Question 010.19

In Section 9.1.2 you state that the spent fuel pool is lined on the inside surfaces with stainless steel plates and that leak tightness is assured by means of a leak detection system. You do not, however, state that the plates are designed to seismic Category I requirements. Verify that they are designed to seismic Category I requirements, or show that a failure of the liner plate as a result of an SSE will not result in any of the following:

1. Significant release of radioactive material due to mechanical damage to the spent fuel.
2. Significant loss of water from the pool which could uncover the fuel and lead to release of radioactivity due to heatup.
3. Loss of ability to cool the fuel due to flow blockage caused by a portion or one complete section of the liner plate falling on top of the fuel racks.
4. Damage to safety-related equipment as a result of the pool leakage.
5. Uncontrolled release of significant quantities of radioactive fluids to the environs.

Response

The stainless steel liner plates are designed according to the seismic Category I requirements. The plates will therefore not fail as a result of an SSE.

Question 010.22

Table 9.l-lA indicates that the spent fuel pool maximum heat load with complete full core unloading in the pool is 62.7 x $l0^6$ Btu/hr. The spent fuel cooling water temperature can be maintained below l50□F with two cooling trains and the supplemental cooling system in operation. However, Table 9.l-2 indicates that the total design heat load of the three heat exchangers in the cooling system is 32.2 x $l0^6$ Btu/hr. Explain how the above pool water temperature will be maintained with your present design.

Response

Initially, the Spent Fuel Pool Cooling and Cleanup System (SFPCCS) heat exchangers were each designed to remove 9.l x $l0^6$ Btu/hr with the Condition A parameters indicated in Table Q0l0.22-l.

These same heat exchangers will remove the heat generated by the abnormal maximum heat load shown in Table 9.1-1. As in the SFPCCS pool temperature increases to the peak temperature shown in Table 9.1-1, the log mean temperature difference increases by a factor of about three, resulting in a similar increase of the heat exchanger heat transfer capacity. As an example of the effect on the heat transfer capacity, an increase in pool temperature is shown in Table Q010.22-1. It should be noted that the temperature of the component cooling water entering the shell side of the SFPCCS heat exchangers remains the same for both Condition A and B because of the large heat sink provided by the Essential Cooling Pond.

Analysis of the spent fuel pool decay heat load demonstrates the ability of the SFPCCS to handle the normal maximum and abnormal maximum heat loads, utilizing the criteria of Standard Review Plan 9.l.3. The results of the analyses are summarized in revised Table 9.l-l.

Since the total design heat load is within the capacity of two SFPCCS heat exchangers, the supplemental cooling system has been deleted in revised Section 9.l.3.l.l, Table 9.l-2, and Figure 9.l.3-l. Table 9.4-1A has also been deleted since it pertained to the supplemental cooling capacity.

TABLE Q010.22-1

HEAT TRANSFER CALCULATION PARAMETERS

	Condition A	Condition B
Design Flow (10^6 lb/hr)		
Tube	1.41	1.41
Shell	1.5	1.5
Temperature, Inlet/Outlet (°F)		
Tube	120/113.6	158/136.2
Shell	105/111.1	105/125.5
Log Mean Temperature Difference	7.95	26.8
Calculated Heat Transfer (10^6 Btu/hr)	18.2	61.4
Coefficient of Heat Transfer (Btu/hr-°F-ft²)	343.15	343.15

Question 281.3N

Describe the samples and instrument readings and their frequency of measurement that will be performed to monitor the Spent Fuel Pool (SFP) water purity and need for SFP cleanup system demineralizer resin and filter replacement. State the chemical and radiochemical limits to be used in monitoring the SFP water and initiating corrective action. Provide the basis for establishing these limits. Your response should consider variables such as: boron concentration, gross gamma and iodine activity, demineralizer and/or filter different pressure, demineralizer decontamination factor, pH, and crud level.

Response

The sample and their frequency of measurement for monitoring the spent fuel pool (SFP) water purity are detailed in Table 9.3-4. Using these samples and the differential pressure instrumentation described in Section 9.1.3.4.2 will allow for a timely replacement of the demineralizer resin and filters as well as indicating a need for purification of the SFP water.

Table 9.1.4 provides the proposed monitoring limits for the STPEGS water purity and the bases for establishing these limits.

Suspended matter (crud) may be introduced into the SFP via the initial fill water, boric acid used to borate the water, corrosion products from the pool lining and fuel storage racks, and from deposited matter on the spent fuel elements which may slough off into the water.

Crud levels are maintained sufficiently low, through removal of suspended matter by filtration in the SFP demineralizer and filters, to ensure proper water clarity for spent fuel and fuel handling operations.

Radiochemistry sampling and analyses (gross beta-gamma activity determination) on the inlet and outlet of the SFP demineralizers is used to monitor the performance (i.e., decontamination factor) of these demineralizers. Gamma Spectrum analyses may be performed for fission products arising from fuel cladding defects to monitor for increasing activity levels (including iodine activity) in order to determine possible health hazards to personnel during refueling operations, depending on the fuel cladding conditions as determined by reactor coolant activities during normal operation.

Question 410.9N

Verify that the fuel pool is not located in the vicinity of any high energy lines or rotating machinery to ensure physical protection for the spent fuel from internally generated missiles and the effects of high energy line breaks.

Response

There are no high energy lines in the Fuel Handling Building (FHB), Postulated breaks in auxiliary steam piping outside the FHB were found not to cause pipe whip or jet impingement with sufficient energy to damage the spent fuel pool to the extent that its safety function would be impaired. Motors, pumps, or fans within the Fuel Handling Building are not capable of generating a missile that could impact the spent fuel pool. The sump pumps, safety injection and spray pumps, and cubicle fans coolers are located in the FHB below the spent fuel pool and rotate in a horizontal plane so potential missiles would not impact the walls or floor of the spent fuel pool. The other pumps and coolers in the FHB are separated from the spent fuel pool by the refueling canal which has sufficient structural strength to stop potential missiles.

Question 010.26

In Section 9.4.l you indicate that centrifugal exhaust air fans are provided to exhaust air from the battery rooms. These exhaust air fans are not shown in Table 9.4-2.l, which lists all safety-related components of the control room and the electrical auxiliary building HVAC system. Also, these exhaust air fans are not shown in your P&IDs. Provide sufficient information to demonstrate that the battery room exhaust system is designed to maintain the hydrogen concentration below two percent by volume assuming a single failure. Confirm that you have provided an alarm in the control room in case the battery exhaust fan should fail.

Response

The EAB HVAC design has been revised to provide safety-related exhaust fans for battery rooms, which will operate continuously during normal and emergency conditions to maintain the Battery Room hydrogen concentration below 2 percent.

These exhaust fans are shown in Figure 9.4.l-l (sheet 2 of 4) and included in Table 9.4-2.l.

Alarm is provided in the Control Room to indicate a Battery Room exhaust fan failure.

Question 410.15N

Describe measures provided for detecting and correcting dust accumulation on safety-related equipment in order to assure their availability when needed. List any outside air intake for safety-related equipment which is less than 20 ft from grade elevation.

Response

With the exception of the ECW intake structure which is approximately 16 ft above grade, all HVAC outside air intakes for Category I structures are located at least 20 ft above plant grade elevation. The HVAC systems for Category I structures are equipped with air filters to remove atmospheric dust particles from the incoming airstream with the exception of the Diesel Generator Building during operation of the diesel generator, the Essential Cooling Water Intake Structure, and the Main Steam Isolation Valve Cubicles.

