GENERAL ELECTRIC

NUCLEAR POWER

SYSTEMS DIVISION

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MFN 054-83
JNF 016-83

March 16, 1983

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555

Attention: Mr. D.G. Eisenhut, Director
Division of Licensing

Gentlemen:

SUBJECT: IN THE MATTER OF 238 NUCLEAR ISLAND
GENERAL ELECTRIC STANDARD SAFETY ANALYSIS REPORT (GESSAR II)
DOCKET NO. STN 50-447

REVISED DRAFT RESPONSES AND RESPONSES TO DISCUSSION ITEMS

Attached please find revised final draft responses to selected Auxiliary Systems Branch questions of the Commission's August 25, 1982 information request. Only modifications (new or revised) to the responses of the referenced letter are provided. Also attached are draft responses to Equipment Qualification Branch discussion items. Responses are provided in the attachments as indicated below:

Attachment Number	
1	Draft Responses to Auxiliary Systems Branch Questions
2	Draft Responses to Equipment Qualification Branch Discussion Items

Sincerely,

R Artigo for

Glenn G. Sherwood, Manager
Nuclear Safety & Licensing Operation

E003

Attachments

cc: F.J. Miraglia (w/o attachments)
D.C. Scaletti
C.O. Thomas (w/o attachments)
L.S. Gifford (w/o attachments)

ATTACHMENT NO. 1

DRAFT RESPONSES TO
AUXILIARY SYSTEMS BRANCH
QUESTIONS

410.24 (9.1.3) Verify that the information provided in Section 9.1.3 of your FSAR is based on the new high density spent fuel pool storage capacity. Provide additional information regarding the spent fuel decay heat load for the maximum, normal and abnormal heat loads as discussed in Items 1.d and 1.h of the review procedures in Section 9.1.3 of the SRP.

410.24 Response

Paragraph 9.1.3.1.2(4) for the Power Generation Design Basis states that the heat load is the sum of 1) the 37% core batch just removed at the last 18-month equilibrium fuel cycle, with four year exposure, and 2) the 37% core batch from the previous refueling outage. The heat load, therefore, is a function of two 37% batches which means that the entire heat capacity of the fuel storage pool does not enter the design. The fresh core supplies about 90% of the heat load and the aged core fraction supplies the other 10% of the design load. The density of the fuel racks would change the heat load calculation only if all of the potential batches stored within the pool are used toward the total design value. Even under these conditions, the design value would be only slightly affected.

Paragraph 9.1.3.2 describes that the above design core load for heat capacity is based upon maintaining 125°F in the pool. This is the system design maximum load and temperature combination. However, if conditions exist as described in paragraph 9.1.3.3, wherein up to a full reactor core is placed into the pool, instead of the 37% batch, the pool may go to 150°F. But adding the RHR cooling capacity will keep the temperature at a maximum of 125°F.

Item 1.h(ii) states that the normal maximum spent fuel heat load is set as one refueling load at equilibrium conditions after 150 hours decay, with one refueling load after 1 year decay, and 140°F pool temperature. The GESSAR II design basis is more conservative in that the refueling load is assumed at 112 hours decay and the maximum pool temperature is set at 125°F. The shorter fresh batch decay time adds to the total heat load sum of the two batches.

Item 1.h(iii) states that the spent fuel pool cooling system shall have capacity for a full core at equilibrium and one refueling load, at 36 days, for a total of 1-1/3 core fraction. Item 1.h(iv) further adds 1/3 core for pool capacity over 1-1/3 batches. If RHR cooling capacity is included in the spent fuel pool cooling system, then the cooling capacity is more than adequate to meet these criteria. The two fuel pool heat exchangers cover only the normal maximum reflecting item 1.h(ii) and the RHR covers any additional load while the reactor is open.

410.37 (6.8) (9.3.1)

In Section 9.3.1.2 of your FSAR, you state that the instrument air supplied to the main steam safety relief valves and isolation valves is filtered to remove all particles larger than 50 microns. To be consistent with Section 9.3.1 of the SRP and ANSI MC11.1-1976, this air should be filtered to 3 microns or less. Revise your design to meet this criterion. Address, as an interface requirement if necessary, the maximum total oil content of the air supply to these valves and their accumulators in accordance with Section 9.3.1 of the SRP. These same requirements should also be addressed for the pneumatic supply system.

