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VPNPD-92-257
NRC-92-079

10 CFR 50.63

July 23, 1992

U. S. NUCLEAR REGULATORY COMMISSION
Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Gentlemen:

DOCKETS 50-266 AND 50-301
SUPPLEMENT TO 10 CFR 50.63,
TACs 68586 AND 68587
LOSS OF ALL ALTERNATING CURRENT POWER
POINT BEACH NUCLEAR PLANTS, UNITS 1 AND 2

In a letter dated October 3, 1990, the NRC transmitted the Safety Evaluation Report (SER) issued by the Nuclear Regulatory Commission Office of Nuclear Reactor Regulation for the Point Beach Nuclear Plant (PBNP) response to the Station Blackout Rule, 10 CFR 50.63. In that SER, the NRC made the following recommendation for using the PBNP gas turbine generator (GTG) as an alternate AC power source:

> "The licensee should demonstrate using actual test data that the GTG can obtain and maintain a reliability of 0.95 or better. This demonstration should be completed within a reasonable time period (approximately 2 years)."

In a letter dated November 8, 1990, we committed to demonstrate the achievability of 95% reliability of the GTG within two years.

On June 25, 1992, Wisconsin Electric staff members met with personnel from the NRC staff to discuss the status of the GTG for Station Blackout Rule compliance. Attached is a status update which summarizes the information discussed and presented at this meeting.

Our efforts to demonstrate and improve the reliability of the GTG include testing, troubleshooting, and modifications. The attachment describes some of the details of our efforts to demonstrate and improve the reliability of the GTG since 1989. The attachment to this letter also provides reliability test data

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results for GTG from June 15, 1990, through March 18, 1992. As discussed with the NRC staff during our meeting on June 25, 1992, we believe the test data results demonstrate that the GTG can obtain 95% reliability. We will be implementing a reliability program that will be used to continue to improve, maintain and monitor the reliability of the GTG. The reliability program is being based on guidance from RG 1.155 for EDG reliability programs. The reliability program provides the method for maintaining 95% reliability

As part of our continuing efforts to improve and maintain the reliability of the GTG, we are currently performing a major overhaul and upgrade of the GTG. The overhaul and upgrade are expected to be completed by October 1992. The attachment to this letter provides a description of the overhaul and upgrade. The attachment also contains a plan for how we intend to test the GTG to re-establish the achievability of 95% reliability after the overhaul. We propose that completion of twenty tests with two or fewer failures re-establishes the achievability of 95% reliability after the overhaul. This is considered "reasonable confidence" that the reliability has not degraded below the target reliability as stated in the proposed Revision 3 to Regulatory Guide 1.155. We have estimated that this testing will be completed approximately thirty weeks following the completion of the overhaul (i.e., about May 1993).

While the GTG is out of service for the major overhaul and upgrade, a diesel generator has been installed temporarily to provide power to the Appendix R alternate shutdown system. The procedures for Appendix R fire scenarios and loss of all AC power have been modified to use the temporary diesel generator (TDG) while the GTG is not available. A description of the TDG and its capabilities for mitigating a station blackout are provided in the attachment to this letter.

We believe the goal to complete twenty tests with two or fewer failures within thirty weeks is achievable. The extensive overhaul and upgrade outage is the main reason for our requesting this time to perform the redemonstration of the achievability of 95% reliability of the GTG. We expect to complete this redemonstration by May 1993. The TDG will be maintained as a compensatory measure until the twenty tests with two or fewer failures are completed or some other licensing action allows its removal.

Implementation schedule requirements for alternate AC power sources are defined in 10 CFR 50.63 (c)(4). This provision requires licensees to submit a schedule for implementing any

associated procedure modifications necessary to meet the requirements of the Station Blackout Rule. Our schedule commitment was provided in our letter dated November 8, 1990. In that letter, we committed to demonstrate the achievability of 0.95 reliability of the GTG within two years. We believe the data provided in this letter satisfy this commitment.