Question 040.17

Figure 1.2-10 [general arrangement drawing 6D01-9-M-00020-8] shows the location of the fuel oil storage tank vent line with flame arrestor. What provision has been made to protect the vent lines from tornado missiles? The arrangement indicates that the three fuel oil storage tank vent lines could be damaged by a single tornado missile.

Response

An impact by a tornado missile causing a complete loss of function of the flame arrestors is not considered to be credible. This is based on the amount of crimping that would be required (99.3 percent) to cause a vacuum to be formed in the tank. It is more likely that the pipe would shear. In addition, the physical location of the arrestors will reduce the probability of a missile impact.

Question 040.18

Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of fuel oil without interrupting operation of the diesel generator. What provision will be made in the design of the fuel oil storage fill system to minimize the creation of turbulence of the sediment in the bottom of the storage tank? Stirring of this sediment during addition of new fuel has the potential of causing the overall quality of the fuel to become unacceptable and could potentially lead to the degradation or failure of the diesel generator.

Response

See Figure 9.5.4-1 which shows a perforated pipe extending the height of the tank with a closed end. The multiple perforations will diffuse the flow of the fuel oil into many flow paths rather than a single, large impingement on the tank bottom. The perforations will also serve as siphon breakers.

Question 040.19

The diesel generator structures are designed to seismic and tornado criteria and are isolated from one another by a reinforced concrete wall barrier. Describe the barrier in more detail and its capability to withstand the effects of internally generated missiles resulting from a crankcase explosion, failure of one or all of the starting air receivers, or failure of any high or moderate energy line. In addition describe the effect of internal flooding from the cooling system on the ability of the barriers to resist flooding so that the assumed effects will not result in loss of an additional generator. (SRP 9.5.4, Part III, Item 2).

Response

The internal walls of the Diesel Generator Building (DGB) are designed to withstand the effects of internally generated missiles (see Section 3.5.1.1.2, Item 4, and Table 3.5-1). Missiles created from a crankcase explosion are not considered to be credible due to adequately sized explosion doors which would relieve the pressure from the primary crankcase explosions and prevent the entry of air to eliminate the possibility of a secondary explosion. The walls, including doors and piping penetrations, of the building are also designed to contain flooding in one compartment. Additionally, there are no cross connections in floor drains or process flow lines which could result in propagation of flooding from one compartment to another.

There are no high energy lines in the DGB. The systems which contain moderate energy lines are discussed in Section 3.6.

Question 040.20

Discuss the precautionary measures that will be taken to assure the quality and reliability of the fuel oil supply for emergency diesel generator operation. Include the type of fuel oil, impurity and quality limitations as well as diesel index number or its equivalent, clould point, entrained moisture, sulfur, particulates and other deleterious insoluble substances; procedure for testing newly delivered fuel, periodic sampling and testing of onsite fuel oil (including interval between tests), interval of time between periodic removal of condensate from fuel tanks and periodic system inspection. In your discussion include reference to industry. (or other) standards which will be followed to assure a reliable fuel oil supply to the emergency generators. (SRP 9.5.4, Part III, items 3 and 4).

<u>Response</u>

1. STPEGS intends to use the McGuire Technical Specifications with the following exception:

   ASTM D4294-83, Sulfur in Petroleum Products by Non-Dispersive X-Ray Fluorescence Spectrometry, will be included in the STPEGS Technical Specifications in addition to ASTM D2622-82, Sulfur in Petroleum Products X-Ray Spectrographic Method. These two analytical procedures are similar in measurement methodology.

   Both methods utilize x-rays to excite the sample. The fundamental difference lies in the method of detection. ASTM D2622-82 describes a general purpose wavelength to dispersive X-ray spectrograph. It uses detector positioning to quantify the sulfur K-alpha radiation (a specific wavelength of radiation which is manifested due to the presence of sulfur). K-alpha radiation is dispersed from an analyzing crystal at a specific angle. ASTM D4294-83 describes a dedicated non-wavelength dispersive sulfur X-ray analyzer. It uses a filter to allow only a narrow band pass of X-rays, which includes the sulfur K-alpha radiation, to reach the detector.

   The wavelength dispersive spectrograph is designed to detect low levels in general, and can detect as low as 10 ppm sulfur. The non-wavelength dispersive analyzer's sensitivity is 100 ppm, but is well suited for the 1000 ppm or greater level of sulfur normally found in no. 2 diesel fuel oil.

   Dedicated sulfur analyzers employing the non-wavelength dispersive technique drastically reduce the cost of sulfur analyses, when compared to the general purpose wavelength dispersive spectrograph required by ASTM D2622-82.

   It should be noted that the consultant used by SNUPPS to revise their Technical Specifications, was contacted on this matter and his professional recommendation was requested. He concurred that the proposed test method satisfies the intent of ASTM 2622-82 and could be

Response (Continued)

used as an alternate test method for sulfur. This recommendation has been documented and transmitted to the NRC via letter from M. R. Wisenburg (HL&P) to George W. Knighton (NRC), ST-HL-AE-1364, dated September 19, 1985.

2. The quality of the fuel oil supply will be verified in accordance with applicable industry standards as discussed in Section 9.5.4.4.

Question 280.2N

Substantiate the fire resistance capability of the barriers used to separate safety-related areas or high hazard areas by verifying that their construction is in accordance with a particular design that has been fire tested. Describe the design, the test method used and the acceptance criteria. Provide information for the following components:

(a) Rated fire barriers, including floor and ceiling construction and the support structure for barriers that are not floors or ceilings;

(b) Fire dampers and fire doors, including a description of how they are installed in the ventilation ducts that penetrate rated fire barriers of safety-related areas; and

(c) Fire barrier penetration seals around ducts, pipes, cables, cable trays, and in other openings (e.g., concrete joints seals and fillers) including verification that all seals are of the thickness specified in the tests, and that cables and cable trays are supported in a manner similar to supporting arrangements used in any tests.

Response

(a) Floors and ceilings in high hazard areas are cast-in-place reinforced concrete. Walls in high hazard areas are cast-in-place reinforced concrete or fire rated concrete unit masonry construction. Steel columns, steel beams, and the under-side of floor decks where required, will be protected with fireproofing material to the required fire rating which will be based on findings of Underwriters Laboratories (UL) Standard UL 263 in accordance with ASTM E-ll9.

(b) With the exception of special purpose doors, doors and frames contained in fire barriers are constructed and installed in accordance with UL requirements for a labeled door with a rating of the fire barrier. Special purpose (airtight and watertight) doors are constructed in accordance with UL requirements but are not tested and labeled.

Fabrication and construction of three hour rated Class A, curtain type fire dampers, suitable for horizontal and vertical installation, are in accordance with the applicable requirements of National Fire Protection Association (NFPA) and UL. Fire dampers are installed in accordance with the manufacturers' instructions, with the exception of three dampers located in Fire Area 7. See Section 3.0 of the FHAR for further detail.

(c) Fire barrier penetration seal assemblies in vertical and horizontal concrete fire barriers are designed to resist a fire for the rated duration of the barrier unless otherwise noted in the FHAR. Prototype assemblies including the immediate support for cable trays are tested in accordance with IEEE 634 for cable penetrations and ASTM E-ll9 for all other penetrating objects. Results are compared by ANI to NELPIA/MAERP standards.

Question 280.4N

Verify that primary and secondary power for the alarm system can be maintained by using normal offsite power as the primary supply, with a 4-hour battery supply as the secondary source and having the capability for manual connection to Class 1E emergency power bus within 4 hours of loss of offsite power.

