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May 13, 1983

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Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Limerick Generating Station, Units 1 and 2
Request for Information from the Power
Systems Branch

Reference: Meeting with the Power System Branch Reviewer,
E. Tomlinson, and Philadelphia Electric Company
on March 9-10, 1983

Dear Mr. Schwencer:

The attached documents are draft revisions to the responses to questions 430.68, .72, .75, and .114.

These changes will be formally incorporated into the FSAR revision scheduled for June, 1983.

Sincerely,

Eugene J. Bradley

B001

JTR/bls/D-12

cc: See Attached Service List

cc: Judge Lawrence Brenner (w/o enclosure)
Judge Richard F. Cole (w/o enclosure)
Judge Peter A. Morris (w/o enclosure)
Troy B. Conner, Jr., Esq. (w/o enclosure)
Ann P. Hodgdon (w/o enclosure)
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Rodney D. Johnson (w/o enclosure)
Atomic Safety and Licensing Appeal Board (w/o enclosure)
Atomic Safety and Licensing Board Panel (w/o enclosure)
Docket and Service Section (w/o enclosure)

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Question 430.75

Diesel generator auxiliary systems piping and components are classified in the FSAR text and Table 3.2.1 as conforming to ASME Section III Class 3, ANSI B31.1, or manufacturer's standard. It is not entirely clear where the respective classifications begin or end. In any event, this is not acceptable. We require the entire diesel generator auxiliary systems to be designed to ASME Section III Class 3, or Quality Group C, in accordance with Regulatory Guide 1.26. Revise your FSAR accordingly. Also, provide the industry standards that were used in the design, manufacture, and inspection of the diesel engine mounted piping and components. Revise the appropriate P&IDs to show where quality group changes occur.

Revised Response

The original response to Question 430.75 and section 3.2.2.d have been revised to address the quality of on-skid diesel equipment. The revised response and section are attached.

QUESTION 430.75 (Sections 3.2, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8)

Diesel generator auxiliary systems piping and components are classified in the FSAR text and Table 3.2.1 as conforming to ASME Section III Class 3, ANSI B31.1, or manufacturer's standard. It is not entirely clear where the respective classifications begin or end. In any event, this is not acceptable. We require the entire diesel generator auxiliary systems to be designed to ASME Section III Class 3, or Quality Group C, in accordance with Regulatory Guide 1.26. Revise your FSAR accordingly. Also, provide the industry standards that were used in the design, manufacture, and inspection of the diesel engine mounted piping and components. Revise the appropriate P&IDs to show where quality group changes occur.

RESPONSE

The diesel generator auxiliary systems are the following:

a. Fuel oil system (Figure 9.5-8)

b. Cooling water system which includes the jacket water cooling loop and the air cooler coolant loop (Figure 9.5-9)

c. Starting system (Figure 9.5-10)

d. Lubrication system (Figure 9.5-11)

e. Combustion air intake and exhaust system (Figure 9.5-12)

Piping and equipment in these systems is provided in accordance with ASME Section III Class 3, ANSI B31.1, and manufacturer's standards as indicated on the above referenced figures, ~~and~~ Table 3.2-1 and Section 3.2.2.d. X

All piping and equipment has been designed to withstand seismic accelerations and operating loads, regardless of design code. The manufacturer has developed a highly reliable engine piping system over the 44 years that the design of this basic engine has been in use.

The design code used for each piping seismic segment or component meets or exceeds the commitment made in the Limerick PSAR, Appendix A and Figure A.2.1.

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ASME III Class 3	ANSI B31.1	Limerick Supplementary Requirements
Requires ASME materials and certified material test reports (CMTR) for all piping larger than 3/4 inch nominal pipe size. Certificates of compliance may be substituted for CMTRS for piping less that 3/4 inch.	Requires materials that conform to either ASME or ASTM specification	ASME materials were procured and CMTRs were supplied
Requires seismic design in addition to the B31.1 requirements	Requires design for pressure, temperature, and and normal operating loads.	Piping is designed to seismic Category I with minimum wall thicknesses in conformance with ASME III, Class 3.
Requires liquid penetrant, magnetic particle, or radiographic examination for circumferential welds greater than 2 inches nominal pipe size.	Requires only visual inspection of welds at the design pressure and temperature of the auxiliary systems.	All pipe welds greater than 2 inches are radiographed.
Requires pneumatic testing as 1.25 x design pressure	Requires initial service leak test	All piping is pneumatically tested to 1.25 x design pressure.

