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Vogtle Project

March 26, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. Elinor G. Adensam, Chief
Licensing Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

File: X7BC35
Log: GN-563

NRC DOCKET NUMBERS 50-424 AND 50-425
CONSTRUCTION PERMIT NUMBERS CPPR-108 AND CPPR-109
VOGTLE ELECTRIC GENERATING PLANT - UNITS 1 AND 2
REQUEST FOR SUPPLEMENTAL INFORMATION
STATUS MEETING - DSER OPEN ITEMS

Dear Mr. Denton:

On March 20-22, 1985, I met with members of your staff to discuss and resolve open items remaining on the VEGP draft SER. Attachment 1 is a listing of enclosures. The enclosures address those open items discussed in the meeting and provide the information necessary for their resolution.

If your staff requires any additional information, please do not hesitate to contact me.

Sincerely,

J. A. Bailey

J. A. Bailey
Project Licensing Manager

JAB/sm
Enclosure
xc: D. O. Foster
R. A. Thomas
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ADD: NSIC

ATTACHMENT

OPEN ITEMS INDEX: MARCH 20-22 MEETING

Item	Enclosure	Remarks
C34	A	ECCS backpressure analysis supplemental information
027	B	Sensitivity of CVCS letdown monitor. Revised response to Q490.4; will appear in Amendment 16.
034	C	Steamline break DNBR. Revised response to Q492.9; will appear in Amendment 16.
042	D	Natural circulation tests. Revised response to Q440.45; will appear in Amendment 16.
044	E	Target Rock valves. Revised response to Q440.47; will appear in Amendment 16.
059	F	No go testing. Revised response to Q420.36; will appear in Amendment 16.
069	G	Instrumentation for safety-related process measurements. Revised paragraph 7.6.6; will appear in Amendment 16.
0101	H	Boron dilution. Revised FSAR subsection 15.4.6 and response to Q440.19; will appear in Amendment 16.
0106	I Bob K	Operational QA program. Revised Table 3.2.2-1 sheets 16 & 97, Q260.61, and 260.62. Revisions will appear in Amendment 16.
Q430.1	J	Revised response to Q430.1; will appear in Amendment 16.
Q430.2	K	Revised response to Q430.2; will appear in Amendment 16.

Q430.4	L	See revised response to Q430.4; will appear in Amendment 16.
Q430.9	M	Supercedes Q430.9 response in GN-558, dated 3/15/85; will appear in Amendment 16.
Q430.12	N	Revised response to Q430.12; will appear in Amendment 16.
Q430.21	O	Revised response to Q430.21; will appear in Amendment 16.
Q430.33	P	Revised response to Q430.33; will appear in Amendment 16.
0430.64	Q	Revised response to Q430.64; will appear in Amendment 16.
Q430.73	R	Revised response to Q430.64 and para. 8.3.1.1.11; will appear in Amendment 16.

Additional Information

Enclosure S. Western Canada Hydraulic Laboratories, Ltd., Hydraulic Model Studies of Alvin W. Vogtle Nuclear Plant Flow Conditions to Containment Emergency Sumps, Final Report

Enclosure T. Western Canada Hydraulic Laboratories, Ltd., Hydraulic Model Studies of Alvin W. Vogtle Nuclear Plant Containment Sump ECCS Recirculation Intakes, Final Report.

0080m

Enclosure A

CONFIRMATORY ITEM #34

It has long been established that the operational containment gas pressure condition, not the Technical Specification extreme pressure value, is appropriate input information in an Appendix K analysis. Such guidance was originally given in 1974 in Appendix A of "Status Report by the Directorate of Licensing in the Matter of Westinghouse Electric Company ECCS Evaluation Model Conformance to 10CFR50, Appendix K." Furthermore, Branch Technical Position CSB 6-1 as reported in NUREG-0800 states that "minimum containment pressure ... encountered under limiting normal operating conditions should be used." The value of 14.7 psia is an appropriate assessment of the ECCS analysis input containment pressure for the Vogtle Plant.

Under certain circumstances the Vogtle Plant might find itself operating at full power at a containment pressure somewhat less than 14.7 psia. The Westinghouse ECCS containment pressure model contains built-in conservatisms to offset any uncertainty about the initial pressure value. For instance, containment wall condensing heat transfer coefficients during blowdown equal five times the value specified by the Tagami correlation. The Tagami correlation was established from tests as a method to define accurately containment heat transfer coefficients following a LOCA event. The impact of using the highly conservative 5 times Tagami coefficients exceeds the effect of any possible uncertainty in initial containment pressure. From existing sensitivity studies for a 4-loop plant, the following comparison can be made regarding calculated containment pressure at 200 seconds, which is very close to the time of calculated peak clad temperature (PCT) for Vogtle:

Impact of Reducing Initial Pressure by 1.5 psi =-1.8 psi

Impact of Using Tagami Instead of 5 Times Tagami = +3.8 psi

Margin in Calculated Pressure = 2 psi

Another large conservatism in the ECCS evaluation model is the consideration of spilling streams of accumulator and pumped safety injection water to reach thermal equilibrium with the containment atmosphere. In fact, these water streams would heat up only slightly during their fall to the containment floor. In the Vogtle ECCS containment pressure analysis the spilling water removes an amount of energy from the atmosphere equivalent to 2 psi worth of containment pressure at the time of calculated PCT. Again, this 2 psi of conservatism in the ECCS containment model acts to balance the potential 1.8 psi reduction in pressure which occurs in the extremely unlikely event that 100% power operation and Technical Specification minimum containment pressure coincide. Other examples also exist which illustrate that conservatism present in the ECCS evaluation model is more than adequate to accommodate the assumption of an unusual initial containment pressure condition. The analysis as submitted is appropriate for Vogtle and is consistent with the established LOCA evaluation model philosophy.

Enclosure B

Open Item 27

Question 490.4

The use of the chemical and volume control system (CVCS) letdown monitor for detecting fuel rod failures has been explained in the VEGP FSAR. Is there a definite commitment and plan for the active use of this system to monitor fuel failures, as per Standard Review Plan 4.2?

Response

The CVCS letdown monitor is used to indicate abnormal reactor coolant activity (possible gross fuel failures). A high alarm in the CVCS letdown monitor will alert the control room operator to obtain a reactor coolant sample. The chemistry staff will then perform an isotopic analysis. The results of isotopic analysis along with other indications such as core exit thermocouple readings, hydrogen concentration, reactor core inventory, and reactor vessel level indicating system instruments readings will be used to assess the extent of core damage. 10 14

The sensitivity of the CVSC letdown monitor is 10^{-2} $\frac{\mu Ci}{cc}$. The range of this monitor is set to encompass normal expected reactor coolant concentrations. In addition, the high end of the range will be set such that the technical specification concentration is covered. From RESAR-3S, a realistic primary coolant concentration is about 10 μCi/cc. A reactor coolant concentration based on 1% failed fuel (with WGPS operating) is about 130 μCi/cc. Given a five decade monitor, since the expected reactor coolant concentration is 10 μCi/cc, the range selected to encompass this is 10^{-2} to 10^{3} μCi/cc. 16

Amend. 9 8/84
Amend. 10 9/84
Amend. 14 2/85

Enclosure C

Open Item 34

Question 492.9

In subsection 15.1.5 of the VEGP FSAR two cases of the steam line break accident are presented: case 1, which is at an initial no-load condition with offsite power available; and case 2, which corresponds to case 1 with additional loss of offsite power at the time the safety injection signal is generated. From the figures presented the minimum reactor coolant system pressure appears to be approximately 500 psia for case 1 (figure 15.1.5-2) and approximately 950 psia for case 2 (figure 15.1.5-5). The following information is requested:

A. What departure from nucleate boiling ratio (DNBR) correlation is used in the analysis for steam line break?

B. Provide information on the applicable range of the parameters for the DNB correlation and compare with the range experienced (especially pressure) in the steam line break accident.

C. Provide information on the DNBR margin available over the design limit for the steam line break.

Response

This question is being handled generically on WCAP 9226 (proprietary) and 9227 (nonproprientary) via letter NS-NRC-85-3007 dated February 19, 1985. In the letter Westinghouse provided information on extending the ~~pressure~~ pressure range for the W-3 correlation. This data demonstrated that extending the lower pressure range has minimal impact on the design limit DNBR. The calculated DNBR for the large MSLB for the VEGP is greater than 1.8, which is much greater than the limit DNBR of 1.3. 15

Enclosure D

Open Item 42

Question 440.45

Describe your proposed program for verification of adequate mixing of borated water added to the reactor coolant system under natural circulation conditions and confirmation of natural circulation cooldown ability, in accordance with the criteria of Branch Technical Position RSB 5-1.

Response

The boron mixing and cooldown tests to be performed at Diablo Canyon I during natural circulation test satisfies BTP RSB 5-1 Position E. VEGP is a similar facility to this plant and, according to BTP RSB 5-1 Position E, may reference the results of these tests in lieu of preforming the boron mixing and cooldown tests during natural circulation. 14

new ¶ (Insert 1)

Insert 1 to Q440.45:

Vogtle and Diablo Canyon Unit 1 have been compared in detail to ascertain any differences between the two plants that could potentially affect natural circulation flow and attendant boron mixing. Because of the similarity between the plants, it was concluded that the natural circulation capabilities would be similar and, therefore, the results of prototypical natural circulation cooldown tests being conducted at Diablo Canyon will be representative of the capability at Vogtle.

The general configuration of the piping and components in each reactor coolant loop is the same in both Vogtle and Diablo Canyon. The elevation head represented by these components and the system piping is similar in both plants.

To compare the natural circulation capabilities of Vogtle and Diablo Canyon, the hydraulic resistance coefficients were compared. The coefficients were generated on a per loop basis. The hydraulic resistance coefficients applicable to normal flow conditions are as follows:

	DIABLO CANYON	VOGTLE
Reactor Core & Internals	125.0×10^{-10}	115.2×10^{-10} Ft/(Loop gpm)^2
Reactor Nozzles	36.7×10^{-10}	27.2×10^{-10} Ft/(Loop gpm)^2
RCS Piping		
R.V. Outlet to S.G. Inlet	(same as Vogtle)	4.0×10^{-10} Ft/Loop gpm)^2
S.G. Outlet to R.C. Pump Inlet		10.0×10^{-10} Ft/(Loop gpm)^2
R.C. Pump Discharge to R.V. Inlet		8.0×10^{-10} Ft/(Loop gpm)^2
R.C. Loop		24.0×10^{-10} Ft/(Loop gpm)^2
Steam Generator	114.5	122.0×10^{-10} Ft/(Loop gpm)^2
Total	300.2	288.3×10^{-10} Ft/(Loop gpm)^2

Flow Ratio Per Loop $\dfrac{\text{VOGTLE}}{\text{DIABLO CANYON}} \cong \left(\dfrac{300.2}{288.3}\right) = \underline{1.0416}$

The general arrangement of the reactor core and internals is the same in Diablo Canyon and Vogtle. The coefficients indicated represent the resistance seen by the flow in one loop.

