LILCO
LONG ISLAND LIGHTING COMPANY
SHOREHAM NUCLEAR POWER STATION
P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

JOHN D. LEONARD, JR.
VICE PRESIDENT - NUCLEAR OPERATIONS

October 22, 1984 SNRC-1092

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Submittal of FSAR Revision
Qualified Load - TDI Diesel Generators
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Denton:

In response to item one (1) of section 4.6 entitled "Interim Basis for Licensing" of the Safety Evaluation Report on Transamerica Delaval, Inc. (TDI) Owners Group Program Plan, we have developed a "qualified load" by a combination of analysis and testing utilizing results of a recent pre-operational test performed on October 5 and 6, 1984. Applicable sections of the FSAR were revised to provide your staff with the detailed technical bases and methods utilized in developing a qualified load of 3300 kW.

Five (5) advance copies are attached herewith for your information. Revision bars, located in the margins, are used primarily to denote substantive text changes. These revisions, as submitted, will be included as part of the forthcoming Revision 34 to the FSAR.

If any additional information is required, please contact this office.

Very truly yours,

John D. Leonard, Jr.
Vice President - Nuclear Operations

TD:ck

Attachment

B001 1/1

cc: P. Eselgroth
C. Petrone
All Parties Listed in Attachment I

ATTACHMENT I

Lawrence Brenner, Esq.
Dr. Peter A. Morris
Atomic Safety and Licensing
Board Panel
U. S. Nuclear Regulatory
Commission
Washington, DC 20555

Dr. George A. Ferguson
Administrative Judge
School of Engineering
Howard University
2300 6th Street, N.W.
Washington, DC 20059

Bernard M. Bordenick, Esq.
David A. Repka, Esq.
U. S. Nuclear Regulatory
Commission
Washington, D. C. 20555
*For Federal Express
7735 Old Georgetown Road
To Mailroom
Bethesda, MD 20814

Mr. James Dougherty
3045 Porter Street
Washington, DC 20008

Ralph Shapiro
Cammer and Shapiro, P.C.
9 East 40th Street
New York, NY 10016

Secretary of the Commission
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Herbert H. Brown, Esq.
Lawrence Coe Lanpher, Esq.
Karla J. Letsche, Esq.
Kirkpatrick, Lockhart, Hill
Christopher & Phillips
8th Floor
1900 M. Street, N. W.
Washington, DC 20036

Robert E. Smith Esq.
Guggenheimer & Untermyer
80 Pine Street
New York, New York 10005

MHB Technical Associates
1723 Hamilton Avenue
Suite K
San Jose, CA 95125

Stephen B. Latham, Esq.
Twomey, Latham & Shea
33 West Second Street
P. O. Box 398
Riverhead, NY 11901

Fabian Palomino, Esq.
Special Counsel to the Governor
Executive Chamber, Room 229
State Capitol
Albany, NY 12224

Atomic Safety and Licensing
Appeal Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Jay Dunkleberger Esq.
New York State Energy Office
Agency Building 2
Empire State Plaza
Albany, New York 12223

Jonathan D. Feinberg Esq.
New York State
Department of Public Service
Three Empire State Plaza
Albany, New York 12223

Martin Bradley Ashare
Suffolk County Attorney
H. Lee Dennison Building
Veterans Memorial Highway
Hauppauge, New York 11788

TDI

4. Reactor vessel pressure

5. Drywell pressure

6. Drywell temperature

7. Suppression pool level

8. Suppression pool temperature

9. Core cooling flows

10. Emergency power system operation and load status

Plant components are designed to shut down safely on loss of nuclear steam so the operator's attention can be directed to the core and containment cooling surveillance without undue concern for the balance of plant (BOP).

Ten minutes has been judged to be ample time for an operator to assess the situation, to determine trends of temperature and pressure, and to decide whether the containment spray should be started or whether the suppression pool cooling should be initiated. Action will depend upon the extent of the primary system break, but in no case is action required in less than ten minutes, and in general a longer time would be available.

The large number of possible variables (i.e., leak size, leak location, loss of offsite power, etc.) that must be considered after the reactor level has automatically been returned to a safe condition can best be judged and acted upon by trained operators using information displayed in the main control room in conjunction with established operating procedures rather than depending on the necessarily complex logic scheme required for automatic initiation.

The design evaluations are all based on these rather long operator delays, and indicate that considerable safety margin is still available.

6.3.2.18 Process Instrumentation

Sufficient instrumentation is available to the operator in the main control room to assist him in accurately assessing the post LOCA conditions if one should occur. Basically, these indications are of two varieties: those that indicate the pressures, temperatures, and levels in the reactor vessel and primary containment, and those that provide indication of operation of the ECCS; position of valves and circuit breakers, flows, temperatures, and pressures of ECCS.

The RB service water pumps C and D and their associated discharge valves are powered from Division III. One of these pumps will be maintained in manual standby and the remaining pump in automatic standby.

7.3.1.8.3 Equipment Design

Control switches and indicating lights for the motors of the service water pumps and the motor-operated valves are provided in the main control room. Three of the four RB service water pumps start automatically if there is a start signal from the emergency bus program. The remaining pump can be manually started from the main control room. Instrumentation in the main control room allows monitoring of the:

1. Discharge header pressure for each loop.

2. Flow to each RHR heat exchanger.

A high radiation alarm is provided in the discharge of each RHR heat exchanger. Automatic indication, accompanied by an audible alarm, is provided in the main control room when the system has been deliberately rendered inoperative by intentional operator action.

The motor operated valves used to isolate noncritical portions of the system and the two redundant portions of the system are closed automatically on a LOCA signal or LOOP.

The service water system logic is shown on Figs. 7.3.1-33A through AD.

7.3.1.8.4 Environmental Considerations

The safety related instrumentation and controls of the service water system are designed to remain functional in the environmental conditions as discussed in Section 3.11.

7.3.1.8.5 Operational Considerations

The portion of the instrumentation and controls of the service water system used during plant operation is verified for operability by their normal use. The operability of the standby diesel generator controls is proven whenever the standby diesel generators are tested. The remainder of the system actuated by automatic signals is given a full operational test during every refueling period. The operability of the instrumentation required for safe shutdown is verified by periodic tests.

7.3.1.9 Containment Spray Cooling Mode (RHR System) Instrumentation and Controls

7.3.1.9.1 System Identification

The containment spray cooling mode is an integral part of the RHR system and is used to aid in reducing drywell pressure and mixing containment air following a LOCA. The containment spray cooling supply. One source is derived from the normal station service (NSS) transformer which is connected between the unit generator circuit breaker and the 138 kV switchyard. This design makes the NSS transformer independent of the main generator and allows it to be bused during startup and shutdown of the unit. A second transformer which is connected to the 69 kV transmission circuit described above. Additionally, an onsite 55 MW gas-turbine generator will be available to supply auxiliary power to the RSS transformer in the event the 69 kW transmission circuit is out of service. Spare RSS and NSS transformers are provided on site to replace the installed transformers in the event of a transformer failure.

