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A. V. MORISI
MANAGER
NUCLEAR OPERATIONS SUPPORT DEPARTMENT

January 5, 1982

BECo. Ltr. #82-2

Mr. Thomas A. Ippolito, Chief
Operating Reactors Branch #2
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

License No. DPR-35
Docket No. 50-293

Response to Request for Information
on Diesel Generators (U.S.I. A-44)

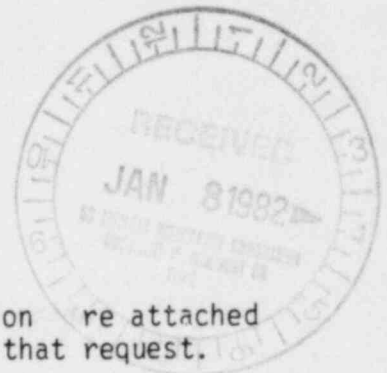
Reference (A): NRC Letter of July 20, 1981
from Mr. Thomas A. Ippolito
to Mr. A. V. Morisi (BECo.
Ltr. #1.81.198)

Dear Sir:

In Reference (A), the NRC requested that we complete the question re attached to it. Boston Edison believes the attached document satisfies that request.

In preparing this response we used, in addition to Licensee Event Reports, the following sources of information:

- (1) System #61 VISI Records -- Maintenance Machine history record files kept on the Diesel Generators and associated equipment - 1972-1980.
- (2) System #61 Maintenance Requests - 1972-1980.
- (3) System #61 PDCR's -- Plant Design Changes on Diesels or associated equipment - 1972-1980.
- (4) Watch Engineer Log Books -- This is the daily log of plant happenings kept by the Watch Engineer - 1972-1980.
- (5) 345 kV Disturbances -- This is a list of disturbances associated with the 345 kV Grid. This list is maintained by the Nuclear Engineering Department (Boston Edison). (Loss of 345 kV requires Diesel's to start.) This is from 1972-1980.
- (6) Surveillance 8.9.1 Data Results -- Routine one hour, 100% load test performed on the Diesel Generators. These records are from 1976 - 1980. Note: This test was performed on a routine weekly basis through 1978. From 1979 to the present, this test is performed every other week. It is also performed after diesel maintenance has been completed.



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- (7) Diesel Report Book 1 & 2 -- These are two books that are kept in the office of the Station Electrical Engineer. They are records of unusual happenings, annual overhaul reports, special reports, etc. The Diesel consultant to Boston Edison maintains these books with the assistance of the Station Electrical Engineer and they are a complete history of the Diesels.
- (8) Surveillance 8.M.3.1.A Data -- This is an annual test performed on the Diesel Generators. This test proves the ability of the Diesel Generators to automatically start and accept their ECCS loads with a simulated loss of AC Power and LOCA.

The information provided in the attached Tables 1, 2 and 3 is for the years 1976 through 1980. The information in Table 4 is from the year the reactor went critical, taken to be 1972, through 1980.

We believe this response addresses your request. Should you require further information regarding this issue, please contact us.

Very truly yours,

John M. Felt
John M. Felt

Attachments: Table #1 - For calendar years 1976 through 1980
Table #2 - For calendar years 1976 through 1980
Table #3 - For calendar years 1975 through 1980
Note: 1975 necessary because of LER Abstract No. 11
Table #4 - From 1972 through 1980

**Diesel Generator Operation- Data
Calendar Year 1977**

Reason for DG Operation, & Scheduled Duration of Run	DG No.	Number of Starts	Number of Failures	Percent Loading of DG (KW)	Duration of Run Before Stop For Each DG Failure	Identification of Failure (Refer to attached LFRs or Table J)
<u>Tech. Spec. Req'd Test</u>	A	62	0	100%		
One Hour at 100%	B	61	0	100%		
Automatic Starting & Load Sequencing, with simulated loss of off- site A.C. Power with LOCA	A	8	0	75%		
	B	8	0	75%		
RHR Logic Auto Start	A	2	0	0		
	B	2	0	0		
Core Spray Logic Auto Start	A	2	0	0		
	B	2	0	0		
DG Actual Demand Starts not for Testing	A	2	0	20%		
	B	2	0	15%		
Miscellaneous Tests (Specify Type)						