The reactor vessel outlet nozzle configuration for both plants is the same. The radius of curvature between the vessel inlet nozzle and downcomer section of the vessel on the two plants is different. Based on 1/7 scale model testing performed by Westinghouse and other literature, the radius on the vessel nozzle/vessel downcomer juncture influences the hydraulic resistance of the flow turning from the nozzle to the downcomer. The Diablo Canyon vessel inlet nozzle radius is significantly smaller than that of Vogtle, as reflected by the higher coefficient for Diablo Canyon.

Steam generator units were also compared to ascertain any variation that could affect natural circulation capability by changing the effective elevation of the heat sink or the hydraulic resistance seen by the primary coolant. It was concluded that there are no differences in the original design of the steam generators in the two plants that would adversely affect the natural circulation characteristics.

It is expected that the relative effect of the coefficients would be the same under natural circulation conditions such that the natural circulation loop flowrate for Vogtle would be within three percent of that for Diablo Canyon.

For typical 4-loop plants there are two potential flow paths by which flow crosses the upper head region boundary in a reactor. These paths are the head cooling spray nozzles, and the guide tubes. The head cooling spray nozzle is a flow path between the downcomer region and the upper head region. The temperature of the flow which enters the head via this path corresponds to the cold leg value (i.e., T_{cold}). Fluid may also be exchanged between the upper plenum region (i.e., the portion of the reactor between the upper core plate and the upper support plate) and the upper head region via the guide tubes. Guide tubes are dispersed in the upper plenum region from the center to the periphery. Because of the non-uniform pressure distribution at the upper core plate elevation and the flow distribution in the upper plenum region, the pressure in the guide tube varies from location to location. These guide tube pressure variations create the potential for flow to either enter or exit the upper head region via the guide tubes.

To ascertain any difference between the upper head cooling capabilities between Diablo Canyon and Vogtle, a comparison of the hydraulic resistance of the upper head regions was made. These flow paths were considered in parallel to obtain the following results:

	DIABLO CANYON UNIT 1	VOGTLE
Flow Area (ft^2)	0.77	.844
Loss Coefficient	1.51	1.45
Overall Hydraulic Resistance (Ft^{-4})	2.57	2.038
Relative Head Region Flowrate (based on hydraulic resistance)	1.00	1.12

As indicated above, the effective hydraulic resistance to flow in Vogtle is slightly less than Diablo Canyon. Assuming that the same pressure differential existed in both plants the Vogtle head flow rate would be 112 percent of the Diablo Canyon flow.

It can, therefore, be concluded that the results of the natural circulation cooldown tests performed at Diablo Canyon will be representative of the natural circulation and boron mixing capability of Vogtle.

Enclosure E
Open Item 44

letdown path to achieve cold shutdown. The RCS hot and cold legs are low points of the RCS and, as such, are vented through the high points of the RCS, i.e., the reactor vessel head and the pressurizer. The RVHVS is adequate to vent the RCS.

H. The entire RVHVS is designed to provide the design functions assuming one single failure. The solenoid-operated valves are all fail-closed, and the paths are redundant to be able to provide both the capability to open and to isolate the vent considering a single active failure. The failure modes and effects analysis for safety-grade cold shutdown operations is provided in table 5.4.7-4.

The reactor vessel head vent system (RVHVS) consists of a single line from the reactor vessel through a series/parallel arrangement of four isolation valves, again through a single line containing two flow elements (flow measurement), and finally through a parallel set of two throttle valves to a single line into the pressurizer relief tank (PRT) inlet line. All of the valves in the RVHVS are Target Rock valves; a common mode failure (in the open position) is postulated for these valves. Should such a failure occur, three of the valves in series (two isolation and one throttle) would have to fail before any flow from the vessel to the PRT could occur. (Also, an inadvertant actuation of the valves in the RVHVS could effect the same result, although this would mandate several consecutive operator errors to open the RVHV path.) In the event this multiple failure occurs, the flow of coolant from the reactor coolant system would be limited by the maximum flow capacity of the throttle valves, so that the normal makeup systems could be used to maintain pressurizer level. The design of the RVHVS is such that the valving arrangement precludes the mentioned unacceptable increase in the probability of a loss of coolant accident, and is a direct result of lessons learned from the Three Mile Island-2 incident. In summary, the system design incorporates adequate flow restriction, and no further flow restrictors must be added so as to limit the flow in the case of a pipe break or inadvertant actuation of the system. 13

In addition, Insert 1

Amend. 6 5/84
Amend. 10 9/84
Amend. 13 1/85

Insert 1 to Q440.47

RVHVS isolation valves are non-pressure balanced solenoid-operated valves. By design, these valves are susceptible to opening upon the imposition of a small reverse delta-p. The amount of delta-p necessary to open the valve depends on certain characteristics of the valve and solenoid operator. In the plant Vogtle systems designs, the reactor vessel head vent letdown path isolation valves are valves which are of the non-balanced solenoid type, and thus are susceptible to this phenomenon. However, these valves are all inside containment, and are used to isolate the paths from the reactor vessel head to the pressurizer relief tank. None of the valves are used for containment isolation, and further, the only time the valves could be opened by the reverse delta-p is when the RCS pressure is lower than the pressure in the PRT. This would occur during shutdown of the RCS, as the pressure is lowered to below approximately 150 psig. During this time, the valves could be used to allow an inert gas blanket to be put over the coolant (i.e., during shutdown, SG maintenance, etc.) so an opening of the valves is not only possible, but is expected for these maintenance procedures to be performed. In summary, the non-pressure balanced solenoid-operated valves found in plant Vogtle systems designs are correctly specified, and are not susceptible to a loss of containment isolation nor a loss of coolant.

The isolation and modulating valves have similar mechanical design features. Both are pilot operated solenoid valves. The operability of these valves has been verified for post accident seismic and environmental conditions (IEEE qualifications) successfully. These valves are adequately qualified to perform their intended functions. Since these valves are seismically and environmentally qualified, common mode failure should be precluded.

Enclosure F

059

Question 420.36

For main steam and feedwater line valve actuation, describe control circuits for isolation valves and include automatic, manual, and test features. Indicate whether any valve can be manually operated and indicate specific interfaces with the safety system electrical circuits.

Response

This question was discussed with the NRC at the ICSB meeting August 27-30, 1984.

Using system piping and instrumentation diagrams and logic and elementary diagrams, the design and operation of the main steam and feedwater isolation system as described in subsection 7.3.8 and paragraphs 10.3.2.2.4 and 10.4.7.2.2.2 were discussed with ICSB reviewers. The valves which receive steam line isolation (figure 10.3.2-1) and feedwater isolation (figure 10.4.1-1) signals were identified, as were the operating conditions which initiate automatic isolation (figures 7.2.1-1 and 7.3.8-1). Interfaces with the safety system electrical circuits were also discussed. Using the isolation valve actuator hydraulic schematics, valve fast and slow close and slow opening modes were illustrated, with emphasis on the redundancy provided to ensure fulfillment of the isolation function.

Manual operation and testing provisions described in paragraphs 7.1.2.5, 10.3.4.4, and 10.4.7.4.3 were discussed. This included identification of those portions of the system, e.g., the isolation valves, which cannot be "go" tested at power.

Table 7.3.1-2 has been revised to identify the process conditions, instrumentation, and number of channels which initiate automatic isolation. Paragraph 7.1.2.5 has been revised to include the feedwater bypass (steam generator, auxiliary nozzle feedwater) isolation valves as being "no-go" tested at power. "No-go" testing arrangements have been reviewed to ensure the test checks continuity through the final testable actuating device (see also the response to question 420.15). Figure 420.36-1 shows the typical testability of "no-go" 15
equipment listed in paragraph 7.1.2.5.

and deficiencies corrected

Add Insert A

Amend. 8 7/84
Amend. 11 11/84
Amend. 15 3/85

INSERT A

(420.36)

Paragraph 7.1.2.5 lists the reactor trip and ESFAS devices, identified at this time, that will not be tested at full power. Except for the main feedwater pump trip solenoids, these devices will be "no-go" tested at full power. As discussed in paragraph 7.1.2.5.F, the main feedwater pump trip solenoids do not require periodic testing. In addition, the reactor coolant pump auxiliry component cooling water supply and return isolation valves are not tested at full power. Because these valves are remote manual and no credit is taken for containment isolation, periodic testing at ~~of~~ full power is not required (see paragraph 9.2.8.4). These valves will be tested during refueling outages, so no damage to the reactor coolant pumps will occur.

Enclosure G

069

7.6.6.1.10 Supporting Systems

The following systems support the RMWST isolation equipment:

- Class 1E, 125-V dc power system.
- Instrument air system.

Failure of either or both systems will cause immediate closure of all four isolation valves and will not degrade the isolation function.

7.6.6.1.11 Analysis

Analysis is provided in paragraph 7.6.6.7.

7.6.6.1.12 Testing

Because no credit is taken for automatically isolating the reactor makeup water storage tanks as discused in paragraph 9.2.7.3, the reactor makeup water storage tank isolation do not require periodic testing.

7.6.6.2 Refueling Water Storage Tank Isolation

7.6.6.2.1 Description

As described in detail in section 6.3, the refueling water storage tank (RWST) provides a source of water for the emergency core cooling operations. The RWST is a nuclear safety class, Seismic Category 1 structure. However, the sludge mixing pump and the electric circulation heater connected to the tank do not meet these qualification requirements; therefore, an isolation capability is provided to prevent a loss of the RWST water volume. Two train-oriented, air-operated, seismically qualified valves mounted in series on the suction line to the sludge mixing pump provide this capability. When closed, they isolate the safety-related portion of the line (connecting to the RWST) from its nonsafety-related, nonseismic portion connected to the sludge mixing pump. Both valves fail closed upon the loss of instrument air and/or control power. Each valve is automatically actuated to close upon a RWST low-level signal from a redundant level switch in its respective safety train. The isolation valves will remain closed until individually opened by the operator's manual action. Such action will result in the opening of the valve only if the RWST low-level signal is no longer present.

The capability for remote-manual isolation from the control room is also provided. The status of each isolation valve is displayed by the indicating lights in the control room.

7.6.6.2.9 Actuated Devices

The actuated devices are two solenoid valves (HY-10957 and HY-10958) controlling the air supply to the pneumatic actuators of the gate-type isolation valves (HV-10957 and HV-10958, respectively).

7.6.6.2.10 Supporting Systems

The following systems support the RWST isolation equipment:

- Class 1E, 125-V dc power supply.
- Instrument air systems.

Failure of either or both systems will cause immediate closure of the isolation valves and will not degrade the isolation function.

7.6.6.2.11 Analysis

Analysis is provided in paragraph 7.6.6.7.

7.6.6.2.12 Periodic Testing

Provisions for the periodic go testing of the actuation system at full power are 15
discussed in the Technical Specifications.