8.1.4 Onsite A-C Power Systems

The station electrical power system will include electrical equipment and connections required to generate and deliver power at 138 kV to the transmission system. It will also include the facilities for providing power to and controlling the operation of electrically-driven station auxiliary equipment.

Three fast starting, onsite standby diesel generators, arranged so that any two have sufficient capability to provide all necessary power for operation of engineered safety features, will assure safe shutdown in the event that all normal sources of offsite station service power are lost. Each diesel generator has a qualified load of 3,300 kW. The nameplate ratings are retained in the FSAR as these ratings were used in the design and initial testing phases. In the future however the new qualified load will be used for all purposes.

The station electrical connections are shown on the main one line diagram, Fig. 8.2.1-1. Ratings of major equipment are given in Table 8.1.4-1.

8.1.5 Onsite D-C Power Systems

Three d-c systems are provided. One safety related system consists of three separate, and independent 125 V batteries, each with its own charger and distribution board. Further, each battery is located in a separate, ventilated room of a building designed as Seismic Category I and the racks on which they are mounted are designed to meet Seismic Category I requirements. The batteries are sized to supply emergency loads for a minimum of two hr. The loss of one of the batteries will not preclude the operation of the minimum required engineered safety features.

The second system, nonsafety related, consists of two separate and independent ±24 V d-c service, two battery chargers, and a distribution panel. This system provides power to the source and intermediate range nuclear instruments and process radiation monitoring equipment.

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 following is a glossary of load and rating terms used in this section of the text:

2 hour nameplate rating - Maximum design rating. This term is equivalent to the short term rating, as defined in IEEE 387,1977.

Continuous nameplate rating - Normal design rating.

Maximum emergency service load	- Is the maximum load which would exist during a LOOP/LOCA. This load is a combination of equipment nameplate loads and actual measured loads. Loads in Table 8.3.1-1A which are preceded by an asterisk (*) are actual measured loads.
Qualified load	- An upper bound of the maximum emergency service load of all three TDI diesels.
Connected loads	- Any equipment load which can be powered by the diesels.
Maximum coincident demand	- Maximum nameplate loads of equipment required to operate during a LOOP/LOCA.

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

In response to item number one of Section 4.6 in the Nuclear Regulatory Commission's Safety Evaluation Report on the Transamerica Delaval, Inc. Diesel Generator Owners Group Program Plan, a qualified load defined as an upper bound of the maximum emergency service load requirements for the Shoreham diesel engines was developed. The use of this qualified load will result in design margin when compared to operation at the nameplate ratings. The qualified load was developed by engineering analysis and actual load measurements taken at Shoreham during testing of the diesels. As a result of these considerations, the qualified load of each diesel generator set is 3300 kW.

Table 8.3.1-1 was developed during initial design of the plant and therefore establishes a maximum design load for each diesel generator. The values in this table are conservative in that they reflect individual equipment loading based upon nameplate data.

As such, the resulting loads (kilowatts) are summations of namplate values rather than the electrical loads representative of an operating plant. Values in Table 8.3.1-1 (as shown in revision 31 dated August 1983) were the basis for Diesel Generator Factory Tests, as described in Section 8.3.1.1.8.

Table 8.3.1-1A provides a more representative listing of actual diesel loads during a LOOP/LOCA and was derived by analysis and field testing. The purpose of this review was to confirm that the SNPS maximum emergency service load requirement for a LOOP/LOCA is substantially below the diesel generator continuous nameplate rating, and also to justify a more appropriate "qualified load". The use of these test results to establish more appropriate diesel generator loads at the operating license stage of review is consistent with Regulatory Guide 1.9 and the T.D.I. Owners Group SER. Table 8.3.1-1A represents the maximum emergency service load prior to any operator action being taken. Intermittent/Cycle loads (i.e. MOV's MCD's etc) are not continuous loads and therefore are not included.

The evaluation of diesel generator loads made use of measured load values obtained during Integrated Electrical Testing and included individual system/component tests. Loads in table 8.3.1-1A (column entitled maximum emergency service load) which are preceded by an asterisk (*) are measured/actual loads; all other values are equipment nameplate loads. A brief description of each test used to obtain these actual loads is discussed below:

Measured values were obtained from the results of a test duplicating the system configuration which would exist after a LOOP/LOCA. The respective diesel generator for the equipment under test was utilized as the power source. Testing was performed with the equipment under test and associated systems mechanically and/or electrically loaded to the steady state levels.

The 480 volt ac LPCI MG Sets were tested at steady state conditions after the LPCI MOV's were placed in the closed (isolation) position and with the protection and control circuits only loading the motor generator. All four MG sets with all possible 480 V motor control center configurations were tested and the largest load value obtained during testing is shown in the table.

The load shown for the RHR pump was determined via an engineering test which evaluated the motor load under all limiting operational conditions. The maximum value shown represents pump runout conditions obtained when operating each RHR pump in the suppression pool-to-suppression pool test mode with the test valve wide open. This value is comparable to the design flow expected when a single RHR pump is operating and injecting flow into a broken recirculation loop and also assumes a concurrent single failure of the alternate RHR pump or power train.

In addition, during design LOCA/LOOP conditions two RHR pumps would initially operate resulting in a further reduction of individual pump flow and motor loading.

The emergency switchgear room, relay and computer ventilation system was tested with either the "A" or "B" train energized for emergency mode operation of the exhaust fan and air conditioning unit. The actual measured value is included in Table 8.3.1-1A.

The load shown for the RBSVS Chiller chilled water pump was determined via an engineering test which evaluated the motor load under all limiting operational conditions. The maximum value shown represents motor loading during single pump/loop operation with an assumed concurrent single failure of the associated pump or power main. Each chiller/pump combination was operated singularly and in the fully loaded condition by allowing the chilled water temperature to increase above 65 F prior to starting the test. Expected system operation would result in 2 pump operation and would further reduce the loading.

Additionally, an analysis was performed to verify the feasibility of inhibiting the automatic start logic from one of the two reactor building service water pumps on diesel generator 103. This review resulted in substantial decreases in both the maximum coincident demand for diesel generator 103. It should be noted that the previous 2 hour nameplate rating of 3,900 kW for all three diesel generators was based upon the maximum coincident demand on diesel generator 103, which was formerly 3,881 kW. Maximum coincident demand on the other two diesels have always been below 3,500 kW.

