ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8903090308 DOC.DATE: 89/02/24 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
AUTH.NAME AUTHOR AFFILIATION
CONWAY,W.F. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Forwards response to request for addl info re emergency power sys enhancement project.

DISTRIBUTION CODE: A001D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 39
TITLE: OR Submittal: General Distribution

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-2 LA	1	0	PD2-2 PD	2	2
	EDISON,G	1	1			
INTERNAL:	ARM/DAF/LFMB	1	0	NRR/DEST/ADS 7E	1	1
	NRR/DEST/CEB 8H	1	1	NRR/DEST/ESB 8D	1	1
	NRR/DEST/MTB 9H	1	1	NRR/DEST/RSB 8E	1	1
	NRR/DEST/SICB	1	1	NRR/DOEA/TSB 11	1	1
	NUDOCS-ABSTRACT	1	1	OGC/HDS2	1	0
	REG FILE 01	1	1	RES/DSIR/EIB	1	1
EXTERNAL:	LPDR	1	1	NRC PDR	1	1
	NSIC	1	1			

R I D S / A D D S

R I D S / A D D S

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM P1-37 (EXT. 20079) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

m/A-4

TOTAL NUMBER OF COPIES REQUIRED: LTTR 19 ENCL 16

P.O. Box 14000, Juno Beach, FL 33408-0420

FPL

FEBRUARY 2 4 1989

L-89-54

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Request for Additional Information on
Emergency Power System Enhancement Project
NRC TAC Nos. 69023 and 69024

Attached is Florida Power & Light Company's response to your January 6, 1989 request for additional information regarding the Emergency Power System Enhancement Project. As discussed with your staff, the responses to questions 1, 2, 32, 33, 34, 35, 37, 38, 39, 47, and all requests dealing with emergency diesel generator qualification testing are not included, but will be provided by March 20, 1989.

Should there be any questions, please contact us.

Very truly yours,

D A Sager
for W. F. Conway
Senior Vice President - Nuclear

WFC/TCG/gp

Attachment

cc: Malcolm L. Ernst, Acting Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

8903090308 890224
PDR ADOCK 05000250
P PNU

A001
1/1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

EMERGENCY POWER SYSTEM ENHANCEMENT PROJECT

Following are Florida Power and Light Company responses to the NRC's January 6, 1989 Request for Additional Information (RAI) regarding the Emergency Power System (EPS) Enhancement Project. For your convenience, the response to each question immediately follows the duplicated RAI.

Please note that responses to requests 1, 2, 32, 33, 34,35,37,38,39,47 and all requests regarding EDG qualification testing are not included but will be provided in a follow up submittal scheduled for March 20, 1989.

RAI 3

Make a positive statement that all electrical systems and equipment associated with the System Enhancement and important to safety are classified as 1E.

Response to RAI 3

All safety related electrical systems and equipment associated with the EPS Enhancement are classified as 1E.

RAI 4

Make a positive statement that the Class 1E electrical equipment and systems associated with the System Enhancement are qualified consistent with Regulatory Guide 1.89. If there are exceptions, specifically note the exceptions and provide the reasons.

Response to RAI 4

Class 1E electrical equipment and systems associated with the Enhancement Project are qualified consistent with Regulatory Guide 1.89. Note however that no design basis accidents discussed in Regulatory Guide 1.89, Revision 1, will adversely affect the Class 1E electrical equipment and systems associated with the Enhancement Project.

RAI 5

Make a positive statement that SSC important to safety meet the requirements of GDC 2, 4 and 5.

Two new battery chargers are provided in the enhanced design, each dedicated to a single 125V battery, and the existing swing battery chargers are each re-dedicated to a single 125V battery. Thus, each battery has two battery chargers associated with it in the enhanced design. Note that below the 125V DC bus level, the existing DC distribution systems are not affected by the Enhancement Project.

As shown by the one-line diagram provided as Figure 1 of the June 23, 1988 submittal, the remaining shared safety related equipment is no longer powered from either unit, but rather, swing load centers have been provided on each unit, and their loads apportioned appropriately, such that a single failure on a unit does not result in loss of the minimum required equipment. Even though the equipment is powered from either bus of a given unit, the equipment function can be shared between units.

RAI 9

For the "Loss of Normal Power Supply Followed by Actuation of SIS" scenario, it is stated that those loads that have already been connected to the 4.16kV bus by the sequencer action, in response to the LOOP, will remain connected if they are required in response to an SIS. Are those loads not required by the SIS stripped from the buses? If so, how is this accomplished? If not, what prevents a possible overload on the diesel generators?

Response to RAI 9

All loads are stripped by either bus undervoltage, relays 127X1 (Z1), or bus undervoltage in conjunction with the Startup transformer breaker open, relays 127X2 (Z2), or by loss of voltage at connected buses.

Upon restoration of the emergency bus voltage by the EDG, the 127X1 relays cited above are reset. 127X2 relays remain actuated until the offsite power source is returned to the bus via the startup transformer. Loads required to run in response to the LOOP are sequenced to their buses by the emergency bus loading sequencers. Certain plant investment loads, having been tripped previously by a 127X1 relay, are capable of being manually loaded by the operator within the generator loading capacity. Equipment which cannot be energized are those loads or supplies blocked or inhibited from starting by 127X2 relay signals (LOOP).

Actuation of SIS during LOOP resets the emergency bus loading sequencers and will shed all loads from the EDG. This is accomplished by reactuation of the 127X1 relays and restarting the sequencer in the LOCA/LOOP mode, sequentially loading equipment onto the EDG for mitigation of the DBA. Not tripping the EDG breaker for the subject scenario reduces the challenges to the breaker to successfully reclose. (Note: The design description provided in this paragraph represents a change which is being incorporated into the Enhancement Project which was not addressed in the June 23, 1988 submittal.)

RAI 10

For the "Actuation of SIS with Normal Power Supply Available" scenario, are the non-safety related loads stripped from the safety related buses?

Response to RAI 10

The non-safety related loads are not stripped from the safety related buses for the "Actuation of SIS with Normal Power Supply Available" scenario.

RAI 11

We understand that the enhancement project will involve the following locations:

1) New diesel generator building
2) Existing diesel generator building
3) Unit 4 auxiliary building, hot machine shop
4) Unit 4 auxiliary building, mezzanine floor
5) Control room

Identify any other general areas that will be impacted by the enhancement project due to equipment installation, relocation or other changes, including cable routing. Identify those safety related circuits (power, control, indication, alarm, etc.) that will pass between or through these general areas. Identify these circuits as to function, end points and intermediate points. Identify those circuits and areas for which divisional separation or isolation consistent with applicable standards is required, and indicate how such separation or isolation will be accomplished.

Response to RAI 11

The EPS Enhancement will impact virtually all power block areas with the exception of the Units 3 & 4 Reactor Buildings.

Interconnecting raceway containing safety related power, control, indication and alarm circuits will be routed between areas, through the existing plant. Identification of these circuits with reference to function, end points and intermediate points is provided in the detailed Plant Change/Modification Packages which are available for NRC review. Divisional separation/isolation will be provided in accordance with the Turkey Point Units 3 & 4 Updated Final Safety Analysis Report, Amendment 6, i.e., circuits to duplicate equipment are routed in separately located raceway, ensuring that any physical damage affecting one circuit will not affect its duplicate.

Additional information concerning separation and isolation criteria for electrical design in the new EDG building will be provided in our responses to RAI 1 and 2.

RAI 12

Consistent with Regulatory Guide 1.6, staff believes that an interlock should be provided on the breakers between 480 volt load center buses 4A and 4B, 4C and 4D, 3A and 3B, and 3C and 3D to prevent an operator error that would parallel these power sources. Provide these interlocks or justify non-conformance.

Response to RAI 12

Normally, these breakers are racked out. When required, they are controlled by existing plant procedures. This aspect of the electrical power distribution system is not changed within the scope of the EPS Enhancement Project.