**Miscellaneous Tests
(Specify Type)**

Diesel Generator Operations Data
Calendar Year 1979

Reason for DG Operation, & scheduled Duration of Run Tech. Spec Req'd Test One Hour at 100%	DG No.	Number of Starts	Number of Failures	Percent Loading of DG (KW)	Duration of Run Before Stop For Each DG Failure	Identification of Failure (Refer to attached LERs or Table 3)
Auto Start Per RHR Logic	A	3	0			Note: LER Abstract #5 Diesel did not fail to start but after test annunciation of a problem was observed.
	B	38	0			
Auto Start Per Core Spray Logic	A	2	0			
	B	2	0			
DG Actual Demand Starts not for Testing	A	2	0	20%		
	B	2	0	15%		
Miscellaneous Tests (Specify Type)						

TABLE 1 Diesel Generator Operation Data
Calendar Year 1980

Reason for DG Operation, & scheduled Duration of Run	DG No.	Number of Starts	Number of Failures	Percent Loading of DG (KW)	Duration of Run Before Stop For Each DG Failure	Identification of Failure (Refer to attached LERs or Table J)
Tech. Spec Req'd Test	A	43	1	100%		LER Abstract #2
Tech. Spec. Req'd Test One Hour at 100%	B	35				
Automatic Starting & Load Sequencing with Simulated Loss of off-site A.C. Power with LOCA	A	2	0	75%		
	B	2	0	75%		
Auto Start Per RHR Logic	A	2	0			
	B	2	0			
Auto Start Per Core Spray	A	2	0			
	B	2	0			
DG Actual Demand Starts not for Testing	A	3	0	20%		
	B	3	0	15%		
Miscellaneous Tests (Specify Type)	A	3	2	100/110%		LER Abstract #3
24 Hr. continuous test at 100% and 1 hr. at 110%	B	1	0	100/110%		

Diesel Generator Scheduled Downtime Record
Calendar Year 1976

Enclosure 1 - Page 2
Plant Name Pilgrim
Unit No. 1

Reason for Downtime	Hours of Downtime										Comments	
	Reactor shutdown					Reactor not shutdown						
	DC/ A	DC/ B	DC/	DC/	DC/	DC/ A	DC/ B	DC/	DC/	DC/		
Scheduled Maintenance											Refuel Outage Dates 1/29/76-6/1/76	
Refueling Outage Preventive maintenance, Annual checks, Repairs, Modifications etc.	720	120										
Unscheduled Maintenance												
Exhaust Bellows Leak						12						Replaced Exhaust Bellows that was leaking at the weld
Engine would not normally shutdown		8										Replaced Gov. Dump Valve Coil
Sticky Turbo Assist Valves		8									Cleaned Valves	
Exhaust Bellows Leak							12				Replaced Exhaust Bellows that was leaking at the weld	

Time DG is unavailable for emergency service because of required tests

Diesel Generator Logic dictates that emergency conditions override normal routine testing; therefore, time available is N/A.
During tests when the emergency logic is prohibited from performing its function, then the Diesel/Generator is considered to be unavailable and the hours are reflected above in the downtime.

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1977

Enclosure 1 - Page 2
 Plant Name Pilgrim
 Unit No. 1

Reason for Downtime	Hours of Downtime										Comments
	Reactor shutdown					Reactor not shutdown					
	DC/ A	DC/ B	DC/	DC/	DC/	DC/ A	DC/ B	DC/	DC/	DC/	
Scheduled Maintenance											
Refueling Outage											Refuel Outage Dates
Preventive maintenance	454	800									8/6/77-12/12/77
Annual checks, Repairs, Modification, etc.											
Installed expansion water tank							30				To allow testing of the coolant system
Relocated Ventilation Cable & Dampers						84	24				To allow pre-work on modifications scheduled to be done during outage
Inspection of Radiator Fan Blades						30	30				Engineering Dept. had requested hubs of blades be inspected
Unscheduled Maintenance											
Leaking Fuel Gauge Line							5				Leak had been observed during routine test and line was replaced
Time DC is unavailable for emergency service because of required tests			N/A				N/A				See 1976 Table 2 Comment