Response

The plant alarm system consisting of tone-generators and controls provided with the paging system, is fed from the normal station auxiliary power. On loss of offsite power (LOOP), a non-Class 1E diesel generator (DG) automatically provides emergency power supply to the plant alarm system.

The capability for manual connection to a Class 1E power bus is not provided since a non-Class 1E DG is automatically connected on a LOOP to feed the alarm system.

Question 280.12N

Provide a list of all interior finish insulation, sound proofing, etc., that are other than noncombustible. Indicate the flame spread and smoke contributed ratings of each material where available. Indicate where their materials are used (by fire area) and in what quantities.

Response

The following finish materials are other than noncombustible:

Suspended acoustical ceiling tiles have a flame spread of 0-25 with a Underwriter Laboratories (UL) label of 25 or under when tested in accordance with ASTM E-84, and will meet the requirements of Federal Specification SS-S-118A. The smoke contributed rating is not available.

Drywall partitions have a flame spread rating of l5 or less and a smoke contributed rating of 0 in accordance with fire test number USG-l7-FT-G&H and/or GA-WP-45-1HR, and are therefore not considered combustible.

Vinyl asbestos floor tiles have a flame spread rating of 75 or less when tested in accordance with ASTM E-84, a NBS Smoke Chamber 450 or less (Specific Optical Smoke Density), and an UL 992 Flame Propagation Index 4.0 or less.

Epoxy floor topping at 15 or 20 dry mil film thickness has been tested in accordance with ASTM E-84 and exhibits a flame spread of 10, smoke density of 40, and a fuel contribution of 0.

The floor of Unit 1 & 2 Control Room and EAB Room 209 (Elev. 35') are covered with carpeting that has been tested in accordance with ASTM E648 to have an average Critical Radiant Flux (CRF) of not less than 0.45 watts/square cm. and in accordance with ASTM E662 to have an average corrected maximum specific optical density DM (corr.) $\leq$450.

Thin-film paints on walls and ceiling in other Category I areas have been tested in accordance with ASTM E-84 and exhibit a flame spread rating of less than 25 with zero fuel contribution and smoke density and are therefore not considered combustible.

There are no combustible finishes in the Diesel Generator Building and the Isolation Valve cubicles.

Thin-film paints applied to non-combustible substrates are not considered combustible.

The epoxy surfaces applied to concrete floors and walls in the Reactor Containment Building has a flame spread rating of 10, a smoke density factor of 15, and a fuel contribution factor of 0, and is therefore not considered combustible.

The above materials are used in building areas normally occupied by the power plant operating personnel, and in nonoccupied areas such as corridors, equipment rooms, etc. The approximate quantities are given in square feet and are listed by fire areas in Table Q280.12N-1.

TABLE Q280.12N-1

APPROXIMATE QUANTITIES OF COMBUSTIBLES (ft^2)

Building	Fire Area	Epoxy	V-A Tile	Carpeting	Ceiling
EAB	2	1,940			
	1		1,020	2,630	250
	3	17,440	6,530	243	5,910
	31		0		0
	4	0	820		820
	67		4,180	0	4,560
MAB	21	550			
	27	11,220			
	24	11,950			
	22	4,190			
	29	1,940			
	23	40,560			
	28	570			
	32	23,840			
	75	19,270			
	30	800			
	25	460			
	26	310			

*(From UFSAR Table 6.1-4)

Question 280.19N

It is our position that an automatic water extinguishing system be provided for the RAB Drumming Storage Area and the RAB Decontamination Room.

Response

An automatic water extinguishing system is provided for the waste baler area and the truck bay area of the drum storage area of the MAB El. 41 ft. The drumming system utilizes concrete and therefore does not intrinsically contain combustibles. These systems are provided for property protection, and the loss of this area to a postulated fire does not affect the ability of the plant to achieve safe shutdown.

The Decontamination Room does not contain flammable liquids and does not present a significant fire hazard. An automatic water extinguishing system is not provided in the Decontamination Room. The FHAR shows that a fire in the Fire Area containing the Decontamination Room (Fire Area 32) would not prevent achieving and maintaining the plant in a safe shutdown condition.

Question 280.23N

Throughout your evaluation you have identified areas which contain redundant HVAC system ductwork and have stated that a fire would not damage the ductwork. Revise your analysis to include the effects on safe cold shutdown if these systems were rendered inoperable by a fire in these areas through collapse of the ductwork and/or closing of fire dampers at area/zone boundaries.

Response

The common risers for the redundant, safety-related HVAC units are separate fire areas. The riser fire areas are bounded by 3-hour fire barriers which are provided with 3-hour rated fire dampers where ventilation ducts enter the risers. (See the response to question 280.24N and the revised STPEGS FHAR.) There is one exception which is the common ductwork to and from the Auxiliary Shutdown Room and the train A, B, and C QDPS Rooms. (See FHAR Zone Figure 7-1 and Fire Area 7, deviation 2.)

Question 280.24N

Fire Areas 005, 036, 039, and 049. In these areas you indicate that ductwork common to trains A, B and C is enclosed in a fire rated casing. Identify the fire rated casing by providing a description of the construction and fire rating of the casing.

Response

The ductwork headers common to equipment trains A, B, and C are encased within 3-hour fire rated concrete chases. Three-hour rated fire dampers are provided at each of the ductwork penetrations through the walls of the concrete chase. The Fire Areas in question are shown in the revised FHAR as Area 2/zone 005, Area 3/zone 036, Area 3/zone 039, and Area 4/zone 049.

Question 280.25N

In Fire Areas 007, 008, 011, 012, 020, 021, 022, 023, 027, 109, 111, and 112 you have not indicated the presence of any access openings to these cable chases. Indicate how access to these areas is obtained for manual firefighting.

Response

The following fire areas have access openings as shown:

- Fire Areas 007 and 008 Train "B" and "C" have access on El. 10 ft-0 in. Rm. 001, 008 Train "C" also has access on El. 35 ft-0 in. Rm. 201. (Fire Areas 71 and 69 in revised FHAR)
- Fire Areas 011 and 012 Train "B" and "C" have access on El. 10 ft-0 in. Rm. 002, El. 35 ft-0 in. Rm. 202 and El. 60 ft-0 in. Rm. 302. (Fire Areas 68 and 74 in revised FHAR)
- Fire Areas 020, 021, 022 and 023 Train "A", "B" and "C" have access on El. 18 ft-3 in., El. 35 ft-0 in. and El. 60 ft-0 in. from rooms 015, 208, 209, 210, 211, 309, 310, 311 and 312. (Fire Areas 18, 73 and 70 in revised FHAR)
- Fire Areas 109 and 111 Electrical chases have access on El. 26 ft-0 in. Rm.106. (Fire Area 27, zone 109 and Fire Area 3, zone 111 in revised FHAR)
- Fire Area 027 Electrical chase has access on El. 21 ft-0 in. Rm. 102. (Fire Area 2, zone 027 in revised FHAR)
- Fire Area 112 Electrical chase has access on El. 29 ft-0 in. Rm. 108B El 41 ft-0in. Rm. 217 and El. 60 ft-0in. Rm. 324A. (Fire Area 75 in revised FHAR)

These chases are dedicated to a single safety related train. Penetration seals and fire rated barrier walls are provided to separate each chase into smaller fire areas. Fire detection devices are installed in each chase. The barriers are rated for 3-hour fire duration.

The revised Fire Hazard Analysis Report discusses access to these cable chases.