The major overhaul and upgrade of the gas turbine are expected to improve the reliability. We are proposing to redemonstrate the GTG reliability after the overhaul by May 1993 by completing twenty countable starts and load-runs with two or fewer failures. If we cannot redemonstrate the reliability, we will submit additional information about how we propose to meet the requirements of 10 CFR 50.63. We request that the NRC staff review and approve this proposal as an acceptable plan and schedule for continued compliance with the Station Blackout Rule at Point Beach Nuclear Plant.

Sincerely,

Bob Link
Vice President
Nuclear Power

Attachment

Copies to NRC Regional Administrator, Region III
NRC Resident Inspector

STATUS UPDATE FOR STATION BLACKOUT RULE IMPLEMENTATION
POINT BEACH NUCLEAR PLANT UNITS 1 AND 2

GAS TURBINE RELIABILITY

In our initial station blackout submittal to the NRC in April 1989, we stated that PBNP would rely on alternate AC power from the gas turbine that exists at the site. At that time, the reliability of the gas turbine was reported to be about 0.91. We also stated that additional testing and maintenance requirements would be implemented to improve the gas turbine's reliability.

In July 1989, we began testing the gas turbine in a mode similar to the way it would be started during a station blackout. The gas turbine has an auxiliary power diesel generator that starts automatically when power to the gas turbine is lost. The new mode of testing includes securing power to the gas turbine, allowing the auxiliary power diesel to start, then starting and running the gas turbine with its support systems powered by the auxiliary power diesel.

During these initial tests, the auxiliary power diesel failed several times by tripping on high temperature. This failure causes the gas turbine to trip due to the loss of its support systems. A main problem causing the high temperature trip was believed to be inadequate ventilation near the auxiliary power diesel. A modification to the gas turbine building ventilation was completed in June 1990.

After the ventilation modification was completed, another test was attempted. The test failed due to the auxiliary power diesel trip on high temperature. The auxiliary power diesel high temperature trip circuit was recalibrated, and the setpoint was raised. The technical manual for the auxiliary power diesel allows the higher setpoint. The gas turbine was tested after the recalibration of the high temperature trip on the auxiliary power diesel. The test was successful, but the maximum outside ambient air temperature that day was only 55°F. Another test was performed during warmer weather. This test failed due to the auxiliary power diesel high temperature trip.

In June 1990, we started to perform monthly station blackout tests. (The attached Gas Turbine G-05 Start and Load Reliability database starts at that time.) The failure of the auxiliary power diesel during a long duration test during hot weather was not yet resolved, but the problem had been minimized to the extent that the gas turbine could be run for at least eight hours during cool weather and about four hours during hot weather. Long duration testing was suspended until the auxiliary power diesel high temperature trip problem could be resolved.

After further study, it was determined that the temperature sensor and the trip circuitry should be upgraded. In March 1991, a change to the high temperature trip circuit for the auxiliary power diesel was completed. On July 18, 1991, an eight-hour test was completed. The maximum outside ambient air temperature was ~86°F. This test confirmed that the auxiliary power diesel high temperature trip problem had been resolved.

In July 1991, a gas turbine reliability team was formed. In the last quarter of 1991, problems with the starting circuits for the starting diesel and the auxiliary power diesel were corrected. Also, the station blackout QA program was finalized and applied to the gas turbine and other station blackout equipment.

A GTG reliability database has been developed based on the methodology in NSAC-108, "The Reliability of Emergency Diesel Generators at U.S. Nuclear Power Plants." A copy of the database and graphs of the cumulative and sliding-10 is also in this attachment. The sliding-10 data are a calculation of the GTG reliability from the 10 start attempts and the 10 load attempts that include and precede that test. The sliding-10 is being used as a method to monitor the rapidly changing reliability.

The guidance documents for 10 CFR 50.63 (NUMARC 87-00 and Reg Guide 1.155) do not provide guidance on how to select a target reliability for Alternate AC power sources. Section 3.3.5 of Reg Guide 1.155 recommends 95% reliability for Alternate AC power sources.