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1978

Enclosure 1 - Page 2
 Plant Name Pilgrim
 Unit No. 1

Reason for Downtime	Hours of Downtime										Comments
	Reactor shutdown					Reactor not shutdown					
	DC/ A	DC/ B	DC/	DC/	DC/	DC/ A	DC/ B	DC/	DC/	DC/	
<u>Scheduled Maintenance</u>											No Refueling Outage
Radiator Fan Blade Inspection	72										
<u>Unscheduled Maintenance</u>											
Belt-Fuel Oil Pp	6					6					
Belt-Fuel Oil Pp						6					
Belt-Fuel Oil Pp											
Engine sluggish							48				
Engine would not shutdown normally							4				
Failed Gen. Exciter							46				
Fuel oil leak						6					
Generator failure		384									
Engine sluggish						4					
Time DG is unavailable for emergency service because of required tests			N/A				N/A				See 1976 Table 2 comment

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1979

Enclosure 1 - Page 2
 Plant Name Pilgrim
 Unit No. 1

Reason for Downtime	Hours of Downtime										Comments
	Reactor shutdown					Reactor not shutdown					
	DC/ A	DC/ B	DC/	DC/	DC/	DC/ A	DC/ B	DC/	DC/	DC/	
<u>Scheduled Maintenance</u>											
Engine Sluggish						4					NO REFUELING OUTAGE
Engine Sluggish						10					Replaced Gov. Oil
Loose Bolts							4				Replaced Gov.
Pre-Lube Trip		4									Indicating Cock Bolts Tightened
Loose Belt						4					Faulty connection in Motor Terminal Box.
<u>UNSCHEDULED MAINTENANCE</u>											Fuel Oil Pp V Belt slipping
Engine could not be normally shutdown							12				Govenor Dump Valve Nut had worked loose
Engine could not be normally shutdown							6				repair was to roughenthe threads
Received Generator Protective Relay Operation							24				Govenor Dump Valve Nut had again worked loose. Repair this time was to drill hole and use stainless steel wire to secure.
											Electrical checks were performed and no reason for the relay operation could be determined
Time DG is unavailable for emergency service because of required tests		N/A					N/A				See 1976 Table 2 comment

TABLE 2

Diesel Generator Scheduled Downtime Record
Calendar Year 1980

Enclosure 1 - Page 2
 Plant Name Pilgrim
 Unit No. 1

Reason for Downtime	Hours of Downtime										Comments
	Reactor shutdown					Reactor not shutdown					
	DC# A	DC# B	DC#	DC#	DC#	DC# A	DC# B	DC#	DC#	DC#	
Scheduled Maintenance											
REFUELING OUTAGE											REFUELING OUTAGE DATES 1/5/80-5/19/80
Preventive maintenance Annual checks, Repairs, Modifications, etc.	240	1082									
Generator Electric Heater	8										Repaired Heater
UNSCHEDULED MAINTENANCE											
Fuel Oil leak						6					Replaced leaking Fuel Oil crossover "T" connection
Time DG is unavailable for emergency service because of required tests			N/A				N/A				See 1976 Table 2 comment

Table 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1975

Enclosure 1 - Page 3
 Plant Name Pilgrim
 Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivery, etc.	Repair/replace	
11	6	30%	N/A	70%	<p>During routine surveillance testing, the engine coming up to speed was noticed to be slower than normal. The trouble was traced to the turbo assist valves which were sticking. The valves were cleaned and the engine starting time tested.</p> <p>Note: This LER is for 1975 but was part of enclosure #2 supplied with the Information Request.</p>

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 19⁷⁶

Enclosure 1 - Page 3
 Plant Name Pilgrim
 Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivered, etc.	Repair/replace	
9	12	20%	20%	60%	<p>During routine surveillance testing of Diesel "B", smoke was observed to be coming out of the exhaust manifold area. A weld on a Bellows Connector which is part of the exhaust manifold had failed. The Bellows Connector was replaced.</p> <p>Note: The failure of this weld on the Bellows Connector would not have prevented the diesel from performing its designed function.</p>
10	12	20%	20%	60%	<p>During routine surveillance testing of Diesel "A", an exhaust manifold leak was reported. A weld on a Bellows Connector which is part of the exhaust manifold had failed. The Bellows Connector was replaced.</p> <p>Note: The failure of this weld on the Bellows Connector would not have prevented the diesel from performing its function.</p>

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1977

Enclosure 1 - Page 3
 Plant Name Pilgrim
 Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivered, etc.	Repair/replace	
6	N/A	N/A	N/A	N/A	This LER was part of enclosure #2 supplied with the information request letter. It does not have anything to do with the reliability of the Diesels and should be disregarded for this study.

