Copy to:
MSMilligan-7 (7 encs.)
DFGarrett-3a (LILCO-Hx) (enc.)
MCMueller-5 (LILCO-MR)

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December 15, 1983
J.O.No. 11600.G2
File No. 244.7, 245.2.1
LIL- 24865

Subject: Two Year Operating Cycle
Emergency Diesel Generators
Shoreham Nuclear Power Station

References: (1) TDI Letter dated 8/15/83 R. A. Pratt to J. C. Ramsayer "Accelerated Maintenance Program
(2) Regulatory Guide 1.108, Aug. 1977
(3) FSAR Table 8.3.1-1

In response to your request, Stone & Webster Engineering Corporation has performed an analysis to estimate the number of emergency diesel generator operating hours and load accrued during a two-year plant operating cycle. The plant operating cycle was chosen based on Reference (1), which requires inspection of critical engine components each plant refueling outage.

Operation of the emergency diesel generators will generally occur as a result of the following:

(A) Surveillance Test runs, Reg. Guide 1.108, Section C.2.c,

(B) Periodic Operational Tests, Reg. Guide 1.108, Section C.2.a, and

(c) Potential Loss of Offsite Power (Loop) event.

Hours and load for each of these areas have been estimated based on the following:

(A) Surveillance Test Runs

To estimate the Reg. Guide 1.108 Section C.2.c (1, 2) hours, the test intervals for the 40-year period were broken down as follows:

1 year at a 31-day test interval; 12 tests.
6 months at a 14-day test interval; 24 tests.
4 months at a 7-day test interval; 18 tests.
2 months at a 3-day test interval; 21 tests.

This results in sixty-five (65) test runs, each for one hour at 3500 kw.

(B) Periodic Operational Tests

The Reg. Guide 1.108, Section C.2.a estimates for time and load are based on actual site experience conducting these tests. Each test is performed once during the operating cycle, as follows:

Reg. Guide Section C.2.a	Hours w/load
(1), (3), (8), (7)	22 Hrs. at 3500 KW and 2.0 Hrs. at 3900 KW
(2)	0.5 Hrs. at 3500 KW
(4)	1.0 Hrs. at 2625 KW
(5)	0.5 Hrs. at 3500 KW
(6)	1.0 Hrs. at 2625 KW

These tests result in 27 hours of operation, with the load as indicated.

(C) Potential LOOP Event

A conservative estimate for engine operation during the LOOP event is 7 days, with load broken down as follows:

0.2 Hrs. at 3881 KW (Ref. 3)

0.8 Hrs. at 3409 KW (Ref. 3, assuming no operator action 60 min.)

167 Hrs. at 2617 KW (Long term recommended loading, based on plant needs)

Generator load is based on the highest loaded diesel generator during each time interval specified.

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Based on the above analysis, the total engine operating hours for the two-year cycle is 260 hours. The attached table combines the engine hours under two categories; continuous and intermittent engine operation.

We trust the above information meets your needs; if any questions should arise, please contact the undersigned.