Reg Guide 1.155 does provide some guidance on the selection of a target reliability for Emergency Diesel Generators (EDG). Section 1.1 of Regulatory Guide 1.155 uses samples of 20, 50, and 100 demands for selection of EDG target reliability. The 20, 50, and 100 demand reliability for the GTG as calculated from the GTG reliability database is:

Last 20 Demands

Starting	20/20	≈	100%
Loading	20/20	≈	100%
Total	100% · 100%	≈	100%

Last 50 Demands (insufficient loading data)

Starting	40/50	≈	80%
Loading	42/46	≈	91%
Total	80% · 91%	≈	73%

Last 100 Demands (insufficient starting and loading data)

Starting	56/71	≈	79%
Loading	42/46	≈	91%
Total	79% · 91%	≈	72%

The criteria given for evaluating EDG reliability are provided in Reg Guide 1.155. They are:

Last 20 demands > 0.90 reliability
Last 50 demands > 0.94 reliability
Last 100 demands > 0.95 reliability

Reg Guide 1.155 also states that, if any of these reliability criteria are met, the nuclear unit may select an EDG reliability target of either 0.95 or 0.975 for determining the applicable coping duration. This information, combined with the recommendation for 95% reliability for an AAC power source, indicates that selection of 95% target reliability for the GTG is reasonable.

The 100% reliability for the last twenty start and load demands demonstrates that the 95% reliability target is achievable. A reliability program based on the target reliability of 95% is being developed for continuing to improve, maintain, and monitor GTG reliability.