RAI 13

Include an analysis to illustrate that the 125 VDC batteries are adequate for the worst single failure and accident loading condition.

Response to RAI 13

Other than the addition of two battery chargers and extending DC Buses 3D01 (3A) and 4D01 (4B) to provide additional distribution circuit breakers, no modifications are being made to the existing 125 VDC distribution system. These modifications have been evaluated and determined not to introduce any unacceptable failure modes. The battery sizing calculations are being revised to include the additional dc loads associated with the EPS enhancement. The results of these calculations will demonstrate that the existing batteries are adequately sized to meet the worst accident loading condition.

Note: The above design description of extending DC Buses 3D01 and 4D01 represents a change which is being incorporated into the design of the EPS Enhancement Project which was not addressed in the June 23, 1988 submittal.

RAI 14

Describe the changes to be made in the Control Room (control, indication, alarms, etc.) for the enhancement project. Discuss how these changes will be scheduled and controlled to limit possible installation induced operational transients.

Response to RAI 14

The existing configuration of EDG controls in the Turkey Point Units 3 and 4 Control Room provides for both EDG A and EDG B control/indication from each of Control Consoles 3C02 and 4C02. On the vertical panels (3C04 and 4C04), EDG controls are not combined; EDG A instrumentation and controls are installed on 3C04 and EDG B instrumentation and controls are installed on 4C04.

As part of the EPS Enhancement Project, the EDG A and EDG B instrumentation and controls on Control Console 3C02 will be relabelled for EDG 3A (existing EDG A) and EDG 3B (existing EDG B) while the instrumentation and controls on Console 4C02 will be relabelled and rewired for EDG 4A (new) and EDG 4B (new). All new safety related instrumentation and controls installed in the Control Room are qualified Class 1E; all Control Room modifications comply with NUREG 0700, "Guidelines for Control Room Design Review."

The control room modifications will be performed during a dual unit outage, thereby avoiding operational transients which might otherwise occur. In addition, the modifications will be performed in a manner which ensures that at least one shutdown cooling train for each unit is always operable.

RAI 15

Review and evaluate the alarm and control circuitry for the diesel generators for any condition that renders a diesel generator unable to respond to an automatic emergency start signal. These conditions include not only the trips that lock out the diesel generator start and require manual reset, but the control switch or mode switch positions that block automatic start, loss of control voltage, insufficient starting air pressure or battery voltage, etc. This review should consider all aspects of possible diesel generator operational conditions, for example test conditions and operation from local control stations. One area of particular concern is the unreset condition following a manual stop at the local station which terminates a diesel generator test and prior to resetting the diesel generator controls for enabling subsequent automatic operation.

Provide the details of your review including the following information:

a) all conditions that render the diesel generator incapable of responding to an automatic emergency start signal for each operating mode as discussed above:

b) the wording on the annunciator window in the control room that is alarmed for each of the conditions identified in (a);

c) any other alarm signals not included in (a) above that also cause the same annunciator to alarm;

d) any condition that renders the diesel generator incapable of responding to an automatic emergency start signal which is not alarmed in the control room; and

e) any proposed modifications resulting from this evaluation.

Response to RAI 15

a) The following are the conditions that render the new diesel generators incapable of responding to an automatic emergency start signal for each operating mode:

   1) Local control master switches "Off-Normal-Local" in "Off" position.

   2) Isolation switches "Normal-Isolate" in "Isolate" position. These switches when in "Isolate" position prevents diesel generator starting from the control room switches manually or automatic emergency starting from the engineered safeguards actuation signal (SI). However, automatic starting of a diesel on LOOP is not affected. Note: This switch is provided to isolate EDG 4B from the control room for alternate shutdown purposes.

   3) Loss of starting air pressure.

   4) Diesel generator lockout relay not reset.

   5) Mechanical engine overspeed trip device not reset. This device trips only on actual engine overspeed and must be reset locally at the engine.

6) 125V DC control power failure. This failure prevents diesel from automatic start only.

7) Barring device engaged. This device is used during engine maintenance only to rotate engine and it cannot be engaged while diesel generator is in standby mode.

b) The wording of the annunciator windows in the control room that are alarmed for each of the conditions identified in (a) and for each new diesel generator are:

   1) "DIESEL GEN 4 - - NOT READY TO START/TRIPPED"

      Input to this window is from local annunciator groups 1 and 2 (see Table 15-1)

   2) "DIESEL GEN 4 - - LOCAL MASTER SWITCH IN OFF POSITION"

      Input to this window is directly from the master control switch in "off" position.

   3) "DIESEL GEN 4 - - TROUBLE"

      Input to this window is from local annunciator groups 3, 4 and 5 as shown on Table 15-2.

c) No other alarm signals are included in b1, b2 and b3 alarm windows that also cause the same annunciator to alarm.

d) No other conditions are anticipated.

e) No additional modifications are required.

TABLE 15-1

INPUTS INTO ANNUNCIATOR

"DIESEL GEN 4 - NOT READY TO START/TRIPPED"

GROUP 1	GROUP 2*
STARTING AIR LINE-1 LOW PRESSURE	ENGINE OVERSPEED TRIP
STARTING AIR LINE-2 LOW PRESSURE	GENERATOR DIFFERENTIAL PHASE A TRIP
186G LOCKOUT RELAY NOT RESET	GENERATOR DIFFERENTIAL PHASE B TRIP
EDG CONTROL POWER FAILURE	GENERATOR DIFFERENTIAL PHASE C TRIP
EDG CONTROL SWITCH IN OFF	
SIS AUTO START IN OVERRIDE	
FUEL PRIMING PUMP NO POWER / OVERLOAD	
BARRING DEVICE ENGAGED	
DAY TANK LEVEL CRITICALLY LOW	
EXCITER FIELD FLASHING POWER NOT AVAILABLE	
GENERATOR BREAKER PULLED OUT	
GEN BREAKER CONTROL POWER NOT AVAILABLE	

* Emergency EDG trips

TABLE 15-2

INPUT INTO ANNUNCIATOR

"DIESEL GEN 4 - TROUBLE"

GROUP 3*

- LUBE OIL HIGH TEMPERATURE TRIP
- COMBUSTION AIR HIGH TEMP TRIP
- EXHAUST HIGH TEMP TRIP
- COOLING WATER HIGH TEMP TRIP
- GEN OVERCURRENT PHASE A
- MAIN MANIFOLD LUBE OIL LOW PRESSURE TRIP
- COMBUSTION AIR LOW PRESSURE TRIP
- EXHAUST HIGH PRESSURE TRIP
- COOLING WATER LOW PRESSURE TRIP
- GEN OVERCURRENT PHASE B
- ENGINE HIGH VIBRATION TRIP
- PISTON COOLING OIL LOW PRESSURE TRIP
- TURBOCHARGER HIGH DIFF TEMP TRIP
- CRANKCASE HIGH PRESSURE TRIP
- FUEL OIL LOW PRESSURE TRIP
- GEN OVERCURRENT PHASE C