Response

The text has been changed to reflect the 3 micron filtering. This will require the line upstream of the filter to be changed from carbon steel to galvanized. The P&ID's will be changed accordingly.

With respect to air quality see response to question 410.33.

9.3.1.2 System Description (Continued)

Instrument air to the Main Steam SRVs and isolation valves is filtered to less than 3 microns. Corrosion-resistant materials are used UPSTREAM AND downstream of the filter. 410.37

All accumulators are constructed of corrosion-resistant material and include low point drains. Accumulator mounting orientation is with the major axis in a vertical direction. Accumulators are located in a manner which prevents their failure from generating missiles or impairing the function of any surrounding safety-related equipment.

The accumulator support structure is designed to sustain the maximum thrust loads developed during a failure of the largest line connected to the accumulator. A flexible section of austenitic stainless steel pipe is installed in the piping from the accumulators of the Main Steam SRVs and MSIVs to the associated actuators. This pipe section accommodates the relative motion of the steamline with respect to the accumulator.

Air supply lines to the accumulators include a checkvalve to prevent backleakage upon loss of supply line pressure. The checkvalve is constructed of corrosion-resistant material and is spring loaded with a resilient seal for "bubbletight" shutoff. Pipe between the MSIV air control valves and accumulators is 1 1/4 in. diameter minimum and 10 ft maximum equivalent length, to maintain valve response.

9.3.1.3 Safety Evaluation

The operation of the Instrument and Service Air Systems is not required to assure of any of the following:

(1) integrity of the reactor coolant pressure boundary;

6.8.2 System Description

The Pneumatic Supply System provides dry, oil-free, compressed air for the actuators of the ADS SRV, the steam-condensing control valves of the RHR System, the specified valves of the SGTS, Hydrogen Mixing and Drywell and Containment Vacuum Relief Systems (see Figure 6.8-1 for details).

The Pneumatic Supply System is separated into two independent divisions. Division 1 supplies air to the ADS valves and accumulators on steamlines A and C and to specified valves of the RHR System, SGTS, Hydrogen Mixing and Drywell and Containment Vacuum Relief Systems. Division 2 supplies air to the ADS valves and accumulators on steamlines B and D and to specified valves of the RHR System, SGTS, Hydrogen Mixing and Drywell and Containment Vacuum Relief Systems. Operation of one division is sufficient to meet the requirements of the systems serviced.

To ensure adequate air supply under both normal and accident conditions, each division is separated by nonsafety and assured safety. The nonsafety portion of each division contains an air compressor and associated air intake filter and after cooler to provide a continuous source of compressed air. This air is dried in a parallel flow air dryer, with its associated prefilters and after filters, and is then directed to the air receiver. Supply headers from the receiver service the air valves. As shown in Figure 6.8-1, the air is filtered with 3 micron filters before it enters the drywell. All piping up steam of the filters is galvanized and piping downstream is stainless steel. 410.38
During LOCA, LOPP and/or system low pressure, the compressor supply to the receiver is automatically cut off, and the assured safety air supply valve is opened. The safety air supply consists of a bank of high pressure air bottles, with a pressure-reducing valve, piped directly to the air receiver. The bottled supply is adequate to meet emergency air requirements for a period of seven days. The operator must replace some of the bottles after this period

410.38 (6.8) (9.3.1) Identify the testing requirements and frequency of tests for the safety-related accumulators and check valves provided in the compressed air system and pneumatic supply system. To assure continuous reliable functioning of the instrument air system and the pneumatic supply system, provide a procedure or an interface requirement for a procedure which requires periodic testing of the air quality for both the instrument air system and the pneumatic supply system.

Response

Response to this question is provided in revised Subsections 9.3.1.4 and 6.8.4.

9.3.1.3 Safety Evaluation (Continued)

energy in the building environment generates missiles nor impairs the functioning of safety-related equipment. Containment isolation valves and associated accumulators are located a minimum distance from the containment wall.