J. Carney
Project Engineer

JCL:dcm

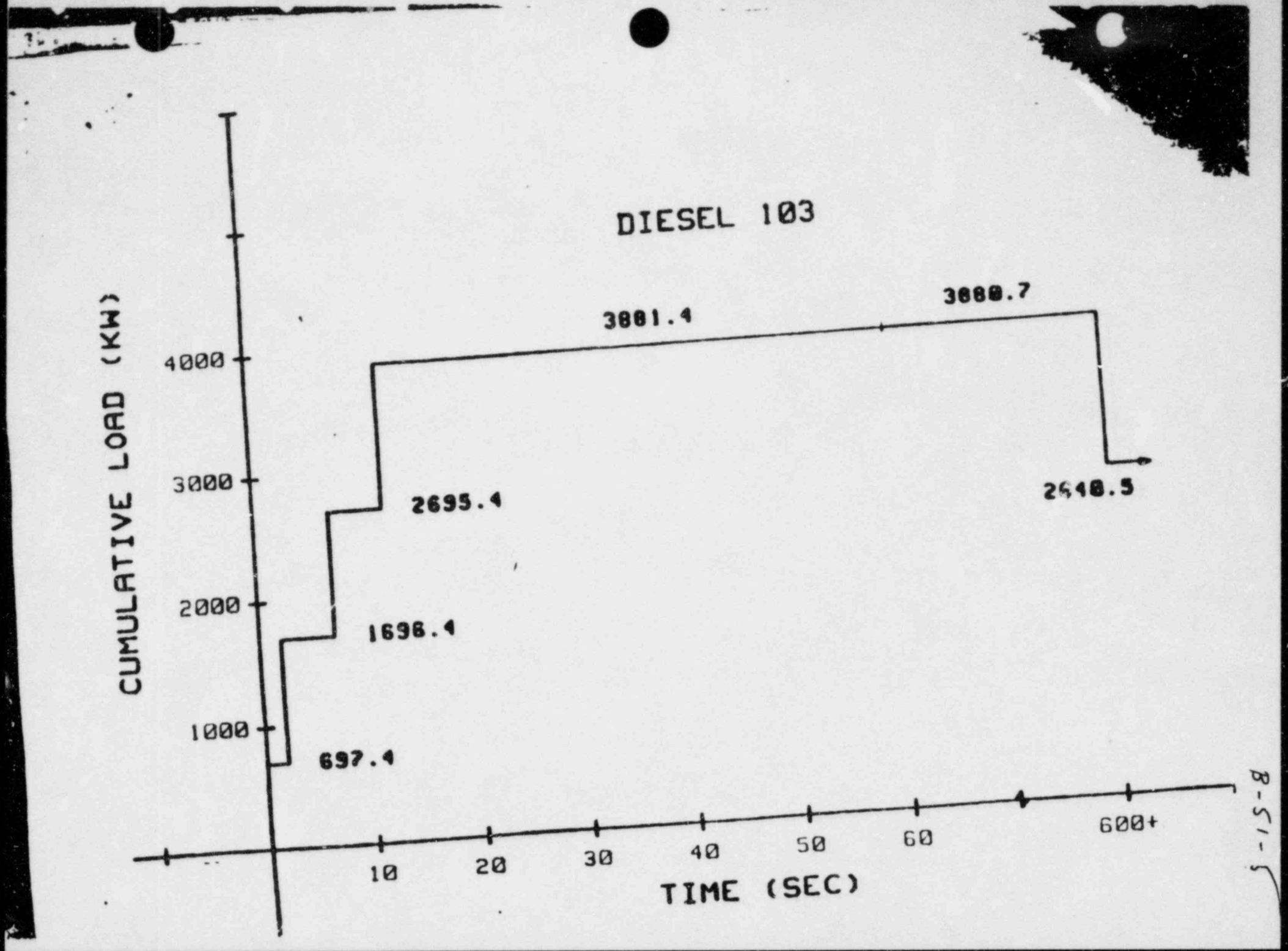
Attachment

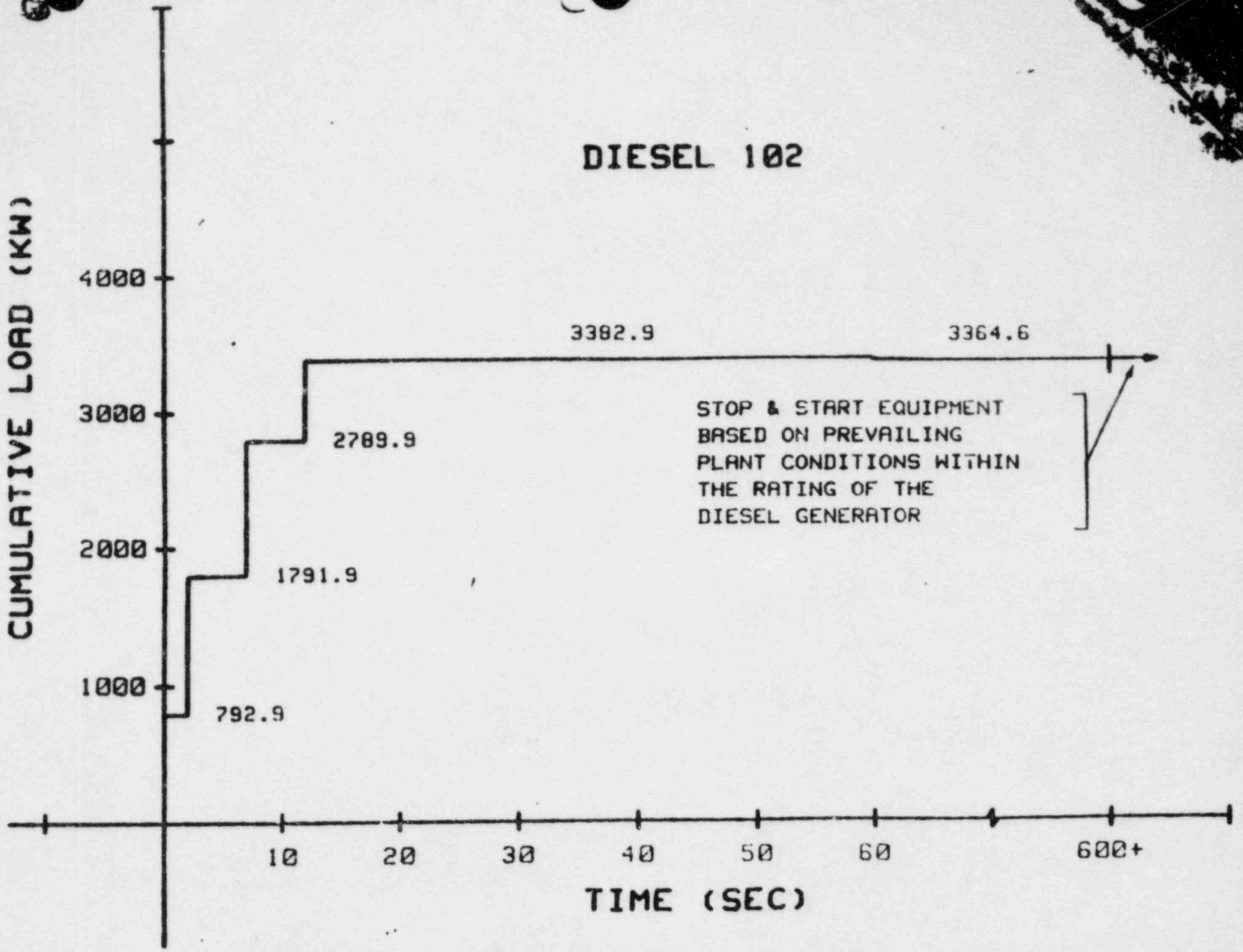
TABLE

ENGINE OPERATING HOURS

2-Year Cycle

Operation (hours)	Load (KW) 2617	2625	3409	3500	3881	3900
1. Intermittent		2		66		
2. Continuous:						
(1) LOOP	167		0.8		0.2	
(2) Test Run				22		2.0


DIESEL 103
CUMULATIVE LOAD (KW)
4000
3000
2000
1000
3881.4
3888.7
2695.4
2648.5
1698.4
697.4
10
20
30
40
50
60
600+
TIME (SEC)
5-15-8


DIESEL 102
CUMULATIVE LOAD (KW)
4000
3000
2000
1000
3382.9
3364.6
2789.9
1791.9
792.9
STOP & START EQUIPMENT
BASED ON PREVAILING
PLANT CONDITIONS WITHIN
THE RATING OF THE
DIESEL GENERATOR
10
20
30
40
50
60
600+
TIME (SEC)