Question 280.28N

Verify that hydrogen and other gas lines are not routed through safety-related areas.

<u>Response</u>

There is a 1 in. hydrogen line running through the radioactive pipe chase in the MEAB Area 28 at El. 35 ft-3 inches. Analysis has shown that sufficient ventilation is provided to preclude hydrogen buildup in this area. There are no other explosive gas lines running through safety-related areas.

High pressure nitrogen lines are routed in the following areas:

1. MEAB

   a. Penetration area near refueling water purification pump 1A.
   b. Area near the refueling water storage tank.
   c. Area near the reactor makeup water storage tank and the reactor makeup water pump.

2. RCB

   a. Lines running through RCB to the safety injection accumulator tanks.

   These lines are included in the analysis of potential sources of internally generated missiles close to pressurized sources.

   Low pressure nitrogen lines are routed in the following areas:

   (1) MEAB

      (a) Area near the refueling water storage tank.

   (2) RCB

      (b) Outside the secondary shield wall to the pressurizer relief tank and the Reactor Coolant System (RCS) pressurizer.

Question 280.29N

State the location of all transformers in the plant and describe the fire protection features provided. If a transformer is one that contains a fire resistant fluid, then describe how its failure/rupture will not impair safety-related cables/equipment.

Response

Figure 8.2-1 indicates the location of all outdoor oil-filled transformers except the 345 kV switchyard service and 500 kVA load center transformers, which are located near the switchyard and the 1200 kVA load center transformer located south of the Fuel Handling Building in the yard. Fire protection provisions for the transformers are discussed in Section 9.5.1.2.13 and Table 9.5-3. The 138 kV emergency transformer and the 345 kV switchyard service transformers are not provided with water spray deluge systems because their isolated locations prevent fires in those transformers from being hazardous to plant safety systems.

In addition to the outdoor oil-filled transformers, there are load center, distribution, and lighting transformers located indoors throughout the plant (refer to general arrangement drawings in Section 1.2). These are air-ventilated dry-type transformers.

There are no transformers in the plant that contain fire resistant fluid.

Question 430.41N

Your response to Question 040.14 is unacceptable. You have not justified the omitting of the day tank in your EDEFSS design, nor have you provided a discussion comparing the system availability and reliability of your present design to system which would have included a day tank. Provide this information. Your discussion should also take into consideration a pipe break in the portion of the fuel oil line in the D/G room from the fuel oil storage tank to the diesel engines and its effect or D/G availability, effect on plant operational safety, means of detection and controlling fuel spill from a pipe break, and provisions made in the plant design to prevent fuel flow into other D/G room and areas of plant containing safe shutdown system and expose these areas to a potential fire hazard.

Response

The response to Question 430.40N provides the technical justification for providing a large fuel oil storage tank internal to the diesel generator (DG) building in lieu of day tanks served by remote storage tanks. Fuel oil is supplied from the tank at El. 55 ft to the engine at El. 25 ft via a 1-in. gravity flow line. A pipe break in the portion of the fuel oil line in the DG room from the fuel oil storage tank (FOST) to the diesel engines is not considered credible; however:

1. If a leak renders a DG inoperable there are two more DGs capable of performing the safety function. Each of the DG trains is physically separated by a 3-hr fire-rated wall from the other trains and no impact results from the above event in the other two trains; if a leak occurs in a DG room fuel oil cannot penetrate the other rooms.

2. Means are provided for detecting and controlling a fuel spill. Each DG room is equipped with an instrumented drain sump. A high level alarm located in the main control room will indicate a leak (whether fuel oil, lube oil, cooling water, etc.) in the DG room. Once a leak has been detected it can be isolated external to the DG room. Once a leak has been detected it can be isolated external to the DG room by a shut off valve in the FOST room thus preventing further leakage.

3. The postulated leakage in a fuel oil line crack is minimal and does not add appreciably to the existing DG room severity.

Question 430.46N

Your response to Question 040.22 with regards to the sources of quality diesel fuel oil is incomplete. Provide the sources where quality diesel fuel oil will be available and the distance required to be travelled from the sources to the plant, as well as discuss how fuel oil will be delivered onsite under extremely unfavorable environmental conditions such as during a flood.

Response

Each standby diesel generator (DG) is provided with a fuel oil storage tank to permit a minimum of seven days continuous operations.

Fuel oil for continued operation beyond the seven-day time interval may be obtained for the onsite fuel oil storage tank. If this supply is unavailable, there are several major suppliers of acceptable quality fuel oil in the area surrounding STPEGS, any one of which can be utilized to provide the additional supply of fuel oil. The following lists several suppliers, their location, and approximate distance required to travel to the plant:

Gulf Oil	Victoria	65 miles
Tesoro Oil	Port Lavaca	55 miles
Mobil Oil	Wadsworth	10 miles
Superior Oil	El Campo	50 miles
Mobil Oil	Houston	110 miles

It is highly unlikely that extremely unfavorable weather conditions will be of such duration as to exhaust all onsite supplies and require fuel delivery while the weather conditions persists. However, HL&P (historical context) has extensive experience in handling and mitigating weather related problems (e.g, hurricanes, tornados, floods). This experience, coupled with the fact that numerous water transportation vehicles are available in the South Texas area, provide assurance that STPNOC will be able to deliver any necessary fuel oil during unfavorable environment conditions. Note that numerous roads to the general site area are available for the transportation of fuel oil to the site area.

See also the response to Q430.86N, item b.

Question 430.47N

The FSAR text, Figure 9.5.4-1 through 9.5.8-1, 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&ID's where the Quality Group Classification changes from ASME Section III Class 3 (Quality Group C).

Response

Regulatory Guide (RG) 1.26, Revision 3, states:

> "Other systems not covered by this guide, such as instrument and service air, diesel engine and its generators and auxiliary support systems, diesel fuel, emergency and normal ventilation, fuel handling, and radioactive waste management systems, should be designed, fabricated erected, and tested to quality standards commensurate with the safety function to be performed."

The engine mounted components and piping from the engine block to the engine interface are considered part of the engine assembly and are seismically qualified to Category I requirements. This piping and associated components such as valves, manufactured headers, fittings, etc. are designed, manufactured and tested in accordance with the guidelines and requirements of DEMA, ANSI B31.1, ANSI N45.2 and 10CFR50 Appendix B QA. (See Table 9.5.4-1). The DEMA standards provide assurance that these auxiliaries are designed, fabricated, erected, and tested to quality standards commensurate with the safety function to be performed. In addition to DEMA tests, the engine is qualified by a reliability test. Generally, diesels are subject to low working stresses for the application which results in a high operational reliability.

Amended Figures 9.5.4-1, 9.5.5-1, 9.5.6-1, 9.5.7-1, and 9.5.8-1 show quality group changes.

Question 430.58N

Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deleterious materials on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, controls switches - etc.). Describe the provisions that have been made in your diesel generator building design, electrical starting system, and combustion air and ventilation air intake 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

Dust accumulation from exterior sources:

The diesel generator building (DGB) heating and ventilating system utilizes three 100-percent capacity supply fans, providing air flow of approximately 16,600 ft^3/min to each DG train which function only when the diesel is not operating. During diesel operation, a larger fan providing air flow of approximately 123,000 ft^3/min to each DG train is operated. The inlet to the smaller supply fan is equipped with a filter having a 40 percent atmospheric dust spot efficiency. Use of the filter will prevent entrance and accumulation of all types of dust (including concrete dust) and other deleterious material on electrical equipment associated with starting of the diesel. See Section 9.4.6, for details. The diesel is operated infrequently for either (1) periodic system testing or (2) subsequent to loss of offsite power or a design basis accident. Operation of the diesel in Unit 1 is scheduled when very little concrete work or other abnormal dust-generating activities remain to be done in Unit 2.

