembly. Indicate what tests and/or analysis that have been performed to demonstrate the acceptability of the design in this regard. Provide whatever information is required to perform an independent evaluation of this aspect of the electrical penetration design.

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040.6 (8.2) Recent operating experience has shown that adverse effects on the safety-related power system and safety related equipment and loads can be caused by sustained low or high grid voltage conditions. We therefore require that your design of the safety related electrical system meet the following staff positions. Supplement the description of your design in the FSAR to show how it meets these positions or provide appropriate analyses to justify non-conformance with these positions.

1. We require that an additional level of voltage protection for the onsite power system be provided and that this additional level of voltage protection shall satisfy the following criteria:

   a) The selection of voltage and time set points shall be determined from an analysis of the voltage requirements of the safety-related loads at all onsite system distribution levels;

   b) The voltage protection shall include coincidence logic on a per bus basis to preclude spurious trips of the offsite power source;

   c) The time delay selected shall be based on the following conditions:

      (1) The allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the PSAR accident analyses;

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(2) The time delay shall minimize the effect of short duration disturbances from reducing the availability of the offsite power source(s); and

(3) The allowable time duration of a degraded voltage condition at all distribution system levels shall not result in failure of safety systems or components;

d) The voltage sensors shall automatically initiate the disconnection of offsite power sources whehenver the voltage set point and time delay limits have been exceeded;

e) The voltage sensors shall be designed to satisfy the applicable requirements of IEEE Std. 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations"; and

f) The Technical Specifications shall include limiting condition for operation, surveillance requirements, trip set points with minimum and maximum limits, and allowable values for the second-level voltage protection sensors and associated time delay devices.

2. We require that the current system designs automatically prevent load shedding of the emergency buses once the onsite sources are supplying power to all sequenced loads on the emergency buses. The design shall also include the capability of the load shedding feature to be automatically reinstated if the onsite source supply breakers are tripped. The automatic bypass and reinstatement feature shall be verified during the periodic testing identified in Position 3.

In the event an adequate basis can be provided for retaining the load shed feature when loads are energized by the onsite power system, we will require that the setpoint value in the Technical Specifications, which is currently specific as "...equal to or greater than..." be amended to specify a value having maximum and minimum limits. The licensee' bases for the setpoints and limits selected must be documented.

3. We require that the Technical Specifications include a test requirement to demonstrate the full functional operability and independence of the onsite power sources at least once per 18 months during shutdown. The Technical Specifications shall include a requirement for tests: (1) simulating loss of offsite power; (2) simulating loss of offsite power in conjunction with a safety feature actuation signal; and (3) simulating interruption and subsequent reconnection of onsite power sources to their respective buses. Proper operation shall be determined by:

a). Verifying that on loss of offsite power the emergency buses have been de-energized and that the loads have been shed from the emergency buses in accordance with design requirements.

b) Verifying that on loss of offsite power the diesel generators start on the autostart signal, the emergency buses are energized with permanently connected loads, the auto-connected shutdown loads are energized through the load sequencer, and the system operates for five minutes while the generators are loaded with the shutdown loads.

c) Verifying that on a safety features actuation signal (without loss of offsite power) the diesel generators start on the autostart signal and operate on standby for five minutes.

d) Verifying that on loss of offsite power in conjunction with a safety features actuation signal the diesel generators start on the autostart signal, the emergency buses are energized with permanently connected loads, the auto-connected emergency (accident) loads are energized through the load sequencer, and the system operates for five minutes while the generators are loaded with the emergency loads.

e) Verifying that on interruption of the onsite sources the loads are shed from the emergency buses in accordance with design requirements and that subsequent loading of the onsite sources is through the load sequencer.

4. The voltage levels at the safety-related buses should be optimized for the full load and minimum load conditions that are expected throughout the anticipated range of voltage variations of the offsite power source by appropriate adjustment of the voltage tap settings of the intervening transformers. We require that the adequacy of the design in this regard be verified by actual measurement and by correlation of measured values with analysis results. Provide a description of the method for making this verification; before initial reactor power operation, provide the documentation required to establish that this verification has been accomplished.

040. (9.5.4) Provide in Section 9.5.4 the means for indicating, controlling and monitoring the emergency diesel engine fuel oil temperature (SRP 9.5.4, Part III, Item 1).

040. (9.5.5) The diesel engine generator sets should be capable of operation at less than full load for extended periods without degradation of performance or reliability. Provide a discussion of your diesel engine operating parameters, including minimum load requirements, and relate this to anticipate minimum loads under accident recovery conditions and during accident standby operation when offsite power is available (SRP 9.5.5, Part III, Item 7).

040. (9.5.8) Section 9.5.8 states that the diesel generator combustion air intake and exhaust system is missile protected. Provide further description (with the aid of drawings) explaining how the openings in the diesel generator building for the air exhaust are protected from tornado borne missiles.

040. (10.2) Discuss what protection will be provided the turbine overspeed control system equipment and associated electrical wiring and hydraulic lines from the effects of a high or moderate energy pipe failure so that the turbine overspeed protection system will not be damaged to preclude its safety function. (SRP 10.2, Part III, Item 8).

040. (10.2) Describe with the aid of drawings, the bulk hydrogen storage facility including its location and distribution system. Include the protective measures considered in the design to prevent fires and explosions during operations such as filling and purging the generator, as well as during normal operations.

040. (10.2) The FSAR discusses the main steam stop and control, and reheat stop and intercept valves. Show that a single failure of any of the above valves cannot disable the turbine overspeed trip functions. (SRP 10.2, Part III, Item 3).