metal-enclosed switchgear with incoming main circuit breaker. The 480 V emergency buses are physically isolated and electrically independent.

The normal and safety related 4,160-480 V transformers are rated 1,000/1,333 kVa, 3 ph, 60 Hz. The circuit breakers used as bus ties in the double ended load centers and all incoming main circuit breakers are rated 1,600 amp continuous and have an interrupting capacity of 50,000 amp symmetrical. All other feeder breakers are rated 600 amp continuous and have an interrupting capacity of 30,000 amp symmetrical with instantaneous trips and 22,000 amp symmetrical without instantaneous trips. All load center breakers are air-magnetic, drawout type.

Power for motors approximately 100 hp and smaller and other small power requirements are, in general, fed from motor control centers (MCCs) supplied from the normal or emergency 480 V unit substations. The MCCs are self-supporting metal-clad structures with circuit breaker type combination magnetic reversing or nonreversing motor starters and molded case circuit breakers. Breakers used in combination starters have a 14,000 amp symmetrical interrupting capacity. Breakers used for branch feeders have 22,000 amp symmetrical interrupting capacity.

Emergency MCCs are physically separated such that any design basis event which may affect one redundant system shall not jeopardize proper operation of the other system. Class IE circuits are designed to operate as required under lowest postulated transmission system conditions.

Essential nonsafety related 480 V loads required during the loss of offsite power are supplied from the emergency 480 V system through two circuit breakers connected in series and physically separated from each other. Certain nonsafety loads are tripped free of the emergency buses at the time of a LOCA (see Table 8.3.1-1 for details).

8.3.1.1.5 Onsite Standby Power Supply

The rating of each diesel generator set is as follows:

Continuous (8,760 hr)	3,500 kW
2,000 hr	3,500 kW
160 hr	3,500 kW
2 hr per 24 hr period	3,900 kW
30 min	3,900 kW

The 2 hr rating in any 24 hr period is the rating without reducing the maintenance interval established for the continuous rating.

The emergency diesel generators are automatically started on:

1. Loss of voltage to the respective 4,160 V bus to which each generator is connected.

2. High drywell pressure.

3. Low reactor coolant level signal.

If the preferred (offsite) power source is not available, the emergency diesel generators are automatically connected to the 4,160 V emergency buses and sequentially loaded. The capacity of any two emergency diesel generators is sufficient to meet the safety related load required by a loss of coolant accident and loss of offsite ac power. The required loads and maximum coincident demand is shown in Table 8.3.1-1. The emergency diesel generator loading sequence for the above shutdown conditions is shown in Table 8.3.1-2. The loading sequence prevents system instability during motor starting. A fast responding exciter and a voltage regulator ensure quick voltage recovery after any load step. The generators use field flashing for quick voltage buildup during the starting sequence. Each diesel generator has independent start control circuits. The emergency diesel generator units are housed in separate Seismic Category I rooms.

Cooling water for each emergency diesel generator is supplied by the service water system. For a complete description, refer to Section 9.5.5.

Each diesel engine has redundant, independent air starting systems. Engine cranking is accomplished by two stored air supplies with sufficient capacity for each of the two supplies to start the engine at least five times without using an air compressor. Fast starting and load pickup are facilitated by electric heaters which keep the engines warm when they are not running. For a complete description, refer to Section 9.5.6.

Each diesel generator is equipped with protective relays which shut the unit down automatically in the event of unit faults. During operation under emergency conditions, trip conditions are limited to those, which if allowed to continue, would rapidly result in the loss of the emergency diesel generator. The emergency diesel generators are tripped automatically under the following conditions:

	Function	Trip	
		Exercise Mode	DBA
1.	Reverse Power	X	
2.	Loss of Excitation	X	
3.	Overcurrent - voltage restrained	X	X
4.	Generator Differential	X	X
5.	Lube Oil Low Pressure	X	

6. Lube Oil High Temperature	X	
7. Turbo Oil Low Pressure	X	
8. Jacket Water High Temperature	X	
9. Crankcase High Pressure	X	
10. Overspeed	X	X