Analysis of the above test results and the removal of one service water pump from the automatic start logic results in maximum emgergency service loads for diesel generators 101, 102 and 103 (representing conservative LOOP/LOCA service load requirements) of 3,253, 3,209, and 3,226 kW, respectively. Table 8.3.1-1A provides additional details on the development of these loads. Therefore, a qualified load of 3,300 kW will bound all three machines.

Even 3,300 kW is conservative because many loads were assumed to be at their maximum levels while in actuality this is unlikely to be the case. Moreover, within 20 minutes after the start of an accident, loads lower than 3,200 kW for all three engines would likely be achieved by operator action to reduce core spray and RHR flow from runout to rated flow conditions.

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 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	Trip: 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	

	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 for 7 days at the qualified load initially, followed by the post LOCA load profile for the remainder of the 7 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 were:

1. The capacity of any two diesels is adequate to meet the safety features demand caused by a loss of coolant accident.

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 8,760 hours. The maximum coincident demand in the first 60 seconds (approx) during the operation of the motor-operated valves is also less than 3,500 kW. 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

largest ESF motor used) with a load of 1,550 kW (approximately 50 percent of the steady state emergency load) already on the diesel generator. One test was performed on each of the three diesel generators.

b. Test Description and Results

Preliminary tests were conducted (during the testing of each unit) to establish a load of 1,550 kW on water rheostat "B" and a load of 1,254 kW on water rheostat "A" (to simulate motor full load). The test panel gauge readings were verified against the calibrated laboratory instruments for kW, frequency, amps, and voltage.

The diesel generator was allowed to carry a load as set on rheostat "B" while the timers on the load control panel were set to simultaneously pick up the load on rheostat "A" and the induction motor load.

When temperature stabilization was reached, the added resistive load and motors were cut in and voltage, frequency, current, and kW load were recorded on the visicorder tape.

The results are shown in Table 8.3.1-4.

The tests demonstrate the ability of the generators and the excitation systems to accept a load approximately 30 percent higher than the most severe step load change in the plant design without experiencing instability resulting in generator voltage collapse or inability of the voltage to recover, and that there is sufficient engine torque available to prevent engine stall and to permit the engine speed to recover. These tests satisfy the requirements for factory margin testing stated in IEEE-387-1977 in that the same acceptance criteria are demonstrated even though IEEE-387 specifies a step load only 10 percent higher than the most severe step load.

3. Load Carrying Capability (Maximum Capability) Test Perform at the Factory

a. Purpose

To demonstrate that the unit is capable of carrying a load 15 percent higher than the estimated continuous load of the plant which was based on nameplate load values of individual equipment. One test was performed on each of the three diesel generators.

b. Test Description and Results

With engine (2 hr nameplate rating) at operating temperature, a load of 3,939 kW was established using water rheostats.

Test panel gauge readings for load and frequency were verified against the calibrated laboratory instruments.

The engine was run for a period of 1 hour with a 3,939 kW load and maintaining a 60 cycle per second frequency. Pertinent data was recorded.

No abnormalities were noted with respect to engine operating parameters, noise, or vibration during operation in the overload condition.

In addition to the above tests the following specific operational functions were examined and verified at the factory:

- Automatic starting
- Fast start capability
- Synchronous operation capability
- Load rejection capability
- Proper adjustment and operation of system alarm and safety functions
- Proper operation of system redundancy functions

For a discussion of the emergency diesel generators preoperational test, see Section 14.1.3.7.24. Emergency diesel generator performance and surveillance tests during operation will be in accordance with the SNPS technical specifications.

8.3.1.1.9 Equipment Criteria

Motor Size

The criterion for safety related motor size is that the motor develop sufficient horsepower to drive the mechanical load under runout or maximum expected flow and pressure, whichever is greater. Safety related motors are sized to permit the driven equipment to develop its specified capacity without exceeding the temperature rise rating of the motor when operated at the duty cycle of the driven equipment.

severe load of diesel generators because the equivalent of starting plus running load is imposed initially.

The factory sequential step-load tests for diesel generators 102 and 103 were performed approximately as closely as possible to the sequential loading shown in Table 8.3.1-2 for diesel generator 101 loading as this is the most severe loading. Also, this served to confirm the results obtained from the tests performed on diesel generator 101 (the first one tested) which were not in full accordance with the requirements of Table 8.3.1-2 (see description below).

The results of the test of diesel generators 102 and 103 are given in Tables 8.3.1-5 and 6, respectively.

The test results show that voltage dip, frequency dip, voltage recovery and frequency recovery at any step load are well within the requirements stated in Regulatory Position C.4 of Regulatory Guide 1.9.

Diesel generator 101 was first tested to demonstrate its capability to start and accelerate to rated speed the loads of the original specification. The test confirmed the unit's ability to do so.

The following additional tests were performed on diesel generator 101 to simulate load increases which occurred after the award of contract. The loads are shown in Table 8.3.1-2.

Test 2A - Inrush kVa Test - To prove that the generator capacity and the voltage regulator response will meet the maximum inrush kVa requirements of any step load. This test was conducted by establishing a 500 kW base load on the unit and then starting simultaneously one 1000 hp and two 300 hp motors.

The voltage dip was 24.28 percent and the time of voltage recovery to 90 percent of rated was 0.45 sec.

The voltage dip and recovery were within the requirements of Regulatory Guide 1.9.

Test 2B - Inrush kW and Running kW Test - To prove that the engine governor system is capable of responding within the specification for the maximum inrush for the load sequencing. This test was conducted by applying motor loads and resistive loads in accordance with the required time intervals. However, only inrush kW and running kW of each load step was simulated.

2. Load Rejection Test

The load rejection test was conducted on each diesel generator by loading it to 3,500 kW, i.e. continuous nameplate rating of the diesel generator, and dropping the entire load instantaneously.

Voltage, current, frequency, and kW load were recorded on the visicorder tape.

The change in speed and voltage on the rejection of the entire load is shown below:

	Diesel Generator		
	101	102	103
Overspeed on load rejection, percent rated speed.	3.0	2.66	2.83
Overvoltage on load rejection, percent rated.	2.4	2.4	2.4
	(Approximately)		

The results show that the overspeed is well within the requirements stated in Regulatory Position C.4. of Regulatory Guide 1.9 and the voltage change is negligible.

All loads connected to the diesel generator (see Tables 8.3.1-1 and 8.3.1-1A) are not included in the maximum coincident demand analysis and maximum emergency service loads for one or more of the following reasons:

1. The equipment is not normally operating and receives no automatic start signal after a LOCA.

2. The equipment is operating during normal plant conditions but has a seal-in type control circuit that drops out on loss of offsite power sources prior to connecting the diesel generators to their associated buses, and does not restart automatically.