Combustion air is filtered via an oil bath air filter as reflected in Figure 9.5.8-1. Filters are provided to filter the supply air in the DGB HVAC Systems. For details see Section 9.4.6.

Dust accumulation from interior sources:

The diesel and generator control panels are housed in a dust-tight enclosure. All concrete surfaces internal to the DGB except the fuel oil tank compartments and the non-labeled fume-tight fire doors will be coated as follows:

1) fluorosilicate concrete hardener on floor.

2) epoxy - polyamide concrete sealer on walls and ceilings.

Response (Continued)

Procedures governing housekeeping that implement the recommendations of Regulatory Guide (RG) 1.39 will be available on site for NRC review prior to fuel load.

The preventive maintenance program developed will require periodic inspection for dust and other deleterious materials and require cleaning, as necessary, of the electrical equipment associated with starting the diesel generator.

Question 430.77N

Section 9.5.2 of the FSAR describes the intraplant communication system at South Texas which is composed of five subsystems. They are the Public Address (PA), Telephone, Fuel Loading Communications, Maintenance Communication, and Two-Way Radio Systems. A number of areas in the plant are served by one or more of these systems. All these systems are classified non-Class 1E. The PA and telephone systems are powered from Class 1E AC power system and the power sources for the other systems are undefined. Assuming a failure, non-availability, due to loss of power, or inability to use a system due to its interference with control instrumentation or equipment such as the radio system, of any or all of these systems following a seismic event, it is possible that portions of the plant may be without adequate communications for an extended period of time during the design basis event. This is unacceptable. It is a requirement that adequate communications be provided at all vital, hazardous, and safety-related areas needed for the safe shutdown of the reactor and the evacuation of personnel in the event of a design basis event. Confirm this service is provided or modify your design to provide the necessary communication for postulated conditions above or justify the present design. (SRP 9.5.2, Parts I and II)

Response

Table 1 below has been prepared to show the power sources for the various communications systems.

TABLE 1

System	Primary Power	Back-Up
Telephone Switch	Normal Plant 120 vac	8 Hr Battery
Public Address	Normal Plant 120 vac	TSC non-Class 1E Diesel
Maintenance Jack and Refueling Communication	a. Normal Plant 120 vac b. Sound Power	Sound Power
2-Way Radio a. Base/Repeater Stations	Normal Plant 120 vac	TSC non-Class 1E Diesel
b. Hand-held Transceivers	Battery Packs	Spare Batteries
Distributed Command Consoles	Normal Plant 120 vac	TSC non-Class 1E Diesel

CN-3114

Response (Continued)

The ability to provide back-up power sources and the proven reliability of the standard telecommunications products being supplied coupled with the diversity of systems furnished makes complete failure of the communications system necessary for safe shutdown unlikely.

Further, all locations needed for safe shutdown have radio, telephone and maintenance jack stations available. If power should be lost or a major equipment failure should occur to the telephone and radio systems, the maintenance jack stations are equipped with a sound powered telephone circuit in addition to two DC powered electrosound loops. CN-3114

The sound powered loops throughout the plant are interconnected at a sectionalizing panel in the Electrical Auxiliary Building (EAB). The simplicity of the sound powered system and the ability to isolate defective loops at the sectionalizing panel make it a highly reliable emergency communication system.

Question 430.78N

Expand the lighting section of the FSAR to include a discussion of how lighting will be provided for these areas listed in requests Q40.10 and Q40.11 and illuminated by the DC emergency lighting system only, in the event of a sustained loss of offsite AC power (in excess of 8 hours and up to 7 days), or provide the rationale why lighting is not required in these areas. Include in your discussion what, if any, other areas would require lighting during a sustained loss of AC power, and how it would be provided. (SRP 9.5.3, Parts I and II)

Response

The Emergency DC Lighting System described in Section 9.5.3.2.3 is part of an integrated lighting system, backed up by the Essential AC Lighting System (described in Section 9.5.3.2.2 item 1), which is powered by onsite diesel generators (DGs) in case of loss of offsite power (LOOP), and is capable of providing illumination up to seven days.

Areas that must be manned for cold shutdown, including all of the containment, are not required to have emergency lighting provided by sealed beam units with eight hour minimum battery power supplies. The justification for this is that:

- Access to these areas is normally required at a time beyond the eight hour battery life.
- Fire brigade and operations personnel required to achieve cold shutdown will be provided with battery-powered portable hand lights.
- Essential AC lighting is provided in these areas.

Question 430.80N

Provide a discussion on the protective measures taken to assure a functionally operable lighting system, including considerations given to component failures, loss of AC power, and the severing of lighting cables as a result of an accident or fire. (SRP 9.5.3, Parts I and II)

Response

As described in Section 9.5.3, the Lighting System is comprised of three entities: the Normal AC Lighting, the Essential AC Lighting, and the Emergency DC Lighting System. The diversity of power sources fed from normal lighting and diesel generators (DGs) together with the eight hour battery packs will assure that lighting from one or more sources is available due to any single malfunction or failure due to fire in a particular fire zone. Upon loss of normal lighting or offsite power the Essential AC Lighting System will provide lighting in the safe shutdown areas. In the event of fire or severing of lighting cables, lighting is provided in the safe shutdown areas, including access/egress, by the eight hour Holophane battery packs supported to withstand a Safe Shutdown Earthquake (SSE).

Question 430.81N

Section 9.5.3 of the FSAR describes the Emergency Lighting System which is composed of four subsystems. They are the 125 vdc, essential AC, 90 minute battery lighting, and 8 hour battery lighting systems. A number of areas in the plant are served by one or more of these systems. All these systems are classified non-Class 1E and receive power from the following sources: non- Class 1E station batteries for the DC lighting, the Class 1E emergency diesel generator for a few select areas of the plant and the non-Class 1E emergency diesel generator for the balance of the AC lighting. Assuming a failure or nonavailability of any or all of these systems following a seismic event, it is possible that portions of the plant particularly the control room may be without sufficient lighting or without lighting for an extended period of time during this design basis event. This is unacceptable. It is a requirement that adequate lighting be provided to all vital, hazardous, and safety-related areas needed for the safe shutdown of the reactor and the evacuation of personnel in the event of any design bases accident. Confirm this service is provided or modify your design to provide this necessary lighting. (SRP 9.5.3, Parts I and II)

Response

8-hour battery packs, supported to withstand a Safe Shutdown Earthquake (SSE), integrated with the Essential AC Lighting System will provide lighting to vital, hazardous, and safety-related areas needed for the safe shutdown of the reactor and evacuation of personnel. See Section 9.5.3. Note: The control room 125 vdc 2-hour station battery has been deleted.

Question 430.82N

You state in Sections 9.5.3.1 and 9.5.3.3 of the FSAR that illumination levels provided in the various areas of the plant either conform to or exceed that required in the Illumination Engineering Society (IES) Handbook. This statement is too general particularly for emergency lighting. Based on the guidelines in the IES Handbook (pages 2-11 and 2-45), the staff has determined that the plant emergency lighting for access and egress should be considered safety lighting for high hazards requiring visual detection and that a minimum of 10 foot-candles at the work station is required to adequately control, monitor and/or maintain safety-related equipment during accident and transient conditions and a minimum of 2 to 5 foot-candles in the corridors which provide access to and egress from these areas. For those safety-related areas listed in requests Q40.10 and Q40.11 and illuminated by the DC lighting systems only verify that the minimum of 10 foot-candles at the work station is being met. Also verify that the 10 foot-candle minimum at the work station is being met in those safety-related areas illuminated by the ac emergency system. Verify that the access and egress corridors are illuminated by a minimum of 2 to 5 foot-candles. Confirm that the design provides the above or modify your design as necessary. (SRP 9.5.3, Parts I and II)

Response

Section 9.5.3.2.2. has been revised. There are no safety-related areas which are illuminated by the DC lighting systems only.