Gas Turbine G-05 Start and Load Reliability Database

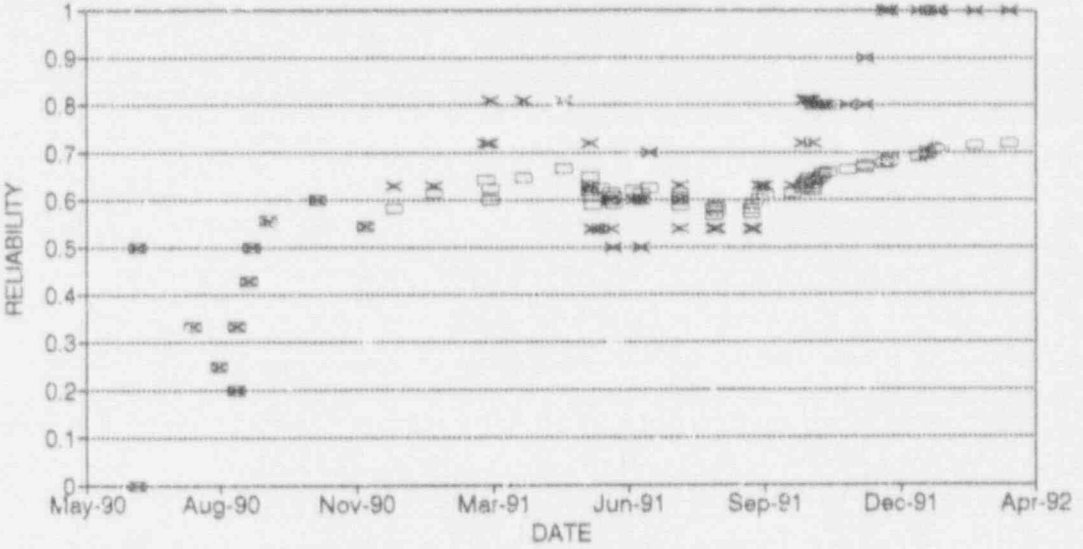
Date	START PHASE		LOAD PHASE		Cumulative			Sliding - 10			
of Test	Attempts	Success	Attempts	Success	START Reli	LOAD Reli	TOTAL Reli	START Reli	LOAD Reli	TOTAL Reli	Comments
06/15/90	1	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	G-501 did not start
06/15/90	2	1	1	1	0.50	1.00	0.50	0.50	1.00	0.50	
07/25/90	3	2	2	1	0.67	0.50	0.33	0.67	0.50	0.33	Loss of G-501
08/14/90	4	3	3	1	0.75	0.33	0.25	0.75	0.33	0.25	Loss of G-501
08/27/90	5	3	3	1	0.60	0.33	0.20	0.60	0.33	0.20	Fuel and Sequence Failure
08/27/90	6	4	4	2	0.67	0.50	0.33	0.67	0.50	0.33	
09/04/90	7	5	5	3	0.71	0.60	0.43	0.71	0.60	0.43	
09/06/90	8	6	6	4	0.75	0.67	0.50	0.75	0.67	0.50	
09/18/90	9	7	7	5	0.78	0.71	0.56	0.78	0.71	0.56	
10/24/90	10	8	8	6	0.80	0.75	0.60	0.80	0.75	0.60	
11/29/90	11	9	9	6	0.82	0.67	0.55	0.90	0.67	0.55	Loss of G-501
12/19/90	12	10	10	7	0.83	0.70	0.58	0.90	0.70	0.63	
01/18/91	13	11	11	8	0.85	0.73	0.62	0.90	0.70	0.63	
02/25/91	14	12	12	9	0.86	0.75	0.64	0.90	0.80	0.72	
02/28/91	15	12	12	9	0.80	0.75	0.60	0.90	0.80	0.72	G-501 Fuse Blown restart in 590 min.
02/28/91	16	13	13	10	0.81	0.77	0.63	0.90	0.90	0.81	
03/25/91	17	14	14	11	0.82	0.79	0.65	0.90	0.90	0.81	
04/24/91	18	15	15	12	0.83	0.80	0.67	0.90	0.90	0.81	
05/13/91	19	15	15	12	0.79	0.80	0.63	0.80	0.90	0.72	Fuel Supply Failure
05/13/91	20	16	16	13	0.80	0.81	0.65	0.80	0.90	0.72	Start Device Failure restart in 50 min.
05/13/91	21	16	16	13	0.76	0.81	0.62	0.70	0.90	0.63	
05/15/91	22	16	16	13	0.73	0.81	0.59	0.60	0.90	0.54	Start Device Failure restart in 13 min.
05/15/91	23	17	17	14	0.74	0.82	0.61	0.60	0.90	0.54	
05/21/91	24	18	18	15	0.75	0.83	0.63	0.60	0.90	0.54	
05/28/91	25	18	18	15	0.72	0.83	0.60	0.60	0.90	0.54	Start Device Failure restart in 191 min.
05/28/91	26	19	19	16	0.73	0.84	0.62	0.60	1.00	0.60	
05/30/91	27	19	19	16	0.70	0.84	0.59	0.50	1.00	0.50	Start Device Failure restart in 101 min.
05/30/91	28	20	20	17	0.71	0.85	0.61	0.50	1.00	0.50	
06/14/91	29	21	21	18	0.72	0.86	0.62	0.60	1.00	0.60	
06/20/91	30	21	21	18	0.70	0.86	0.60	0.50	1.00	0.50	Start Device Failure restart in 54 min.
06/20/91	31	22	22	19	0.71	0.86	0.61	0.60	1.00	0.60	
06/26/91	32	23	23	20	0.72	0.87	0.63	0.70	1.00	0.70	
07/18/91	33	23	23	20	0.70	0.87	0.61	0.60	1.00	0.60	Start Device Failure
07/18/91	34	24	24	20	0.71	0.83	0.59	0.60	0.90	0.54	High Bearing Temp
07/18/91	35	25	25	21	0.71	0.84	0.60	0.70	0.90	0.63	
08/12/91	36	25	25	21	0.69	0.84	0.58	0.60	0.90	0.54	G-501 Fuse Blown
08/12/91	37	25	25	21	0.68	0.84	0.57	0.60	0.90	0.54	Fuel Supply Failure
08/14/91	38	26	25	21	0.68	0.84	0.57	0.60	0.90	0.54	Minimum load only for Operability check
08/14/91	39	27	26	22	0.69	0.85	0.59	0.60	0.90	0.54	
09/09/91	40	27	26	22	0.68	0.85	0.57	0.60	0.90	0.54	G-500 failure restart in 24 min. with repair
09/09/91	41	28	27	23	0.68	0.85	0.58	0.60	0.90	0.54	
09/11/91	42	29	28	24	0.69	0.86	0.59	0.60	0.90	0.54	
09/15/91	43	30	29	25	0.70	0.86	0.60	0.70	0.90	0.63	
09/19/91	44	31	30	26	0.70	0.87	0.61	0.70	0.90	0.63	
10/10/91	45	32	30	26	0.71	0.87	0.62	0.70	0.90	0.63	Minimum load only for Operability check
10/17/91	46	33	31	27	0.72	0.87	0.62	0.80	0.90	0.72	
10/18/91	47	34	32	28	0.72	0.88	0.63	0.90	0.90	0.81	
10/20/91	48	35	32	28	0.73	0.88	0.64	0.90	0.90	0.81	Minimum load only for Operability check
10/22/91	49	36	33	29	0.73	0.88	0.65	0.90	0.90	0.81	