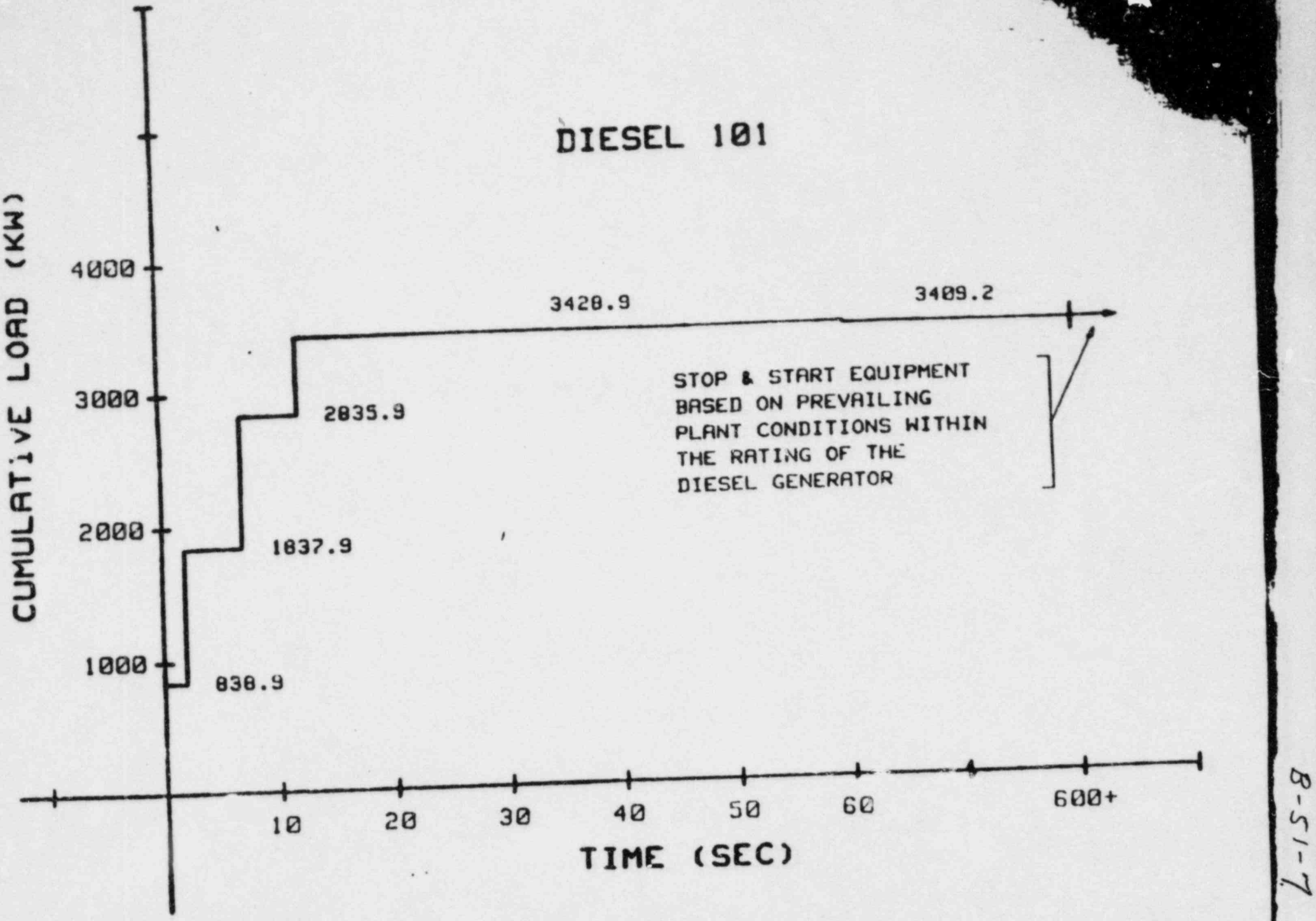

DIESEL 101
CUMULATIVE LOAD (KW)
4000
3000
2000
1000
3428.9
3409.2
2835.9
1837.9
838.9
STOP & START EQUIPMENT
BASED ON PREVAILING
PLANT CONDITIONS WITHIN
THE RATING OF THE
DIESEL GENERATOR
10
20
30
40
50
60
600+
TIME (SEC)

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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) (***) (*) DG-101	DG-102	DG-103
Core Spray Pump	1250	2	1 (**)	1	-	998	998	-
Residual Heat Removal Pump	1250	4	2 (**)	1	2	999	999	1998 (**)
Service Water Pump	450	4	2	2	3 (***)	358	358	716
RBSVS and CRAC Water Chiller	292	4	2	2	2	235	235	470 (**)
RBSVS and CRAC Water Chiller Lube Oil Pump	.25	4	2	2	2	0.2	0.2	0.4 (**)
RBSVS Chiller Circ. Water Pump	75	4	2	2	2	60	60	120 (**)
RBSVS Chiller Cond. Water	20	4	2	2	2	16	16	32 (**)
RBSVS Unit Cooler	30	8	4	4	4	6	96	-
RBSVS Exhaust Fan	100	3	2	2	2	82.5	82.5	92.5
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 (***)	72 (***)	72 (***)
Diesel Generator Jacket Water Keep Warm Pump	2.5 kW	3	-	-	-	2.5 (***)	2.5 (***)	2.5 (***)
Diesel Generator Lube Oil Heater	20 kW	3	-	-	-	20 (***)	20 (***)	20 (***)
Diesel Generator Before & After Lube Oil Pump	5	3	-	-	-	4 (***)	4 (***)	4 (***)
Diesel Generator Heater	4.2 kW	3	-	-	-	4.2 (***)	4.2 (***)	4.2 (***)
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 (***)	-	-	52 (**)
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 (CONT'D)

