PSNH

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United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing

References: (a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444

Subject: Open Item Responses: (SRP 9.5.4, 9.5.5, 9.5.6; Power Systems Branch)

Dear Sir:

We have enclosed responses to the following open items which were discussed with representatives of the NRC Staff in meetings conducted on January 10-12 and 25, 1983:

NRC BRANCH	SRP SECTION	COMMENTS
Power Systems	9.5.4	430.65; Vibration
Power Systems	9.5.4; 9.5.5	430.76; RG 1.26
Power Systems	9.5.4; 9.5.5	430.99; Buried Pipe/Cable
Power Systems	9.5.4; 9.5.6	430.111; Air Start HELB
Power Systems	9.5.4	430.126; Dirt/Dust
Power Systems	9.5.4	430.130; No-Load/Light-Load Operation

The enclosed responses will be included in Amendment 49 to the OL Application.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

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ALL/fsf

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430.65 The availability on demand of an emergency diesel generator is dependent upon, among other things, the proper functioning of its control 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: Instrumentation and controls not specifically mounted on the engine or associated piping are located in the "engine gauge panel", "relay and terminal box", and the "diesel generator control panel".

The "engine gauge panel" is mounted on the engine end of the skid using vibration isolating mounts, and contains gauges and switches. Failure of any instrument located in this panel does not affect operation of the diesel generator.

The "diesel generator control panel" is a free-standing, floor-mounted panel separated from the engine skid. This control panel contains the balance of diesel generator controls and monitoring instrumentation.

The "relay and terminal box", mounted on the generator end of the skid, contains control relays and the solid-state speed switch. These devices are not considered sensitive instrumentation subject to setpoint drift due to vibration. The devices located in this panel have been seismically qualified. In addition to the above qualification, one of the following will also be performed:

a) Independent vibration qualification for all equipment whose failure could degrade operation or cause shutdown of the engine will be performed,

b) The "relay and terminal box" will be removed from the engine skid and mounted as a free-standing, floor-mounted panel, or

c) Vibration qualification of equipment within the relay and terminal box during pre-operational or qualification testing to confirm that actual equipment vibration is within the tolerances specified as acceptable by the manufacturer.

430.76 (3.2) The FSAR text and Table 3.2-1 states that the components and piping systems for the diesel generator auxiliaries (Fuel Oil System, Cooling Water, Lubrication, Air Starting, and Intake and Combustion System) that are mounted on the auxiliary skids are designed Seismic Category I and are ASME Section III, Class 3 quality. The engine-mounted components and piping are designed and manufactured to DEMA standards, and are Seismic Category I. This is not in accordance with Regulatory Guide 1.26 which requires the entire Diesel Generator Auxiliary Systems be designed to ASME Section III, Class 3 or Quality Group C. Provide the industry standards that were used in the design, manufacture, and inspection of the engine-mounted piping and components. Also, show on the appropriate P&IDs where the Quality Group classification changes from Quality Group C, and where the seismic classification changes. (See Request 430.111 for additional requirements on the Air Start System.)

RESPONSE: The diesel engine and its engine-mounted portions of auxiliary piping are designed to Seismic Category I requirements and follow the guidelines of DEMA standards, which are endorsed by Regulatory Guide 1.9 and IEEE Standard 387. Regulatory Guide 1.26 states that "other systems not covered by this guide, such as ... diesel engine and its generators and auxiliary support systems, diesel fuel ... should be designed, fabricated, erected and tested to quality standards commensurate with the safety function to be performed".

FSAR Figures 9.5-5, 6, 7, 8 and 9 indicate the on-skid and off-skid portions of piping systems and components, and their Quality Group Classification. All piping and components are designed to Seismic Category I requirements. The components of these systems that are not an integral part of the engine, but are mounted on the skid, are made to ASME standards as shown on the system piping diagrams. Additional details of on-skid piping are shown on the following engine manufacturer's drawings, which will be added to the FSAR:

UE&C F.P. Number	New FSAR Fig. No.	Title: Diesel Generator
20588	430.76-1	General Fluids Systems
20593	430.76-2	Fuel Oil System
20594	430.76-3	Jacket Coolant System
20592	430.76-4	Air Cooler System
20591	430.76-5	Starting Air System
20590	430.76-6	Lube Oil System
20589	430.76-7	Intake Air & Exhaust System