3. The equipment is tripped intentionally (automatically) on a LOCA signal.

Table 8.3.1-1 identifies equipment being tripped. Disconnecting of load is based on a one-of-two logic of LOCA contacts - one each from the RHR and core spray system actuation logics - acting on Class IE 4 kV switchgear breakers, Class IE 480 V load center switchgear breakers, or 480 V shunt-trip molded case circuit breakers installed in Class IE motor control centers.

Except for the control rod drive pumps, all nonsafety related loads are connected to the diesel generator bus through two series connected breakers (for those 480 V loads that are disconnected on LOCA, one of these breakers is the molded case shunt-trip or switchgear breaker discussed above). The magnetic breakers have been installed to limit detrimental effects on the emergency buses due to faults and overloads on nonsafety related equipment. The power and control circuits for the control rod drive pumps are treated as Class IE circuits, and the power circuits to 480 V nonsafety loads fed through two series connected breakers are treated as Class IE circuits up to the second breaker. Generally, Class IE and non-Class IE circuits do not share the same raceways. Wherever Class IE and non-Class IE circuits share the same raceways, these non-Class IE circuits remain with and follow the same rules as Class IE circuits of respective separation division and are uniquely marked.

The emergency diesel generators are not used for the purpose of supplying additional power to the utility power system (peaking).

Each emergency diesel generator unit has its own independent auxiliary system. Separate fuel oil storage tanks are provided to independently supply each diesel engine. The onsite fuel oil storage capacity provides for at least seven days operation of the emergency diesel generators at the qualified load initially, followed by a projected post LOCA load profile.

The onsite power system satisfies GDC 17 and 18, IEEE 308-1971, and Regulatory Guide 1.9.

The design of diesel generator protective trip circuit bypasses satisfies Branch Technical Position EICSB 17 except for the following.

Paragraph B 1 of EICSB 17 states that the design of standby diesel generator systems should retain only the engine overspeed and the generator differential trips and bypass all other trips under an accident condition. The voltage-restrained time overcurrent trip (device 51V) is also retained during the accident conditions for the following reasons:

water condensers. One of the supply pipes provides cooling water to two chilled water condensers while the remaining pipe supplies the other two. A separate, return pipe per diesel cooler ensures that a continuous flow of service water can be passed through the coolers at all times. The full flow of water through each cooler is controlled by an air operated valve. Two separate return pipes are used to discharge cooling water from the RBSVS chilled water condensers through temperature control valves. Service water from the diesel engine coolers and the RBSVS and CRAC chilled water system is discharged to the circulating water discharge tunnel.

A single pipe connected to each of the supply pipes to the RBSVS and CRAC chilled water condensers is used to provide water to the main chilled water condensers. Service water supply to the main chilled water condensers is not safety related. During an accident, service water supply to the main chilled water condensers is automatically isolated by double isolation valves.

During normal operation, two of the four RB service water pumps are in operation to supply cooling water to one of the RBCLCW heat exchangers, one of the four RBSVS and CRAC chilled water condensers, one of the two drywell cooling booster heat exchangers, and to the main chilled water condensers. No service water is required for residual heat removal or diesel engine cooling during normal operation. The third reactor building service water pump is kept on automatic standby. The remaining service water pump is placed in manual standby and shall be a Division III pump.

During a normal or scheduled shutdown, two or three RB service water pumps operate to supply cooling water to one of the RBCLCW heat exchangers, to one or both RHR heat exchangers, to one of the RBSVS and CRAC chilled water condensers, to one of the drywell cooling booster heat exchangers, and to the main chilled water condensers. The fourth pump remains in manual standby.

Radiation monitors are installed on the secondary (service water) side of the RHR heat exchangers, on the primary (demineralized water) side of the RBCLCW heat exchangers, and on the service water drains subsystem. Effluents from the service water system are diluted in the circulating water discharge tunnel. The environmental acceptance of these effluents is discussed in Section 2.4.12.

Since the service water system utilizes seawater directly from Long Island Sound, the only practical means of corrosion control is the selection of suitable materials. Thus, all safety related piping and the internals of all service water system components are fabricated from corrosion resistant materials that are designed for service in a seawater environment.

Turbine Building Service Water Subsystem

The turbine building service water subsystem is shown on Figure 9.2.1-1B. Service water supply to the turbine building consists of three 50 percent capacity motor-driven pumps, each rated at 8,000 gpm and associated piping, valves, and instrumentation. The three pumps discharge to a common header that branches off to each of the two TBCLCW heat exchangers. Service water supply to the TB is not safety related. Service water supply to the TB is isolated from the RB service water system by double isolation motor operated valves. During normal operation these valves are locked closed. In an absolute necessity, RB service water flow could be supplied by the TB system. However, the double isolation motor-operated valves receive signals to close during a loss-of-coolant accident or a loss of offsite power.

During normal operation, two of three TB service water pumps are in operation to supply cooling water to the TBCLCW heat exchangers. The third pump remains in automatic standby. During a normal or scheduled shutdown, one of the three TB service water pumps is in operation to supply cooling water to the TBCLCW heat exchangers. One of the two non-operating pumps remains in automatic standby.

A list of components by the TB service water system is provided in Table 9.2.1-1.

9.2.1.3 Safety Evaluation

The RB service water subsystem is capable of cooling essential equipment through two redundant headers. It is designed so that no single failure of any component will prevent the system from performing its intended safety function. During a design basis accident, each supply pipe is capable of providing sufficient cooling water to the following equipment, essential to the safe shutdown of the plant:

1. One residual heat removal (RHR) exchanger required for long-term core and containment cooling as described in Section 6.3.2.

2. One reactor building closed loop cooling water (RBCLCW) heat exchanger.

3. All three diesel engine coolers.

4. Two reactor building standby ventilation system (RBSVS) and control room air conditioning (CRAC) chilled water condensers.

The RB service water subsystem is designed so that, following an accident, not less than two service water pumps will be in operation to cool the equipment listed above.

No service water is supplied to the TB or the main chilled water system following an accident.

The design margin for the above mentioned components is based on the maximum duty required for each. In addition, sufficient redundancy is provided in the individual systems to accommodate loss of a component.

On an accident signal, such as low reactor coolant level or high primary containment pressure, the following automatic operations take place:

1. The isolation valves on the service water pump discharge header close, dividing the main supply pipes.

2. Service water supply to the RHR and drywell cooling booster heat exchangers and the main chilled water system is isolated.

3. The TB service water system is isolated from the RB service water system.

4. The motor operated valves in the supply pipes to both RBCLCW heat exchangers are interlocked in the open position.

5. Three RB service water pumps are signaled to start. The fourth service water pump, powered from Division III, remains in manual standby.

6. All RBSVS and CRAC condensing water pumps start.

After the above automatic operations, operator action is required to supply service water to the RHR heat exchanger when it becomes necessary.