Insert (A)

The control structure chilled water system is designed to Quality Group D standards; however, it was subjected

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Insert (A)

The on-skid piping and components in the diesel-generator auxiliary systems were provided in accordance with ASME Section III Class 3 or manufacturer's standards, as shown in Figures 9.5-8 through 9.5-12. Auxiliary system components were supplied to ASME III/3 to the greatest extent practicable at the time of procurement. The referenced figures indicate that this encompasses most of the equipment within the main process loop of each skid-mounted auxiliary system.

All skid-mounted components, regardless of design code, have been designed to withstand seismic accelerations (Seismic Category I) as well as normal diesel operating loads. Each assembled diesel-generator skid was subjected to a series of operating tests including load acceptance and rejection, air start capacity, variable load, overspeed, 300 hr. rating, normal operating, and contract acceptance tests. In addition to the operating tests, specific component tests were conducted as indicated below.

1. Fuel Oil Injectors - These were functionally tested and calibrated to deliver a metered amount of fuel to the combustion chamber. Each injector has a unique serial number which permits traceability to its shop test and calibration records.

2. Flexible Hose Assemblies and Pipe Coupling Connectors - These components (located as shown in Figures 9.5-8 through 9.5-12) incorporate the manufacturer's unique design requirements which are used to ensure flexibility in the piping systems, and are not supplied

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to ASME III/3. However, these components were fabricated in accordance with engineering specifications and each component was hydrotested to a pressure greater than 1.25 times design pressure.

3. ASME III/3 and Non-ASME III/3 Piping - All piping systems regardless of design code were hydrostatically tested to 1.5 times the design pressure. These tests are documented in the shop test records.

All diesel components were supplied or manufactured in accordance with the supplier's quality control standards as indicated below:

1. Subsupplied Components - Design and procurement controls were used in the procurement of all subsupplied components. These components were purchased to detailed engineering specifications and drawings. Upon receipt, all components (or a representative sample) were inspected against the specification, drawings and purchase order requirements, and affixed with appropriate tags to be removed at the point of use in the manufacturing cycle. Periodic reviews of subsupplier performance and audits of vendor records were conducted to ensure that the quality of the items provided remained acceptable.

   Typical examples of subsupplied items procured under this program include:

   a) Air start solenoid valves, filters*, strainers*, and compressors

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b) Inlet and exhaust expansion joints and the exhaust silencer

c) Motor driven fuel oil, jacket water, and lube oil pumps

d) Combustion air coolers, lube oil and jacket water standby heaters

e) Fuel and lube oil strainers*

f) Jacket water, air cooler coolant, and lube oil thermostatic bypass valves

g) Electrical and pneumatic instrumentation and controls.

2. Supplier-Manufactured Components - Equipment and components designed and manufactured by the diesel-generator supplier were designed in accordance with written design control procedures which required appropriate reviews and approvals of all detail drawings, specifications, procedures and instructions. During the manufacturing process, visual inspection, dimensional checks, final inspections, and customer hold and witness points were utilized. Procedures were also developed and utilized for rejection of components, recall of materials, and internal audits.

Typical examples of supplier-manufactured components incorporating the above standards include the following:

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a) Air admission check valves, pilot valves, and air start distributors

b) Engine-mounted intake and exhaust air piping, scavenger air receivers, and evacuation system [redacted] components

c) Fuel injectors, dirty fuel drip tank, fuel and oil drip pan

d) Governor control linkage.

The above standards are fully documented in the diesel-generator suppliers' Quality Assurance Plan which addresses the eighteen criteria contained within 10CFR50, Appendix B. It is used for all diesel generators supplied by this manufacturer for use in nuclear plants, and has received the approval of the appropriate operating utilities and the NRC.

The controls described above were used for all piping and components supplied by the diesel-generator manufacturer. In addition, the applicant invoked supplemental quality [redacted] assurance requirements on the following diesel-generator and auxiliary system components:

1. Subsupplier Items:
   - Generators, generator controls, and static exciters
   - Starting air receivers and inlet valves
   - Jacket water, lube oil and air cooler coolant heat exchangers

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- Lube oil strainers and filters
- Governors
- Inlet air filters
- Turbochargers
- Fuel oil day tank
- Lube oil storage tank
- Jacket water expansion tank.

2. Diesel-Generator Supplier-Manufactured Items:

- Engine blocks
- Subbase oil pan
- Cylinder liners
- Exhaust belts
- Pistons and piston inserts
- Crankshafts and connecting rods
- Vertical drive assembly
- Scavenging air blower gears, housings and impellers
- Engine-driven lube oil, jacket water and air cooler coolant pumps
- Jacket liners
- Skid-mounted piping and valves provided to ASME III/3.