7.6.6.3 <u>Condensate Storage Tank Isolation</u>

7.6.6.3.1 Description

As described in detail in subsection 10.4.9, the two condensate storage tanks provide a source of water for the auxiliary feedwater pumps. Both tanks are safety-related structures, whereas the degasifying loops connected to them are nonsafety and nonseismic equipment. The isolation capability is provided by two safety-related, air-operated isolation valves, each mounted on the line connecting the condensate storage tank with the degasifier feed pump's suction. When closed, each valve prevents the leakage of water from its respective condensate storage tank. The valves are normally open and fail closed upon a loss of instrument air and/or control power. Each valve belongs to a different safety train and is automatically actuated to close upon receiving a low degasifier feed pump suction pressure signal from a separate pressure switch. Each

7.6.6.3.8 Diversity

Manual operation is available as a backup to the automatic mode, providing functional diversity.

7.6.6.3.9 Actuated Devices

The actuated devices are two solenoid valves (HY-5087 and HY-5088) controlling the air supply to the pneumatic actuators of the gate-type isolation valves (HV-5087 and HV-5088, respectively).

7.6.6.3.10 Supporting Systems

The following systems support the condensate storage tank isolation equipment:

- Class 1E, 125-V dc power supply.
- Instrument air system.

Failure of either or both systems causes immediate closure of the isolation valves and hence does not degrade the isolation function.

7.6.6.3.11 Analysis

Analysis is provided in paragraph 7.6.6.7.

7.6.6.3.12 Testing

Because no credit is taken for automatically isolating the non-safety related lines connected to the CSTs as discussed in subsection 9.2.6, the isolation of the non-safety related lines does not require periodic testing

7.6.6.4 Isolation of Reactor Coolant Pump Thermal Barrier Cooling Water

7.6.6.4.1 Description

As described in detail in subsection 9.2.8, the auxiliary component cooling water (ACCW) system cools the thermal barriers of the reactor coolant pumps. The portion of the ACCW system related to this function is safety-related and Seismic Category 1; it interconnects with the nonsafety-related and nonseismic portion of the system. An isolation valve (HV-2041) is provided separating the safety from nonsafety class, nonseismic portions of the thermal barriers ACCW discharge line. The valve is a safety-related, motor-operated gate valve interlocked in a manner that prevents a spill of the reactor coolant from the postulated, breached thermal barrier should a break occur in the nonsafety-related piping downstream of that

7.6.6.4.13 Periodic Testing

Provisions for the periodic go testing of the actuation system at full power are discussed in the Technical Specifications. 15

7.6.6.5 Isolation of ACCW to the Auxiliary Steam Condensate Return Liquid Process Radiation Monitor

7.6.6.5.1 Description

One of the functions of the ACCW system is to provide the cooling water to the radiation monitor in the waste evaporator steam supply system. (See subsection 9.2.8.) The seismically qualified portion of the ACCW supply line (i.e., the line connected to the ACCW system) and its nonseismic portion

7.6.6.6.8 Diversity

Isolation can be initiated on either high line flow or high temperature, providing actuation diversity function. Manual isolation capability is provided as a backup for the automatic mode, which provides functional diversity.

7.6.6.6.9 Actuated Devices

The actuated devices are two solenoid valves (HY-19722 and HY-19723) controlling the air supply to the pneumatic actuators of the gate-type isolation valves (HV-19722 and HV-19723, respectively).

7.6.6.6.10 Supporting Systems

The following systems support the electric boiler steam isolation equipment:

- Class 1E, 125-V dc power supply.
- Instrument air system.

Failure of either or both of those systems will cause immediate closure of the isolation valves and will not degrade the isolation function.

7.6.6.6.11 Analysis

Analysis is provided in paragraph 7.6.6.7.

7.6.6.6.12 Instrumentation

A common annunciator window is provided in the control room to alert the operator of high temperature in any of six equipment rooms. The specific room may be identified by means of redundant temperature indicators with a selector switch in the control room. An annunciator window is also provided in the control room to indicate high flow in the electric steam boiler line. Isolation valve status is provided in the control room by indicating lights. 15

7.6.6.6.13 Periodic Testing

Provisions for the periodic go testing of the actuation system at full power are discussed in the Technical Specifications.

Enclosure H

boric acid or demineralized water flowrates deviate from preset values as a result of system malfunction.

This event is classified as an American Nuclear Society Condition II incident (an incident of moderate frequency) as defined in subsection 15.0.1.

15.4.6.2 Analysis of Effects and Consequences

15.4.6.2.1 Method of Analysis

To cover all phases of the plant operation, boron dilution during refueling, startup, cold shutdown, hot standby, and power operation are considered in this analysis.

15.4.6.2.1.1 Dilution During Refueling. An uncontrolled boron dilution accident cannot occur during refueling. This accident is prevented by administrative controls which isolate the RCS from the potential source of unborated water.

Valves 175, 176, 177, and 183 in the CVCS will be locked closed during refueling operations. These valves will block the flow paths which could allow unborated makeup water to reach the RCS. Any makeup which is required during refueling will be borated water supplied from the refueling water storage tank by the low head safety injection pumps.

15.4.6.2.1.2 Dilution During Cold Shutdown, Hot Shutdown, and Hot Standby. ~~Conditions at cold shutdown require the reactor to be shut down by at least 1.0-percent Δk/k. The maximum boron concentration required to meet this shutdown margin is conservatively estimated to be 1672 ppm. The following conditions are assumed for an uncontrolled boron dilution during cold shutdown.~~

See insert 1

~~Dilution flow is assumed to be the combined capacity of the two primary grade water pumps with the coolant system depressurized (approximately 242 gal/min). This is assumed although normally only one pump is in operation. Mixing of the reactor coolant is accomplished by the operation of one residual heat removal (RHR) pump. A minimum water volume (3435 ft³) in the RCS is used. This is a conservative estimate of the active volume of the RCS with the water level drained down from a filled and vented condition while on one train of RHR. This condition is the most limiting during cold shutdown. Dilution during cold shutdown bounds dilution during hot shutdown.~~

~~15.4.6.2.1.3 Dilution During Hot Standby. Conditions at hot standby require the reactor to have available at least 1.30-percent Δk/k shutdown margin. The maximum boron concentration required to meet this shutdown margin is conservatively estimated to be 1693 ppm. The following conditions are assumed for a continuous boron dilution during hot standby:~~

~~A. Dilution flow is assumed to be the combined capacity of the two primary water makeup pumps (approximately 242 gal/min).~~

~~B. A minimum water volume (5840 ft^3) in the RCS is used. This volume corresponds to the active volume of the RCS with one reactor coolant loop in operation.~~

15.4.6.2.1.~~4~~3 Dilution During Full Power Operation, Including Startup.

15.4.6.2.1.~~4~~3.1 Dilution During Startup. Conditions at startup require the reactor to have available at least 1.30-percent Δk/k shutdown margin. The maximum boron concentration required to meet this shutdown margin is conservatively estimated to be 1704 ppm. The following conditions are assumed for an uncontrolled boron dilution during startup:

A. Dilution flow is assumed to be the combined capacity of the two primary water makeup pumps (approximately 242 gal/min).

B. A minimum water volume (9757 ft^3) in the reactor coolant system is used. This volume corresponds to the active volume of the RCS minus the pressurizer volume.

15.4.6.2.1.~~4~~3.2 Dilution During Power Operation. During power operation, the plant may be operated two ways, under manual operator control or under automatic T_{avg}/rod control. While the plant is in manual control, the dilution flow is assumed to be a maximum of 242 gal/min, which is the combined capacity of the two primary water makeup pumps. While in automatic control, the dilution flow is limited by the maximum letdown flow (approximately 125 gal/min).

Conditions at power operation require the reactor to have available at least 1.30-percent Δk/k shutdown margin. The maximum boron concentration required to meet this shutdown margin is very conservatively estimated to be 1704 ppm.

A minimum water volume (9757 ft^2) in the RCS is used. This volume corresponds to the active volume of the RCS minus the pressurizer volume.

15.4.6.2.2 Results

The calculated sequence of events is shown in table 15.4.1-1.

15.4.6.2.2.1 <u>Dilution During Refueling</u>. Dilution during refueling cannot occur due to administrative controls. (See paragraph 15.4.6.2.1.1.)

15.4.6.2.2.2 <u>Dilution During Cold Shutdown</u>. ~~For dilution during cold shutdown, the minimum time required for the shutdown margin to be lost and the reactor to become critical is 4.7 min.~~

See Insert 2

15.4.6.2.2.3 <u>Dilution During Hot Standby</u> and Hot Shutdown. ~~For dilution during hot standby and startup, the minimum time required for the shutdown margin to be lost and the reactor to become critical is 10.2 min.~~

See Insert 3

15.4.6.2.2.4 <u>Dilution During Startup</u>. In the event of an unplanned approach to criticality or dilution during power escalation while in the startup mode, the operator is alerted to an unplanned dilution by a reactor trip at the power range neutron flux high, low setpoint. After reactor trip there is at least 19.0 min for operator action prior to loss of shutdown margin.

15.4.6.2.2.5 <u>Dilution During Power Operation</u>. During full-power operation with the reactor in manual control, the operator is alerted to an uncontrolled dilution by an overtemperature ΔT reactor trip. At least 19.0 min are available from the trip for operator action prior to loss of shutdown margin.

During full-power operation with the reactor in automatic control, the operator is alerted to an uncontrolled reactivity insertion by the rod insertion limit alarms. At least 36.3 min are available for operator action from the low-low rod insertion limit alarm until a loss of shutdown margin occurs.

15.4.6.3 Conclusions

The results presented above show that adequate ~~the~~ time is available for the operator to manually terminate the source of dilution flow. Following termination of the dilution flow, the operator can initiate reboration to recover the shutdown margin.

~~15.4.6.4 Standard Review Plan Evaluation~~

~~The VEGP is not fully in conformance in regard to the 15-min~~ 1
~~margin to terminate the boron dilution induced after the initial alarm announcement. This issue is currently being reviewed.~~

INSERT 1

A failure analysis was done to evaluate boron dilution events during cold shutdown, hot shutdown, and hot standby. Failure modes and effects analysis, human error analysis, and event tree analysis were used to identify credible boron dilution initiators and to evaluate the plant response to these events. For the initiators identified, time intervals from alarm to loss of shutdown margin were calculated to determine the length of time available for operator response. These calculations depended on dilution flowrates, boron concentrations, and Reactor Coolant System volumes specific to the event and mode of operation. The analysis modeled realistic plant conditions and responses.

This analysis identified four events which were considered to be the most likely initiators.

1. Demineralizer outlet isolation valve open during resin flushing.

2. Valve 226 open following BTRS demineralizer flushing operation.

3. Failure to secure chemical addition.

4. Boric acid flow control valve (FV-110A) fails closed during make-up.

Initiator 4 was found to be the most limiting event for modes 3, 4 and 5. The parameters used in the calculation of time available for operator responses are listed in Table 15.4.6-1.

INSERT 2

For diluation during cold shutdown (reactor vessel drained) the minimum time from an alarm which alerts the operator to the dilution event to the loss of shutdown margin is 18 minutes. The alarms which alert the operator to the event in this case are the boric acid and make-up flow deviation alarms.

INSERT 3

For dilution during hot standby and hot shutdown, the minimum time from the alarm to the loss of shutdown margin is 38 minutes. The alarms which alert the operator to the event in this case are the boric acid and make-up flow deviation alarms.