Surveillance instrumentation is provided to monitor the status of the diesel generator. Provisions for surveillance are an essential requirement in the design, manufacture, installation, testing, operation, and maintenance of the diesel generators. Such surveillance not only provides continuous monitoring of the status of the emergency generators so as to indicate their readiness to perform their intended function, but also serves to facilitate testing and maintenance of the equipment. Conditions which can adversely affect performance of the emergency diesel generators are annunciated locally and in the main control room. The following list shows the important functions that are annunciated:

	Alarm	
Function	Local	Control Room
1. Low Pressure Lube Oil	X	X
2. High Temperature Lube Oil	X	
3. Low Pressure Turbo Oil	X	
4. High & Low Temperature Jacket Water	X	
5. Low Pressure Jacket Water	X	
6. Low Level Jacket Water	X	
7. Low Level Fuel Day Tank	X	
8. Low Level Lube Oil	X	
9. Low Pressure Starting Air	X	
10. Aux. Pump Switches Off	X	
11. Low Pressure Lube Oil Shutdown	X	
12. High Temperature Lube Oil Shutdown	X	
13. Low Pressure Turbo Oil Shutdown	X	
14. High Temperature Jacket Water Shutdown	X	
15. High Pressure Crankcase Shutdown	X	
16. Overspeed Shutdown	X	X
17. Low Pressure Fuel Oil	X	
18. High Level Fuel Day Tank	X	
19. Low Flow Service Water	X	
20. Fail to Start	X	
21. Unit Unavailable	X	
22. Diesel System Degraded		X
23. Diesel System Inoperative		X
24. Diesel Engine Trouble		X
25. Emergency Bus Supply or Feeder Breaker Auto Trip		X
26. Generator Neutral Ground Overcurrent		X
27. Low Level Fuel Storage Tank	X	
28. Generator Field Manual Shutdown	X	
29. Generator PT Blown Fuse		X
30. Generator Voltage Regulator Power Failure		X
31. Main Board Control Disabled	X	X

	Alarm	
	Local	Control Room
32. Generator Heater Loss of Control	X	
33. F.O. Suction Strainer High Differential Pressure	X	
34. Jacket Water Conductivity High	X	
35. Motor Driven Fuel Pump Running	X	
36. Field Flash Inoperative	X	
37. Fuel Oil Transfer Pump Locked Out	X	
38. Fuel Oil Booster Pump Strainer High Differential Pressure	X	

Note: Alarm No. 24 includes Local Alarm Nos. 2 through 10, 17, 18, 19, 20, 27, 28 and 34. Alarm No. 23 includes Local Alarm No. 21 and 36. Alarm No. 22 includes Local Alarm No. 32.

The emergency generators and the offsite power sources are synchronized only during periodic testing or restoration of service. Synchronization is done manually, through synchronization check relays, and automatic synchronization is not provided.

Onsite fuel storage is adequate for operating each emergency diesel generator at rated load for seven days. This includes one day tank for each diesel, with capacity for 2 hours of operation with the generator fully loaded.

A separate underground fuel oil storage tank for each emergency diesel generator is provided. Each storage tank has two full capacity transfer pumps that are operated automatically at preset level points in the corresponding day tank. For complete information on the fuel oil system refer to Section 9.5.4.

The criteria used to size the emergency diesel generators are:

1. The capacity of any two diesels is adequate to meet the safety features demand caused by a loss of coolant accident. The established demand is shown in Table 8.3.1-1.

2. The maximum continuous load imposed on the diesel is less than the continuous rating of the machine, defined as the output the unit is expected to maintain for a minimum of 8,700 hours. The maximum intermittent load in the first 60 seconds (approx) during the operation of the motor-operated valves is less than the 2-hour rating of the machine. These loads are given in Table 8.3.1-1.

3. Each generator is capable of starting and accelerating to rated speed, in the required sequence, all of its

engineered safety features and emergency shutdown loads, as shown in Table 8.3.1-2.