Upon loss of all offsite power without LOCA, the following operations take place automatically:

1. Service water pumps are tripped.

2. The standby diesel generators are started.

3. When diesel generator operating voltage is reached, the diesel generators are connected to their respective buses. (Safety related instrumentation is supplied from the emergency buses as soon as power from standby diesel generators is available.)

4. The RB service water pumps on each emergency bus start 12 sec after the diesel generator is connected to the bus, except for the service water pump on manual standby.

5. Valve operators move automatically into the position for post-accident condition with the exception of the drywell cooling booster heat exchangers which remain in position.

In the event of an accident, followed by loss of offsite power, all operations described above take place automatically. In addition, the following events take place:

1. Valve operators move automatically into the proper position for post-accident condition.

2. Operator action is necessary to supply service water to the RHR heat exchangers.

The RB service water subsystem is designed so that it is capable of accommodating any single failure of a component within the system or of a component in another related system without affecting the overall system capability of effecting plant shutdown and cooldown or post-accident heat dissipation. Operator actions may be required to isolate a given failed component from the remainder of the service water system and to transfer cooling to the redundant cooling subsystem.

A single active or passive failure of a component in the service water system initiates an alarm, e.g., diesel generator trip, flow, level, pressure or temperature condition in the control room. Upon annunciation, the operator responds by remote manual initiation of the necessary valve action to isolate the failed component and to make use of the proper independent redundant subsystem.

Following a design basis accident with coincident loss of offsite power, the maximum heat load on the service water system, with minimum safeguard equipment operating, would be 129,300,000 Btu/hr resulting from the following safety related sources:

9.5.4 Diesel Generator Fuel Oil Storage and Transfer System

9.5.4.1 Design Bases

The plant is provided with three standby generators separately driven by three diesel engines operating on No. 2 fuel oil. Each engine is supplied by a separate diesel generator fuel oil storage and transfer system design to allow for 7 days operation of the diesel engine at qualified load/post LOCA load profile. All safety-related portions of the diesel generator fuel oil storage and transfer systems are designed to ASME III, Code Class 3, and Seismic Category I requirements.

The system design incorporates sufficient redundancy to prevent a malfunction or failure of any single active or passive component from impairing the capability of the system to supply fuel oil to at least two of the diesel engines.

The diesel generator fuel oil storage and transfer systems are designed so that makeup fuel oil may be transferred from the auxiliary boiler fuel oil storage tanks to the fill piping for the diesel generator fuel oil storage tanks. Auxiliary boiler fuel will be compatible with diesel generator fuel requirements. Missile protection is provided for the fuel oil storage and transfer systems in accordance with General Design Criterion 4 of 10CFR50, Appendix A.

9.5.4.2 System Description

The diesel generator fuel oil storage and transfer system (Fig. 9.5.4-1) located in and adjacent to the diesel generator rooms in the control building, consists of:

1. Three buried diesel fuel oil storage tanks - one for each diesel engine. Each storage tank has a capacity of 42,000 gal., providing sufficient fuel oil for 7 days of operation initially at the qualified load followed by a projected post LOCA load profile. Each tank is vented to atmosphere.

2. Six 10 gpm full-capacity, electric motor driven rotary positive displacement fuel oil transfer pumps (two pumps for each diesel generator fuel oil storage tank) are provided. Each pump is provided with a relief valve discharging back to its associated suction line. Each diesel generator fuel oil transfer pump is mounted directly above its associated fuel oil storage tank.

3. A diesel generator fuel oil day tank for each diesel engine is situated in the associated diesel generator room. Each diesel generator fuel oil day tank is sized to store 550 gal. of fuel oil. Each diesel generator fuel oil day tank is supplied with a flame arrestor on the vent.

4. Two 13 gpm, full capacity, positive displacement fuel oil booster pumps per diesel engine. The shaft driven and d-c motor driven booster pumps are piped in parallel and mounted on the diesel engine skid. Each pump discharge is equipped with a relief valve back to the pump suction. A large mesh Y type fuel oil strainer is located upstream of each booster pump.

9.5.4.3 Safety Evaluation

As a result of the redundancy incorporated in the system design, the diesel generator fuel oil system provides its minimum required safety function under any of the following conditions:

1. Loss of offsite power coincident with failure of one diesel generator.

2. Loss of offsite power coincident with maintenance outage or failure of one diesel generator fuel oil transfer pump or one diesel generator fuel oil booster pump associated with each diesel generator.

Each diesel generator fuel oil storage tank is sized to store sufficient diesel fuel oil for a minimum of 7 days of operation initially at the qualified load followed by a projected post LOCA load profile. Additional fuel oil may be readily delivered to the site by truck on short notice. The fuel oil storage tanks are buried 2 1/2 ft below grade, with a 4 ft separation between the sides of each tank. The tanks rest on, and are covered by compacted sand. Six in. above the top of the tanks, supported by the compacted soil, is a 2 ft thick concrete slab, designed to Seismic category I requirements. The fuel oil transfer pumps are mounted above this slab, and take suction through the top of the tanks. A seismic Category I concrete block house is provided above each tank to enclose the two fuel oil transfer pumps, associated discharge piping, instrumentation, and manhole into the tank. The blockhouse and slab together provide the fuel oil storage and transfer system with adequate protection against potential missiles due to tornadoes or hurricanes. This arrangement meets the intent of General Design Criterion 4.

The diesel generator fuel oil storage tanks are adequately protected against long term corrosion by the following means.

1. The tank interior is coated with an epoxy finish.

2. The tank exterior is coated with a zinc rich polyamide primer and a coal tar epoxy material.

The diesel fuel oil storage tanks will be inspected periodically. The tanks are sloped a minimum of 1/26 in. per ft, or 2 in. total, to accumulate any moisture at the low end of the tanks, away from the fuel oil pumps. The fuel oil will be sampled as described in Section 9.5.4.4. If excessive amounts of moisture are found accumulating in the tank, a portable sump pump will be used to remove the water via the sounding tube.

Each of the diesel generator fuel oil day tanks is sized to store a maximum 550 gal. of diesel fuel oil, as allowed by National Fire Protection Association (NFPA) standards, Vol.1, 1971-1972. This storage capacity provides for 2 hr. of continuous operation of the diesel generator at qualified load. The sulfur content of the diesel fuel oil is specified at 1.05 percent maximum, by weight, to minimize corrosiveness of sulfur compounds in the diesel engine exhaust gas.

9.5.4.4 Testing and Inspection Requirements

The diesel generator fuel oil supply piping is hydrostatically tested during construction. All active system components and controls are functionally tested during startup and periodically thereafter. The diesel fuel oil is sampled periodically to determine possible contamination or deterioration of the oil in the storage tank. The diesel fuel oil inventory is periodically checked. The Y strainer located on each fuel oil booster pump suction line is cleaned quarterly, after 100 hr. of operation, or upon a high differential pressure alarm, whichever occurs first.