The engine manufacturer has taken the position that the piping systems integral to the engine, such as the Lube Oil Distribution Header, Jacket Water Distribution Header, Rocker Arm Distribution System, etc., are a proprietary design, and cannot be made to ASME Section III, Class 3 requirements as such. These components are designed to a specific purpose and situation. They are inspected to meet engineering drawings and tested to Colt's rigid quality standards including hydrostatic pressure requirements, leakage at joints, etc. Furthermore, on this particular engine design, the components are made to drawings provided by the engine licensor, and Colt is not permitted to deviate from that design without his consent and design input.

An indication of typical materials used and margin between design pressure and working pressure for the on-engine piping is as follows:

System	Design Margin	Pipe and Tubing Materials
Fuel Oil	1.715 (60/35)	AISI-1010, 1018, 304
Jacket Coolant	1.167 (70/60)	AISI-1010, 1018
Starting Air	1.035 (450/435)	ASTM-A53, A120 AISI-1010, 1020
Lube Oil	1.250 (150/120)	AISI-1010, 1018, 1020
Comb. Air Intake	N/A (Atm.)	Almag 35 (Alcoa 323T6)
Exhaust Manifold	1.250 (5/Atm.)	ASTM-A200 Gr. T22

These materials are standard for power industry applications and are equivalent to ASME Section III, Class 3 material requirements.

The piping and associated components are conservatively designed to provide low working stresses for this application, and assure reliability of the diesel engine.

430.99 (9.5.5) In Section 9.5.5 of the FSAR you state that the diesel generator component cooling water heat exchanger is not located in the Diesel Generator Building but in the Primary Auxiliary Building. Figure 9.5-6 confirms this arrangement and it also shows that the diesel generator cooling water lines are routed from the Diesel Generator Building through the plant yard before entering the Primary Auxiliary Building. No mention is made about the exact routing of the piping or tornado missile protection for these lines. Provide the following:

a. Indicate where these lines are located (above or below ground) and the tornado missile protection provided for these lines. If none is provided, it is our position that tornado missile protection be provided. Comply with this position.

b. Provide a discussion of the external corrosion protection provided for this piping. Where corrosion protective coatings are being considered, include the industry standards which will be used in their application. If this piping is buried, discuss what provisions will be made in the design of this piping in the use of an impressed current type cathodic protection system in addition to waterproof protective coatings to minimize corrosion of buried piping. If cathodic protection is not being considered, provide your justification supplements by adequate drawings.

c. It is our position that if the cooling water piping for Diesel Generator Room 1A passes through Diesel Generator Room 1B or if the piping for both diesel generators are in close proximity to each other such that a single accident, such as a tornado missile or high energy line pipe break, could damage both the trains, then this is unacceptable and your design will have to be revised. Provide a description supplemented by adequate drawings of the routing of the cooling water piping for both trains. Include in the description sufficient information to show that the piping is adequately separated or protected and that any single accident will not degrade both trains.

RESPONSE: a. The diesel generator cooling water lines exit the Diesel Generator Building below grade through the west wall and enter the Primary Auxiliary Building below grade. Both buildings are Seismic Category I and provide tornado missile protection for equipment and piping inside the buildings. The underground portions of the cooling water lines are a minimum of seven feet below grade, to provide protection against freezing and tornado missiles.

b. The buried piping has been coated and wrapped prior to installation with Tapecoat-20, applied in accordance with the manufacturer's recommendations and standard industry practice. An impressed current system for cathodic protection has been provided.

c. The cooling water piping for one diesel generator does not pass through any areas associated with the other diesel generator. The piping exits to the yard through the west wall of the Storage Tank Rooms, which are separated by a division wall. There are no high energy lines in the Primary Auxiliary Building and Diesel Generator Building whose failure could affect the cooling water piping. Adequate drainage is provided in the Primary Auxiliary Building and Diesel Generator Building to prevent flooding caused by a crack in the cooling water piping, or other adjacent moderate energy piping.