The Essential AC Lighting System provides a minimum of 10 ft-candles at the work stations and illuminates the access/egress routes by a minimum of 2 to 5 ft-candles as described in Section 9.5.3.2.2.

Power for the Essential AC Lighting System is supplied from two Class 1E and one non-Class 1E system. Upon loss of the normal power supply, the Essential AC Lighting System is automatically connected to the power sources. The sources for the safe shutdown areas and access/egress routes are provided in Table 9.5.3-1.

The Emergency DC Lighting System consists of lighting supplied from batteries upon the loss of both the normal and Essential AC Lighting Systems. Although the Emergency DC Lighting System provides illumination at safe shutdown areas including access/egress routes between them, primary emergency lighting is provided by the Essential AC Lighting System. Therefore, the illumination levels provided by the Emergency DC Lighting System do not necessarily meet IES guidelines.

Question 430.83N

Section 9.5.3 of the FSAR does not describe the inservice inspection tests, preventive maintenance, and operability checks that will be performed periodically to prove the availability of the emergency lighting systems. Provide this information. (SRP 9.5.2 Part II and III)

Response

See UFSAR Sections 9.5.3.4 and 14.2.12.2.

Question 430.86N

In Section 9.5.4.3 of the FSAR you state that the emergency flood protected fill connection for the fuel oil storage tanks is located on the DG building roof. It is also stated that "a hose could then be routed to the roof via an existing hose reel for tank filling when the flood level has receded". Provide the following:

a. State whether the "existing hose reel" is located inside or outside the DG building. Describe any other uses (fire protection, etc.) associated with this hose and hose reel.

b. Assuming the emergency fill connection must be used to refill the fuel oil storage tanks, describe how fuel oil will be delivered to the site during flood conditions and the procedures that will be used in refilling and storage tanks during flood conditions and non-flood conditions. The procedures should include fuel hose routing and fire watches. (SRP 9.5.4, Parts I, II, and III).

<u>Response</u>

a. Present plans are not to provide a permanent existing hose reel in the Diesel Generator Building (DGB), but to utilize a hose from the fuel delivery service; i.e., truck.

b. Plant procedures will detail the method for refilling the storage tanks using the emergency fill connection. The procedure will include provisions for routing the hose up to the roof from outside the building. The truck pump can supply sufficient head to transfer the fuel oil from the truck to the storage tank.

   The method for delivery of fuel oil to the site will be via standard fuel-oil tank truck, even in the event of flood conditions. Local fuel oil distributors utilize Roper rotary pumps on their fuel oil trucks. The pump vendor has verified that the pumps have sufficient discharge head to transfer the fuel oil from the truck to the storage tank using the emergency fill connection. A procedure for emergency filling of the fuel oil storage tanks will be in place prior to fuel load. The duration of impassable flood water levels around the site is such that the on-site seven day fuel oil capacity is adequate to endure the maximum flood event.

   Hydrology studies for STPEGS show that the limiting flood event, the breech of upstream dams (see Section 2.4, event 7), results in flood levels that increase gradually to approximately 4 ft above grade and decrease gradually afterwards. However, the total duration of flood water levels which exceed the local grade elevation is only 2.5 days. For further discussion of external flooding see Section 2.4.

Question 430.88N

Section 9.5.5 indicates that the function of the diesel generator cooling water system is to dissipate the heat transferred through the: 1) engine water jacket, 2) lube oil cooler; 3) engine air water coolers, 4) fuel oil cooler, and 5) governor lube oil cooler. Provide the design margin (excess heat removal capacity) included in the design of major components and subsystems. (SRP 9.5.5, Parts II and III)

Response

The Diesel Generator Cooling Water System (DGCWS) is designed to handle a maximum heat load of 13.99×10^6 Btu/hr, per engine, from the engine water jacket, lube oil cooler, engine air water coolers, and governor lube oil cooler. All the coolers are designed to dissipate the actual predicted heat losses. Various fouling factors are used which require the predicted heat loss still be dissipated given a fouled (or dirty) heat exchanger (HX). In addition, the worst cases of coolant flow and temperature are used to maximize HX sizing and therefore capability. The HXs are designed for a maximum essential cooling water (ECW) temperature of 115 F, however, the design basis ECW temperature is 105.7 F.

Question 430.91N

Recent licensee event reports have shown that tube leaks are being experienced in the heat exchangers of diesel engine jacket cooling water systems with resultant engine failure to start on demand. Provide a discussion of the means used to detect tube leakage and to corrective measures that will be taken. Include jacket water leakage into the lube oil system (standby mode), lube oil leakage into the jacket water (operating mode), jacket water leakage into the engine air intake and governor systems (operating or standby mode). Provide the permissible inleakage or outleakage in each of the above conditions which can be tolerated without degraded engine performance or causing engine failure. This discussion should also include the effects of jacket water/service water systems leakage. (SRP 9.5.5, Parts II and III)

Response

The jacket water system is completely separate from and does not interface (provide cooling) with the lube oil system. The ECW system provides cooling water to the lube oil system cooler.

It is noted that a major cause of the reported tube leaks (see IE Information Notice 79-23) was attributed to inadequate tubesheet thicknesses and poor tube to tube sheet attachments. The STPEGS lube oil and jacket water cooler tubesheets are greater than 1-inch in thickness (versus 1/8 in. reported in IE Information Notice 79-23) and the tubes are rolled (versus soldered and epoxy reported in IE Information Notice 79-23). Another potential cause of tube leaks is the quality of water used for cooling. The essential cooling water (ECW) quality has been evaluated in Section 9.2.1.2.3. The STPEGS diesel engine manufacturer is not aware of any tube leaks in these coolers on diesel engines they have supplied. They have supplied 36 diesel engines to the nuclear industry. Ten of these engines have been operated over ten years and there have been no reports of tube leaks. Based upon the construction of these coolers, tube leakage is considered improbable.

In the unlikely event of tube leaks; e.g., lube oil into the ECW, unusual amounts of makeup required are an indication that the system should be checked for leakage. The lube oil sump tank level gauge can be used to check lube oil level for abnormal changes. For a jacket water/ECW leak, ECW would leak into the jacket water resulting in raising the jacket water standpipe level. This would alarm in the control room. Corrective measures could then be initiated. Additionally, the cooling water, lube oil and air intake systems will be inspected as described in Sections 9.5.5.4, 9.5.7.4, and 9.5.8.4, respectively.

Question 430.92N

Operating experience indicates that diesel engines have failed to start on demand due to water spraying on locally mounted electronic/electrical components in the diesel engine starting system. Describe what measures have been incorporated in the diesel engine electrical starting system to protect such electronic/electrical components from such potential environment. (SRP 9.5.5, Parts II and III)

Response

Except for solenoids and various instrument switches, there are no locally mounted electronic/electrical components in the starting system. The starting components are mounted inside the engine control panel (similar to NEMA 3R) which is located in excess of 40 ft from the subject water sources. The starting air valves are pneumatic as such the water spray from a leak is not considered a potential problem. Solenoids and various instrument switches (pressure, temperature, limit, etc.) are gasketed, redundant and determined not to impact the starting system as a result of potential water source.