Sizing of the emergency diesel generators is consistent with Regulatory Guide 1.9.

Each of the emergency diesel generator units is located in its own separate room within the control building, as shown on the physical drawing (Figs. 3.8.4-6 and 7).

TABLE 8.3.1-1

EMERGENCY DIESEL GENERATOR SYSTEM
REQUIRED LOADS AND MAXIMUM COINCIDENT DEMAND

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required: Design Basis Loss of Coolant Accident 0-10 Min	Number Required: Design Basis Loss of Coolant Accident 10 Min on	Number Required: Loss of Offsite Power (Hot Standby)	Maximum Coincident Demand (Kilowatt) [1] [2]: DG-101	DG-102	DG-103
Core Spray Pump	1250	2	1 [8]	1	-	998	998	-
Residual Heat Removal Pump	1250	4	2 [8]	1	2	999	999	1998 [4]
Service Water Pump	450	4	2	2	3 [3]	358	358	716
RBSVS and CRAC Water Chiller	292	4	2	2	2	235	235	470 [4]
RBSVS and CRAC Water Chiller Lube Oil Pump	.25	4	2	2	2	0.2	0.2	0.4 [4]
RBSVS Chiller Circ. Water Pump	75	4	2	2	2	60	60	120 [4]
RBSVS Chiller Cond. Water	20	4	2	2	2	16	16	32 [4]
RBSVS Unit Cooler	30	8	4	4	4	96	96	-
RBSVS Exhaust Fan	100	3	2	2	2	82.5	82.5	82.5
Reactor Building Exhaust Booster Fan	7.5	2	1	1	1	6	6	-
RBSVS Filter Reheat Coil	6.6 kW	2	1	1	1	6.6	6.6	-
RBCLCW Circ. Pump	100	3	2	2	2	80	80	80
Diesel Generator Air Compressor	10	6	-	-	-	12	12	12
Diesel Generator Fuel Oil Transfer Pump	.5	6	2	2	2	0.4	0.4	0.4
Diesel Generator Jacket Water Heater	36 kW	6	-	-	-	72 [13]	72 [13]	72 [13]
Diesel Generator Jacket Water Keep Warm Pump	2.5 kW	3	-	-	-	2.5 [13]	2.5 [13]	2.5 [13]
Diesel Generator Lube Oil Heater	20 kW	3	-	-	-	20 [13]	20 [13]	20 [13]
Diesel Generator Before & After Lube Oil Pump	5	3	-	-	-	4 [13]	4 [13]	4 [13]
Diesel Generator Heater	4.2 kW	3	-	-	-	4.2 [13]	4.2 [13]	4.2 [13]
Battery Charger (125 V)	60 kVa [15]	3	2	2	2	20	25	17
120 V ac Instrument Power	100 kVa DG 101 100 kVa DG 102 50 kVa DG 103	3	2	2	2	80	80	40
120 V Nonemergency Feeds	65 kVa	-	-	-	X [17]	-	-	52 [8]
Diesel Generator Room Vent Supply Fan	20	3	2	2	2	16	16	16
Battery Room Vent Supply Fan	2	3	2	2	2	1.6	1.6	1.6
Control Room Air Conditioning Unit	40	2	1	1	1	33.9	33.9	-
Control Room Vent Booster Fan	7.5	2	1	1	1	6.0	6.0	-

TABLE 8.3.1-1 (CONT'D)