(6) All of the accumulators, piping connecting the accumulators and the actuator supply line and support structures for the accumulators are designed, built, installed and tested to ASME Code, Section III, Safety Class 3 and Seismic Category I.

(7) Support structures are designed to absorb the thrust loads that would be developed assuming a failure of the largest pipe connected to the accumulator.

9.3.1.4 Inspection and Testing Requirements

The Instrument Air System and Service Air System are proved operable by their use during normal plant operation. Portions of both systems normally closed to airflow can be tested to ensure operability and integrity of each system. AIR QUALITY SHALL BE TESTED PERIODICALLY TO ASSURE COMPLIANCE WITH ANSI MC11.1-1976. 410.38

The air supply system to the MSIV and main steam SRV shall be subjected to preoperational tests in accordance with Chapter 14, AFTER WHICH PERIODIC TESTS OF THE CHECK VALVES AND ACCUMULATORS SHOULD BE CONDUCTED TO ASSURE VALVE OPERABILITY. 410.38

The motor-operated isolation valves are capable of being tested to assure their operational integrity by manual actuation of a switch located in the control room and by observation of associated position indication lights. Test and vent connections are provided at the isolation valve penetrations in order to verify their leaktightness.

6.8.3 System Evaluation (Continued)

which are designed to Seismic Category I, ASME Code III, Class 2, Quality Group B and Quality Assurance B requirements.

The pneumatic supply is separated into two independent divisions, with each division capable of supplying 100% of the requirements of the division being serviced. Each division is mechanically and electrically separated from the other. The system satisfies the components' air demands during all plant operation conditions (normal through faulted).

Safety grade portions of the Pneumatic Supply System are capable of being isolated from the nonsafety parts and retaining their function during LOCA and/or seismic events under which any nonsafety parts may be damaged.

Pipe routing of Division 1 and Division 2 pneumatic air is kept separated by enough space so that a single fire, equipment dropping accident, strike from a single high energy whipping pipe, jet force from a single broken pipe, internally generated missile or wetting equipment with spraying water cannot prevent the other division from accomplishing its safety function. Separation is accomplished by spatial separation or by a reinforced concrete barrier, to ensure separation of each pneumatic air division from any systems and components which belong to the other pneumatic air division.

6.8.4 Inspection and Testing Requirements

Periodic in-service inspection of components, in accordance with ASME Section XI, to ensure the capability and integrity of the system is mandatory. Air quality shall be tested periodically to assure compliance with ANSI MC11.1-1976. 410.38

6.8.4 Inspection and Testing Requirements (Continued)

The air-operated isolation valves are capable of being tested to assure their operational integrity by manual actuation of a switch located in the control room and by observation of associated position indication lights. Test and vent connections are provided at the containment isolation valves in order to verify their leaktightness. Operation of valves and associated equipment used to switch from the nonsafety to safety air supply can be tested to assure operational integrity by manual actuation of a switch located in the control room and by observation of associated position indication lights. Periodic tests of the check valves and accumulators shall be conducted to assure valve operability. A10.38

6.8.5 Instrumentation Requirements

Supply-air-header-pressure and moisture-content sensors are located at the supply header of each division and monitored in the control room.

A pressure sensor is provided for the safety air supply, and an alarm signals low air pressure.

Automatic isolation valves are provided for the safety and non-safety air supply. Upon a LOCA and/or detection of nonsafety air low pressure, the system automatically isolates the nonsafety air supply and opens the isolation valve to the safety air supply. A remote manual switch and open/closed position lights are provided in the control room for verification of proper valve operation. The compressor is shut down by a high backpressure signal or by manual override.

Air-operated isolation valves in series are provided for the pneumatic air pipe penetrations through the containment and drywell. These valves are not automatically closed by a LOCA isolation signal. Air supply for the isolation valve air operators is from the Pneumatic Supply System itself. The

ATTACHMENT NO. 2

DRAFT RESPONSES TO
EQUIPMENT QUALIFICATION BRANCH
DISCUSSION ITEMS

Item 1

Applicability of NEDE-24326-1-P Section 4.4 qualification methodology to mechanical equipment.