d. The buried portions of these lines are physically separated from each other so that a MELB in one line will not affect the integrity of the others. There are other moderate energy lines adjacent to the buried diesel generator cooling water lines. The attached figures indicate the physical locations of these buried lines. The location and separation of these lines precludes any affect on the diesel generator cooling water lines. In the unlikely event of a leak or break, all of Service Water (SW) lines adjacent to and below the diesel generator lines can be isolated (see Figure 9.2-1), to prevent severe erosion and undermining. If it becomes necessary to excavate any buried lines during plant operation, appropriate provisions will be made for temporary supports and heating for the diesel generator cooling water lines as required.

e. There are no buried cables close to these buried water lines that are associated with the operation of the diesel generators and/or plant shutdown.

430.111 (9.5.6) The Air Starting System for your plant is defined as a high energy system. A high energy line pipe break in the Air Starting System of one diesel generator, plus any single active failure in any auxiliary system of the other diesel generator will result in loss of all on-site ac power. This is unacceptable. Provide the following information:

a. Assuming a pipe break at any location in the high energy position of the Air Starting System, demonstrate that no damage from resulting pipe whip, jet impingement, or missiles (air receivers, or engine mounted air tanks) will occur on either of the two diesel generators or their auxiliary systems.

b. Section 9.5.6.2 states that the air receivers, valves, and piping to the engine are designed in accordance with ASME Section III, Class 3 (Quality Group C) requirements. This is partially acceptable. We require the entire Air Starting System from the compressor discharge up to and including all engine-mounted air start piping, valves, and components be designed to Seismic Category I, ASME Section III, Class 3 (Quality Group C) requirements. Show that you comply with this position.

RESPONSE: a. Each diesel generator has redundant air receivers and supply lines to the engine-mounted air start valves and distributors. All piping to the diesel generator is designed to Seismic Category I requirements. The 2-inch lines from the air receivers (TK-45) to the main air start valves (V60, V224), the 3/8-inch lines to the air start solenoid valves (V43, V44), and the branch lines to valves V52 and V58, including the air tanks, are normally pressurized at 600 psig, and are considered high energy lines. These high energy lines are located and supported so that a loss, failure or pipe break (HELB) of one line will not affect other lines or other engine components, so that each diesel generator is still capable of starting and operating. This has been demonstrated during shop testing of the diesel generator sets, using one starting air receiver and one on-engine air header to start the unit within ten seconds.

A loss of air pressure in one of the two redundant supply lines to the engine could affect the supply of 20 psig control air to the diaphragm operating cooling water control valves. Under this condition, the unit will continue to operate, but with lower jacket water and air cooler water temperatures since the control valves would go to the full open (maximum cooling) position. Operation at loads greater than 80% of rated load will minimize the effects of this condition. Redundant alarms are provided to alert the plant operators for appropriate action in the event of low starting air header pressure. Air pressure is also supplied to the backup pumps solenoid valve and the relays associated with cooling water contols. However, loss of control air to any or all of these components will not result in an engine shutdown or degradation of engine performance.

The remaining portions of the Air Starting System are normally not pressurized above 100 psig and are not considered high energy lines. The portions downstream of the main air start valves are pressurized only during engine starting. The portions upstream of the air receivers are pressurized only when the compressor is operating to restore air receiver pressure. A HELB of any of these lines would not result in a loss of both Air Starting Systems due to supports and restraints which preclude the possibility of damage to either receiver or its associated piping.

b. The compressors, air dryers, prefilters, and after filters are not commerically available as ASME Section III, Class 3 design. The on-engine air start piping is designed to engine manufacturer's standards. (See response to question 430.76.) Also, the air compressor is considered non-critical since capability for starting the diesel generator is based on having pressurized air receivers with inlet valves for isolation from the compressors. For details of the on-skid piping, see manufacturer's drawing attached to RAI 430.76, which will be added to the FSAR.

430.126 (9.5.8) Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deliterious materials on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, control switches, etc.). Describe the provisions that have been made in your Diesel Generator Building design, electrical starting system, and combusition air and ventilation air intakes design(s) to preclude this condition to assure availability of the diesel generator on demand.