9.5.4.5 Instrumentation Application

Each of the diesel generator fuel oil storage tanks is provided with a connection for manual determination of the diesel fuel oil level. A level transmitter is also provided to give a continuous computer monitored reading of the tank level in the main control room. On low fuel level, a low level alarm, initiated by a level switch independent from the level transmitter, is annunciated in the diesel generator room, and a diesel trouble alarm is annunciated in the main control room.

Each diesel generator fuel oil day tank is provided with local indication of the day tank level. A level switch is provided to alarm high and low diesel generator fuel oil day tank level on the standby diesel generator panel, and diesel trouble in the main control room. The level of the fuel oil day tanks is controlled by the automatic starting and stopping of the corresponding preferred diesel generator fuel oil transfer pump. Should the preferred transfer pump fail to start, a redundant level switch will automatically start the second fuel oil transfer pump. Manual pump control is also provided on the standby diesel generator panel for starting or stopping either the preferred or secondary fuel oil transfer pumps. In the event that the pumps fail to stop, a gravity drain overflow is provided from the day tank back to the diesel fuel oil storage tank. An interlock is provided to automatically shut off the fuel oil transfer pumps when the carbon dioxide fire protection system is actuated in the associated diesel generator room.

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 (6)	1	-	998	998	-
Residual Heat Removal Pump	1250	4	2 (6)	1	2	999	999	1998 (4)
Service Water Pump	450	4	2	2	3 (3)	358	358	716 (3)
RBSVS and CRAC Water Chiller	292	4	2	2	2	235	235	470 (4)
RBSVS and CRAC Water Chiller Lube Oil Pump	0.25	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 (14)
Diesel Generator Air Compressor	10	6	-	-	-	12	12	12
Diesel Generator Fuel Oil Transfer Pump	0.5	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)

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
Diesel Generator Heater	4.2 kW (15)	3	-	-	-	4.2 (13)	4.2 (13)	4.2 (13)
Battery Charger (125 V)	60 kVa	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 (7)	-	-	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	-
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	-	-	[illegible]0 (9, 14)
TSC Air Cooled Condenser	30 kW	1	-	1	1	-	-	30 (9, 14)
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	0.75	2	1	1	1	0.5	0.5	-

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	10 Min on	Loss of Offsite Power (Hot Standby)	Maximum Demand Coincident (Kilowatt) (1) (2) DG-101	DG-102	DG-103
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	1	24 (14)	24 (14)	-
Loop Level Pump (CS, RHR, HPCI, RCIC)	7.5	4	4	2	4	12.0	12.0	-
Atmosphere Cont. - Hyd. Recombiner	109 kW	2	-	1	-	109 (9)	109 (9)	-
MSIV-LCS Heaters	6.6 kW	4	-	-	-	-	26.4 (9)	-
MSIV-LCS Blowers	4.4	3	-	-	-	7 (9)	3.5 (9)	-
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 (8)
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 (1 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

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 Demand Coincident (Kilowatt) (1) (2) 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 (9)	-	-
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 (12)	4	2	2	2	160	160	214

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 Demand DG-101	Coincident (Kilowatt) DG-102	(1) (2) DG-103
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 Notes 3 and 11 Loads						- 95.9	- 75.3	- 358
						4285.4	4072.5	4135.7
Minus Note 8 Loads						-573.8	- 404.0	- 439.6
						3711.6	3668.5	3696.1
Minus Note 10 Loads						- 20	- 20	- 0
						3691.6	3648.5	3696.1
Minus Notes 9 and 14 Loads						-136.0	- 138.9	- 150.0
						3555.6	3509.6	3546.1
Minus Note 13 Loads						-102.7	- 102.7	- 102.7
Total kW (60 seconds approx)						3452.9	3406.9	3443.4
Minus Operating MOV's						- 19.7	- 18.3	- 0.7
Total kW (Prior to 10 minutes)						3433.2	3388.6	3442.7
Minus Note 4 Loads						- 0	- 0	-1310.2
Plus Note 14 Loads						0	0	+ 150
Total kW (After 10 Minutes)						3433.2	3388.6	2282.5

TABLE 8.3.1-1 (CONT'd)

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 motor greater than 100 Hp.

(3) 3 service water pumps are required for hot standby. 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 received 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 consists 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.

TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM
MAXIMUM EMERGENCY SERVICE LOADS

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 Emergency Service Load (kW) DG-101	Maximum Emergency Service Load (kW) DG-102	Maximum Emergency Service Load (kW) DG-103	Remarks
Core Spray Pump	1250	2	1	1	-	998	998	C	1
Residual Heat Removal Pump	1250	4	2	1	2	*1022	*1022	*1955.2	2
Service Water Pump	450	4	2	2	3	358	358	358	3
RBSVS and CRAC Water Chiller	292	4	2	2	2	235	235	470	1
RBSVS and CRAC Water Chiller Lube Oil Pump	0.25	4	2	2	2	0.2	0.2	0.4	1
RBSVS Chiller Circ. Water Pump	75	4	2	2	2	*32	*32	*64	4
RBSVS Chiller Cond. Water	20	4	2	2	2	16	16	32	1
RBSVS Unit Cooler	30	8	4	4	4	96	96	C	1
RBSVS Exhaust Fan	100	3	2	2	2	82.5	82.5	82.5	1
Reactor Building Exhaust Booster Fan	7.5	2	1	1	1	6.0	6.0	C	
RBSVS Filter Reheat Coil	6.6 kW	2	1	1	1	6.6	6.6	C	1
RBCLCW Circ. Pump	100	3	2	2	2	80	80	E	1
Diesel Generator Air Compressor	10	6	-	-	-	-	-	-	5
Diesel Generator Fuel Oil Transfer Pump	0.5	6	2	2	2	-	-	-	5
Diesel Generator Jacket Water Heater	36 kW	6	-	-	-	D	D	D	
Diesel Generator Jacket Water Keep Warm Pump	2.5 kW	3	-	-	-	D	D	D	
Diesel Generator Lube Oil Heater	20 kW	3	-	-	-	D	D	D	
Diesel Generator Before & After Lube Oil Pump	5	3	-	-	-	D	D	D	

TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM
MAXIMUM EMERGENCY SERVICE LOADS