Question 430.94N

Diesel generators in many cases utilize air pressure or air flow devices to control diesel generator operation and/or emergency trip functions such as air operated overspeed trips. The air for these controls is normally supplied from the emergency diesel generator air starting system. Provide the following:

a) Expand your FSAR to discuss any diesel engine control functions supplied by the air starting system or any air system. The discussion should include the mode of operation for the control function (air pressure and/or flow), a failure modes and effects analysis, and the necessary P&ID's to evaluate the system.

b) Since air systems are not completely air tight, there is a potential for slight leakage from the system. The air starting system uses a nonseismic air compressor to maintain air pressure in the seismic Category I air receivers during the standby condition. In case of an accident, a seismic event, and/or loop, the air in the air receivers is used to start the diesel engine. After the engine is started, the air starting system becomes nonessential to diesel generator operation unless the air system supplies air to the engine controls. In this case the controls must rely on the air stored in the air receivers, since the air compressor may not be available to maintain system pressure and/or flow. If your air starting system is used to control engine operation, with the compressor not available, show that a sufficient quantity of air will remain in the air receivers, following a diesel engine start, to control engine operations for a minimum of seven days assuming a reasonable leakage rate. If the air starting system is not used for engine control describe the air control system provided and provide assurance that it can perform for a period of seven days or longer. (SRP 9.5.6, Part III)

<u>Response</u>

1. Air is needed to start the engine and once the engine is operating in the emergency mode, air pressure is no longer required for control function including the maintenance barring device. It should be noted that there are only three protection trips when operating in the emergency mode: 1) generator differential, 2) overspeeding, and 3) low lube oil pressure. If a generator differential or low lube oil pressure exists, the generator is stripped from the bus mechanically. However, the engine is stopped using air to isolate the fuel supply. In the event air is lost, a manual operated control is provided. Although air is needed to stop the engine, it is not needed to satisfy the system protection since the bus is stripped mechanically. In the event an overspeed condition exists the engine is stopped when combustion air is blocked to the turbocharger via mechanical operation of a butterfly valve. The fuel supply is stopped in the same manner as for the generator differential or low lube oil pressure with the use of the air controlled valve.

2. Not Applicable, See 1, above.

Question 430.97N

You state in Section 9.5.7 of the FSAR that the lube oil to lubricate the engine is stored in the engine lube oil sump tank. During diesel engine operation a certain amount of lube oil is consumed as part of the combustion process. Since the diesel generator may be required to operate for a minimum seven days during a loss of offsite power or accident condition, sufficient lube oil should be stored in the sump and/or site to preclude diesel generator unavailability due to lack of lube oil. Provide the following:

a) Provide the normal lube oil usage rate for each diesel engine under full load conditions, the lube oil usage rates which would be considered excessive, and the sump capacity.

b) Show with the lube oil in the sump at the minimum recommended level (low level alarm setting) that the diesel engine can operate without refilling the lube oil sump for a minimum of seven days at full rated load. If the sump tank capacity is insufficient for this condition, show that adequate lube oil will be stored onsite for each engine to assure seven days of operation at rated load.

c) If the lube oil consumption rate becomes excessive, discuss the provisions for determining when to overhaul the engine. The discussion should include the procedures used and the quality of operator training provided to enable determination of excessive L.0. consumption rate. (Refer to requests 430.28 and 430.100 for additional requirements on procedures and training). (SRP 9.5.7, Parts II and III)

Response

a) Normal lube oil usage: approximately 12 gallons per 24 hrs at rated load

Excessive lube oil usage: See item (c) below

Sump capacity: 1260 gallons

b) The oil sump capacity between low oil level alarm and minimum operating oil level is 549 gallons. Thus, assurance of seven days of operation at rated load would be possible at a lube oil consumption rate of as much as 78 gallons per day before reaching minimum operating level.

c) Logs of engine characteristics such as temperature, pressure, run time, as well as lube oil consumption rate, will be maintained. This information may be used to determine whether or not the lube oil consumption rate is excessive and to identify the need for an engine overhaul.

Licensed and non-licensed operators are presented a classroom lecture on Engineered Safety Feature (ESF) Diesel Generators (DGs) followed by written examination and a system checkout. This training includes how

Response (Continued)

to monitor the oil level in the engine sump and the alarms and setpoints associated with engine sump oil level. Operator training also alerts them to monitor for trends in operational parameters as good engineering practice.

Question 430.98N

In Section 9.5.4 you state that diesel fuel oil is available from local distribution sources, but you have not discussed the availability of the lube oil. Identify the sources where diesel quality lube oil will be available and the distances required to be travelled from the source(s) to the plant. Also discuss how the lube oil will be delivered onsite under extremely unfavorable environmental conditions. (SRP 9.5.7, Parts II & III)

Response

Quality lube oil for the diesel may be obtained from the onsite lube oil storage facility. If this supply is unavailable, there are several local distribution sources of acceptable quality lube oil. The following lists the suppliers, locations, and approximate distance to the plant:

Gulf Oil	Bay City	20 miles
Gulf Oil	El Campo	50 miles
Gulf Oil	Victoria	65 miles
Gulf Oil	Houston	110 miles

The method for delivery of lube oil to the site will be via standard lube delivery service (i.e., truck), even in the event of extremely unfavorable environmental conditions, including flood conditions. The duration of impassable flood water levels around the site is such that the on-site lube oil capacity is adequate to endure the maximum flood event.

Hydrology studies for STPEGS show that the limiting flood event, the breech of upstream dams (see Section 2.4, event 7), results in flood levels that increase gradually to approximately 4 ft above grade and decrease gradually afterwards. However, the total duration of flood water levels which exceed the local grade elevation is only 2.5 days. For further discussion of external flooding see Section 2.4.

Question 430.99N

Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of lube oil without interrupting operation of the diesel generator. Provide the following:

a) What provisions will be made in the design of the lube oil system to add lube oil to the sump. These provisions shall include procedures or instructions available to the operator on the proper addition of lube oil to the diesel generator as follows:

   1. How and where lube oil can be added while the equipment is in operation,

   2. Particular assurance that the wrong kind of oil is not inadvertently added to the lubricating oil system, and

   3. That the expected rise in level occurs and is verified for each unit of the lube oil added.

b) Verification that these operating procedures or instructions will be posted locally in the diesel generator rooms.

c) Verification that personnel responsible for the operation and maintenance of the diesel are trained in the use of these procedures. Verification of the ability of the personnel on the use of the procedures shall be demonstrated during preoperational tests and during operator requalification.

d) Verification that the color coded, or otherwise marked, lines associated with the diesel-generator are correctly identified and that the line or point for adding lube oil (when the engine is on standby or in operation) has been clearly identified. (SRP 9.5.7, Parts II & III)

<u>Response</u>

a) A plant procedure will be written for the addition of lube oil to an operating diesel generator. This procedure will address how to add lube oil and the type of lube oil to be used and will require the operator to verify the expected rise in oil level.

b) The plant procedure for adding lube oil will be available for use at the operator's work station.

c) Training on the Engineered Safety Feature (ESF) Diesel Generators (DGs) will provide operators with sufficient knowledge of the Diesel Engine Oil System such that they can safely follow the procedure for oil addition during engine operation.

d) The plant procedure for adding lube oil will contain adequate instructions such that special markings will not be required.