TABLE 15.4.6-1

Parameters

Dilution Flowrates:

initiator	flowrate(gpm)
1	63
2	120
3	3.5
4	186

Volumes:

mode	Volume (ft^3)	volume (gal)
3,4	5840.0	43800
5 (filled)	11200.9	84007
5 (drained)	3435.0	25763

Boron Concentrations:

mode	C_c (ppm)	C_o (ppm)	% SDM
3,4	674	795	1.3
5 (filled)	971	1045	1.0
5 (drained)	971	1119	2.0

Question 440.119

As noted in FSAR paragraph 15.4.6.4, the VEGP is not in compliance with the Standard Review Plan 15-min margin to terminate the boron dilution event for hot standby and cold shutdown conditions. Please describe how you will comply with this criterion.

Response

~~Additional~~ analysis is being performed to evaluate ~~the boron~~
dilution event during ~~modes 3, 4, and 5.~~ The results of this 10
~~analysis will be~~ provided by March 1985.

see revised subsection 15.4.6 16

Amend. 9 8/84
Amend. 10 9/84

TABLE 3.2.2-1 (SHEET 16 OF 97)

Principal System and Components	(a) Location Unit 1	(a) Location Unit 2	(b) Source of Supply	(c) Quality Group	(d) VEGP Safety Class	(e) Seismic Category	(f) Codes and Standards Designator	(g) Principal Construction Code	(h) Q-List	(i) Safety Related	(j) Environmental Designator	(k) Comments
8. Safety-related instrumentation			B	NA	1	1	J	mfg	Y	Y		Note s
9. Safety-related valve operators			B	NA	1	1	E	NEMA MG1	Y	Y		
AUXILIARY COMPONENT COOLING WATER SYSTEM												
1. ACCW surge tank	AB-132	AB-105	B	D	4	1	5	III-3	N	N		Note zz for ~~all~~ 415 components
2. ACCW pumps	AB-B23 & B24	AB-B112 & B113	B	D	4	1	5	III-3	N	N		
3. ACCW pump motors	AB-B23 & B24	AB-B112 & B113	B	NA	1	1	E	NEMA MG1	Y	Y	VIII,B4	Note m
4. ACCW HXs	AB-132 & 134	AB-103 & 105	B	C	3	1	3	III-3, TEMA-R	Y	Y	VIII	
5. Reactor coolant drain tank HX (shell side)	C-171'	C-171'	W	D	4	1	5	III-2, TEMA-R	N	N		Note t
6. Chemical addition feeder tank	AB-B23	AB-B112	B	D	4	2	4	VIII	N	N		
7. Safety-related valves and piping			B	D	3	1	3	III-3	Y	Y		
8. All other valves and piping			B	D	4	1	5	III-3	N	N		
9. Safety-related valve operators			B	NA	1	1	E	NEMA MG1	Y	Y		
10. Safety-related instrumentation			B	NA	1	1	J	mfg	Y	Y		Note s
11. All other instrumentation			B	NA	6	2	J	mfg	N	N		
SPENT FUEL COOLING AND PURIFICATION SYSTEM												
1. SFP HXs	AB-A53 FB-A07	AB-A91 FB-A04	W	C	3	1	3	III-3, TEMA-R	Y	Y	VIII,VII	
2. SFP pumps	AB-A53 FB-A07	AB-A91 FB-A04	W	C	3	1	3	III-3	Y	Y	VIII	
3. SFP pump motors	AB-A53 FB-A07	AB-A91 FB-A04	W	NA	1	1	E	NEMA MG1	Y	Y	VIII	Note m

Enclosure I

Open Item 106

TABLE 3.2.2-1 (SHEET 97 OF 97)

Position CMEB 9.5-1, Appendix A, attached to Nuclear Regulatory Commission (NRC) Standard Review Plan 9.5.1. 3

w. The quality assurance program to be applied to radioactive waste management systems is described in Regulatory Guide 1.143.

x. The Seismic Category 1 fire protection standpipe system serves no safety function but is classified as project class 313 to ensure the implementation of a Seismic Category 1, ASME III-3 design and installation. 3

y. Changes to the site grading will be done on an engineered basis so as to assure acceptability of the drainage analysis for the probable maximum precipitation (PMP) event as described in paragraph 2.4.2.3. 15

Insert A →

GENERAL NOTES

1. For systems under the Westinghouse scope of supply, all piping and all manual valves 2 in. and smaller are supplied by Bechtel, except for the reactor coolant loop piping, the pressurizer surge line, the pressurizer relief piping complex, reactor vessel bottom mounted instrument tubing, reactor vessel head vent piping to refueling disconnect flange, and reactor vessel seal leak detection leakoff appurtenance.

2. Hangers and supports for Seismic Category 1 systems and components are designed as Seismic Category 1. In general hangers and supports for Seismic Category 2 piping, cable tray, and ducting in Seismic Category 1 buildings are designed to maintain their structural integrity under the postulated earthquake conditions; however, exceptions to this requirement are permitted when it is demonstrated that their failure will not adversely affect adjacent Seismic Category 1 equipment or systems. 12

3. All "Q" listed coatings are assigned a project classification of O2C. Q listed coatings are not seismically qualified but will not fail in a manner that would compromise the function of safety-related equipment in the event of an earthquake since they are applied to Seismic Category 1 structures.

INSERT A

z. Selected materials, components, parts, appurtenances, and piping subassemblies are procured in accordance with ASME Code, Section III, Class 3. The system is designed and installed in accordance with ASME Section III, Class 3 except that System N-Stamping and associated documentation is not provided. Post installation nondestructive examination of the system in accordance with ASME Section III, Class 3 is performed to further ensure the integrity of the system.

Response

The following responses correspond to the above questions:

A. In regard to items of table 3.2.2-1:

1. Table 3.2.2-1 (sheet 1), item 3, identifies the fuel assemblies as being controlled by the QA program.

2. Table 3.2.2-1 (sheet 90) has been revised to include underground Category 1 piping and conduits.

3. The site drainage system is not Q listed; however, the following portions of the QA program are applicable:

   - 17.2.5 Instructions, Procedures, and Drawings 15

   - 17.2.3 Design Change Control

   - 17.2.10 Inspections 16

   The site drainage system is included in table 3.2.2-1 (sheet 90) and is specially footnoted.

4. Roof scuppers on Category 1 structures are concrete extensions of the Category 1 structures and are consequently included under the structure without explicit identification. The Category 1 structures are listed on sheets 88 and 89 of table 3.2.2-1.

5. Table 3.2.2-1 (sheets 88 and 89) have been revised to include the dikes around the refueling, reactor makeup, and condensate tanks (items 12, 13, and 22, respectively).

6. The fuel handling building radiogas radiation monitors in the HVAC ducting are Q listed and are discussed in section 11.5. These radiation monitors are included in table 3.2.2-1 (sheet 82, item 1). The fuel handling building area monitors are non-Q listed and are discussed in subsection 12.3.4. These area monitors are included in table 3.2.2-1 (sheet 82, item 3).

7. The accident-related metrological data collection equipment is non-Q listed. This equipment is included in table 3.2.2-1 (sheet 83, item 3). However, to ensure the availability and reliability 15 of the accident-related meorological data collection equipment, this equipment is maintained

a. Inspection and testing of the crane will be conducted per applicable requirements of ANSI B30.2-1976 "Overhead and Gantry Cranes."

b. Maintenance will be performed in accordance with manufacturer's recommendations and per applicable requirements of ANSI B30.2-1976.

7. Steam generator steam flow restrictors are identified in table 3.2.2-1, sheet 28, item 20, as steam flow limiters.

8. Westinghouse Electro-Mechanical Division (EMD) uses the EMD QA program for the design, fabrication, and testing of reactor coolant pump seals. This QA program is covered under WCAP 8370. Insert 1 (Also see response to Question 210.24). 15

B. In regard to quality assurance program requirements:

1. See the response to question 210.7.

2. See the response to question 210.8.

3. See the response to question 210.9.

4. See the response to question 210.12.

5. See the response to question 210.12.

In addition the following applies to items B.1. through B.5 above. The rationale for the quality group D classification for the above components in the auxiliary component cooling water (ACCW) system is discussed in the responses to NRC Questions 210.7, 210.8, 210.9, and 210.12. This classification applies the ACCW system design and installation. The ACCW is not required for a safe shutdown or for the mitigation of an accident. However, as discussed in the responses to the NRC questions, these components are designed and procured at a minimum to ASME Section III, quality group C standards. Also, as discussed in subsection 9.2.8, redundant instrumentation is provided to detect loss of ACCW to and from the reactor coolant pump motor, lube oil, and thermal barrier coolers to protect the pumps from a loss of cooling water. Thus, the above components need not be maintained in conformance with 10 CFR 50, Appendix B. As discussed above, these items are 15

Insert 1: The same level of QA will be applied for replacement seals during operations as was exercised with the purchase of the original seals.

Enclosure J

Q430.1

Two other operators are available as needed. Additional operators could be reassigned from other shifts if required. In addition to the two crews with system responsibilities, the other personnel in the maintenance department could be assigned to maintenance efforts if required. 13

All personnel will have a high school diploma or equivalent. The minimum educational and experience requirements for the aforementioned personnel are as specified in subsection 13.1.3. The following is a sample training course outline for operators.

Insert A

I. Course Outline (Operations Personnel)

A. Purpose

B. General Overview

1. Diesel Engine

2. Generator

3. Support Systems

C. Component Description

1. Diesel Engine

2. Generator

3. Support Systems' Major Components 13

D. I & C or QEAB

E. Local Controls

F. Start Signals

G. Breaker Permissives

H. Trips

I. Sequencing

J. Paralleling Operations

Simulator used for topic emphasis and additional training on diesel generators.

Course length is one day.

Amend. 7 5/84
Amend. 13 1/85

Instructors hold SRO Certification.

Replacement personnel trained using classroom course and simulator exercises similar to that used for the original crew.

Refresher Training is done per VEGP-FSAR section 13.2.1.3.2.

Insert B

II. Training (Maintenance Personnel)

A. Five foremen and 30 mechanics have completely rebuilt the diesel engines.

B. A vendor representative will be on the site for all extensive modification and all major preventive maintenance. 13

C. Vendor courses will be scheduled if necessary or an instructor will be qualified by attending the vendor course.

D. Presently no need for any training beyond that received by on-the-job training.

Maintenance instructions will be aware of the theories of operation of emergency diesel generators. "How and where" lube oil will be added is to be covered in the on-the-job training program. VEGP currently is conducting a job and task analysis for operations and maintenance personnel. Based upon the analysis results, the curriculum for initial/refresher training may be modified.

Insert A I. Course Description and Outline for Operations Personnel

A. Purpose - discuss design basis and purpose of the emergency diesel generators.

B. Isenejal Overview - provide a general overview of the emergency diesel generator with emphasis on interrelationships of major systems.

C. Component Description - for the major components of the emergency diesel generator, discuss the function and any requirements related to technical specifications.

D. Instrument and Control - discuss main control board instrumentation associated with emergency diesel generator operation.