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 Emergency Service Load (kW) DG-101	Maximum Emergency Service Load (kW) DG-102	Maximum Emergency Service Load (kW) DG-103	Remarks
Diesel Generator Heater	4.2 kW	3	-	-	-	D	D	D	
Battery Charger (125 V)	60 kVa	3	2	2	2	20	25	17	6
120 V ac Instrument Power	100 kVa DG 101 100 kVa DG 102 50 kVa DG 103	3	2	2	2	80	80	40	6
120 V Nonemergency Feeds	65 kVa	-	-	-	X	A	B	D	
Diesel Generator Room Vent Supply Fan	20	3	2	2	2	16	16	16	1
Battery Room Vent Supply Fan	2	3	2	2	2	1.6	1.6	1.6	1
Control Room Air Conditioning Unit	40	2	1	1	1	33.9	33.9	C	
Control Room Vent Booster Fan	7.5	2	1	1	1	6.0	6.0	C	
Emergency Switchgear, Relay & Computer Rooms Air Conditioning Unit	40	2	1	1	1	*36.4	*36.4	C	
TSC Air Conditioning Unit	40 kW	1	-	1	1	A	B	40	1
TSC Air Cooled Condenser	30 kW	1	-	1	1	A	B	30	1
Emergency Switchgear, Relay & Computer Rooms Exhaust Fan	10	2	1	1	1	8.0	8.0	C	
RBSVS Chiller Room Exhaust Fan	3	2	1	1	1	2.4	2.4	C	1
Screenwell Exhaust Fan	10	2	1	1	1	8.0	8.0	C	1
Screenwell Interposing Relay Panel	1 kVa	1	1	1	1	A	0.8	C	1
MCC Room Ventilation	0.75	2	1	1	1	0.5	0.5	C	1

TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM
MAXIMUM EMERGENCY SERVICE LOADS

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 Emergency Service Load (kW) DG-101	DG-102	DG-103	Remarks
LPCI M-G Set Room Ventilation	3	4	2	2	2	2.4	2.4	4.8	1
Unit Cooler MCC OB1 Room	1.5	1	1	1	1	A	1.2	C	1
Spent Fuel Pool Cooling Water Pump	30	2	-	1	1	F	F	C	
Loop Level Pump (CS, RHR, HPCI, RCIC)	7.5	4	4	2	4	12.0	12.0	C	1
Atmosphere Cont. - Hyd. Recombiner	109 kW	2	-	1	-	D	D	C	
MSIV-LCS Heaters	6.6 kW	4	-	-	-	A	D	C	
MSIV-LCS Blowers	4.4	3	-	-	-	D	D	C	
Radiation Monitoring	1	10	-	-	-	4.8	3.2	C	6
Lighting (Equivalent kW)	407.2 kW	-	-	-	X	D	B	D	
Fence Security Lighting	60 kW	-	-	-	X	34	B	26	6
Reactor Protection System M-G Set	25	2	-	-	2	D	D	C	9
Reactor Protection System Backup Transformer	25 kVa	1	-	-	1	A	B	D	
Battery Charger ±24 V	3 kVa	4	-	-	-	D	D	C	
Uninterruptible Power (Vital Bus)	37.5 kVa	1	1	1	1	A	B	30	6
Uninterruptible Power (Security & Communications)	20 kVa	1	1	1	1	A	B	16	6
Battery Charger (Security and Communication)	20 kVa	1	-	-	-	A	B	4	6
Uninterruptible Power (Computer Bus)	20 kVa	1	1	1	1	16	B	C	6
Control Rod Drive Pump	250	2	-	-	1	D	D	C	
Drywell Cooling System Fan	25	8	-	-	4	D	D	C	

TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM
MAXIMUM EMERGENCY SERVICE LOADS

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 Emergency Service Load (kW) DG-101	Maximum Emergency Service Load (kW) DG-102	Maximum Emergency Service Load (kW) DG-103	Remarks
Primary Containment Air Cooler Subfeed	2 kVa	2	-	-	1	D	D	C	
Reactor Water Cleanup Recirc. Pump	60	2	-	-	1	A	D	D	
Suppression Pool Pump Back Pump	25	1	-	-	-	D	B	C	
Main Turbine Turning Gear	60	1	-	-	1	A	B	D	
Main Turbine Piggyback Turning Gear Drive	0.5	1	-	-	1	A	B	D	
Main Turbine Turning Gear Oil Pump	40	1	-	-	1	A	B	D	
Main Turbine Bearing Lift Pump	5	7	-	-	7	D	D	D	
Feedwater Turbine Turning Gear	1.5	2	-	-	2	D	D	C	
Feedwater Turbine Turning Gear Oil Pump	10	2	-	-	2	D	D	C	
RFP EHC Control Transformer	1.5 kVa	2	-	-	2	D	D	C	
Standby Liquid Control Pump	40	2	-	-	-	D	D	C	
Standby Liquid Control Main Heater	10 kW	1	-	-	-	A	D	C	
Standby Liquid Control Mixing Heater	45 kW	1	-	-	-	D	B	C	
Standby Liquid Control Heat Tracing	3 kVa	2	-	-	-	D	D	C	
Heat Tracing Transformer	25 kVa	2	1	1	2	20	20	C	6
480 V M-G Set	200	4	2	2	2	*19	*19	*38	7

TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM
MAXIMUM EMERGENCY SERVICE LOADS

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 Emergency Service Load (kW) DG-101	Maximum Emergency Service Load (kW) DG-102	Maximum Emergency Service Load (kW) DG-103	Remarks
Refueling Jib Crane	3.25	2	-	-	-	D	D	C	
Refueling Platform Assembly	3.5	1	-	-	-	D	B	C	
Motor Operated Valves	-	-	X	-	-	-	-	-	8
Nonoperating MOV's	-	-	-	-	-	-	-	-	8
Total Maximum Emergency Service Loads (LOOP/LOCA)						3,253.3	3,208.7	3,225.5	

Remarks:

1. Nameplate Value
2. Maximum load (1022 kW) corresponds to one RHR pump at run-out flow into a broken Recirc. loop. Maximum load (1955.2 kW) for DG-103 corresponds to one RHR pump at run-out flow into a broken Recirc loop and the other pump operating at expected flow conditions into the intact loop.
3 1 Div. III pump in pull to lock (i.e.) no auto start.
4 Actual test data showed load value of 32 kW vs. 60 kW nameplate.
5 Loads are cyclic and not continuous, therefore not included in total.
6 Not an actual measured load. Load obtained from Table 8.3.1-1.
7 MG set will be unloaded after LPCI valves have stroked.
8. Not a continuous load.
9. RPS MG set de-energizes on LOOP/LOCA.