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1978

Enclosure 1 - Page 3

Plant Name PilgrimUnit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivered, etc.	Repair/replace	
7	400	10%	30%	60%	During routine surveillance testing of Diesel "B", the Generator output breaker tripped. Investigation showed that stator of the Generator had shorted to ground. The stator was rewound.
8	48	40%	10%	50%	During routine surveillance testing of Diesel "B", the Generator was inadvertently thrown in out of synchronization. Investigation showed that various electrical components within the exciter & regulator had failed. Failed components were replaced and the 1 hour full load test was performed for 3 hours.

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1979

Enclosure 1 - Page 3
 Plant Name Pilgrim
 Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Deliv-ery, etc.	Repair/replace	
5	24	100%	-	-	A routine starting surveillance had been performed on "A" Diesel and after the surveillance was performed annunciation was observed showing that the generator output breaker was tripped. The surveillance test only required that the diesel be observed to start and was not required to be loaded. However, an investigation was made and tests performed to show that a problem did not exist. When all tests proved positive, the diesel was started, loaded and run for 1 hour at 100% full load before being returned to service.

TABLE 3

Diesel Generator Unscheduled Downtime Record
Calendar Year 1980

Enclosure 1 - Page 3
 Plant Name Pilgrim
 Unit No. 1

LER Abstract No. (Refer to attached LER Abstracts)	Downtime Hours				Comments - If any of the reported failures would not have been a failure under emergency conditions, please explain here. Refer to attached LERs or the failures listed in Table 1.
	Total Hours	Trouble-shooting	Parts, Delivered, etc.	Repair/replace	
1	N/A	N/A	N/A	N/A	This LER was part of enclosure #2 supplied with the information request letter. As stated in the LER, the reason for the LER was because of ambiguous language in the Tech. Specs. This LER is not related to the reliability of the Diesels and should be disregarded for this study.
2	6	N/A	50%	50%	While performing a routine surveillance test on Diesel "A" a fuel oil leak was observed. The failed component was a crossover "T" connection in the fuel line and was replaced.
3	102	25%	25%	50%	A special test on "A" Diesel was being performed as requested by the NRC. This test included operating the unit for 24 continuous hours at 100% full load and for one hour during the test, the unit is to be loaded to 110%. This test was being performed after the annual maintenance overhaul. Three hours after the initial start the unit tripped, because the fuel oil transfer pump breaker which had been tagged out for the annual overhaul had not been restored to service. After restoration of the fuel oil transfer pump, the test was restarted. About 1 1/2 hours into the test the shaft driven oil pump V belt broke and transferred over to its backup. It was decided to stop the test, replace the belt and restart the test the next day. The next day the test was started and after 21 hours the unit tripped because of a transformer failure. The transformer and other electrical components which had failed were replaced and after the 24 hour test was performed, the unit was declared operable.
4	N/A	N/A	N/A	N/A	This LER was part of enclosure #2 supplied with the information request letter. It does not have anything to do with the reliability of the Diesels and should be disregarded for this study.

TABLE 4

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Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification RecordEnclosure 1 - Page 4
Plant Name Pilgrim
Unit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
A & B Diesel Exhaust Manifold Pipes & Bellows	1977	Cracks were being experienced on the welds of the Exhaust Manifold Pipes and the Bellows	<ol style="list-style-type: none"> 1: Changed the welding specifications so that all exhaust manifold welds would use filler metal (Inconel 625) 2: Changed Bellows to Inconel type 3. Changed exhaust manifold support assembly to minimize vibration 4. Replaced all exhaust manifold pipes & Bellows to new style
A & B Diesel Radiator Fan Blades	April 1977	Hub of Radiator Fan Blades subjected to high torsional stresses and the Engineering Dept. requested that they be checked.	<p>Procedure written that requires that hub of blades be examined on a routine basis. (Dye Penetration)</p> <p>Proc. 3.M.4-36</p>
A & B Generator Exciter, Regulator and Circuit Breaker Logic	1977 Aug. thru Dec.	<p>While performing a routine test a failure of Diodes in the regulator circuit cascaded into failures of other electrical components in the exciter and the regulator.</p> <p>Investigation of this failure resulted in desired changes to improve the reliability during voltage transients and the elimination of a race of relay contacts in the generator breaker logic.</p>	<ol style="list-style-type: none"> a: Replaced (3) saturable core transformers b: Replaced (2) fuses on primary transformer with 15 c: Replaced (2) fuses in regulator with solid links d: Removed diodes that were unnecessary e: Installed a time delay relay to remove race of relay contacts