E. Local Controls - discuss local controls required for starting, operating, or shutting down the emergency diesel generator.

F. Automatic Features - discuss start signals, automatic and manual trips, and breaker permissives.

G. Sequencing and Paralleling Operations - participate in sequencing and paralleling operations as a part of simulator training.

Course length is one day (including simulator).

Instructors hold SRO certification or are technically proficient in emergency diesel generator operation.

Replacement personnel will be trained using classroom courses and simulator exercises similar to that used for the original crew.

Refresher training is discussed in section 13.2.1.3.2.

Insert B II. Training (Maintenance Personnel)

A. Five foremen and thirty mechanics, Georgia Power personnel, have completely disassembled and reassembled the VEGP diesel engines under the direction of a TDI representative. This on-the-job training qualifies these individuals as diesel generator technicians.

B. A vendor representative will be on the site for extensive modification and all major preventive maintenance.

C. Vendor courses will be scheduled, if necessary, or an instructor will be qualified by attending the vendor course to develop an equivalent training program for VEGP personnel.

Maintenance personnel are taught the system purpose, major components and system objectives for the emergency diesel generators and auxiliary systems in the Pressurized Water Reactor Systems Orientation. "How and where" lube oil will be added is covered in the on-the-job training program. Further, VEGP is conducting a detailed job and task analysis for maintenance personnel. This task analysis will include all tasks to be performed in the maintenance of the emergency diesel generators. Based upon the analysis results and its comparison to the TDI program the curriculum for initial/refresher training will be developed. The maintenance training program for emergency diesel generators will provide training as outlined below.

COURSE OUTLINE

I. Introduction

A brief description of the training will be given, followed by a review of theory of diesel engine operations.

II. The Model DSR/DSRV-4 Engine

A. Basic engine construction - discussions will concentrate on the configuration of the engine and function of various components, the flow of fluids (i.e., air, oil, water, fuel and exhaust) will then be presented.

B. Turbocharger - theory of operaton of turbochargers will be covered followed by a description turbocharger, and required maintenance.

C. Fuel injection equipment - this session will describe fundamentals of direct injection in diesel engines.

III. Governor Operation

Basic theory of governor operation will be reviewed followed by description of the Woodward Governor system.

IV. Vital Flows/Auxiliary Skid

Schematics of the flows of lubricating oil, fuel oil, intake and exhaust gas, jacket water and starting air will be reviewed. Elements of each flow system including pumps, filters, and strainers will then be identified in the auxiliary skid and adjustment and maintenance reviewed.

VI ~~V~~. Engine Operation

With completion of the description of all system components, integration and operation of the complete system will be discussed. Normal operating parameters will then be reviewed.

V Control Systems

Control design and drawings will be reviewed followed by a description of the pneumatic and electric elements utilized in the system. Finally operation of the complete control system will be discussed.

VII. Preventive Maintenance and Maintenance Schedule

Preventive maintenance techniques will be reivewed and then typical maintenance intervals discussed.

VIII. Maintenance Procedures

The presentation will cover tools and procedures for maintaining major components of the engine.

IX ~~VIII~~. Troubleshooting

Troubleshooting techniques will be reviewed.

X ~~IX~~. Review and discussion.

Course length is four days.

0084m

Enclosure K

Question 430.2

Operating experience of two nuclear power plants has shown that during periodic surveillance testing of a standby diesel generator, initiation of an emergency start signal (loss-of-coolant accident or loss of offsite power) resulted in the diesel failing to start and perform its function due to depletion of the starting air supply from repeated activation of the starting relay. This event occurred as the result of inadequate procedures and from a hangup in engine starting and control circuit logic failing to address a built-in time delay relay to assure the engine comes to a complete stop before attempting a restart. During the period that the relay was timing out, fuel to the engine was blocked, while the starting air was uninhibited. This condition, with repeated start attempts, depleted starting air and rendered the diesel generator unavailable until the air system could be repressurized.

Review procedures and control system logic to assure this event will not occur at your plant. Provide a detailed discussion of how your system design, supplemented by procedures, precludes the occurrence of this event. Should the diesel generator starting and control circuit logic and procedures require changes, provide a description of the proposed modifications.

Response

The only time such as is

~~There~~ will be a 90-s time delay initiated when the engine is intentionally shut down during periodic surveillance testing. ~~or shut down for any other reason~~. If during the 90-s time delay period a loss-of-offsite power signal is received or a manual start attempt is initiated, the engine will not start because fuel to the engine will be blocked. If the operator depresses the manual start pushbutton during the 90-s time delay period, the starting air valves will open for 5 s and automatically close after the 5 s have elapsed. This built-in 5-s time limit on the opening of the starting air valves is to prevent the depletion of the starting air. This 5-s limit also applies to loss-of-offsite power start signals received at the engine control panel. ① ~~However,~~ ② ~~if~~ an emergency start signal (loss-of-coolant accident) ③ ④ is received at the control panel during the 90-s time delay period, the engine control system will automatically bypass the 90-s time delay and will allow fuel oil and starting air to be admitted to the engine. Also, the 5-s time limit will be automatically bypassed, i.e. the starting air valves remain open until the engine starts (starting air pressure above 150 psig), or until the starting 13

① New ¶
② However if a diesel generator is being manually stopped and
③ with or without loss of offsite power)
~~④ N/A~~

air pressure drops to 150 psig. At this pressure, the automatic start attempt will stop because at 150 psig the starting air valves automatically close. At this point, the engine can only be started manually by pushing the manual start button. Pushing the manual start button will cause the starting air valves to open again. There is no built-in time delay between the conclusion of the automatic start sequence and the manual start attempt in a situation as described above. In other words, if the engine fails to start automatically, a manual start can be initiated immediately. The starting air sequence is designed in this manner so that the manual start attempt capability is available if an automatic start attempt fails. The engine can be manually started in this manner until the starting air pressure drops to 90 psig. Generally, starting air pressure below 90 psig will not start the engine when an attempt is initiated.

~~In summary, any time the engine control panel receives an emergency (loss-of-coolant accident) start signal, the fuel stop interlock will be retracted automatically. It does not have to wait for the engine to stop, or to get through the 90-s time delay period. This assumes that~~ (5) the mode switch (6) ~~is~~ in the "Operational" position, and the point of control (7) switch ~~is~~ in the "Remote" position. (8) ~~For any other starting signals (including loss of offsite power) received by the control panel, the fuel stop interlock will not be retracted automatically until the 90-s time delay period has elapsed. Also, the 5-s time limit on the opening of the starting air valves will be active in the control logic for all normal start signals even if the 90-s time delay is not initiated~~. 13

In order to maintain the emergency start capability of the diesel generator, operating procedures will specify that periodic surveillance testing is to be initiated only from the control room, i.e., control switch is in the "Remote" position. Also, the operator will be made aware of the built-in 90-s time delay and will be instructed not to initiate manual starting of the engine during this period. See figure 430.33-1.

(5) For the diesel generator to be automatically started or started from the control room

(6) , on the engine control panel, must be

(7) on the diesel control panel

(8) If either of the switches are not in these positions, an alarm in the control room on the bypass an inoperable status panel will alert the operator that the diesel is disabled.

Enclosure L

Question 430.4

The availability on demand of an emergency diesel generator is dependent upon, among other things, the proper functioning of its controls and monitoring instrumentation. This equipment is generally panel mounted and in some instances the panels are mounted directly on the diesel generator skid. Major diesel engine damage has occurred at some operating plants from vibration-induced wear on skid-mounted control and monitoring instrumentation. This sensitive instrumentation is not made to withstand and function accurately for prolonged periods under continuous vibrational stresses normally encountered with internal combustion engines. Operation of sensitive instrumentation under this environment rapidly deteriorates calibration, accuracy, and control signal output.

Therefore, except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring instrumentation should be installed on a free-standing floor-mounted panel separate from the engine skids and located on a vibration-free floor area. If the floor is not vibration free, the panel shall be equipped with vibration mounts.

Confirm your compliance with the above requirement or provide justification for noncompliance.

Response

The diesel generator buildings for Units 1 and 2 are similar in design. The concrete foundation for each building is 114 ft x 94 ft x 9 ft thick. The diesel generator, control cabinets, and associated equipment are mounted on the building foundation. The diesel engine is a four-stroke cycle, V-type engine with an operating speed of 450 rpm. Because of the type of engine and the large mass of the foundation, the magnitude of vibration anticipated during engine operation will be within the limits of IEEE 323-1974 qualifications. Except for sensors and local gauges that are required to be mounted on the engine, there are no controls or monitoring instruments mounted on the engine. 13

The mounting requirements for the diesel generator control cabinets specified by the vendor are that the cabinets are to be floor-mounted with anchor bolts without using vibration isolators. Also, the seismic qualification testing performed on the control cabinets by the vendor was conducted by bolting the cabinets to the shake table to simulate actual field mounting condition. The cabinets are qualified in ~~accordance with IEEE 323-1974 which addresses vibration aging.~~ Seismic qualification tests performed on the Control Cabinets envelope the seismic response spectra and the building foundation vibration due to engine operation.

Enclosure M

Question 430.9

In FSAR section 1.9, you state that the design of the fuel oil storage and transfer system conforms to the requirements of Regulatory Guide 1.137, which endorses ANSI N-195. However, there is no reference to testing of fuel oil as discussed in Appendix B of ANSI N-195 and position C2 of Regulatory Guide 1.137. Revise your FSAR to include a discussion of your conformance to these requirements.

Response

VEGP conformance to Regulatory Guide 1.137 is addressed in subsection 1.9.137. VEGP does not conform to the requirements of ANSI N195-1976, Appendix B. A ~~The testing requirements of ANSI N195-1976 endorses ASTM D2274. Because of poor correlation between this test and fuel suitability in storage, VEGP has substituted the requirements of ASTM D2276 for those of ASTM D2274~~. The testing requirements for the diesel generator fuel oil will be specified in the Technical Specifications, which are scheduled to be submitted to the Nuclear Regulatory Commission by June 1985. 13

The VEGP fuel oil surveillance program will, however, follow the ~~a~~ program ~~such as the one~~ that was approved for the McGuire Nuclear Station. 16

Amend. 7 5/84
Amend. 8 7/84
Amend. 9 8/84
Amend. 13 1/85

Enclosure N

Question 430.12

In the FSAR, you state that the fuel oil storage tanks are vented to the "valve house" located between the storage tanks. Expand your FSAR to provide additional information on the design features of this "valve house" which ensure adequate ventilation of the structure so as to preclude a buildup of combustible gases and the provisions to prevent the ventilation capability being blocked as a consequence of any weather condition.

Response

Insert A

Diesel fuel oil is a heavy distillate gas oil, which by virtue of its specification and chemical composition does not contain light petroleum distillate products such as propane, butane, and gasoline, which are volatile and can transform into readily combustible gases. Therefore, at room temperature it is highly unlikely for a combustible gas to build up, since the means for producing the combustible gases is not present.

Two 4-in., U-bend vents are provided on the roof of the valve house to provide redundancy in ventilation under the most adverse weather conditions. Similarly, two 4-in., U-bend vents are provided on the roof of each diesel fuel oil storage tank pumphouse.