NOTES:

A. Not a DG-101 load
B. Not a DG-102 load
C. Not a DG-103 load
D. Tripped on a LOCA/Loss of Offsite Power/DG Start
E. Locked out for 10 min. on LOCA, manual start and manual line-up
F. Administratively de-energized not required during first cycle of operation, (no spent fuel).
* Actual measured loads

TABLE 8.3.1-2

SEQUENTIAL LOADING OF DIESEL GENERATOR SETS PERFORMED AT THE FACTORY

Sequence	Time (Sec) (3)	Rated Horsepower	Brake Horsepower	Starting kVa (4)	Running kW (4)	Cummulative kW (4)
Diesel 101						
1. Initial Load - Motor load, including MOVs, Ltg., etc. on 1,000/1,333 kVa, 4,160-480 V, transformer with 8% impedance	0	-	-	4,742	838.9	838.9
2. Start RHR Pump	2	1,250	1,250	5,644	999	1,837.9
3. Start CS Pump	7	1,250	1,250	5,638	998	2,835.9
4. Start Service Water Pump	12 (2)	450	450	2,022	358.0	-
and RBSVS Chiller	-	-	292	1,327	235.0	3,428.9
5. MOVs Complete Operation	60 (Approx)	-	-	-	(19.7)	3,409.2
6. Manually stop loads not required and add additional loads as required within the rating of the diesel generator	600 - On	-	-	-	-	-
Diesel 102						
1. Initial Load - Motor load, including MOV's, Ltg., etc. on 1,000/1,333 kVa, 4,160-480 V, transformer with 8% impedance	0	-	-	4,449	792.9	792.9
2. Start RHR Pump	2	1,250	1,250	5,644	999	1,791.9
3. Start CS Pump	7	1,250	1,250	5,638	998	2,789.9
4. Start Service Water Pump	12 (2)	450	450	2,022	358.0	-
and RBSVS Chiller	-	-	292	1,327	235.0	3,382.9
5. MOVs Complete Operation	60 (Approx)	-	-	-	(18.3)	3,364.6

TABLE 8.3.1-2 (CONT'D)

Sequence	Time (Sec) (3)	Rated Horsepower	Brake Horsepower	Starting kVa (4)	Running kW (4)	Cummulative kW (4)
Diesel 102 (cont'd)						
6. Manually stop loads not required and add additional loads as required within the rating of the diesel generator	600 - On	-	-	-	-	-
Diesel 103						
1. Initial Load - Motor load, including MOVs, Ltg., etc. on 1,000/1,333 kVa, 4,160-480 V, transformer with 8% impedance	0	-	-	3,931	697.4	697.4
2. Start RHR Pump	2	1,250	1,250	5,644	999	1,696.4
3. Start RHR Pump	7	1,250	1,250	5,644	999	2,695.4
4. Start two Service Water Pumps	12(2)	450	400	4,044	716	-
and two RBSVS Chiller	-	-	584	2,654	470	3,881.4
5. MOVs Complete Operation	60 (Approx)	-	-	-	(0.7)	3,880.7
6. Stop 1RHR PP, Stop 1 CRAC and RBSVS Water Chiller and assoc. aux. equipment, start TSC air conditioning.	600 - On	-	-	-	(1,240.2)	2,640.5

(1) All large motors and a majority of small motors are squirrel cage induction motors.

(2) Service water pumps and RBSVS chillers receive start signals from the bus program at 12 sec as shown. However, other interlocks may delay motor start beyond this point.

(3) The time shown in table is time after the diesel generator breaker closes to its associated 4 kV bus.

(4) Load values calculated from nameplate data.

14.1.3.7.24 Emergency Diesel Generators Preoperational Test

Objective

To verify the capability of the emergency diesel generator system to start upon receiving a start signal from the various modes, come up to operating speed, phase on to its bus, and carry its rated load.

Prerequisites

1. The applicable general prerequisites, as listed in Section 14.1.3.4, will be met.

2. Emergency diesel generator room ventilation system operational.

3. Sufficient load available for full loading of system.

4. Emergency diesel generator auxiliaries available and ready for diesel operation.

Test Method

1. Each emergency diesel generator was started under simulated loss of ac power conditions, ECCS initiating signals, and proper starting and automatic bus stripping demonstrated.

2. The emergency diesel generators were started simultaneously under simulated loss of ac power conditions, ECCS initiating signals, and proper starting and automatic bus stripping demonstrated.

3. The ability of the emergency diesel generators to accept their rated load and maintain proper voltage and frequency within design requirements was demonstrated.

4. The ability of the emergency diesel generators to maintain a load equal to the continuous rating for the time required to reach a temperature equilibrium plus 1 hr was demonstrated.

5. The ability of the emergency diesel generators to maintain a load at least equal to 3500 kW for 2 hr has been demonstrated for DG-101 on March 7, 1984, DG-102 on January 30, 1984, and DG-103 on August 6, 1984. This was accomplished prior to the issuance of the SER on the TDI Owners Group Plan and the development of a qualified load as described in section 8.3.

6. The ability of the emergency diesel generators to maintain a load at least equal to the qualified load (3,300 kW) for a time required to reach a temperature equilibrium plus 1 hr was demonstrated.

7. The ability of the emergency diesel generators to reject a load at least equal to the qualified load will be demonstrated.

8. During the plant preoperational test program, the diesel generators shall be tested in accordance with the intent of Regulatory Positions C.2.a and C.2.b of Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Power at Nuclear Power Plants" (Revision 1, August 1977) in that the diesel generators will be tested enveloping the load conditions that would be expected if actual demand were placed on the system, in accordance with Section 8.3.1.1.5.

9. A confirmatory test will be performed to establish the adequacy of the TDI diesel engines at the 3300 kW qualified load.

Acceptance Criteria

1. The applicable general acceptance criteria, as listed in Section 14.1.3.6, will be met.

2. The emergency diesel generators can supply and maintain rated load and voltage in accordance with design requirements.

3. The emergency diesel generators will start and supply the 4,160 V ac emergency buses in all operating modes.

4. Bus stripping will be in accordance with design requirements.

5. The emergency diesel generators can reject load without tripping.

6. The TDI Owners Group acceptance Criteria will be applied at the conclusion of the test described in item nine (9) above. In case where these criteria have not been explicitly stated in Owners Group reports or in the Component Revalidation checklist submitted as part of the Shoreham DRQR package (e.g., engine block, pistons), LILCO will identify its quantitative criteria for evaluating indications as being acceptable and/or relevant, and provide the technical basis for these criteria.

14.1.3.7.25 Primary Containment Local Leak Rate Test Types B and C

Objective

To verify that the leakage rate of primary containment isolation valves and testable penetrations is less than the allowable value specified in 10CFR50 Appendix J - "Reactor Containment Leakage Testing for Water Cooled Power Reactors."

Prerequisites

1. The applicable general prerequisites, as listed in Section 14.1.3.4, will be met.

2. All piping penetrations sufficiently complete to facilitate testing their isolation valves.

3. Isolation valves operable and seated by normal remote means.

4. Fluid piping drained adjacent to tested valves, wherever possible.

5. Nonpiping penetration construction complete.

Test Method

1. Primary containment penetrations will be pressurized to the maximum calculated post-accident primary containment internal pressure.