GROUP 4**

- LUBE OIL PRESSURE LOW
- LUBE OIL METAL PARTICLE DETACHED
- EXHAUST HIGH TEMP PRE-TRIP
- COOLING WATER LEVEL LOW
- ENGINE HIGH VIBRATION PRE-TRIP
- LUBE OIL LEVEL LOW
- SOAKBACK PUMPS NO POWER/OFF
- EXHAUST HIGH PRESSURE PRE-TRIP
- COOLING WATER HIGH TEMPERATURE PRE-TRIP
- FIELD FLASHING BACKUP TIMER TIMED OUT
- LUBE OIL HIGH TEMP PRE-TRIP
- COMBUSTION AIR HIGH TEMP PRE-TRIP
- EDG START FAILURE
- COOLING WATER LOW PRESSURE PRE-TRIP
- RADIATOR FAN #1 TRIPPED/OFF
- LUBE OIL FILTER DIFF PRESSURE HIGH
- RADIATOR FAN #2 TRIPPED/OFF
- LUBE OIL STRAINER DIFF PRESSURE HIGH
- TURBOCHARGER HIGH DIFF TEMPERATURE PRE-TRIP
- FUEL OIL LOW PRESSURE PRE-TRIP
- FUEL OIL FILTER DIFF PRESSURE HIGH
- PT/TRANS FUSE FAILURE
- RADIATOR FAN #3 TRIPPED/OFF
- LUBE OIL COOLER DIFFERENTIAL PRESSURE HIGH
- STARTING AIR TANKS PRESSURE LOW
- FUEL OIL PRIMING PUMP TIMER TIMED OUT
- FUEL STRAINER DIFFERENTIAL PRESSURE HIGH
- GENERATOR STATOR TEMPERATURE HIGH
- EDG OVER/UNDER VOLTAGE
- 186G LOCKOUT RELAY COIL OPEN

GROUP 5***

- COOLING WATER IMMERSION HEATER TRIPPED/OFF
- AIR COMPRESSOR TRIPPED/OFF
- DAY TANK LEVEL HIGH
- BACKUP DC OIL PUMPS RUNNING
- EDG CONTROL PANEL FAN FAILURE
- COOLING WATER TEMPERATURE LOW
- FUEL TRANSFER PUMP TRIPPED/OFF
- STORAGE TANK HIGH LEVEL
- BACKUP DC OIL PUMPS NO POWER/OVERLOAD
- EDG BUILDING VENTILATION FAILURE
- STARTING AIR TANKS HIGH PRESSURE
- STORAGE TANK LOW LEVEL
- WATER DETECTED IN AIR RECEIVER DRAIN
- APPENDIX R ISOLATION SWITCHES IN "ISOLATE" POSITION

TABLE 15-2 (Cont'd)

INPUT INTO ANNUNCIATOR

"DIESEL GEN 4 - TROUBLE"

GROUP 3*	GROUP 4**	GROUP 5***
GENERATOR REVERSE POWER	COMBUSTION AIR LOW PRESS PRE-TRIP	
GENERATOR LOSS OF EXCITATION	DAY TANK LEVEL LOW	
GENERATOR UNDERFREQUENCY	ENGINE SPEED HIGH	

*   - Non emergency trips
** - EDG degraded
*** - EDG auxiliaries

RAI 16

Concerning the Class 1E Direct Current Power System, address the following:

As a result of recent reviews on the adequacy of safety-related direct current power systems of operating plants, the following recommendations applicable to those plants undergoing operating license and construction permit reviews have been proposed. In this regard, state if your design conforms to these recommendations and explicitly identify any exception.

a) The position of circuit breakers or fused disconnect switches associated with the battery charger, battery and direct current bus supply should be monitored to conform to the recommendations of Regulatory Guide 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems," (May 1973).

b) The technical specifications should include periodic testing of battery chargers to verify that the current limiting characteristics have not been compromised or lost.

c) The technical specifications should require that cell-to-cell and terminal connection resistance measurements be made as recommended in IEEE Standard 450-1972, "Recommended Practice for Maintenance, Testing and Replacement of Large Stationary Type Power Plant and Substation Lead Storage Batteries".

d) The direct current power system design should include the following monitors and alarms.

   1) An ammeter (directional and dual range) in the battery output to monitor the battery input current while the battery is on floating and equalizing charge and to monitor the battery output current when it is supplying power.

   2) An annunciator to alarm whenever the charger goes into a current limiting condition.

   3) A temperature indicator to measure the battery room ambient temperature.

Response to RAI 16

a) No new circuit breakers/fused disconnect switches associated with the battery chargers or batteries are being provided via the EPS Enhancement. The new battery chargers will be connected to existing circuit breakers, which do not have monitoring provisions allowing conformance to the recommendations of Regulatory Guide 1.47.

b) Battery chargers are equipped with a completely automatic load limiting feature which prevents the output from exceeding 115 percent of rated output amperes regardless of the total dc load or the state of charge of the battery. In the event of failure of the load limiting feature, backup protection has been provided which will trip the unit off the line and provide annunciation of this condition.

However, neither the existing nor proposed Technical Specifications require periodic testing to verify that the current limiting characteristics have not been compromised or lost, and, in light of the backup protection provided, it is not intended to add this new technical specification.

c) The proposed Technical Specification 4.8.2.1.d.2 requires that, at least once per 18 months, the cell-to-cell and terminal connection resistance be measured.

d) 1) The existing ammeter is a bi-directional, single range ammeter. This function is not being modified by the EPS Enhancement.

2) An alarm is provided whenever the charger goes into a current limiting condition.

3) No modifications are being made to the existing battery rooms via the Enhancement Project.

<u>RAI 17</u>

State if the battery charger has sufficient capacity to meet the requirements of position c.1.b of Regulatory Guide 1.32. Also, state if the stability of the battery charger output is load dependent and if so, describe.

<u>Response to RAI 17</u>

The new battery chargers have been sized to meet the requirements of position c.1.b of Regulatory Guide 1.32, i.e., the supply is based on the largest combined demands of the various steady-state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state within the FSAR design basis 24 hour time period, irrespective of the status of the plant during which these demands occur. The stability of the battery charger output is not load dependent, but is self-regulating, automatically holding output voltage within +/-0.5 percent over the working range from no load to full load.

<u>RAI 18</u>

Provide a description of the capability of the emergency power system battery chargers to properly function and remain stable upon the disconnection of the battery. Include in the description any foreseen modes of operation that would require battery disconnection such as when applying an equalizing charge.

<u>Response to RAI 18</u>

The new battery chargers are capable of operating and remaining stable with the battery disconnected for maintenance. No modes of normal operation should require battery disconnection. The only time the battery should be disconnected would be to perform corrective actions based on surveillance inspections or to perform a battery service test.

RAI 19

Provide the details of your design of the DC power system that assures equipment will be protected from damaging overvoltages from the battery chargers that may occur due to normal equalize charging, faulty regulation or operator error.

Response to RAI 19

To protect the dc system against overvoltages from the new battery chargers, an overvoltage relay is connected internally, across the output terminals of each charger. Actuation of this relay will trip the charger off the line and provide an alarm.

RAI 20

For the diesel engine fuel oil storage and transfer system, discuss the testing necessary to maintain and assure a highly reliable instrumentation, control, sensor, and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe what operator actions are required during alarm conditions to prevent harmful effects to the diesel engine. Discuss the system interlocks provided.

Response to RAI 20

Each engine has its own fuel system consisting of a day tank, duplex strainer, engine driven pump, DC motor driven priming pump, duplex filters, fuel injector filters, fuel injectors, and various check and relief valves. Pressure switches, level switches, pressure gauges, and level gauges are also included for alarm, control and indication. Instrumentation associated with the EDG fuel oil storage and transfer systems includes the components shown on Table 20-1.

The operator action required following alarm actuation will be specified in applicable off normal operating procedures. These actions will be consistent with the manufacturer's guidelines.

The only interlock in the diesel oil storage and transfer systems is between a given diesel oil day tank and its associated diesel oil transfer pump.

System components are inspected and tested by the manufacturer. After installation and before plant startup, the diesel oil storage and transfer systems are inspected, tested, and operated. Testing will be performed to verify system operability per Technical Specification requirements in accordance with manufacturer recommendations and applicable codes and standards.