The storage tank is vented in two separate locations. One is located outside of the valve house as shown in figure 430.12-1 and the second is through a branch line from the 4-in. truck fill line to the diesel fuel oil day tank vent line as shown in figure 9.5.4-1 of the FSAR.

The storage tank vent line located outside of the valve house is branched out into two separate 4-in. vent lines downstream of the flame arrester inside the valve house. One branch is terminated above the valve house roof with a 180° bend, and the other branch is terminated outside the valve house wall with a 90° bend. Neither of the vent lines outside the valve house are missile protected.

The second venting for the storage tank is connected to the diesel fuel oil day tank vent line just upstream of the day tank vent flame arrester located outside the diesel generator building. The flame arrester and connected piping building are protected from tornado missiles as shown in figure 430.13-1. 14

In the unlikely event that both of the diesel fuel oil storage tank vent lines outside the valve house are damaged or blocked, the storage tank can still be vented by the second vent point

430.12

Response

The storage tank vent ~~time~~ line is branched into two separate 4-in vent lines downstream of the flame arrestor located inside of the valve house. One branch is externally terminated in an open vent above the valve house roof and the other branch, oriented 90°from the first vent, is externally terminated in an open vent outside the valve house wall. Thus, all storage tank vents terminate outside of the valve house, which precludes an accumulation of combustible gases within the structure.

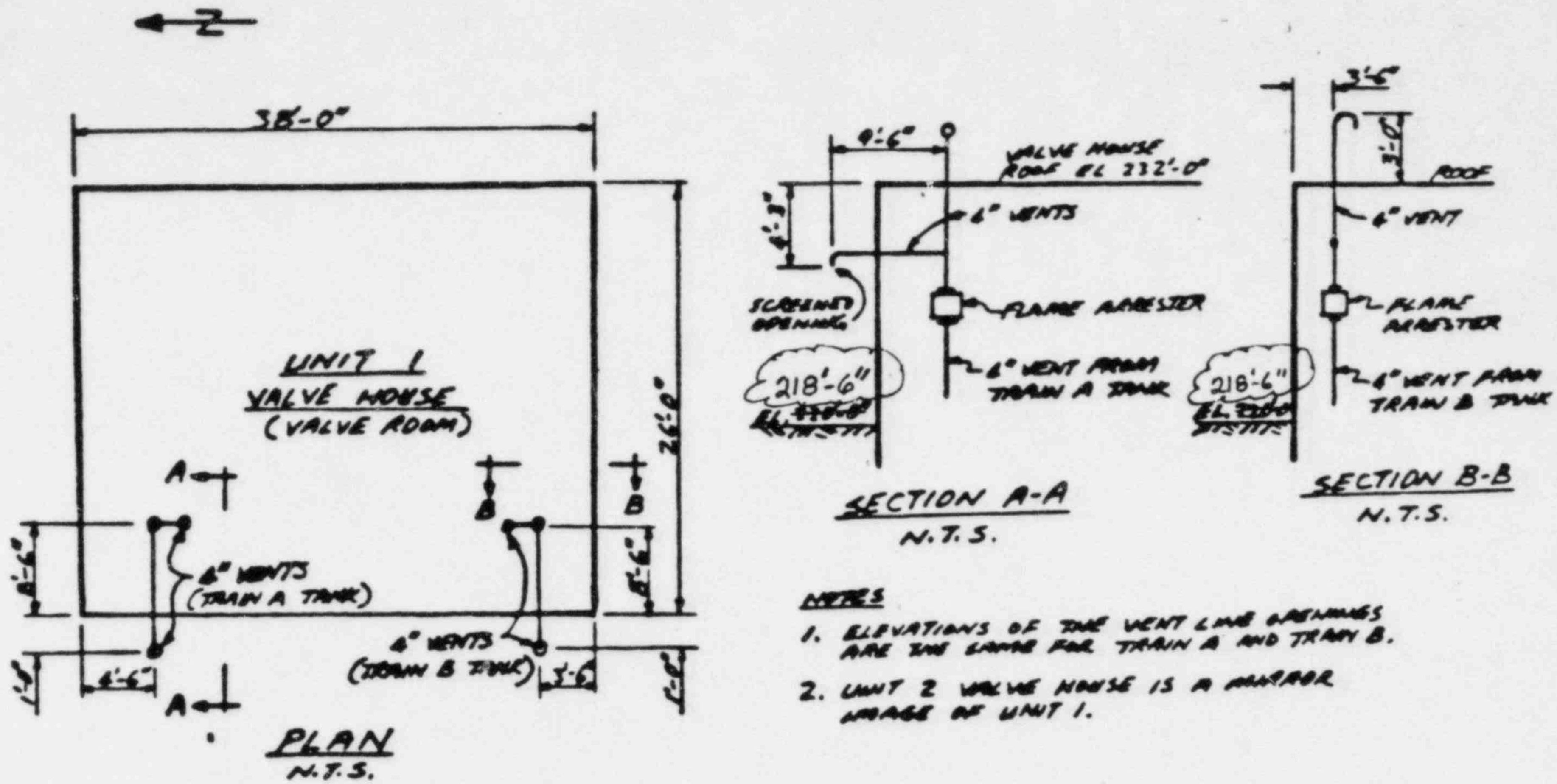
Furthermore, diesel fuel oil is a heavy distillate which, by virtue of its specification, does not contain light petroleum distillate products such as propane, butane, or gasoline which are volatile and readily form combustible gases. Therefore, at room temperature the means for producing appreciable amounts of combustible gases are not present.

Two vents are provided external to the valve house to provide ventilation redundancy under adverse weather conditions. The storage tank is vented in two separate locations. The valve house vents are shown on figure 430.12-1. Figure 430.12-2 shows the second storage tank vent, which is a branchline from the 4-in truck fill line to the diesel fuel oil day tank vent line. The portion of the second vent line outside of the diesel generaor building and the fuel oil storage tank is buried and, therefore, not subject to damage under adverse weather conditions.

If a postulated tornado severs both vent lines, the vents continue to operate. For the highly improbable event of a postulated tornado blocking both vents, the storage tank is sealed from the escape of any combustible gases.

The second storage tank vent, flame arrestor, and connected piping are missile protected. In the unlikely event that both of the diesel fuel oil storage tank vent lines outside of the valve house are damaged or blocked, the storage tank can be vented through the second vent when the fuel oil transfer pump is in operation. The fuel oil transfer pump creates sufficient differential pressure between the vapor pressure within the tank and the ambient atmosphere to ensure proper transfer of diesel fuel from the storage tank to the day tank, regardless of the condition of the storage tank vents.

If necessary, emergency venting of the storage tank can be accomlished by unbolting the side plates of the flame arrestor or by opening the storage tank man way cover.



13

Amend. 13 1/85

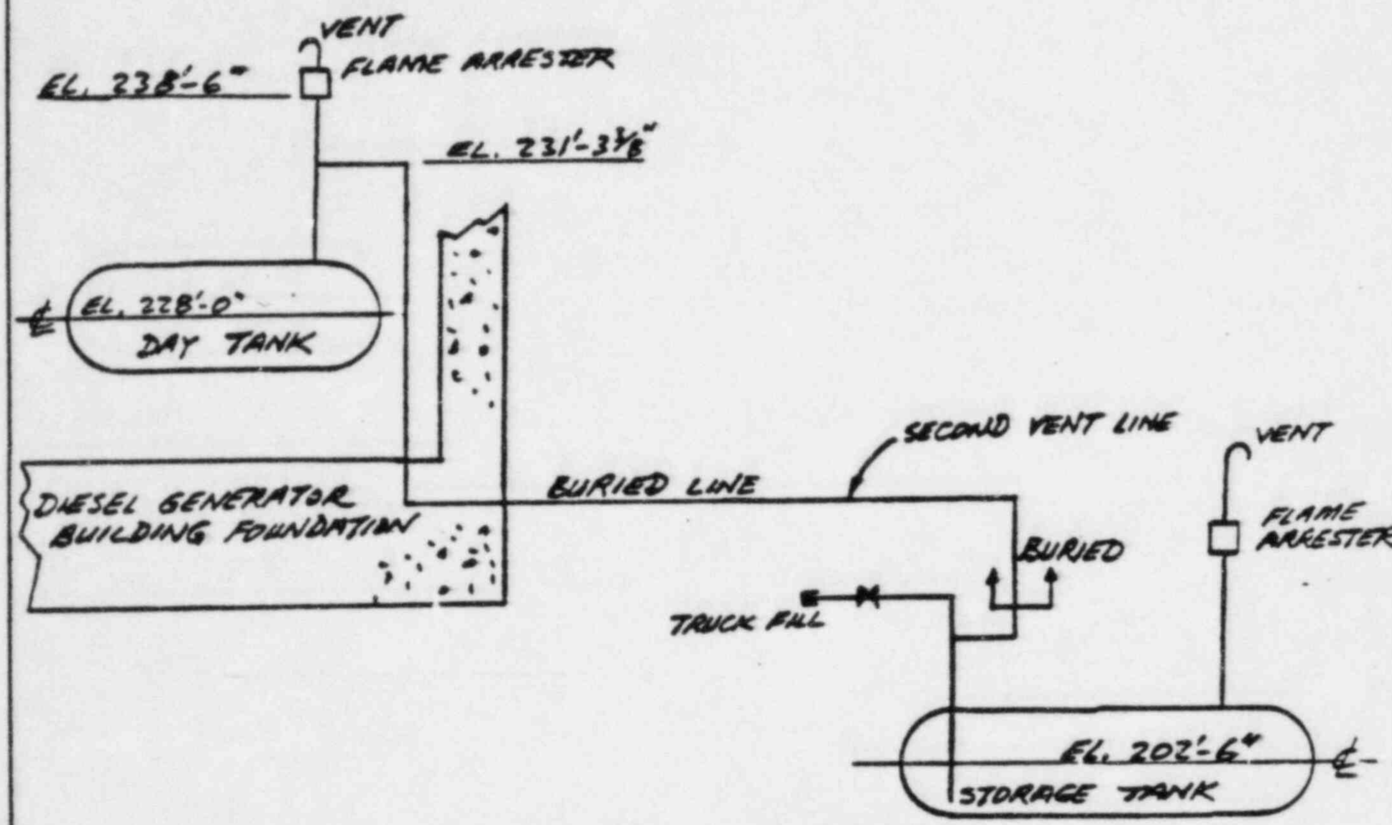
Georgia Power

VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

Storage Tank Venting
Outside The Valve House

FIGURE 430.12-1

433-9



NOTE: THE SECOND VENT LINE OUTSIDE THE DIESEL GENERATOR BUILDING AND THE FUEL OIL STORAGE TANK BUILDING IS BURIED. THE LOWEST PORTION OF THIS VENT LINE IS AT EL. 210'-1¾".

Georgia Power	VOGTLE ELECTRIC GENERATING PLANT UNIT 1 AND UNIT 2	DIESEL STORAGE TANK VENTING CONFIGURATION FIGURE 430.12-2

433-9

New figure

Question 430.21

In FSAR table 9.5.4-1, you include a heading of "nonsafety-related portion" under the title of Standby Diesel Generator Fuel Oil Storage and Transfer System. Describe what portions of this system are nonsafety-related, show these portions on the piping and instrumentation diagram, and describe their isolation from safety-related portions.