Response

A reference will be added to Section 3.9.3.2 as shown on page 3.9-76.

Item 2

Preference of tests and analyses of assemblies over separate components.

Response

A statement will be added to Subsection 3.10.1.1 as shown on page 3.10-2 showing tests or analyses of assemblies is prefered to tests or analyses on separate components.

Item 3

Applicability of R.G. 1.148.

Response

A reference to R.G. 1.148 will be added to Subsection 3.10.1.3 as shown on page 3.10-3. Note the addition of Subsection 1.8.148.

Item 4

Justification of less than 5 OBE's.

Response

As described in revised response 271.04a of Attachment No. 6 to the letter from Glenn G. Sherwood to D.G. Eisenhut dated February 17, 1983 (MFN 035-83), 5 OBEs combined with the appropriate hydrodynamic loads are utilized for equipment qualification.

Item 5

Usage of NUREG-0484 for combining dynamic loads.

Response

As described in revised response 271.02a of Attachment No. 6 to the letter from Glenn G. Sherwood dated February 17, 1983 (MFN 035-83), hydrodynamic and seismic loads are combined using the methodology of NUREG-0484.

Item 6

Documentation of justification for using single axis or single frequency tests.

Response

A statement will be added to Subsection 3.10.2.1.4 as shown on page 3.10-9 to require the final test report justify using single axis or single frequency tests for all items that are tested in this manner.

Item 7

Confirmation that all safety-related does not have any natural frequency below 4 Hz.

Response

This is part of the confirmatory response to Structural and Geotechnical Engineering Branch questions 220.09 and 220.44 scheduled for completion in April 1983.

3.9.3.1.20 Non-NSSS Piping (Response to Item 1)

basis in accordance with Appendix F of the code. For Class 2 and 3 piping, stresses are calculated on an elastic basis in accordance with Appendix F of the code. For Class 2 and 3 piping, stresses are calculated on an elastic basis in accordance with NC/ND-3600 of the code.

3.9.3.2 Pump and Valve Operability Assurance

Table 3.9-14 lists the active pumps and valves in the NSSS. Tables 3.9-15 and 3.9-16 list the active non-NSSS pumps and valves, respectively.

Active mechanical equipment are classified as Seismic Category I and each is designed to perform a mechanical motion for its safety funtion during the life of the plant under postulated plant conditions. Equipment with faulted condition functional requirements include active pumps and valves in fluid systems such as the Residual Heat Removal System, Core Spray System, and Main Steam System.

Safety-related valves and pumps are qualified by testing and analysis and by satisfying the stress and deformation criteria at the critical locations. Operability is assured by meeting the requirements of the programs defined in Subsection 3.9.2.2, Section 3.10, Section 3.11 and the following subsections.

→ INSERT

3.9.3.2.1 ECCS Pump/Motors

All active pumps are qualified for operability by first being subjected to rigid tests both prior to installation in the plant and after installation in the plant. The in-shop tests include: (1) hydrostatic tests of pressure-retaining parts of 125% of the design pressure; (2) seal leakage tests; and (3) performance tests while the pump is operated with flow to determine total developed head, minimum and maximum head and net positive suction head (NPSH) requirements. Also monitored during these operating tests are

INSERT FOR PAGE 3.9-76

Section 4.4 of NEDE-24326-1-P* applies to this subsection and the seismic qualification methology presented in NEDE-24326-1-P is applicable to mechanical as well as electrical equipment.

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* N.C. Shirley, "General Electric Environmental Qualification Program", January 1986 (Proprietary)

3.10.1 Seismic Qualification Criteria (Including Hydrodynamic Loads)

3.10.1.1 Selection of Qualification Method

Response to Item 2

Qualification of Seismic Category I instrumentation and electrical equipment is accomplished by test, analysis, or a combination of the two methods.

In general, analysis is used to supplement test data although simple components may lend themselves to dynamic analysis in lieu of full-scale testing. The deciding factors for choosing between tests or analysis include:

(1) magnitude and frequency of the seismic and hydrodynamic loadings;

(2) environmental conditions (Subsection 3.11.1) associated with the dynamic loadings;

(3) nature of the safety function(s);

(4) size and complexity of the equipment; and

(5) dynamic characteristics of expected failure modes (structural or functional).