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required: Design Basis Loss of Coolant Accident 0-10 Min	Number Required: Design Basis Loss of Coolant Accident 10 Min on	Number Required: Loss of Offsite Power (Hot Standby)	Maximum Coincident Demand (Kilowatt) [1] [2]: DG-101	DG-102	DG-103
Emergency Switchgear, Relay & Computer Rooms Air Conditioning Unit	40	2	1	1	1	33.9	33.9	-
TSC Air Conditioning Unit	40 kW	1	-	1	1	-	-	40 [3], [4]
TSC Air Cooled Condenser	30 kW	1	-	1	1	-	-	30 [3], [4]
Emergency Switchgear, Relay & Computer Rooms Exhaust Fan	10	2	1	1	1	8.0	8.0	-
RBSVS Chiller Room Exhaust Fan	3	2	1	1	1	2.4	2.4	-
Screenwell Exhaust Fan	10	2	1	1	1	8.0	8.0	-
Screenwell Interposing Relay Panel	1 kVa	1	1	1	1	-	0.8	-
MCC Room Ventilation	.75	2	1	1	1	0.5	0.5	-
LPCI M-G Set Room Ventilation	3	4	2	2	2	2.4	2.4	4.8
Unit Cooler MCC OB1 Room	1.5	1	1	1	1	-	1.2	-
Spent Fuel Pool Cooling Water Pump	30	2	-	1	1	24 [8]	24 [8]	-
Loop Level Pump (CS, RHR, HPCI, RCIC)	7.5	4	4	2	4	12.0	12.0	-
Atmospheric Cont. - Hyd. Recombiner	109 kW	2	-	1	-	109 [8]	109 [8]	-
MSIV-LCS Heaters	6.6 kW	4	-	-	-	-	26.4 [8]	-
MSIV-LCS Blowers	4.4	3	-	-	-	7 [8]	3.5 [8]	-
Radiation Monitoring	1	10	-	-	-	4.8	3.2	-
Lighting (Equivalent kW)	407.2 kW	-	-	-	X [7]	180 [8]	-	227.2 [8]
Fence Security Lighting	60 kW	-	-	-	X [7]	34	-	26
Reactor Protection System M-G Set [5]	25	2	-	-	2	20 [10]	20 [10]	-
Reactor Protection System Backup Transformer	25 kVa	1	-	-	1	-	-	20 [9]
Battery Charger ±24 V	3 kVa	4	-	-	-	2.4 [8]	2.4 [8]	-
Uninterruptible Power (Vital Bus) [5]	37.5 kVa	1	1	1	1	-	-	30
Uninterruptible Power (Security & Communications) [5]	20 kVa	1	1	1	1	-	-	16
Battery Charger (Security and Communication)	20 kVa [11] [5]	1	-	-	-	-	-	4
Uninterruptible Power (Computer Bus) [5]	20 kVa	1	1	1	1	16	-	-
Control Rod Drive Pump [5]	250	2	-	-	1	206.1 [8]	206.1 [8]	-
Drywell Cooling System Fan [5]	25	8	-	-	4	80 [8]	80 [8]	-

TABLE 8.3.1-1 (CONT'D)