Response

The truck fill lines (from truck fill connection to the first valve connection) and the flame arresters for both the fuel oil storage and fuel oil day tanks are the nonsafety-related portions of the fuel oil storage and transfer system.

The nonsafety-related portions of the system are designated as project class 626 and are shown in figure 9.5.4-1. See revised table 9.5.4-1.

Insert 1

~~The flame arrester consists of a heavy cast aluminum housing which contains a removable multiplate flame arresting bank. Plates in the flame-arresting bank are made of aluminum which is noncorrosive in hydrocarbon gases. Net-free area through the flame-arresting bank is three to four times the corresponding pipe size. It is designed to greatly reduce surface friction and increase flow capacity. The aluminum bank can be easily removed for quick inspection and cleaning by unbolting the aluminum housing side plates.~~ 13

~~Since there are no moving parts inside the flame arrestor, blockage of the vent line or its venting capability due to structural failure of its internal components is unlikely. In the event that the housing is punctured, the venting capability will increase instead of decrease. Therefore, failure of the flame arrester will not impair the safety function of the vent line.~~

INSERT 1 (Q430.2)

The flame arrestors are cast aluminum devices that are placed in the diesel oil tank vents. They operate at approximately atmospheric pressure and are constructed of aluminum, which is noncorrosive in hydrocarbon bases. Depending on the model type, the internals are constructed of either confined aluminum corrugated plates contained within a heavy cast aluminum housing or a single piece corrugated aluminum sheet rolled on a mandrel confined within a section of aluminum pipe that is bolted to the flanged end pieces. In either type, the internals are firmally supported and not susceptible to damage.

~~430.81~~

An analytical analysis was performed on each type of flame arrestor to access the capability to withstand a seismic event. The methodology, assumptions and conclusions of these analyses are discussed below.

Methodology

1. Determine most detrimental failure mode for postulated vent choking following a seismic event.
2. Obtain acceleration at each arrestor location from piping analysis data base.
3. Apply accelerations to each arrestor and calculate stress levels for those components restraining the failure mode determined in (1) above.

Day Tank Flame Arrester

Description: Single-piece corregated aluminum sheet rolled on mandrel and confined within an aluminum pipe section that is bolted to flanged end pieces.

Assumptions:
1) Postulated failure or casing or flange bolts increases venting area.
2) Entire load of internals restrained by one of two retaining bars.
3) Normal operating loads and pressures are negligibly small.

Conclusions:
1) SSE is governing load
2) Internals are restrained from "telescoping" by intact restraining pin. margin of allowable acceleration to postulated imposed acceleration is in excess of 1.5.
3) Internals will remain in place to ensure proper venting.

Storage Tank Flame Arrestor

Description: Confined aluminum corrugated arrestor plates contained within a heavy cast aluminum housing.

Assumptions:
1) Postulated failure of casing or flange bolts increases venting area
2) Normal operating loads and pressures are negligibly small
3) Restraining frame angles are aluminum 1x1x1/8".

Conclusions:
1) SSE is governing load
2) Arrestor plates and arrestor frame sections will withstand the postulated imposed accelerations.
3) Internals will remain in place to ensure proper venting.

Enclosure P

Question 430.33

In FSAR paragraph 9.5.7.5 you briefly discuss the low lube oil pressure trip. Expand your FSAR to provide additional information on this trip function, including more details on the pressure switches (manufacturer, model, etc.), the location of these switches on the diesel generator, and identification of these switches on the piping and instrumentation diagram (figure 9.5.4-1).

Response

The low pressure lube oil trip function is provided for the automatic safe shutdown of the engine during both normal and emergency operations. It is a two out of three logic (see paragraph 9.5.7.2.2). This means that there are three oil sensors installed on the engine lube oil inlet header. The lube oil pressure sensors are set to trip open at 30 psig decaying pressure. Their operation is similar to mechanical valves which are closed when pressure is above 30 psig and trip open on decreasing pressure. These sensors are monitored by a series of pneumatic logic circuits mounted inside the engine control panel. In the event that any two of the sensors are tripped open, they vent 60 psi pressure from an alarm/shutdown circuit in the pneumatic safety system. When venting occurs, a control air pressure extends the fuel rack shutdown cylinder at the engine. The cylinder moves the fuel racks to the no fuel position, and the engine stops due to fuel starvation. At the same time, a pressure switch in the engine control panel indicates to the electrical system that a malfunction has occurred in the lube oil system.

The oil pressure sensors are manufactured by California Controls Company (model B-4400), and the pressure switch is manufactured by Barksdale Controls Division, Transamerica Delaval, Inc. (model E15-M90).

The oil pressure sensors and switches are furnished by the engine manufacturer as integral parts of the engine and control panel. They are shown on engine pneumatic schematic and engine control panel schematic drawings furnished by the vendor. Therefore, they are not shown on the piping and instrumentation diagram. 13

The high temperature jacket water and low pressure lubricating oil sensors remain active for tripping during the emergency operation. As shown on figure 430.33-1, three sensors are used to monitor each of these parameters. At least two of these sensors must trip before a shutdown occurs. For example, if only the low pressure lubricating oil sensor on line 10A trips, there is a loss of pressure at port 1 of the UPPER |A-6943 assembly. This causes element MEM-5 to stop transmitting which, in turn, causes element NOT-9 to have an output. The NOT-9 output is applied to port "A" of element AND-13, and is also applied to port 8 of the assembly through elements OR-17 and OR-18. Pressure at port 8 activates pressure switch PS-48N which indicate to the electrical system that one of the lube oil sensors has malfunctioned. If a second lube oil sensor were to indicate a malfunction condition, the engine would shut down. For example, if the sensor on line E-10B vents, in addition to the sensor on line E-10A, then the loss of pressure at port 3 of the upper 1A-6943 board would result in an output from element AND-13. The AND-13 output pressurizes port 6 of the assembly, and is also applied to both port "B" of element NOT-12, and to an accumulator pair at port 11 through orifice/check 16. Port 6 pressure causes pressure switch PS-42N to transmit the trip indication to the alarm system. NOT-12 has an output for approximately two minutes, until terminated by the accumulator timer. The NOT-12 output pressurizes port 12 of the upper assembly, and is transmitted through the lower assembly to pressurize port 4 of logic board 1A-7055. Note that the port 4 stop signal bypasses the NOT-17 and NOT-18 elements which inhibit a normal safety shutdown. The port 4 signal produces a memorized output from element AND-24 which extends the fuel rack shutdown cylinder through port 7 of 1A-7055. This shutdown signal is ~~AND-24 which extends the fuel rack shutdown cylinder through port 7 of 1A-7055. This shutdown signal is~~ terminated after approximately two minutes to allow the engine to be restarted if the problem is corrected. 13

Figure 430.33-1 includes the engine control panel schematic, engine pneumatic schematic, lube oil piping schematic, and control logic diagram.

The lube oil pressure sensors are mounted on the engine, but all other related pneumatic safety components are mounted in the engine control panels. Seismic testing of ~~a~~ the panel to simulate its permanent installation at VEGP has been performed and has passed the seismic shake test. One engine control panel has been seismically tested. The other three panels are seismically qualified since they are identical to the one tested. Therefore, the engine control panels meet the Seismic Category 1 requirements. Safety-related components inside the panel, which are required to perform safety control functions of the diesel generator, are environmentally qualified per IEEE 323-1974. Also, these safety-related components are powered by Class 1E electrical power supply, and the peumatic air supply to the engine control panel is from safety-related starting air receiver.

ADD INSERT to 430.33

INSERT TO 430.33

The failure of the nonsafety-related portion of the pneumatic control system will not prevent diesel generator start or continued opeation for the followng reasons.

- o The compressed air for each diesel is stored in an individual safety-related storage and starting system. Each system holds sufficient air to start the diesel five times under a no-load condition without the assistance of the nonsafety-related compressor.

- o The fuel pump is engine-driven and does not require pneumatic control.

- o The engine governor is electrically operated and is provided with an integral independent mechanical backup neither of which require the pneumatic control air system to sustain operation.

- o The fuel shutdown cyclinder is normally open and air supply is required to move the cylinder to a "no fuel" position. Therefore failure of the air supply to the pneumatic logic control will not cause the diesel engine to stop due to fuel starvation.

- o The safety-related sensing lines for the 2 out of 3 trip logic for low pressure lube oil and high temperature jacket water can be vented only by sensor actuation. These sensing lines are pressurized during startup via safety-related check valves 1, 2 and 3 (see Figure 430.33-1, sheet 1). The check valves will maintain these lines pressurized in case of an air supply failure. If a 2 out of 3 trip signal is generated after an air supply failure, the pneumatic logic will not be operable to provide an output signal to the shutdown cyclinder. In addition, no air will be available to move the shutdown cylinder to "no fuel" position. Therefore, the failure of air supply system will not cause fuel starvation to the diesel.

Starting air quality is discussed in subsection 9.5.6. T e pneumatic control system air quality is the same as for air start system.

Enclosure Q

Response

The following responses correspond to the above questions:

A. The smallest conductor size used for any power circuit is No. 12 AWG. Cables are protected by the magnetic only trip circuit breakers as indicated in figure 8.3.1-7, sheet 1.

FSAR figure 8.3.1-7 is only completely applicable to circuits inside containment. Outside containment, the magnetic-only circuit breaker is relied upon for circuit protection without a thermal magnetic circuit breaker backup.

Insert 1 →

The area of overlap between the highest magnetic-only circuit breaker setting of 50A and the thermal capability of the associated No. 12 field conductor does not begin until 500 s as shown on the revised sheet 1 of FSAR figure 8.3.1-7. It is not judged credible that such a high impedance, 25-50A fault, could exist continuously fo. more than 500 s without the fault increasing to the level which would actuate the magnetic-only circuit breaker. 15

If such a high impedance fault could exist beyond 500 s, the three conductor cable would most likely fail internally affecting only that cable for one train.

Insert 2 →

B. Magnetic only trip circuit breakers are set to operate at two times the locked-rotor current of the MOV but not to exceed 13 times the motor full load current. The lowest setting on the next larger size breaker is used where this criterion cannot be met.

C. Section 4.13 of IEEE 279 and Regulatory Guide 1.47 require continuous monitoring of a component of a protection system being bypassed or deliberately rendered inoperative. The VEGP design is such that, when an MOV is moved away from the safe position, it is monitored at the system bypass status panel. Bypassing the TOL is bypassing an overcurrent protective device, not bypassing a protective system component as defined by IEEE 279. It should be noted that the overload heater itself in the power circuit is not bypassed, only the trip contact in the control circuit. During plant operation an MOV motor overload condition is annunciated in the control room as "equipment trouble alarm using a second independent contact in the overload relay.

