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October 24, 1984

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Attn: D. G. Eisenhut, Director
Division of Licensing
Washington, DC 20555

Reference: Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
Diesel Generator Reliability
(Generic Letter 84-15)

Gentlemen:

We have completed our review of the subject letter and evaluated the Staff concerns and recommendations in the areas of: cold fast starting diesel generators; revised technical specifications; compliance with vendor recommendations; performance reliability; and the findings of NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability, February 1979."

We recognize the importance of maintaining the diesel generators' reliability at the highest level attainable, but also believe that the Non-1E sources of power to the emergency electrical system should be similarly maintained to insure that the challenges to the emergency power system are minimized.

To this end, we have already made numerous modifications to operating and maintenance procedures and plant design (Attachment 3) to enhance the reliability of the diesel generators and the Non-1E electrical sources of power to the emergency busses.

We have stated in a past submittal (Generic Letter 83-28) that we believed the database for some of the background documents being utilized in the Staff review of Unresolved Safety Issue A-44, Station Blackout, may not have represented a totally accurate historical indicator of the overall reliability of emergency diesel generators. This is based on the considerations discussed below.

Some of the reported diesel failures utilized in the database did not represent actual failures in the ability of the diesel to start under emergency conditions and assume load on the emergency bus. Due to the reporting requirements in effect during that period, many of the recorded failures appear to have been interpreted as events which would have actually prevented the diesel from performing its emergency function. This was due, in part, to the inadequacies of the Licensee Event Reports submitted by the

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utilities to discriminate between relatively minor test deficiencies and actual failures which would have inhibited the diesel from starting or assuming load under a loss of offsite power (LOP) condition. An example of this is that many starting failures were recorded because the diesel did not start when the manual pushbuttons were actuated in the control room. At BV-1, different relays and contacts are used to start the diesel under a LOP condition than when a manual start is initiated from the control room, the problem cannot be assessed as a bona fide failure until the exact mechanism is identified and reviewed for its potential failure contribution during a LOP condition. A second example of this would be that additional diesel starting failures were reported because the first bank of air starting motors failed to start the diesel, although in many cases the second bank of motors did, in fact, automatically start the unit in an acceptable time frame.

Another example of reported failures which contributed to the database can be classified as breaker failures, whereby the generator output breaker failed to close on demand during a test sequence. Without properly identifying the root cause of the failure in the LER and evaluating the failure mode under a LOP condition, a proper determination cannot be made as to whether the breaker would have actually closed under a LOP. This is due to the fact that when a diesel is paralleled to the bus with the Non-1E power source, a number of interlocks and synchronizing circuits are utilized which would be bypassed under actual LOP conditions. In retrospect, it is difficult to assess a relay failure mode and determine if the test failure would have also occurred under an actual LOP since the corrective action usually replaced the relay, or cleaned all of the contacts. For purposes of conservatism, it was assumed that the failure would have inhibited the diesel from operating under a LOP unless it could be excluded through specific review of the maintenance work order.

We believe the Staff has also recognized this reporting problem and taken appropriate action through a more meaningful interpretation of "failure" in Regulatory Guide 1.108 and subscribed to this definition with the issuance of Generic Letter 84-15.

We are not suggesting that the database for USI A-44 be reevaluated based on these considerations because we believe that diesel reliability and grid stability are areas upon which the industry can improve to reduce their contribution to risk; however, we would recommend that licensees be required to assess the failure mechanism under LOP condition to insure that the future inputs to the database are not biased with a number of events which may be classed as testing deficiencies. A similar methodology should be applied when requesting licensees for input to other databases to insure that the information gives an accurate accounting for risk assessment purposes and safety issue prioritization.

Our evaluation of the reliability goal and proposed technical specifications methodology of Generic Letter 84-15 has identified similar concerns and, as requested, we have provided comments in Enclosure 3 and Attachment 4.

We are not submitting revised specifications to reduce the number of cold fast starts as requested in Enclosure 1 as we have not identified any past failures related to this mode and do not consider the existing specifications detrimental to diesel performance.

Attachments 1 and 2 provide a summary of diesel generator demands and failures which we will update at each refueling cycle. Enclosure 2 summarizes the reliability and test data as requested.

Based on the present reliability of our diesels (past 20 tests, ≥0.95), and other reliability-oriented methods of assuring that all safety-related equipment failures are thoroughly reviewed to avoid symptomatic repairs, we do not find it necessary to incorporate a diesel generator reliability program into the Technical Specifications at this time. We will provide the reliability level of the diesel generators with future LERs following this refueling outage to measure the effectiveness of our programs in this area.