TABLE 4

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Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification RecordEnclosure 1 - Page 4
Plant Name Pilgrim
Unit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
A & B Generator Relay Protection	1977 Aug. thru Dec.	To provide antimotoring protection during tests when the Generator is tied to the system.	Installed Reverse Power Relays to protect against antimotoring during test.
A & B Diesel Exhaust Ducts	1977 Aug. thru Dec.	Moisture entrapment was causing corrosion on the ducts.	Modified the Exhaust Pipe top rain shield and repaired the Missile Shield.
A & B Diesel Air Discharge Plenum	1977 Aug. thru Dec.	The Diesel Engine Room Air discharge route was restrictive. This resulted in the cooling radiators being inefficient.	Changed the discharge plenums so as to eliminate the air restrictions and increase the cooling radiators efficiency.
A & B Diesel Combustion Air Intake Filter	1977 Aug. thru Dec.	Air supplied to the Diesel Combustion Air Intake Filter was required to pass over the hot running diesel. This would result in the air absorbing heat and supplying hot air, which resulted in the engines running hotter than was necessary.	Installed the necessary piping to relocate the engine Combustion Air Intake Filter so that the engine received intake air at ambient temp.
A & B Diesel Fuel Oil Pp. (V Belt)	1978	Shaft Driven (V Belts) were failing at the connection where they were spliced.	Changed to a new style belt and a different type connection.

TABLE 4

Page 3 of 4

**Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification Record**

Enclosure 1 - Page 8

Plant Name PilgrimUnit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
A & B Diesel Governor Solenoid Coil	1978	Normally energized coils when engine <u>not</u> running were failing. This resulted in inability to shutdown engines electrically after they were started. The coils were 125V rating and being maintained at 134V.	Replaced 125V rating coil with 140V rating coil.
A & B Diesel Generator Monthly Surv.	Jan. 1979	Surveillance test as required by Tech. Specs. is to be run once a month. Per administrative decision, this was being performed once a week. It was felt the test should be cut down to every other week and this would be better for the diesels and their associated equipment.	Per administrative directive, Testing Surveillance performed every other week as opposed to <u>once</u> a week. Note: Consideration is being given to going back to once per week testing and also to run the unit for 2 hours at approximately 75% and once a month at 100% for one hour to meet the Tech. Spec. requirement.
A & B Diesel Cooling Water Jacket Expansion Tanks	1980	The location (height) of the expansion tank was at a level (low) that on fast starts of the engine air could be entrapped into the cooling water of the diesel.	Raised the expansion tank to a level that would prevent air from being entrapped in the cooling water.

TABLE 4

Page 4 of 4

Onsite Emergency Diesel Generator and
Auxiliary Equipment Modification RecordEnclosure 1 - Page 4
Plant Name Pilgrim
Unit No. 1

Equipment or procedure modified	Date of Mod.	Reason for Modification and Desired Improvement	Description of Modification
A & B Once Per Cycle Automatic Load Sequencing of the Diesels Proc. 8.M.3.1	1978 1979 1981	Changes in Technical Specifications required that the procedure be changed for documentation of testing, more testing, etc.	Changed/updated procedure as required.
A & B Diesel Generator Control Logic	1979 1980	Fire in the Cable Spreading Room. The control cables that run between the Diesel Room and the Main Control Room that pass thru the Cable Spreading Room were required to be isolated if a fire were to occur in the Cable Spreading Room.	Isolation switch installed in Diesel Room to isolate the Cable Spreading Room Cables and allow operator control from the Diesel Room.
A & B Diesel Air Start and Turb Assist Air Compressors	1980	The gasoline engines which are a back-up for the motors on the compressors were hard to start.	Installed 12V electric starting motors and batteries.
A & B Diesel Fire Protection	1978	To comply with NRC Branch Position 9-5.1.	Installed: Pre-Acting Automatic Sprinkler System Smoke Detection System Heat Tracing on Sprinkler Piping