Q430.64

Insert 1

Failure of power cables to Class 1E MOVs due to sustained locked rotor currents (LRC) is not considered to be credible based on the following. Limitorque, who has supplied the Class 1E MOVs to the project, has established a LOS limit on safe stalled time for the motor actuators. Beyond this time, LRC will rapidly degrade the motor windings resulting in either (1) a short circuit and actuation of the associated magnetic only (MO) circuit breaker, or (2) a motor winding open circuit which will terminate the overcurrent situation.

As is demonstrated by Figure 8.3.1-7, sheet 1, it requires a current of 350A to flow for LOS to reach the thermal limit curve for 12 AWG field conductors. (It should be noted that this thermal limit curve is based upon the time required at each current level for the conductor to reach its rated 250°C short circuit temperature starting from an initial conductor temperature of 90°C. MOV power cables would in reality be starting from temperatures much lower than this since they are normally not running). The largest MOV used on this project with this cable size is rated 2 HP with an LRC of 26A. The associated MO breaker is set to trip instantaneously at 50A.

Insert 2:

A similar comparison could be made for larger MOVs, which would have correspondingly larger cables. Under any combination of power cable and MOV rating, adequate margin exists between the cable thermal limit and the LOS MOV safe stalled time thermal limit.

Enclosure R

Question 430.73

Regarding motor-operated valves with power lockout:

A. Provide or reference motor control schematic drawings for the valves listed in FSAR paragraph 8.3.1.1.11.A which show the power lockout capability at the main control board. Describe the technique used to lock the power out, and describe the redundant valve position indication and their power supplies provided for each valve.

B. Clarify that the power is locked out to the accumulator isolation valves identified in paragraph 8.3.1.1.11.B by drawing the circuit breaker from the motor control center during startup and maintaining it in the racked out position during reactor power operation.

C. Identify how the accumulator isolation valve circuits comply with each position given in Branch Technical Position ICSB-4 (PSB) and provide or reference motor control schematic drawings for the valves. Identify the redundant power supplies provided to the position indicators of each valve.

Response

The following elementary diagrams detail the circuitry associated with the valves listed in section 8.3.1.1.11.A:

A. Emergency core cooling system (ECCS) valves and relative figure numbers are listed below:

HV-8806	Figure 430.73-1
HV-8835	Figure 430.73-2
HV-8802A	Figure 430.73-3
HV-8802B	Figure 430.73-4
HV-8840	Figure 430.73-5
HV-8809A	Figure 430.73-6
HV-8809B	Figure 430.73-7
HV-8813	Figure 430.73-8
~~HV-8803A~~ R	~~Figure 430.73-13~~ R
~~HV-8803B~~ R	~~Figure 430.73-14~~ R 13

Power lockout for the ECCS valves is attained at the main control board through the use of a lockout switch.

Redundant indication is provided at indicator light boxes ZLB6 and ZLB7 which are mounted on the main control board. The power supplies for these light boxes are from termination cabinets which are supplied power from 120-V distribution panels located in Class 1E motor control centers (one per train). The termination cabinet is not powered from a motor control center providing main power to any valve listed above. The second position indication is powered from the motor-operated valve control circuit.

Valves HV-8803A and B are two new valves identified in paragraph 8.3.1.1.11 which will also have power lockout using locked open breakers. The circuit breakers for these valves will be padlocked in the open position during reactor power operation after the valves have been aligned to the required position.

INSERT "A"

Light box ZLB6 is powered from distribution panel 1AYC131 (MCC1ABC), with the valve position indicating lights for valves HV-8802A, HV-8809A, and HV-8835. None of these valves are powered from MCC 1ABC.

Light box ZLB7 is powered from distribution panel 1BYA131 (MCC 1BBA), with the valve position indicating lights for valves HV-8802B, HV-8809B, HV-8806, HV-8813, and HV-8840. None of these valves are powered from MCC 1BBA. 13

The correct position of the lockout switch contacts is monitored by a white light on the main control board. When the lockout switch is on the "lockout" position, two contacts from the switch will disable the control circuitry. One of the switch ~~controls~~ CONTACTS will disable the hot leg of the circuitry and at the same time will deenergize the white light. The other switch contact will disable the neutral leg of the circuitry. A deenergized white light when the lockout switch is on the "lockout" position means the control circuitry is inoperable.

INSERT "B"

~~In the event that the switch contact on the hot leg of the circuitry fails to open, the white light will remain lighted, but the control circuit will still be disabled because the switch contact on the neutral leg of the circuit will open. By the same token, a defective bulb failing to monitor the status of the hot leg switch contact will not cause a problem since the contact on the neutral leg will still disable the~~

~~circuit. The defective bulb can be detected when the lockout swi. h is placed on the "ON" position, with the white light still deenergized.~~

B. The accumulator isolation valves circuit breakers will be padlocked in the open position during reactor power operation. Paragraph 8.3.1.1.11 has been revised and notes have been added to the individual schematic diagrams for each of the accumulator isolation valves to indicate the padlock requirement. 13

C. The accumulator isolation valve circuits conform with Branch Technical Position ICSB-4 (PSB) by virtue of:

1. K621 and K603 relays for automatic valve opening.

2. Handswitch indicator lights for visual valve indication.

3. Critical function alarm with periodic reflash for independent audible and visual alarm.

4. Relay K603 automatic prevention of valve closure.

Motor control schematic drawings and drawings for the critical function alarm have been provided in figures 430.73-9 through 430.73-12.

insert C

~~For the valves using locked open circuit breakers, the position indicating lights on the handswitch will be deenergized. This position, however, is monitored in the ~~motor~~ MONITOR light box. The power supply to the ~~motors~~ MONITOR light box is independent of the power provided to the valves.~~ 13

Redundant indication and power supply provided to the position indicators of valves are:

1. Motor-operated valve control handswitch indication light, feed from control circuit.

2. Monitor light (on main lighting board), fed from termination cabinet.

3. Critical function alarm (periodic reflash), fed from annunciator panel (dc and diesel generator-backed ac powered).

Insert A:

The monitor light box for valve HV-8803A is MLB05, which is powered from distribution panel 1AYC1 (MCC 1ABC). Valve HV-8803A is powered from MCC 1ABD. The monitor light box for valve HV-8803B is MLB06, which is powered from distribution panel 1BYA1 (MCC 1BBA). Valve HV-8803B is powered from MCC 1BBD.

Insert B:

In the event that the switch contacts on either the hot leg or the neutral leg of the circuitry fail to open (undetected failure) the control circuit will still be disabled and the white light will still be deenergized, because the switch contact on one of the circuit legs (either the hot leg or the neutral leg) is open, rendering the control circuit loop open. Assuming that, in addition to this failure, a second failure occurs such that the switch contact that opened when the lockout switch was initially placed in the "lockout" position shorted out or became bypassed, two things can happen. The second failure can generate a short circuit which will open the fuse (installed to protect the circuit from this incident). The opening of the fuse will isolate the fault and at the same time will deenergize and disable the control circuitry. On the other hand, the second failure can complete the control circuit loop such that the control circuitry is energized and the white light turned on. This condition will indicate to the operator a discrepancy and that a problem exists in the power lockout control circuitry and that some measure has to be taken to correct the situation. Suppose that instead of the white light being energized a third failure occurs, which causes the bulb filament of the white light to fail. In this case, the deenergized white light (defective bulb) would indicate that the lockout circuitry is disabled, although, under this particular condition because of the different failures postulated above, the lockout circuitry is in fact energized. Still, a fourth failure will be required to take place - that of an operator action, accidental or otherwise - to change the position of the valve. If the operator actuates the switch which will change the position of the valve, visual and audible indications from three different places will be actuated. The system status monitor panel will provide visual and audible indication on a system level that a particular condition has been violated. Concurrent with this, the annunciator panel will provide visual and audible indication, on a group level, and identify the group to which the affected component belongs. The monitor light panel, which arranges the components in groups, will provide visual indication on a component level and identify exactly the component, the position of which was violated.

As postulated above, it will require four successive failures (beyond the single failure criterion) to bring the lockout control circuitry to a condition that will allow the valve position to be changed. Assuming, however, that such a condition can be obtained, the presence of redundant visual and audible indications alerting the operator of the violated condition will prevent the condition from taking place. On the other hand, let's assume that the undetected failure occurred in the switch contact in the neutral leg of the power lockout circuitry and that a hot short occurred in the hot leg of the circuitry such that the valve solenoid is energized and the valve position is violated. As discussed above, this condition will cause variance levels of visual and audio indications to actuate which will alert the operator of the violated condition and will therefore prevent the valve position from being reversed.

Moreover, the occurrence of accidental hot shorts which will cause the valve's solenoid to be energized and change position is not credible. The wires are terminated on terminal blocks with barriers between the block points so as to prevent adjacent points from shorting each other. In addition, the points in question are terminated far apart such that the only credible hot short is obtained by intentionally connecting the points manually with a long piece of bare copper wire.

Insert C

The position indicating lights on the handswitch for each accumulator isolation valve indicate the open or closed status of the valve when it is stroked open for operation at power or stroked closed for shutdown. When the isolation valves are padlocked in the open position during reactor power operation by locking open the circuit breakers, these position indicating lights on the handswitch will be deenergized. At this time, this position is monitored by MCB annunciators or in the monitor light box. The position signal is from a contact on the valve cam operator switch. Another contact on the valve cam operator switch signals the critical function valve alarm that the valve is not opened. There is also a critical valve reflashing alarm that indicates when the valve is not fully open which is signaled from a stem mounted limit switch. These diverse indications warn the operator if the valve is not open when it is required to be open for correct ECCS alignment. The power supplies to the MCB annunciators on the monitor light box are independent of the power provided to the valves. HV-8803A & B will have power locked out. In addition, the electrical connections to these valve operators will be removed or the valves will be padlocked open.

8.3.1.1.11 Motor-Operated Valves with Power Lockout

The motor-operated valves that require power lockout to meet BTP ICSB 18 and that have the means to accomplish power lockout are listed and outlined as follows:

A. The following motor-operated valves power lockout and restoration capability is accomplished at the main control board:

HV-8806	Safety injection pump suction from refueling water storage tank
HV-8835	Safety injection pump cold leg injection
HV-8802A, B	Safety injection pump hot leg injection
HV-8840	Residual heat removal pump hot leg injection
HV-8809A, B	Residual heat removal pump cold leg injection
HV-8813	Safety injection pump miniflow isolation
~~HV-8803 A, B~~	~~Centrifugal charging pump discharge to boron injection tank~~

B. The following motor-operated valve power lockout is accomplished by padlocking the circuit breaker at the motor control center during startup and maintained in the locked open position during reactor power operation: 1 7

HV-8808A, B, C, D	Accumulator isolation valves
HV-8803 A, B	Centrifugal charging pump discharge valve to boron injection tank

In addition, the emergency core cooling system motor-operated valves (item A) are provided with valve position-indicating light boxes to provide a continuous indication of valve position.

The Technical Specifications list these valves and their required positions.

8.3.1.1.12 Containment Building Electrical Penetrations

The electrical penetrations are protected from damage resulting from overcurrent conditions through the use of redundant overcurrent protective devices as indicated in paragraph 1.9.63.2. The use of series Class 1E fuses for backup protection on the 480-V switchgear power circuits is justified