TABLE 20-1

FUEL OIL SYSTEM COMPONENTS

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
PS61	FPS1-Fuel Pressure Low Alarm	Local	10psig			X	
PS62	BFCS - Backup DC Fuel Pump Control	Local	15psig Inc. 10 psig Dec.		X X		
PS63	FPS2 - Fuel Pressure Low Shutdown/Alarm	Local	8psig			X	X
DPS61	FSDP - Fuel Strainer Differential High	Local	5psig		X		
DPS62	FFDP - Fuel Filter Differential High	Local	35psig		X		
PI61	Fuel Manifold Pressure	Local	0-100psig	X			
PI62	Fuel Manifold Pressure (4-20 MADC)	Local	0-100psig	X			
PI63	Pump Manifold Pressure	Local	0-100psig	X			
LV61	1 Hour Fuel Day Tank Level Low Alarm	Local	TBD			X	
LV62	Fuel Day Tank Level Low Alarm	Local	TBD			X	
LV63	Fuel Transfer Pump On	Local	20"(314 gal)		X		
LV64	Fuel Transfer Pump Off	Local	37"(619gal)		X		
LV65	Fuel Day Tank Level High Alarm	Local	TBD			X	
LI61	Fuel Day Tank Level (4-20 MADC)	Local	0-100%	X			
LT4-6587A	DOST 4A Level (Narrow Range)	Local	500-555 inches			X	
LI4-6587A	DOST 4A Level Indication (Narrow Range)	Local	500-555 inches	X			

TABLE 20-1 (Cont'd)

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
LT4-6586A	DOST 4A Level (Wide Range)	Local	19'3"-46'3"			X	
LI4-6586A-1	DOST 4A Level Indication (Wide Range)	Local	19'3"-46'3"	X			
LI4-6586A	DOST 4A Level Indication (Wide Range)	Local	19'3"-46'3"	X			
LAH4-6587A	DOST 4A High Level Alarm (Local)	Local	552 inches			X	
LAL4-6587A	DOST 4A Low Level Alarm (Local)	Local	510 inches			X	
PDIS4-6332A	Differential Pressure Across Pump Suction Strainer	Local	1.5psid			X	
PI4-6722A	Diesel Oil Transfer Pump A Discharge Pressure	Local	0-50psig	X			
PDIS4-6333	Fill Line Filter Differential Pressure	Local	1.5psid			X	
TI4-6388A	DOST 4A Temp Indicator	Local	50°-100°F	X			
LT4-6587B	DOST 4B Level (Narrow Range)	Local	500-555 inches			X	
LI4-6587B	DOST 4B Level Indication (Narrow Range)	Local	500-555 inches	X			
LT4-6586B	DOST 4B Level (Wide Range)	Local	19'3"-46'3"			X	
LI4-6586B-1	DOST 4B Level Indication (Wide Range)	Local	19'3"-46'3"	X			
LI4-6586B	DOST4B Level Indication (Wide Range)	Local	19'3"-46'3"	X			
LAH4-6587B	DOST 4B High Level Alarm (Local)	Local	552 inches			X	

TABLE 20-1 (Cont'd)

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
LAL4-6587B	DOST 4B Low Level Alarm (Local)	Local	510 inches			X	
PDIS4-6332B	Differential Pressure Across Pump Suction Strainer	Local	1.5psid			X	
PI4-6722B	Diesel Oil Transfer Pump Discharge Pressure	Local	0-50psig	X			

* Manufacturer tag number
** All values are approximate and may change as detailed design is finalized.

RAI 21

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

Response to RAI 21

The fill lines enter the storage tanks near the top of the tanks. Therefore, if one of the lines were to be impacted by a tornado missile, there would be no effect on the fuel inventory in the tank. In addition, in the event that a fill line were to be impacted by a tornado missile, alternate methods exist to resupply the storage tanks.

Either of the following methods could be used:

1. Cross connects between the new fuel oil storage tanks and the existing fuel oil storage tanks will be installed under the Enhancement Project. Manual alignment of these cross connects would allow resupply of the affected tank.

2. Available fuel oil system piping connections exist inside each EDG room. Use of these connections would allow the affected storage tank to be resupplied by a fuel oil delivery truck.

The impact of a tornado missile causing the complete loss of function of a vent line is not considered credible since almost complete crimping of the vent line would be required to cause a vacuum to be formed in the tank.

RAI 22

Discuss the means for detecting or preventing growth of algae in the diesel fuel storage tank. If it were detected, describe the methods to be provided for cleaning the affected storage tank.

Response to RAI 22

In accordance with existing procedures, a program of detection and prevention based upon current practices is utilized to prevent the deleterious affects of biological activity upon diesel fuel oil quality. Upon receipt, each oil delivery truck is subject to testing for microbial activity prior to transferring the diesel fuel oil from the oil delivery truck to the diesel fuel oil storage tank. Prior to transfer of the fuel oil from the truck to the tank, Kathon (a biocide), or an approved equivalent, is added to the fuel oil at the appropriate concentration. In addition, all diesel oil tanks including day tanks are subjected to microbial testing on a periodic basis.

Should microbial activity be detected in the diesel oil storage tank, tie in points are available in the suction and fill lines to allow the use of portable filtering equipment to clean and filter the fuel oil. Should microbial activity be detected in a day tank, the tank is drained and refilled with clean oil.

RAI 23

For the diesel fuel oil system, include a more explicit description of proposed protection of underground piping. Where corrosion protective coatings are being considered (piping and tanks) include the industry standards which will be used in their application. Also discuss what provisions will be made in the design of the fuel oil storage and transfer system in the use of a impressed current type cathodic protection system, in addition to waterproof protective coatings, to minimize corrosion of buried piping or equipment. If cathodic protection is not being considered, provide your justification.

Response to RAI 23

To protect against corrosion, all fuel oil transfer piping that is underground will be 304 stainless steel and will be covered with Koppers Super Service Black (or equal), 3 to 4 mils, and then wrapped with Polyken Pipeline Coating (or equal) with a 2 inch overlap. Pipes exiting or entering the ground will be wrapped to a minimum of 3 inches above ground level and encased in a concrete collar. Cathodic protection will not be used because the above mentioned materials and coverings afford adequate protection to the system piping.

The diesel oil storage tanks (DOSTs) are above ground reinforced concrete and steel lined structures and are part of the diesel generator building. The diesel oil day tanks are horizontal steel tanks located on the ground floor of the diesel generator building. Therefore, the tanks are considered as being enclosed within the building and not subjected to environmental conditions.

The liner plate and embedments for the DOSTs will be shop coated with a weldable inorganic zinc primer for protection during shipment and installation. Upon completion of the DOST liner installation, the interior surface of the DOST will be blasted clean and field coated with an epoxy coating system. This work will be performed in accordance with the coating manufacturer's and Structural Steel Painting Council requirements.

Interior and exterior surfaces of the diesel oil day tanks will also be provided with a suitable protective coating.

RAI 24

Discuss what precautions have been taken in the design of the fuel oil system in locating the fuel oil day tank and connecting fuel oil piping in the diesel generator room with regard to possible exposure to ignition sources such as open flames and hot surfaces.

Response to RAI 24

The fuel oil day tank is located 9 feet away from the EDG engine. It is at elevation 21 feet. The EDG exhaust piping, which is completely insulated, is at elevation 34.5 feet (13.5 feet above the fuel oil day tank). Since there are no open ignition sources in the EDG room and since the day tank is located in one of the cooler areas of the EDG room, the possibility of the fuel oil day tank being overheated or being in the area of an open flame is minimal. Also, when the engine is running, the radiator fan system moves air through the engine room at such a rate to prevent any heat buildup in the area where fuel oil is located.

The piping from the fuel oil day tank to the engine skid is at a low elevation in a trench below floor level and then it rises to the skid piping. The remaining piping is per the manufacturers design on the engine skid. The engine room is also protected by a complete fire detection/fire protection system.

1) Fire/heat detectors are located in the ceiling in the EDG engine room.

2) Water sprinklers are located throughout the room to protect the equipment should a fire start for any reason.

3) The building walls are three hour rated fire barriers and the entrance between the EDG rooms is equipped with a three hour rated fire doors to preclude a fire from spreading outside of the engine room.