As stated in the enclosure, a reliability assurance program which is unique to the diesels has not been implemented as it is an inherent part of the overall corrective action network which embraces all safety-related equipment. We are continuing to upgrade maintenance and operating procedures based on reported and non-reportable failures on all safety-related equipment.

We believe that overall plant performance and the reliability of all safety-related equipment are inextricably linked through our desire to maximize these factors and the requirements of the Technical Specifications. We believe the actions which have been taken in conjunction with those planned will be responsive to USI A-44 and B-56.

This report is current as of August 1984. If you require additional information, please contact my office.

Very truly yours,

J. J. Carey
Vice President
Nuclear Group

Enclosures

cc: U. S. Nuclear Regulatory Commission
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COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF BEAVER)

On this 25th day of October, 1984, before me, Sheila M Fattore, a Notary Public in and for said Commonwealth and County, personally appeared J. J. Carey, who being duly sworn, deposed, and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge, information and belief.

Sheila M. Fattore

SHEILA M. FATTORE, NOTARY PUBLIC
SHIPPINGPORT BORO, BEAVER COUNTY
MY COMMISSION EXPIRES SEPT. 16, 1985
Member, Pennsylvania Association of Notaries

ENCLOSURE 1

REDUCTION IN COLD FAST START SURVEILLANCE
TESTS FOR DIESEL GENERATORS

Surveillance Requirements

Beaver Valley Technical Specification 3/4.8.1 provides the surveillance requirements for the diesel generators. In summary, this specification requires:

1. At least once per 31 days on a staggered test basis, verification that the diesel starts from ambient condition and the generator is synchronized, loaded to ≥1425 KW, and operates for ≥60 minutes.

2. At least once per 18 months during shutdown, simulate a loss of offsite power in conjunction with a safety injection signal verifying the diesel starts from ambient conditions, energizes the emergency busses with permanently connected loads, energizes auto-connected loads through the load sequencer, and operates for ≥5 minutes with the emergency loads.

3. At least once per 18 months during shutdown, verify the diesel operates for ≥60 minutes while loaded to ≥2750 KW.

4. With one offsite circuit and/or one diesel generator or two offsite circuits inoperable, verify that the diesel starts from ambient conditions within one hour and at least once per 8 hours thereafter.

Manufacturer Recommendations

The following practices are recommended by the manufacturer, Electro-Motive Division of General Motors, when testing the diesel generators:

1. The engine be started and run at idle speed for a period of 3 to 5 minutes to alleviate loading of unlubricated engine parts during the interval when the lube oil pump is filling the engine lube oil passages.

2. To eliminate discharge of unburned lube oil into the exhaust system, the diesel generator should be operated with ≥50% load, but not less than 20% load, and prior to shutdown, the unit should carry at least 75% load for one hour.

Testing Program

Testing to meet the surveillance requirements at Beaver Valley Unit 1 is performed under Operating Surveillance Tests (OSTs) 1.36.1, 1.36.2, 1.36.3, and 1.36.4.

OSTs 1.36.1 and 1.36.2 are monthly tests which start the diesel from ambient conditions and verify synchronizing and loading. Following the manufacturer recommendations, the engine is allowed to idle for several minutes and is checked for proper operation prior to increasing speed and loading. The generators are then loaded to 2850 KW (100% design) for at least one hour. In addition, these tests are used when an AC source is inoperable, but only to verify diesel starting with no loading performed. When the OSTs are used for this, the manufacturer recommendation of loading is not followed.

OSTs 1.36.3 and 1.36.4 are 18-month tests which fast cold start the diesels and verify auto loading and operation for ≥5 minutes. The manufacturer's recommendations of idling before loading and loading at ≥75% load for one hour are not followed during these tests since an outage condition and plant design do not provide sufficient load under a condition whereby the 1E bus is separated from the Non-1E source.

Action to Reduce Fast Cold Starts

We believe that the current testing program and requirements of fast cold starts every refueling are not excessive. Therefore, no program to reduce fast cold starts is in place, and no additional action is considered necessary for reducing the number of tests which fast cold start the diesels.

The few tests which do not follow manufacturer's recommendations are not considered to excessively degrade the diesel since they are not performed often.

In reference to prelube recommendations, Beaver Valley Unit 1 diesel generators have an auxiliary oil system which supplies warm oil to the turbocharger and engine sump when the engine is shut down. This system operates continuously and, with the engine shutdown, maintains engine oil temperature and lubrication for fast starting. A design change (DCP 452) which includes a second oil pump was also completed to assure proper system operation after a "hot shutdown" from a previous run.