Also describe under normal plant operation what procedure(s) will be used to minimize accumulation of dust in the Diesel Generator Room; specifically address concrete dust control. In your response also consider the condition when Unit 1 is in operation and Unit 2 is under construction (abnormal generation of dust).

RESPONSE: Electrical components associated with the starting of the diesel generators (e.g., auxiliary relay contacts, control switches, etc.) are located within NEMA 12 control cabinets which minimize the accumulation of dust and dirt on electrical contacts. The cabinet doors are gasketed and, where louvers are provided, the openings are covered by filters which will prevent passage of particulate matter including products of combustion which could degrade engine starting or operation.

In addition, the diesel generator floor has a steel trowel finish which minimizes the potential for dusting. After finishing, liquid membrance coating is added which provides proper curing and a more completely hydrated surface. All of the above methods reduce the potential for concrete dusting.

During construction of Seabrook Station, dust control has always been provided at the site. Water trucks are used when required to control dusting. The chemical "Coherex" is added to the water to aid in dust control in high dust situations. This practice will continue when Unit 1 is operational until construction of Unit 2 is complete.

430.130 In Section 9.5.8.2 of the FSAR you state that the diesel generators are "capable of operating at its maximum rated output for the following service conditions and for the durations indicated during the following weather disturbances:

a. Service Conditions:

1. Ambient Air Intake: -10 to 95°F

2. Humidity: 20 to 80%

b. Weather Disturbances:

1. A tornado pressure transient causing an atmospheric pressure reduction of 3 PSL in 3 seconds followed by a rise to normal pressure in 3 seconds.

2. A hurricane pressure of 26 inches Hg for a duration of one (1) hour."

We find these service conditions unacceptable. The following environmental services have been determined to be more appropriate for Seabrook:

a. Service Conditions:

1. Humidity: 20 to 100%

b. Weather Disturbances:

1. A tornado pressure transient causing an atmospheric pressure reduction of 3 PSI in 1.5 seconds followed by a rise to normal pressure in 1.5 seconds.

2. A hurricane or northeastern storm pressure of 26 inches Hg for a minimum duration of two (2) hours followed by a pressure of approximately 26 to 27 inches Hg for an extended period of time (approximately 12 hours).

Provide the following:

a. In light of recent weather conditions in the northeast (subzero temperatures) justify the lower limit of -10°F for the ambient air intake temperature. If the temperature has to be revised downward, discuss the effects this will have on engine operation and output, and will air preheating be required to maintain engine performance.

b. Using the revised conditions stated above, discuss the effects they will have on engine operation and output.

RESPONSE: a. A low ambient air intake temperature will have no affect on engine operation under load, and output. Combustion air is preheated in the turbocharger and is supplied to the engine at a temperature of 100 minimum and 200 maximum.

The diesel engine manufacturer has advised that an air temperature of 50°F or greater at the turbocharger inlet will result in sufficient engine air temprature preheating to at least 50°F will be provided by the installation of electric heaters in the air intake plenum. The heaters will be capable of raising the air temperature from the extreme low ambient temperature to at least 50°F, based on no-load combustion air flow. Heating elements will be powered by train-associated 1E busses. Consistent with the design of the Combustion Air Intake System, the heaters will be seismically supported such that following a seismic event the operation of the diesel engine will not be degraded. An air temperature less than 50°F at the turbocharger inlet will be alarmed. The heating elements will be automatically energized following engine start as a result of an "S" signal, during low ambient conditions.

b. A tornado pressure transient of 1.5 seconds is less severe and will not affect engine operation and output. A storm pressure of 26 inches Hg for a period of 14 hours may result in a reduction in mass flow of combustion air to the engine. However, since the Combustion Air System is designed for approximately 50% excess air flow, this transient will not affect engine operation and output. The engine may tend to smoke more than normal, but it will be capable of carrying rated load. A storm pressure of 26 inches Hg corresponds to an altitude of less than 4,000 feet. The engine manufacturer's derating tables indicate that no derating is required for an altitude up to 4,600 feet.

c. FSAR Subsection 9.5.8.2 will be revised to reflect the environmental conditions stated in the RAI.