4) The fuel oil day tank vent has a flame arrestor to ensure the fuel oil day tank is protected.

5) All off-skid fuel oil piping and the day tank that could contain fuel oil is designed to ASME Section III, Class 3 and Seismic Category I.

RAI 25

Identify all high and moderate energy lines and systems that will be installed in the diesel generator room. Discuss the measures that will be taken in the design of the diesel generator facility to protect the safety related systems, piping and components from the effects of high and moderate energy line failure to assure availability of the diesel generators when needed.

Response to RAI 25

There are no high or moderate energy lines in the EDG building.

RAI 26

The discussion of your diesel engine fuel oil storage and transfer system (EDEFSS) does not specifically reference ANSI Standard N195 "Fuel Oil Systems for Standby Diesel Generators". Indicate if you intend to comply with this standard in your design of the EDEFSS; otherwise, provide justification for non-compliance.

Response to RAI 26

The fuel oil storage and transfer system complies with ANSI Standard N195-1976, Fuel Oil Systems for Standby Diesel Generators with the following single exception. The overflow line for the day tank does not go to the fuel oil supply tank, but goes to a waste sump located outside the EDG building. For justification, see response to RAI 20 for controls and instrumentation which would prevent or alarm this condition.

RAI 27

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 to RAI 27

Should this unlikely event occur, the following provisions have been made to eliminate fouling of the fuel oil to the EDG.

1) The fuel oil transfer pump takes suction from an elevation 19.5 feet, 6 inches from the local bottom of the fuel oil storage tank. The 12 gpm through the 3 inch suction line has a flow velocity of approximately 0.55 feet/second, which is very low, therefore, it will not cause turbulence of any sediment at the intake to the suction line.

2) The fill line to the fuel oil storage tank enters the tank at the 45 feet elevation and terminates inside the tank at the 42.5 feet elevation. Technical Specification requires a minimum seven day supply and the level for this quantity of fuel oil is the 42.2 feet elevation. The EDG at full load will use approximately 3 feet of fuel oil per 24 hours. When the fuel oil level decreases below 42.2 feet elevation, arrangements will be made to obtain more fuel oil. Assuming it takes four days to obtain more fuel oil, the fuel oil elevation at that point will be 29.2 feet, which is approximately 10 feet above the suction line and greater than 10 feet above the bottom of the tank. Since the fill line is oversized to assure low velocity flow, the dynamic effects of the new fuel oil entering the storage tank will be insignificant with respect to stirring up the fuel oil at the bottom of the storage tank.

3) The fuel oil transfer pumps also have duplex suction strainers to further assure that no debris is transferred from the fuel oil storage tank to the fuel oil day tank. The suction strainers can be shifted while the transfer pumps are in operation, and the strainer that is out of service can be cleaned and made ready for service while the transfer pump is operating. The suction strainers also have a differential pressure gauge across them so the operator can determine if the strainer needs to be cleaned.

4) The fuel oil entering the fuel oil storage tank must pass through a one micron filter. This will assure that no particles larger than one micron will enter the fuel oil storage tank.

5) In addition to the above, fuel oil exiting the day tank first passes through a duplex suction strainer, then the fuel oil pump and finally, just before it enters the engine fuel racks, the fuel oil must pass through a one micron duplex filter. Both the strainer and the filter can be changed and cleaned while the EDG is in operation and both have differential pressure indication/switches to alert the operator that the strainer/filter in service needs cleaning long before fuel oil would be restricted from the EDG.

<u>RAI 28</u>

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 of its equivalent, cloud point, entrained moisture, sulfur, particulates and other deleterious insoluble substances; procedure for testing newly delivered fuel, periodic sampling and testing of on-site 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) standard which will be followed to assure a reliable fuel oil supply to the emergency generators.

<u>Response to RAI 28</u>

The quality and reliability of the fuel oil supply is assured per existing procedure. For particulate testing, the program follows the requirements of ASTM-2276. The remainder of the fuel oil testing follows the requirements of ASTM-D975-1981. All monthly tests are completed every 31 days and all quarterly tests are performed on a bi-monthly basis. Every eighteen months, the fuel oil is also tested per manufacturer standards which includes all requirements of ASTM-D975-1981 plus testing for chlorides. These same or equivalent requirements will apply to the new fuel oil supply system.

<u>RAI 29</u>

Discuss the design considerations that will/have determine(d) the physical location of the diesel engine fuel oil day tank(s) at your facility. Assure that the proposed/selected physical location of the fuel oil day tank(s) meet(s) the requirements of the diesel engine manufacturers.

<u>Response to RAI 29</u>

The fuel oil day tank has a total capacity of 650 gallons. The tank has a critical low level alarm, a one hour alarm and a high level alarm. The internal diameter of the tank is 42 inches. The tank is mounted horizontally; its overall length is approximately 117.5 inches.

The fuel oil day tank normally has between 20 and 37 inches of fuel oil in it, the fuel oil transfer pump auto-start and auto-stop levels, respectively. Therefore, there is usually enough fuel oil in the day tank to support about three hours of EDG operation.

The physical location of the fuel oil day tank was selected taking into account the following considerations.

1) For fire safety, the tank could not be located near hot surfaces such as the engine or an exposed section of the exhaust piping.

2) The tank must be accessible to be able to perform maintenance on the level switches.

3) The elevation of the tank could not be too high because its head pressure would overcome the ten psi check valves in the EDG fuel oil piping system to the engine. These valves must open only when the EDG fuel oil pumps are running.

4) The elevation could not be too low because the EDG fuel oil pumps would not have sufficient NPSH to supply fuel oil to the engine. The tank location meets the requirements of the diesel engine manufacturer.

5) The tank has been located where it can be seismically supported to assure it can withstand earthquake loadings.

6) The tank has been located where it is protected from tornado missiles or other natural phenomena.

7) The tank has been located where it is safe from sabotage, that is, within the vital security area.

8) The tank has been located such that it will not interfere with normal EDG maintenance. The engine room requires access for monorails and equipment dollies for engine maintenance.

9) The tank has been located in a fire protected area because of the fuel oil the tank contains.

RAI 30

Will the diesel generator fuel oil storage tank be provided with an individual fill and vent line. Indicate where these lines are located (indoor or outdoor) and the height these lines are terminated above finished ground grade. If these lines are located outdoors, discuss the provisions made in your design to prevent entrance of water into the storage tank during adverse environmental conditions.

Response to RAI 30

The fuel oil storage tanks have individual vent lines. The fill lines are tied into the fuel transfer system so fuel oil can be transferred between the fuel oil storage tanks if required. The fill lines enter the tanks at the 45 feet elevation and terminate inside the tank at the 42.5 feet elevation. The ground elevation is 18 feet. The truck fill connection to the fuel oil transfer piping is located outside the EDG building at elevation 22.5 feet (4.5 feet above ground level), with a normally closed valve. It also has a quick-disconnect fitting and a cap.

The vent on the roof of the building has a flame arrestor and a 180 degree elbow, both of which will prevent water from entering the fuel oil storage tank during inclement weather. The vent lines flame arrestors are located at approximately the 52 feet elevation on the roof of the EDG building.

RAI 31

We require the vent line from each diesel day tank to be designed to seismic Category 1, Class C requirements. Also, the portion of the vent line and flame arrestor exposed above the diesel generator building roof should be protected from damage by tornado missiles. Your design should meet these requirements.

Response to RAI 31

As stated in Response to RAI 26, the fuel oil system is designed in accordance with ANSI Standard N195-1976, with one minor exception, the vent line. The above standard requires only materials for pressure containing components to be designed to ASME Section III, Subsections ND. Since vent lines are not pressure containing components (they are open to the atmosphere) and since they are located at an elevation above any fuel oil level, they were designed to ANSI Standard B31.1. However, each vent line from its day tank to the building roof has been seismically analyzed and shown to be acceptable.