Gas Turbine G-05 Start and Load Reliability Database Continued

Date	START PHASE		LOAD PHASE		Cumulative			Sliding - 10			
					START	LOAD	TOTAL	START	LOAD	TOTAL	
of Test	Attempts	Success	Attempts	Success	Reli	Reli	Reli	Reli	Reli	Reli	Comments
10/24/91	50	36	33	29	0.72	0.88	0.63	0.90	0.90	0.81	G-500 low Lube Oil Pressure
10/24/91	51	36	33	29	0.71	0.88	0.62	0.80	0.90	0.72	High Vibration
10/24/91	52	[illegible]	34	30	0.71	0.88	0.63	0.80	1.00	0.80	
10/25/91	53	[illegible]	35	31	0.72	0.89	0.64	0.80	1.00	0.80	
10/28/91	54	39	36	32	0.72	0.89	0.64	0.80	1.00	0.80	
10/30/91	55	40	37	33	0.73	0.89	0.65	0.80	1.00	0.80	
11/01/91	56	41	38	34	0.73	0.89	0.66	0.80	1.00	0.80	
11/04/91	57	42	38	34	0.74	0.89	0.66	0.80	1.00	0.80	
11/19/91	58	43	39	35	0.74	0.90	0.67	0.80	1.00	0.80	
12/02/91	59	44	39	35	0.75	0.90	0.67	0.80	1.00	0.80	Reverse Power Trip restarted in 33 minutes
12/02/91	60	45	40	36	0.75	0.90	0.68	0.90	1.00	0.90	
12/16/91	61	46	40	36	0.75	0.90	0.68	1.00	1.00	1.00	Reverse Power Trip
12/19/91	62	47	40	36	0.76	0.90	0.68	1.00	1.00	1.00	Minimum load only for Operability check
12/20/91	63	48	41	37	0.76	0.90	0.69	1.00	1.00	1.00	
01/10/92	64	49	41	37	0.77	0.90	0.69	1.00	1.00	1.00	Reverse Power Trip restarted in 17 minutes
01/10/92	65	50	41	37	0.77	0.90	0.69	1.00	1.00	1.00	Minimum load only for Operability check
01/17/92	66	51	41	37	0.77	0.90	0.70	1.00	1.00	1.00	Reverse Power Trip restarted in 34 minutes
01/17/92	67	52	42	38	0.78	0.90	0.70	1.00	1.00	1.00	
01/24/92	68	53	43	39	0.78	0.91	0.71	1.00	1.00	1.00	
01/26/92	69	54	44	40	0.78	0.91	0.71	1.00	1.00	1.00	
02/21/92	70	55	45	41	0.79	0.91	0.72	1.00	1.00	1.00	
03/18/92	71	56	46	42	0.79	0.91	0.72	1.00	1.00	1.00	