Question 430.101N

In Figure 9.5.8-1 of the FSAR a crankcase breather system is shown. Provide a more detailed description of the system including operating modes, and power sources. If this system is necessary during normal operation of the diesel engine (prevention of crankcase explosion) we require that the mechanical portions of this system be designed to seismic Category I ASME Section III Class 3 (Quality Group C) requirements and the electrical systems (if any) to Class 1E requirements. The portion of the system extending outside the diesel generator building shall be tornado missile protected. Describe any other systems or devices used to preclude or mitigate the consequences of a crankcase explosion. (SRP 9.5.7, Part II)

Response

The crankcase breather system is a static piping system that allows the evacuation of crankcase gases. This system does not need to be functional during any operation of the diesel engine. Since there is no fan required to evacuate these gases from the crankcase, there are no electrical power requirements. In addition to the crankcase vent system, rapid pressure relief valves (non ASME; Diesel meets DEMA standards) are provided on some of the crankcase doors to relieve overpressure in the event such would occur inside the engine crankcase.

Question 430.102N

Diesel generators for nuclear power plants should be capable of operating at maximum rated output under various service conditions. No load and light load operations, the diesel generator may not be capable of operating for extended periods of time under extreme service conditions or weather disturbances without serious degradation of the engine performance. This could result in the inability of the diesel engine to accept full load or fail to perform on demand. Provide the following:

a) The environmental service conditions for which your diesel generator is designed to deliver rated load including the following:

Service Conditions

(a) ambient air intake temperature range,˚F

(b) humidity, max-%

b) Assurance that the diesel generator can provide full rated load under the following 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 low pressure storm such as a hurricane resulting in ambient pressure of not less than 26 inches Hg for a minimum duration of 2 hours followed by a pressure of no less than 26 to 27 inches Hg for an extended period of time (approximately 12 hours).

c) In light of recent weather conditions (subzero temperatures), discuss the effects low ambient temperature will have on engine standby and operation and effect on its output particularly at no load and light load operation. Will air preheating be required to maintain engine performance? Provide curve or table which shows, performance verses ambient temperature for your diesel generator at normal rated load, light load, and no load conditions. Also provide assurance that the engine jacket water and lube oil preheat systems have the capacity to maintain the diesel engine at manufacturer's recommended standby temperatures with minimum expected ambient conditions. If the engine jacket water and lube oil preheat systems' capacity is not sufficient to do the above, discuss how this equipment will be maintained at ready standby status with minimum ambient temperature.

d) Provide the manufacturer's design data for ambient pressure vs engine derating.

e) Discuss the effects of any other service and weather conditions will have on engine operation and output, i.e., dust storm, air restriction, etc. (SRP 8.3.1, Parts II and III; SRP 9.5.5, Part III, SRP 9.5.7, Parts II and III; and SRP 9.5.8, Parts II and III)

Response (Continued)

a) The diesel generators (DGs) are designed to deliver rated load at:

Ambient air intake temperature: 29 - 95°F
81°F Wet Bulb

b) The engines will continue to maintain 100 percent rated load given the pressure depression at 3 psi in 1.5 seconds followed by a rise to normal pressure in 1.5 seconds. The postulated hurricane resulting in 25 in. Hg ambient pressure for a time period of 2 hours minimum duration followed by a rise to a pressure of no less than 26 in. to 27 in. Hg for a minimum time of 12 hours will not prevent the diesel engine from maintaining 100 percent rated load.

c) It is not anticipated that the temperature at the STPEGS location will be subzero. The lower recorded temperature is 5°F (Houston area), 8°F (Bay City area), and in the last 40 years, 11□F (Bay City). The diesel generator building (DGB) is provided with 5 heaters per room to maintain a minimum room temperature of 50°F, based on an outside temperature of 29□F. Although the outside temperature has gone below 29°F, this temperature represents the 99 percent design value. Per ASHRAE, therefore, only at 1 percent of the winter month hours would the temperature be below 29°F. This corresponds to 22 hours per year. The diesel engine manufacturer has identified that their engines can start and operate with an outside temperature of 8°F.

The outdoor service condition of 29°F to 95°F are based on the environmental conditions stated in ASHRAE Handbook of Fundamentals. These conditions are used in the design of the ventilation systems serving the DGB. Provision for air preheating is included in the engine design. Whenever the turbocharger blower discharge temperature is less than 105°F, heated jacket water will be circulated through the fore section of the intercoolers and will therefore preheat the combustion air either for startup or light load operation. Therefore during winter months, jacket water will be heating the combustion air as needed. It is noted that air for startup comes predominantly from the air receivers which are located inside the DGB. Total outside air is used after the engine has reached 280 rpm.

The power to both the jacket water heater and circulation pump motor is Class 1E. The heater and pump are seismically supported and the heater meets the requirements of IEEE 323-1974. The above is also true for the lube oil circulation pump and heater. The engine jacket water and lube oil coolers are sized to a room ambient temperature down to 50°F minimum. The engine manufacturer assures that the jacket water and lube oil systems will maintain their proper warm standby temperature conditions.

The diesel engine is capable of operating with an outside air ambient temperature between 8°F to 105°F. Humidity has no adverse effect on DG performance. Although low temperature is not alarmed, DG room temperature is available in the control room.

In the event of sustained cold weather at the plant site, less than 29°F, administrative procedures will require that DG room temperature is monitored at a

Response (Continued)

frequency of once per shift to allow for appropriate and immediate remedial action. If the minimum ambient room conditions fall below 50□F, the key parameters which affect the operability of the diesel will be monitored and maintained within the required limits.

Class 1E temperature indication is provided in the DGB to alarm on high temperature. This is necessary for determining if the HVAC system is operating to avoid violating environmental qualifications of equipment. A low temperature alarm is not considered necessary since DG generator room temperature is available in the control room.

d) The ability of the diesel engines to deliver rated load at various altitudes is affected by the ability of the turbocharger to develop the required manifold pressures. The turbochargers on these engines are rated for a 3:1 pressure ratio. Based upon this rating, the turbocharger can develop sufficient manifold pressure with a minimum ambient pressure of 25 in. Hg. Consequently, no engine derating applies with respect to the expected ambient pressure.

e) In order to reduce the potential impact of the external environment, the engine combustion air intake system, including the intake filter, is installed indoors. The air intake filter is installed in a separate room located on the second level of the DGB. Air is drawn from the outside through a louvered/screened opening into the air filter room. The intake air filter is an oil bath type with a screened intake opening. As a result of abnormal climatic conditions, i.e., dust storms, or air restriction (due to foreign objects), the air filter will of course require maintenance sooner than the scheduled maintenance. The air filter is provided with differential pressure indications to ensure that the intake pressure losses do not exceed manufacturer's recommendations. (See Q430.103N.)

Question 430.103N

Recent events have shown that not all aspects in the design of the DG combustion air intake and exhaust system have been taken into account resulting in the pressure losses through the system exceeding manufacturer's limitations. Verify that the pressure losses through your system do not exceed manufacturer`s recommendations taking into consideration pipe losses, and pressure drops associated with the filters, silencers, and intake and exhaust structure openings. (SRP 9.5.8, Part III)

Response

The engine manufacturer's maximum allowable total inlet and exhaust system pressure drop is 25 in. H_2O (20 exhaust; 5 intake). A calculation has been performed to determine the actual values and they do not exceed the manufacturer's recommended pressure losses.

This calculation considers pipe losses, and pressure drops associated with filters, silencers, and intake and exhaust openings.