The vent line flame arrestor and all piping exposed above the roof are made from extra heavy steel. The impact of a tornado missile causing the complete loss of function of the vent line and flame arrestor is not considered credible since almost complete crimping would be required to cause a vacuum to be formed in the tank.

RAI 36

For the diesel engine cooling water system discuss the testing necessary to maintain and assure a highly reliable instrumentation, control, sensor, and alarm system. Identify the temperature, pressure, level, and flow (where applicable) sensors which alert the operator when these parameters exceed the range recommended by the engine manufacturer and describe what operator actions are required during alarm conditions to prevent harmful effects to the diesel engine. Discuss the systems interlocks provided.

Response to RAI 36

The diesel engine cooling water system has instruments, controls and alarms either local or on the local control panels for EDG-4A or EDG-4B. Any abnormal condition in the cooling water system is annunciated locally at the local control panels of EDG-4A or EDG-4B and in the main control room through a common trouble annunciator. For listing of instrumentation, see Table 36-1.

The necessary controls are provided with each cooling system to maintain the engine jacket at the proper temperature for all modes of operation. Alarms are provided at the local control panel, with a common EDG trouble alarm in the main control room, for low expansion water tank level, abnormal jacket water temperature, and low jacket water pressure at the inlet to the engine. The operator action required following alarm actuation will be specified in off-normal operating procedures. These actions will be consistent with the manufacturer's guidelines.

Response to RAI 5

GDC 2

The new EDG and Diesel Oil Storage Building, containing the majority of the new EPS equipment, is designed and constructed as a seismic Category I structure and is designed to withstand design basis natural phenomena including earthquake (Maximum Hypothetical Earthquake of 0.15g), wind, tornado (including tornado-generated missiles) and flooding. The latest criteria, including the applicable Regulatory Guides which address natural phenomena (e.g., RG 1.76), were used in the design of this structure. The new equipment housed in this structure thus meets the current GDC 2. Any of the new equipment which is located outside of the new structure is also housed in seismic Class I structures and protected against the effects of natural phenomena. As a minimum, equipment located outside the new structure meets the criteria specified in the FSAR for compliance with GDC 2.

GDC 4

The new equipment being installed for the EPS Enhancement Project is appropriately specified and designed to accommodate the effects of and be compatible with the environmental conditions associated with normal operation, maintenance and testing. The equipment in the new building is in a mild environment, and is not subject to a design basis accident harsh environment as currently defined in 10 CFR 50.49. Any new equipment being located in the Auxiliary Building is designed as a minimum to meet the environmental conditions specified for the existing equipment located in the same locations.

The new equipment installed in the new building is not subject to high energy pipe break effects (i.e. dynamic effects, missiles, pipe whip or jet impingement) or to moderate energy pipe cracks. Any new equipment located in the Auxiliary Building is evaluated against the existing pipe break criteria presented in the Turkey Point FSAR. In addition, the location of new equipment will consider the pipe break criteria presented in NUREG-0800, Appendix B to Branch Technical Position ASB 3-1.

GDC 5

The enhanced EPS configuration is not intended to modify the existing design of shared equipment, but is designed to provide additional installed EDG capacity. Under the Enhancement Project, shared systems currently available to Turkey Point Units 3 & 4 are retained. Consistent with GDC 5, such sharing does not significantly impair their ability to perform their safety functions including (in the event of an accident in one unit) an orderly shutdown and cooldown of the other unit.

RAI 6

It is understood that 125 VDC Bus 3A is to be connected to 125 VDC Bus 4B (and Bus 3B to 4A) for battery testing. What limits are placed on the conditions under which or the length of time that the buses are to be connected?

Response to RAI 6

The limits for testing the existing plant batteries and the length of time that the buses are connected are defined by existing plant procedures. These limits will not be impacted by the EPS Enhancement Project. Please note that current plant practice is to connect 125 VDC Bus 3A and 125VDC Bus 4B to the existing C-Bus batteries, and not to each other, whenever battery testing is required.

RAI 7

Describe the operation of the 4160 volt ties between buses 4B and 4C, 4A and 4C, 3B and 3C, 3A and 3C, 3A and 4A (Auxiliary Transformer connection), and 4A and 3A (Auxiliary Transformer connection). What interlocks, keylocks or administrative procedures ensure electrical separation between unit divisions (A and B), between units (3 and 4), and between safety and non-safety buses.

Response to RAI 7

The operation of the 4160 volt ties between the identified buses is defined by existing plant procedures and will not be impacted by the EPS Enhancement Project. Please note that the ties between 3A and 4A, and 4A and 3A are at the startup transformers and not the auxiliary transformers.

RAI 8

After the system enhancement, what major systems/equipment important to safety will be shared by the two units? What are the alternative power supply sources (buses) for these systems/equipment?

Response to RAI 8

Major equipment shared by both units includes:

COMPONENT/NO. AVAILABLE

- High Head SI Pumps/4
- Auxiliary Feedwater Pumps/3 (See Note)
- Battery Chargers (in existing)/6
  (in enhanced)/8
- 125 V DC Batteries/4
- Control Room AC Units/3
- Boric Acid Heat Trace/2
- Boric Acid Tank Heaters/3
- Boric Acid Pumps/3
- Miscellaneous HVAC

Note: AFW System not affected by scope of Enhancement Project.

In the enhanced design, each High Head Safety Injection Pump is still powered from its own 4.16 kV bus, which now has a single EDG associated with it. Thus the single failure of an EDG does not result in the loss of more than one HHSI pump.

If the cooling water pressure and temperature go beyond their shutdown limits, the diesel generators are interlocked to shutdown under non-emergency conditions.

System components are inspected and tested by the manufacturer. After installation and before plant startup, the cooling water systems are inspected, tested and operated. Testing will be performed to verify system operability per Technical Specification requirements in accordance with manufacturer recommendations and applicable codes and standards.

TABLE 36-1

COOLING WATER SYSTEM INSTRUMENTS

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
PS-42	Cooling Water Pressure Low	Local	25psig			X	
PS-41	Cooling Water Pressure High	Local	30psig				X
TS-42	Cooling Water Temp High	Local	208°F			X	
TS-41	Cooling Water Temp High	Local	215°F				X
TS-43	Cooling Water Temp Low	Local	95°F			X	
TS-44	Immersion Htr Temp Control	Local	125°F-155°F		X		
TS-45	Lube Oil Temp. Enable for Diff. Press. Across Lube Oil Cooler	Local	160°F		X (1)		
TI-41	Cooling Water Temp Engine Out	Local	50°F-300°F	X			
TI-42	Cooling Water Temp Radiator Out	Local	50°F-300°F	X			
TI-43	Cooling Water Temp Engine In	Local	50°F-300°F	X			
TI-44	Cooling Water Temp Engine Out	Local	50°F-300°F	X			
TI-45	Cooling Water Temp Radiator Out	Local	50°F-300°F	X			
TI-46	Cooling Water Temp Engine In	Local	50°F-300°F	X			
TI-47	Cooling Water Temp Radiator In	Local	50°F-300°F	X			
LV-41	Expansion Tank Level Low	Local	7.2"			X	

* Manufacturer tag number
** All values are approximate and may change as detailed design is finalized.

(1) - Enables annunciator circuit for high differential pressure across lube oil cooler.

RAI 40

Provide the source of power for the standby immersion heater in the diesel engine cooling water systems.

Response to RAI 40

The standby immersion heaters in the diesel engines' cooling water systems are provided power via Class 1E Motor Control Centers, 4J and 4K for EDG's 4A and 4B, respectively.

RAI 41

What is the source of power for the electric motor driven (AC and DC) external lube oil pumps.

Response to RAI 41

The ac motor driven external lube oil pumps are provided power via Class 1E Motor Control Centers, 4J and 4K for EDGs 4A and 4B, respectively. The dc motor driven external lube oil pumps are provided power via Class 1E 125V DC buses, 4D23 and 4D01 for EDGs 4A and 4B, respectively.