→ INSERT

3.10.1.2 Input Motion

The input motion for the qualification of equipment and supports is defined by response spectra. The response spectra (Figures 3.10-1 through 3.10-84) are generated from the building dynamic analysis. They are grouped by buildings and by elevations. This RRS definition incorporates the contribution of hydrodynamic loads

INSERT FOR PAGE 3.10-2

¶ The selection of qualification methods to be used is largely a matter of engineering judgement; however, tests or analyses of assemblies are preferable to tests or analyses on separate components (e.g., a motor and a pump, including the coupling and other appurtenances should be tested or analyzed as an assembly).

3.10.1.2 Input Motion (Continued)

in the following combination which incorporates all possible combinations:

SSE + AP + LOCA + SRV

Response to Item 3

where

AP = annulus pressurization
LOCA = loss of coolant accident
SRV = safety/relief valve

The curves for the SSE are obtained by doubling the acceleration values of the corresponding OBE curves. When one type of equipment is located at several elevations and/or in several buildings, the governing response spectra are specified.

3.10.1.3 Seismic Qualification Program

The qualification program for Seismic Category I instrumentation and electrical equipment is designed to conform to the requirements of IEEE 323-1974 as modified and endorsed by Regulatory Guide 1.89. In addition, the program is intended to meet the criteria contained in IEEE 344-1975 as modified and endorsed by Regulatory Guide 1.100. Regulatory Guide 1.100 endorses IEEE 344-1975 with the exceptions of using a static coefficient of 1.5 without justification, the use of a test response spectrum (TRS) that does not envelop the RRS for single frequency tests, the use of the sine sweep test method, and the lack of malfunction data in the test documentation. This qualification program satisfies these requirements. Finally, the qualification program complies with Regulatory Guide 1.148 as identified in Subsection 1.8.148.

3.10.2 Method and Procedures for Qualifying Electrical Equipment and Instrumentation

The following subsections describe the methods and procedures used to qualify by test or analysis Seismic Category I instrumentation and electrical equipment for operation during and after an

1.8.148 Regulatory Guide 1.148, Revision 0, Dated April 1981

Title: Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants

This guide delineates requirements for function and operability for valve assemblies in systems important to safety. This guide will be applied to active valve assemblies in systems important to safety in light-water-cooled nuclear power plants.

Evaluation

The GESSAR II design complies with this guide by using the following GE interpretation:

Position C.1.c (1) - GESSAR II design specifications for valves include all needed operability requirements without having to reference other documents.

Position C.1.c (2) - Not needed, since the GE design documentation system is based on a "top-down" flow of requirements to assure requirement traceability.

Position C.2.d - Seat leakage limits need not be specified for BWR safety/relief valves since GE evaluates the consequences of "stuck-open" valves in FSAR Chapter 15, and leakage could never be higher than the "stack-open" valve.

NEW

3.10.2.1.4 Final Test Report (Continued)

(3) calculation of equipment damping coefficient if there is resonance in the 1-60 Hz range or over the range of the test response spectra;

(4) test equipment used;

(5) approval signature and dates;

Response to Item 6

(6) description of test facility;

(7) summary of results; ~~and~~

(8) conclusion as to equipment seismic (including hydrodynamic loads) qualification; and

(9) justification for using single axis or single frequency tests for all items that are tested in this manner.

3.10.2.2 Qualification by Analysis

The procedures presented in the following subsections apply to the qualification of equipment by analysis.

3.10.2.2.1 Analysis Methods

Dynamic analysis or an equivalent static analysis is employed to qualify the equipment. In general, the choice of the analysis is based on the expected design margin, since the static coefficient method (the easiest to perform) is far more conservative than the dynamic analysis method.

If the fundamental frequency of the equipment is above the input excitation frequency, the equipment is considered rigid. In this case, the loads on each component can be determined statically by concentrating its mass at its center of gravity and multiplying the values of the mass with the appropriate maximum floor