The additional quality assurance requirements invoked by the applicant include: (1) periodic documented subsupplier audits (including plant visits); (2) review and approval of subsupplier QA programs and manuals; (3) test and inspection audits; (4) calibration of test gauges before and after use; and (5) control of calibration records and acceptance devices.

With the imposition of the above design, manufacturing and testing controls, ~~and standards~~ the on-skid and off-skid piping and components ~~are~~ have been made equivalent to Quality Group C.

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* Note - The external (pressure boundary) components of these filters and strainers have been analyzed or tested to Seismic Class I accelerations. Confirmatory analyses or tests of component internals will be completed prior to plant startup.

The control structure chilled water system is designed to Quality Group D standards; however, it was subjected

[continue with page 3.2-7]

Place this note on the bottom of the page on which the asterisked item from page 3 of this package is printed.

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Question 430.72

Describe your design provisions made to protect the fuel oil storage tank fill and vent lines from damage by tornado missiles.

Revised Response

The original response to Question 430.72 has been revised to show that due to the design of the fuel oil storage tank fill and vent lines, it is extremely unlikely that the lines would be damaged by tornado missiles. In addition, the revised response shows that even if a line were struck by a tornado missile, design provisions have been made to allow for continued operation of the diesel generators.

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QUESTION 430.72 (Section 9.5.4)

Describe your design provisions made to protect the fuel oil storage tank fill and vent lines from damage by tornado missiles.

RESPONSE

The fill and vent lines have a minimum extension above ground. The vent line for each tank is backed up by a separate vacuum relief valve/line, making the probability of loss of both lines very low. Alternate paths of filling/venting (e.g., manhole of tank) are available for use in the unlikely event of damage by tornado missiles. Cross connections are also provided in the fuel oil supply and return lines to each diesel to allow any diesel to be supplied from any storage tank (Figure 9.5-8). Credible tornado missile damage to the fill line or a vent line would not affect the safe shutdown of the plant.

Insert (A)

Insert (A) DRAFT

A single above ground fill connection to the fuel oil storage tanks is provided to supply each tank through an underground common header, as shown in Figure 9.5-8, Sheet 1. Each tank is equipped with a separate above ground vent line. Both the fill connection and the vent lines extend only a minimal distance above the ground. In the unlikely event of damage by tornado missiles, the following design features are present in the system to allow continued operation of the diesel generators:

a) Alternate paths for filling and venting each tank are available (e.g. manhole of the tank).
b) The vent line for each tank is backed up by a separate vacuum relief valve, which is located within the tank valve pit. The presence of this valve allows continued operation of the fuel oil transfer pump in the event of blockage in the vent line. The valve pit is also vented to the atmosphere.
c) Cross connections are provided in the fuel oil supply and return lines to each diesel to allow any diesel to be supplied from any storage tank.

As an example, if the storage tank "A" fill or vent lines were damaged so as to make the tank unavailable, and diesel generator "B" was not available, the following manual operator actions would be taken (Figure 9.5-8): valves

Insert (A) (cont'd) DRAFT

1045B and 1101A would be closed and valves 1080A, 1080B, 1100A and 1100B would be opened. The "B" transfer pump would be started and would pump to the "A" day tank. When the "A" day tank is full, the full flow overflow line would return the diesel oil to the "B" storage tank. As noted in section 9.5.4.2, the day tank holds sufficient fuel for 4 hours of continuous diesel generator operation at full load; sufficient fuel oil for approximately one hour of full load operation remains at the point where the low level alarm annunciates.

Therefore, credible tornado missile damage to the fill line or a vent line would not affect the safe shutdown of the plant.

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Question 430.68

Consider a design basis seismic event coincident with loss of offsite power and failure of all non-seismic equipment/components. Under these conditions, discuss how minimum lighting levels will be maintained in the control room until such time as the emergency diesel generators have come on line and emergency ac lighting has been restored. Using these same conditions, state whether lighting would be required in any other part of the plant for the time interval between loss of offsite power and availability of onsite power.

Revised Response

The original response to Question 430.68, section 9.5.3.2.2 and Table 9.5-12 have been revised to clarify the availability of emergency lighting following a design basis LOCA coincident with the loss of offsite power. The revisions are attached.

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QUESTION 430.68 (Section 9.5.3)

Consider a design basis seismic event coincident with loss of offsite power and failure of all non-seismic equipment/components. Under these conditions, discuss how minimum lighting levels will be maintained in the control room until such time as the emergency diesel generators have come on line and emergency ac lighting has been restored. Using these same conditions, state whether lighting would be required in any other part of the plant for the time interval between loss of offsite power and availability of onsite power.