RAI 42

Provide a discussion of the measures that have been taken in the design of the standby diesel generator air starting system to preclude the fouling of the air start valve or filter with moisture and contaminants such as oil carryover and rust.

Response to RAI 42

The air start systems to be used for the new EDGs will essentially eliminate moisture carry over into the starting air receivers because a refrigerant-type air dryer will be installed between the air compressors and the air receivers. Whenever the air compressors are operating, the air dryer will also be operating. Therefore, the air entering the air receivers will have a very low dewpoint. As an additional precaution, the air receivers and all system piping, valves and instruments are to be made from stainless steel to further prevent rusting. The air receivers will be monitored for moisture buildup with water detection devices which will alarm should moisture accumulate in the air receivers. As an administrative control, the air receivers will also be checked monthly for water/moisture buildup. A wye type strainer is also installed in the air start piping just as the air enters the skid piping to further control the possibility of water entering the air start motors.

Oil carryover is not a concern because of the design of the system (i.e., use of prefilters, dryers, receiver piping arrangement, etc.). It should also be noted that a small amount of oil is actually injected into the air start piping just upstream of the air start motors to assure they are properly lubricated. This is the manufacturer's normal design.

Note: The above design description represents a change which is being incorporated into the design of the new EDGs which was not addressed in the June 23, 1988 submittal.

RAI 43

For the diesel engine air starting system, describe the testing necessary to maintain a highly reliable instrumentation, control, sensor and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided.

Response to RAI 43

The diesel engine air starting system is equipped with controls and alarms for:

1) Independently starting and stopping the compressor.

2) Operating each or both air motors.

3) Alarming low starting air pressure with a common EDG alarm in the control room.

Indication of starting air pressure upstream of the starting air valves is provided in the EDG control room and locally. The EDG starting air system indications and alarms are summarized in Table 43-1.

The operator action required following alarm actuation will be specified in the off-normal operating procedures. These actions will be consistent with the manufacturer's guidelines.

This system has no interlocks to shutdown the diesel generators.

System components are inspected and tested by the manufacturer. After installation and before plant startup, the air start systems are inspected, tested and operated. Testing will be performed to verify system operability per Technical Specification requirements in accordance with manufacturer recommendations and applicable codes and standards.

TABLE 43-1

STARTING AIR INSTRUMENTS

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
PS-71	Starting Air Tank Pressure Low	Local	197psig			X	
PS-72	Starting Air Tank Pressure High	Local	215psig			X	
PI-71	Air Receiver Press	Local	0-300psig	X			
PI-72	Air Receiver Press	Local	0-300psig	X			
PI-73	Engine Start Air Pressure - Left	Local	0-300psig	X			
PI-74	Engine Start Air Pressure - Right	Local	0-300psig	X			
PI-75	Engine Start Air Pressure - Left	Local	0-300psig	X			
PI-76	Engine Start Air Pressure - Right	Local	0-300psig	X			
PS-73	Start Air Line Pressure Low	Local	197psig			X	
PS-74	Start Pinion - Fail to Engage/Recycle Control	Local	10psig			X	
PS-75	Air Compress Motor Control	Local	193-202psig		X		

* Manufacturer tag number
** All values are approximate and may change as detailed design is finalized.

RAI 44

Expand your description of the diesel engine starting system. Describe the diesel engine starting sequence including the number of air start valves used and whether one or both air motors are used.

Response to RAI 44

Each engine has four air start motors. For a normal start, all four air motors are used to roll over the engine. If two air start motors are inoperable, the other two have sufficient torque to start the EDG in the required time interval. If one set of air start motors do not engage to roll over the engine during a start attempt, an alarm will alert the operator that these air start motors are not functional even though the EDG has started. This provides an added safety feature which will allow maintenance to correct any problem with the inoperable set of air start motors prior to the next start attempt.

When the air start system is in normal standby, there is approximately 200 psig air pressure in the piping up to the two redundant air start solenoid valves. The electrical start signal will open both of the air start solenoid valves and admit starting air to the lubricator assembly and then to the air start motors. When the starting air enters the air start motor assemblies, it first pressurizes the pinion which engages the air start motor to the engine flywheel; then the air starts to turn the air start motor internals and the engine flywheel together.

When the air pressure downstream of the air start motors builds to a preset value due to the air start motors rotational velocity, a pneumatic pressure sensing line sends air to the governor servo-booster pump and simultaneously to the top side of the air start solenoid valve. This allows the governor to obtain control of the EDG faster and it also shuts the air start solenoid valve when the EDG has reached the necessary starting speed so the fuel racks can maintain and accelerate the engine to the desired rpm.

RAI 45

A study by the University of Dayton has shown that accumulation of water in the starting air system has been one of the most frequent causes of diesel engine failure to start on demand. Condensation of entrained moisture in compressed air lines leading to control and starting air valves, air start motors, and condensation of moisture on the working surfaces of these components has caused rust, scale and water itself to build up and score and jam the internal working parts of these vital components thereby preventing starting of the diesel generators.

In the event of loss of offsite power the diesel generators must function since they are vital to the safe shutdown of the reactor(s). Failure of the diesel engines to start from the effects of moisture condensation in air starting systems and from other causes have lowered their operational reliability substantially. In an effort toward improving diesel engine starting reliability we require that compressed air starting system designs include air dryers for the removal of entrained moisture. The two air dryers most commonly used are the desiccant and refrigerant types. Of these two types, the refrigerant type is the one most suited for this application and therefore is preferred. Starting air should be dried to a dew point of not more than 50°F when installed in a normally controlled 70°F environment, otherwise the starting air dew point should be controlled to at least 10°F less than the lowest expected ambient temperature.

Describe the design of the diesel engine air starting system with respect to this concern.

Response to RAI 45

A refrigerated type air dryer and filter is incorporated into the air start systems for both the diesel and electric driven air compressors. A dew point of 0°F and a maximum particulate size of 1 micron has been specified as the minimum air quality requirements for the air dryer package. (Note the equipment has not been selected at this time.) Additionally, the air receivers, system piping up to the skid, valves and instruments are made of stainless steel to prevent the generation of rust particles. The air receivers will be monitored for moisture buildup with water detection devices which will alarm should the air dryer fail and moisture accumulate in the air receivers. (Also see response to RAI 42.)

Note: The above design description represents a change which is being incorporated into the design of the new EDGs which was not addressed in the June 23, 1988 submittal.

RAI 46

Provide the source of power for the motor driven air stating system compressor and the motor characteristics, i.e., motor hp, operating voltage.

Response to RAI 46

The motor driven air starting system compressors are provided power via Class 1E Motor Control Centers, 4J and 4K for EDG's 4A and 4B, respectively. Motors are rated 10 hp for use on a 480 V AC, 3-phase 60 Hz system.

RAI 48

For the diesel engine lubrication oil system, describe the testing necessary to maintain a highly reliable instrumentation, control, sensor, and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe any operator action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided.

Response to RAI 48

The diesel engine lubrication oil system has instruments, controls and alarms either local or on the local panels for EDG-4A and EDG-4B. Abnormal conditions in the lube oil system are annunciated locally at the local control panels of EDG-4A or EDG-4B and in the main control room through a common trouble annunciator. For listing of instrumentation, see Table 48-1.

The necessary controls are provided with each lube oil system to maintain the proper engine lubrication for all modes of operation. Operator action required following alarm actuation will be specified in off-normal operating procedures. These actions will be consistent with the manufacturer's guidelines.

Interlocks which result in shutdown of the EDG are shown on Table 48-1.

System components are inspected and tested by the manufacturer. After installation and before plant startup, the lubrication oil systems are inspected, tested and operated. Testing will be performed to verify system operability per Technical Specification requirements in accordance with manufacturer recommendations and applicable codes and standards.