GAS TURBINE RELIABILITY SINCE JUNE 1990

TOTAL RELIABILITY



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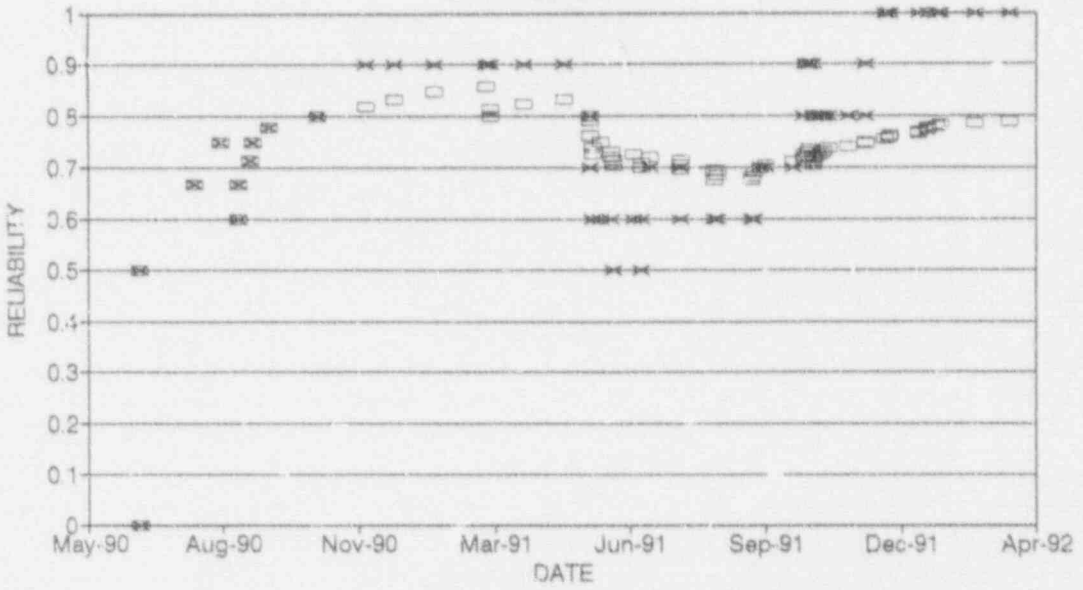

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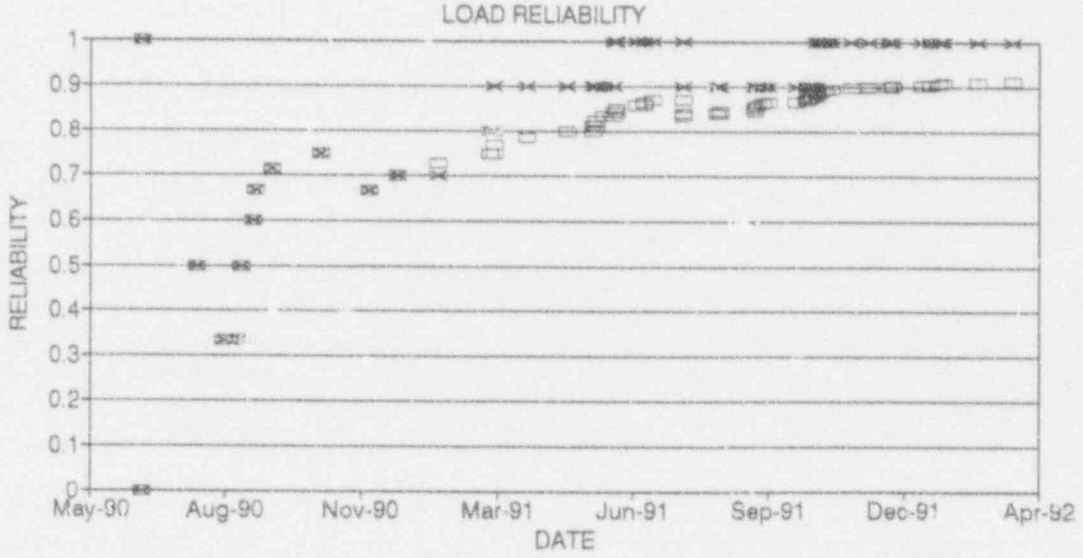

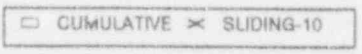

THE GAS TURBINE GENERATOR OVERHAUL and UPGRADE AND THE POST-OVERHAUL TEST PLAN

In April 1992, during an internal fiber-optic scope inspection of the gas turbine generator (GTG), we discovered component degradation and wear. After consultation with Westinghouse, the GTG manufacturer, we declared the GTG out of service and began preparations for a major overhaul of the GTG.

The GTG overhaul will include repairs of the first stage vanes, combustor baskets, combustor casings, and the exhaust stack. Additionally, there are other suspected problems that we will investigate during the GTG disassembly. These suspected problems include an inadequate reduction gear concrete pedestal and rotor blade wear. Other critical parts will be repaired as necessary, based on the results of post-disassembly inspections. As part of this overhaul, we will also be completing modifications and upgrades to the GTG that are expected to further improve the reliability.