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required: Design Basis Loss of Coolant Accident 0-10 Min	Number Required: Design Basis Loss of Coolant Accident 10 Min on	Number Required: Loss of Offsite Power (Hot Standby)	Maximum Coincident Demand (Kilowatt) (1) (8): DG-101	DG-102	DG-103
Primary Containment Air Cooler Subfeed	2 kVa	2	-	-	1	1.6 (8)	1.6 (8)	-
Reactor Water Cleanup Recirc. Pump (5)	60	2	-	-	1		48 (8)	48 (8)
Suppression Pool Pump Back Pump	25	1	-	-	-	20 (8)	-	-
Main Turbine Turning Gear (5)	60	1	-	-	1	-	-	48 (8)
Main Turbine Piggyback Turning Gear Drive	0.5	1	-	-	1	-	-	0.4 (8)
Main Turbine Turning Gear Oil Pump (5)	40	1	-	-	1	-	-	32 (8)
Main Turbine Bearing Lift Pump (5)	5	7	-	-	7	8 (8)	8 (8)	12 (8)
Feedwater Turbine Turning Gear (5)	1.5	2	-	-	2	1.2 (8)	1.2 (8)	-
Feedwater Turbine Turning Gear Oil Pump (5)	10	2	-	-	2	8 (8)	8 (8)	-
RFP EHC Control Transformer	1.5 kVa	2	-	-	2	1.2 (8)	1.2 (8)	
Standby Liquid Control Pump	40	2	-	-	-	32 (8)	32 (8)	-
Standby Liquid Control Main Heater (5)	10 kW	1	-	-	-	-	10 (8)	-
Standby Liquid Control Mixing Heater (5)	45 kW	1	-	-	-	45 (8)	-	-
Standby Liquid Control Heat Tracing	3 kVa	2	-	-	-	3 (8)	3 (8)	-
Heat Tracing Transformer	25 kVa	2	1	1	2	20	20	-
480 V M-G Set	200 (11)	4	2	2	2	160	160	214
Refueling Jib Crane	3.25	2	-	-	-	2.5 (8)	2.5 (8)	-
Refueling Platform Assembly	3.5	1	-	-	-	2.8 (8)	-	-
Motor Operated Valves	-	-	X (7)	-	-	19.7	18.3	0.7
Nonoperating MOV's (11)	-	-	-	-	-	95.9	75.3	-
Total Connectable Loads						4381.3	4147.8	4493.7
Minus Note 11 Loads						- 95.9	- 75.3	- 0
						4285.4	4072.5	4493.7
Minus Note 8 Loads						- 597.8	- 428.0	- 439.6
						3687.6	3644.5	4054.1
Minus Note 10 Loads						- 20.0	- 20.0	- 0
						3667.6	3624.5	4054.1
Minus Note 9 Loads						- 136.0	- 138.9	- 70.0
						3531.6	3485.6	3984.1
Minus Note 13 Loads						- 102.7	- 102.7	- 102.7
Total kW (60 seconds approx)						3428.9	3382.9	3881.4
Minus Operating MOV's						- 19.7	- 18.3	- 0.7

TABLE 8.3.1-1 (CONT'D)

Total kW (Prior to 10 minutes)	3409.2	3364.6	3880.7
Minus Note 4 Loads	- 0	- 0	-1310.2
Plus Note 14 Loads	0	0	+ 70.0
Total kW (After 10 minutes)	3409.2	3364.6	2640.5

NOTES:

(1) Maximum coincident demand shown occurs during the 0-10 minute period after a design basis loss of coolant accident (LOCA).

(2) Kilowatt loads given are from manufacturer's data for the CS, RHR, service water pumps, motor-generator sets, RBSVS chiller units, and all motors greater than 100 Hp.

(3) On loss of offsite power, it is necessary to go to a cold shutdown condition if DG-103 does not start, since the three required service water pumps will not be available. Note that only two service water pumps are required for a design basis LOCA condition. (Only one pump is connected automatically to DG-103, the other may be connected manually only.)

(4) Two units are started on DG-103. One unit is shut down when it is determined which section of the system will be used.

(5) These nonclass IE components are not required for a safe shutdown. Loading indicated for various modes of operation is desirable, although not essential. All remaining components are Class IE.

(6) Minimum safe shutdown requirements for a suction line break. Actual pump requirements depend on break location (see Section 6.3.3).

(7) X indicates load required.

(8) These loads are tripped intentionally (automatically) on a LOCA.

(9) These loads are not normally operating and receive no automatic start signal after a LOCA.

(10) These nonsafety related loads have seal-in type control circuits that drop out on a loss of offsite power prior to connecting to the diesel generators.

(11) These MOV's are connected to their respective diesel buses but do not operate upon a LOCA.

(12) The load to be carried by the M-G Sets consist of certain motor-operated valves. On Unit 103, one set operates at full load and one set operates unloaded.

(13) These loads are automatically tripped when diesel generator starts.

(14) These loads are prevented from starting until 10 minutes after a LOCA signal.

(15) Loads imposed by battery chargers are based on the dc loading of the battery chargers.

50-322OL I-SC-80...

NUCLEAR REGULATORY COMMISSION

Docket No. 50-322-OL Official Exh. No. 80

In the matter of LILCO - Shoreham

Staff		IDENTIFIED	✓
Applicant		RECEIVED	✓
Intervenor	✓	REJECTED	
Cont'g Off'r			
Contractor		DATE	11-8-84
Other		Witness	Panel
Reporter	ACE		

11/8/84
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