Function	Nameplate Rating (HP)	Total Plant Number	Number Required Design Basis Loss of Coolant Accident (0-10 Min)	(10 Min-10 Min)	Loss of Offsite Power (Unit Standby)	Maximum Coincident Demand (Kilowatt)		
						DG-101	DG-102	DG-103
Emergency Switchgear, Relay & Computer Rooms Air Condi tioning Unit	40	2	1	1	1	33.9	33.9	-
TSC Air Conditioning Unit	40 kW	1		1	1			40 *, **
TSC Air Cooled Condenser	30 kW	1		1	1			30 *, **
Emergency Switchgear, Relay & Computer Rooms Exhaust Fan	10	2	1	1	1	8.0	8.0	-
RHR/VS Chiller Room Exhaust Fan	3	2	1	1	1	2.4	2.4	-
Penwell Exhaust Fan	10	2	1	1	1	8.0	8.0	-
Penwell Interposing Relay Panel	1 kVa	1	1	1	1		0.8	-
MCC Room Ventilation	75	2	1	1	1	0.5	0.5	
ECCS M G Set Room Ventilation	1	4	2		2	2.4	2.4	4.8
Unit Cooler MCC CRT Room	1.5	1	1	1	1		1.2	-
Spent Fuel Pool Cooling Water Pump	30	2		1	1	24 **	24 **	-
Sump Level Pump (CS, RHR, HPCI, RCIC)	7.5	4	1	2	4	12.0	12.0	-
Atmospheric Cont - Hyd Recombiner	100 kW	2		1		109 **	109 **	-
MSIV-LCS Heaters	6.6 kW	87				-	26.4 **	-
MSIV-LCS Blowers	4.4	1				7 *	3.5 **	-
Radiation Monitoring	1	10				4.8	3.2	-
Lighting (Equivalent kW)	47.2 kW				2 *	180 *		227.2 **
Fence Security Lighting	50 kW				1 *	34	-	26
Reactor Protection System M G Set **	25	2			2	20 **	20 **	-
Reactor Protection System Backup Transformer	25 kVa	1			1	-	-	20 **
Battery Charger 125 V	1 kVa	4				2.4 *	2.4 **	-
Uninterruptible Power (Vital Bus) **	37.5 kVa	1	1	1	1			30
Uninterruptible Power (Security & Communications) **	20 kVa	1	1	1	1			16
Battery Charger (Security and Communication)	20 kVa	1					-	4
Uninterruptible Power (Computer Bus) *	20 kVa	1	1		1	1*		-
Control Rod Drive Pump *	25	2			1	200 *	200 *	
Dry-well Cooling System Fan *	25	8			4	80 *	80 *	

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TABLE 8.3.1-1 (CONT'D)

Function	Nameplate Rating (Hp)	Number Required: 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) [11] [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 [8]	60	2	-	-	1		48 [8]	48 [8]
Suppression Pool Pump Back Pump	25	1	-	-	-	20 [8]	-	-
Main Turbine Turning Gear [8]	60	1	-	-	1	-	-	48 [8]
Main Turbine Piggyback Turning Gear Drive	0.5	1	-	-	1	-	-	0.4 [8]
Main Turbine Turning Gear Oil Pump [8]	40	1	-	-	1	-	-	32 [8]
Main Turbine Bearing Lift Pump [8]	5	7	-	-	7	8 [8]	8 [8]	12 [8]
Feedwater Turbine Turning Gear [8]	1.5	2	-	-	2	1.2 [8]	1.2 [8]	-
Feedwater Turbine Turning Gear Oil Pump [8]	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 [8]	10 kW	1	-	-	-	-	10 [8]	-
Standby Liquid Control Mixing Heater [8]	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 [8]	-	-	19.7	18.3	0.7
Nonoperating MOV's [11]	-	-	-	-	-	95.0	75.3	-
Total Connectable Loads						4381.3	4147.8	4483.7
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.

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TABLE 8.3.1-2 (CONT'D)

Sequence	Time (Sec) [1]	Rated Horsepower	Brake Horsepower	Starting kVa	Running kW	Cumulative kW
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 and two RBSVS Chillers	12 [2]	450	400 584	4,044 2,654	716 470	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.

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TABLE 8.3.1-2

SEQUENTIAL LOADING OF DIESEL GENERATOR SETS

Sequence	Time (Sec)	Rated Horsepower	Brake Horsepower	Starting kVa	Running kW	Cumulative kW
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 and RBSVS Chiller	12	450 -	450 292	2,022 1,327	358.0 235.0	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	252.6	252.6
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 and RBSVS Chiller	12	450 -	450 292	2,022 1,327	358.0 235.0	3,382.9
5. MOVs Complete Operation	60 (Approx)	-	-	-	(18.3)	3,364.6
6. Manually stop loads not required and add additional loads as required within the rating of the diesel generator	600 - On	-	-	-	-	-

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