Post-overhaul testing will demonstrate the GTG operability and re-establish the achievability of 95% reliability. Once again, due to lack of AAC reliability guidance, EDG reliability guidance is being used. Initiative 5A in NUMARC 87-00 states that an emergency diesel generator experiencing four or more failures in the last twenty-five demands will demonstrate restored performance by conducting seven consecutive failure-free start and load-run tests. This accelerated testing shall be conducted at a frequency of no less than twenty-four hours and no more than seven days between each demand. The key aspect of this guidance is "demonstrate restored performance." We will adapt this guidance to our GTG and demonstrate its "restored performance" by completing seven consecutive successful tests.

The testing of the GTG will continue at a frequency of no more than fourteen days between each demand until at least an additional thirteen start and load-run tests are completed. If more than two countable failures occur during the additional thirteen tests, then we will provide a letter to the NRC within sixty days of the second failure. This letter will explain the circumstances of the failures and how we propose to continue with Station Blackout Rule compliance. If the seven consecutive and the thirteen additional tests with two or fewer countable failures are completed, then we will provide a letter that gives the results of this testing as confirmation of its completion.

The proposed schedule for these efforts is completion of the gas turbine overhaul in October 1992, then approximately four weeks to complete the seven consecutive failure-free start and load-run tests, and then approximately twenty-six weeks or less (i.e., by May 1993) for the additional thirteen tests. Afterward, testing will continue on at least a quarterly basis as part of the GTG reliability program.

THE TEMPORARY DIESEL GENERATOR

On April 23, 1992, we began the process of procuring and installing a temporary diesel generator (TDG) to be connected to the Appendix R alternate shutdown system switchgear. The procurement began after the the determination that an overhaul of the GTG was necessary. On June 15, 1992, we completed the post-installation acceptance test of the TDG. The temporary modification that installed the TDG was placed in service on June 19, 1992.

The TDG is a Caterpillar Model 3516 rated at 1750 kW. The TDG is able to provide power to the alternate shutdown system switchgear in lieu of the GTG. The TDG provides for the same capability as the GTG for Appendix R fire scenarios where the GTG may be required to operate.

The TDG does not have the same capability as the GTG for station blackout because the GTG could provide power through the normal electrical distribution system and hence could supply all loads determined to be necessary for a station blackout. The alternate shutdown system provides power to a subset of loads previously considered for station blackout (see the attached load lists). The TDG is connected to the alternate shutdown system switchgear, which is used for placing the plant in shutdown for Appendix R fire scenarios that cause inoperability of some of the normal electrical distribution system. Therefore, the TDG can be used to achieve and maintain safe shutdown using Appendix R equipment.

Station Blackout Load List

Load	HP	KW	Number	Total
Service Water Pump	300	239.3	2	478.6
Instrument Air Compressor	100	93.0	1	93.0
Containment Fan Cooler	150	45.0	2	90.0
Shroud Fan	60	25.0	2	50.0
Cavity Cooling Fan	40	20.0	2	40.0
Cable Spreading Room Cooling	15	12.4	2	24.8
Control Room Cooling Fan	15	12.4	2	24.8
Boric Acid Transfer Pump	7.5	6.2	2	12.4
Computer Room Cooling Fan	15	12.4	2	24.8
Component Cooling Water Pump	250	207.2	2	414.4
Charging Pump	100	82.9	2	165.8
EAC Lighting		27.0	1	27.0
Battery Charger D07		54.0	1	54.0
Battery Charger D08		54.0	1	54.0
Battery Charger D107		75.0	1	75.0
Battery Charger D108		75.0	1	75.0
Battery Room Fan	12.5	9.3	1	9.3
			Total Load	1712.9

Alternate Shutdown System Loads for Station Blackout

Load	HP	KW	Number	Total
Service Water Pump	300	239.3	2	478.6
Charging Pump	100	82.9	2	165.8
Component Cooling Water Pump	250	207.2	2	414.4
Batttery Charger D109		75.0	1	75.0
Battery Room Fan	12.5	9.3	1	9.3
			Total Load	1143.1