TABLE 48-1

LUBE OIL SYSTEM INSTRUMENTS

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
PS21	Crankcase Pressure High	Local	0.8-1.8" H2O				X
PS31	Oil Pressure Low	Local	17psig			X	X
PS32	Low Oil Pressure Control-Idle	Local	25psig		X	X	
PS33	Low Oil Pressure Alarm-Running	Local	40psig			X	
PS34	Low Turbo Oil Pressure Alarm	Local	6psig			X	
PS35	Low Circ Oil Pressure Alarm	Local	6psig			X	
PS36	Low Piston Cooling Oil Pressure Shutdown	Local	6psig			X	
PS37	Backup DC Turbo Oil Pump Control	Local	20psig INC 15psig DEC		X X		
PS38	Backup DC Circ Oil Pump Control	Local	20psig INC 15psig DEC		X X		
DPS31	Engine Oil Storage Differential High Alarm	Local	6psig			X	
DPS32	Oil Filter Differential High Alarm	Local	20psi			X	
DPS33	Oil Cooler Differential High Alarm	Local	30psi			X	
DPS34	Engine Pump Differential High Alarm	Local	4psi			X	
DPS35	Aux Turbo Oil Filter Differential High Alarm	Local	20psi			X	
DPS36	Turbo Oil Filter Differential High Alarm	Local	20psi			X	
PI31	Engine Oil Pressure	Local	0-160psig	X			
PI32	Turbo Standby Oil Pressure	Local	0-100psig	X			
PI33	Engine Oil Pressure	Local	0-160psig	X			

TABLE 48-1 (Cont'd)

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
TS31	High Oil Temperature Shutdown/Alarm	Local	230°F			X	X
TS32	Low Oil Temperature Alarm	Local	65°F			X	
TS33	High Oil Temperature Alarm	Local	220°F			X	
LV31	Engine Oil Sump Level Low	Local	7 1/4"			X	
MD31	Metal Particles in Oil Alarm	Local	Fixed			X	
DPI31	Oil Filter Differential Pressure	Local	0-60psi			X	
DPI32	Oil Strainer Differential Pressure	Local	0-20psi			X	

* Manufacturer tag number
** All values are approximate and may change as detailed design is finalized.

RAI 49

Describe the instrumentation, controls, sensors and alarms provided in the design of the diesel engine combustion air intake and exhaust system which alert the operator when parameters exceed ranges recommended by the engine manufacturer and describe any operator action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided.

Response to RAI 49

The diesel engine combustion air intake and exhaust system has instruments, controls and alarms on the local panels for EDG-4A and EDG-4B. For listing of instrumentation, see Table 49-1.

Indication is provided at the local control panel for intake air manifold temperature, turbocharger inlet and outlet air temperature, individual cylinder exhaust temperature, and intake air manifold pressure. A common trouble alarm will be provided in the main control room and individual alarms on the local panel for intake air filter high differential pressure and for a failed turbocharger bearing.

Operator action required following alarm actuation will be specified in off-normal operating procedures. These actions will be consistent with the manufacturer's guidelines.

Interlocks which result in shutdown of the EDG are shown in Table 49-1.

System components are inspected and tested by the manufacturer. After installation and before plant startup, the combustion air intake and exhaust systems are inspected, tested and operated. Testing will be perform to verify system operability per Technical Specification requirements in accordance with manufacturer recommendations and applicable codes and standards.

TABLE 49-1

COMBUSTION AIR INSTRUMENTS

TAG*	DESCRIPTION	LOCATION	SETPOINT/ RANGE**	INDIC.	CONTROL	ALARM	SHUTDOWN
PI-81	Air Box Pressure	Local	0-30psig	X			
PS-81	Combust Air Press Low	Local	10psig 7psig			X	 X
TS-82	Combust Air Temp High	Local	160°F			X	
TS-81	Combust Air Temp High	Local	180°F				X
PS-91	Exhaust Air Press High	Local	TBD			X	X
TM-91	Exhaust Temp High	Local	TBD			X	X
TI-91	Engine Exhaust Pyrometer	Local	0-1200°F	X			
TM-93	Turbocharger Temp High	Local	500°F			X	
TM-92	Turbocharger Temp High	Local	550°F				X

* Manufacturer tag number
** All values are approximate and may change as detailed design is finalized.

RAI 50

Show by analysis that a potential fire in the diesel generator building together with a single failure of the fire protection system will not degrade the quality of the diesel combustion air so that the remaining diesel will be able to provide full rated power.

Response to RAI 50

With a fire in one engine room, it is also assumed that the engine room in question has had a failure of its fire protection system. It is required that the other EDG can operate at 100 percent load if it is called upon to do so.

Between the two engine rooms is a three hour rated fire wall and a fire rated door. Therefore, a fire in one engine room would not cause overheating of the other engine room.

The smoke from this fire will exit the engine room via the south side and the north side of the building. The smoke exiting through the radiator fans in the south wall will not interfere with the operation of the other EDG in any way since a fire barrier separates the south walls of the two EDGs.

It is possible for smoke to exit the north wall if the engine is not running, or more precisely, the radiator and room exhaust fans for that engine are not running. The smoke would have to ascend up into the air compressor room through the 22 by 25 foot grating, and migrate north to the normal air intake opening. The smoke would then be required to descend to below the 50 foot elevation through the security barriers (grating) that are 8.0 by 25 feet. At this point, the smoke would be falling down along the north wall of the building and therefore, could not go directly to the air intake of the other EDG room because there is a divider wall separating the two air intakes. The smoke would have to travel north approximately four feet and then travel east (or west) to the intake of the other EDG room. During this time, when the smoke is outside in the atmosphere, most of it will rise to a height above the air intake of the other EDG room. Although it may be possible for some smoke to find its way to the intake of the other EDG room, the amount will be reduced because of the torturous path it must follow. Also, when the smoke leaves the north wall of the burning EDG, it will be mixing with fresh air before traveling to the intake of the other EDG room. It must also be considered that the main stream of air entering the operating EDG room will be coming from the north side, well below the 50 feet elevation. Therefore, the amount of smoke that could be entrained in the air intake of the operating EDG would be minimal and for a relatively short duration of time.

Since the EDG operates at a relatively high excess of oxygen, some amount of smoke in the combustion air system could be accommodated by the EDG simply taking in more combustion air to make up the difference in order to obtain 100 percent power.

RAI 51

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

Response to RAI 51

Combustion air and cooling intake air enters the EDG building on the north side at the 51 feet elevation. Since the ground elevation is 18 feet, there is a minimum amount of dust or other deleterious materials in the air at an elevation of 33 feet above ground level. This air travels through the air compressor room at the 42 feet elevation, down through the grating and into the engine room. Some of the air goes into the engine as combustion air, and the remainder is exhausted out the south wall through the cooling water radiators. Although this air should be reasonably clean, there will be some dust, etc. entrained in it, and therefore, all switches in these rooms will be enclosed to protect them from dust and moisture.

The greater quantity of switches, relays and other electrical contacts will be located in the local control rooms located directly above the EDGs. These rooms are separate from the engine rooms and will be climate controlled, i.e., air entering these rooms will be filtered and cooled via the air conditioning units on the roof. Not only will this arrangement prevent dust and other deleterious material from fouling the electrical equipment, it will also prevent excess moisture from accumulating in the room that could cause rusting or corroding of electrical contacts or the drifting of setpoints of instruments and meters due to temperature variations.

Concrete walls and floors in the EDG building will also be sealed and/or painted to preclude any dust, especially concrete dust, from being generated internally. Smooth, clean and sealed surfaces are necessary for general good housekeeping, but especially in the engine room where lube oil, cooling water with inhibitors and fuel oil fumes are likely to be present.

In addition, housekeeping and cleanliness control procedures applicable to existing plant areas will be applied to the new EDG building.