RESPONSE

During a design basis seismic event coincident with loss of offsite power and failure of ~~the non-seismic dc power source, the control room and general area plant lighting will be restored via the emergency ac lighting within 13 seconds. No operator action is required during this time period for the safe shutdown of the plant. Under this postulated scenario, all areas of the plant will experience a loss of lighting for this short time period; however, no operator action is required in any of these areas during this time.~~

all non-seismic equipment/components, the control room lighting will be maintained at approximately 10 foot candles by the emergency AC lighting system. The fixtures in the Control Room are seismically mounted and the power is from a Class IE source. The raceway from the source to the Control Room will be routed in a Seismic Class I structure and will be seismically supported.

Section 9.5.3.2.2 - cont'd

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b. Emergency dc Lighting

Emergency dc lighting consists of a combination of ac-dc lighting fixtures normally supplied from the Class 1E buses. Upon loss of the Class 1E ac source, an automatic transfer switch transfers this lighting immediately to the 125V dc non-Class 1E station battery source. The 125V dc non-Class 1E station battery source will provide power to the emergency ac-dc lighting system for one hour. All emergency ac-dc lighting fixtures are incandescent type.

Insert (A)

Emergency lighting in remote structures and areas where the above dc source is not available consists of battery-powered self-contained units.

Emergency dc lighting fixtures and illuminated exit signs are located in the control room, stairways, and along exit routes from each floor throughout the plant.

Table 9.5-12 identifies the illumination intensities for the vital and hazardous areas where emergency lighting is provided for normal plant operation and and the evacuation of personnel in the event of an accident. The table provides both the normal and emergency operating conditions for these areas. These illumination levels conform to the IES Lighting Handbook recommended levels. Column 4 of Table 9.5-12 shows the 125V dc power-supplied lighting illumination intensity levels that are maintained in the control room and other areas of the plant between loss of offsite power and availability of onsite power.

Table 9.5-13 identifies the areas where remote actions are required to safely shutdown the plant in the event of a control room fire, auxiliary equipment room fire, or a failure of the remote shutdown system. The lighting levels provided at these locations is shown.

The emergency ac/dc lighting system provides approximately 10 to 20 percent of the total lighting of the plant. The percentage of emergency lighting fed from each division of Class 1E power is as follows:

a. Division 1 = 6%
b. Division 2 = 32%
c. Division 3 = 12%
d. Division 4 = 50%

The emergency lighting load is not divided equally among the four diesel generators due to plant utilization. Emergency lighting, both ac and dc, has been provided for all areas shown in Table 9.5-13. In these areas, the loss of the diesel generator would

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Insert (A)

after a LOCA coincident with a loss of offsite power. The battery chargers for this battery are fed from the Division IV diesel generator and can be manually reconnected to the diesel after the LOCA. Upon loss of offsite power without a LOCA, these chargers remain connected to the diesel generator and DC lighting will remain available as long as the diesel is running.

TABLE 9.5-12

LIGHTING SYSTEM
INTENSITIES OF ILLUMINATION

OCATION(1)	Normal Maintained Foot Candles	Emergency Lighting - Foot Candles AC Supplied	Emergency Lighting - Foot Candles DC Supplied
ment (PGCC) Room	30	10	Silhouette
om El. 269'-0"	100	20	3
(Circulating Water	20	Silhouette	
Room El. 254'-0"	30	10	Silhouette
Room El. 239'-0"	30	10	3
Room El. 289	30	10	~~Silhouette~~ 3
Area El. 217'-0"	30	Silhouette	
trol Room to Emerg. .	As indicated by applicable areas below	5	Silhouette
trol Room to Reactor	As indicated by applicable areas below		
re			
331'-0"	refueling floor -30 operating areas -20 non-operating areas -10	Silhouette	
r Enclosure 0"	30	10	3
ng Floor	30	Silhouette	

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Question 430.114

The diesel engine exhaust piping shown on Figure 1.2-36 is not in concurrence with the description in Section 9.5.8. Figure 1.2-36 shows a 45 degree fitting at the end exhaust piping, while the text discusses an elbow at the same location. Revise your FSAR to resolve this inconsistency. Also, expand your FSAR discussion to show how the presence of water, dust, ice, or snow in the exhaust system would be detected and what provisions will be made for removal of same.

Revised Response

Section 9.5.8.3 was revised in Revision 19 to indicate that condensation will be removed from the engine silencers by periodically (at intervals to be determined by operating experience) opening the drains.