ENCLOSURE 2

DIESEL GENERATOR RELIABILITY DATA

Data

Attachments 1 and 2 provide a time history of diesel generator demands and failures for the Number 1 and 2 diesel generators, respectively, for all demands/failures during the last 100 valid demands and failures.

The criteria used to determine a valid demand/failure are contained in Regulatory Guide 1.108, Revision 1, August 1977, position C.2.e. With this criteria, starts due to a safety injection signal, where diesel operation is terminated without loading to 50% load for at least one hour, are not considered valid demands. (positions C.2.e.(3) and (4))

Using the data in the attachments, the reliability of each diesel generator is:

	Number of Failures	Reliability*
No. 1 Last 20 Demands	1	0.95
No. 1 Last 100 Demands	15	0.85
No. 2 Last 20 Demands	1	0.95
No. 2 Last 100 Demands	14	0.86

*Reliability calculated by 1.0 - Number of Valid Failures/Number of Demands

Records and Reports

Beaver Valley Unit 1 does not currently maintain a record itemizing the demands and failures experienced by each diesel generator as outlined in Regulatory Guide 1.108, position C.3.a, nor maintain a yearly data report for each diesel generator.

However, as part of the Operational Assessment Group's review and tracking of Incident Reports and Licensee Event Reports, any reportable failure would be tracked for corrective action, reviewed against past reportable failures, and reported in a monthly trend report.

In addition, Enclosure 3 describes the present method of maintaining reliability, and it is our intent to maintain and update Attachments 1 and 2 at each refueling cycle.

ENCLOSURE 3

DIESEL GENERATOR RELIABILITY

Reliability Improvements Program

Beaver Valley Unit 1 does not presently have a diesel generator-specific reliability program to attain and maintain a specific reliability goal. However, as with all safety-related equipment, reliability is assured and maintained by:

1. Successful performance of technical specification surveillance requirements. (See Enclosure 1 for diesel generator requirements and tests.)

2. Reviewing failures to determine the root cause and taking corrective action to resolve the root cause. (See Attachments 1 and 2.)

3. Review of failures against past failures for repetitive failures.

4. Reviewing manufacturer and industry information for applicability to the facility and possible improvements.

5. A planned program of preventive maintenance.

As a result of the above method of maintaining reliability, many design changes have been completed or planned to increase diesel generator reliability. Attachment 3 provides a summary of these design changes.

To aid in the above reviews, we will maintain and update Attachments 1 and 2 as part of our overall reliability program.

Performance Specification Review

We have reviewed the example performance specification included as an attachment to Enclosure 3 of Generic Letter 84-15 and provided some general comments in Attachment 4.

In summary, the performance factor may be more representative of reliability if it is based on additional factors, such as grid stability, in addition to the number of failures per demand. The requalification program appears to be more detrimental to the diesel generators due to the excessive number of starts required; and requiring a 7-day surveillance frequency for two unrelated failures during the past 20 tests also appears excessive.

ATTACHMENT 1

SUMMARY OF DIESEL GENERATOR #1 DEMANDS OCCURRING WITHIN THE TIME PERIOD OVER WHICH THE LAST 100 VALID DEMANDS WERE PERFORMED

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
	08/22/84	T.S. 3.8.1.1	No	N/A	0		
1	08/08/84	Surv. Test	Yes	1	0		
2	07/11/84	Surv. Test	Yes	1	0		
3	06/13/84	Surv. Test	Yes	1	0		
4	05/16/84	Surv. Test	Yes	1	0		
5	04/18/84	Surv. Test	Yes	1	0		
6	04/06/84	T.S. 3.8.1.1	Yes	0	1	Upon pushing the #1 D.G. start pushbutton on benchboard Section C, the Diesel Generator start failure alarm came in. On a second start attempt, immediatly following the first, the diesel started properly. A third start attempt was made approximately one hour later and all systems functioned normally. No exact cause for the start failure could be determined.	This event was a first time occurrence and was non-reproducible during Testing. This event has been entered in the OAG's IR/LER Tracking and Trending Program. Should a second similar event occur indicating a possible degradation in Diesel Generator Operability, corrective action will be taken.
	04/05/84	T.S. 3.8.1.1	No	N/A	0		
7	03/19/84	Surv. Test	Yes	1	0		
8	02/22/84	Surv. Test	Yes	1	0		
	01/25/84	SIS	No	N/A	0		
9	01/23/84	Surv. Test	Yes	1	0		
10	12/23/83	Surv. Test	Yes	1	0		
	12/14/83	T.S. 3.8.1.1	No	N/A	0		
	12/02/83	Testing	No	N/A	0		
11	11/25/83	Surv. Test.	Yes	1	0		
12	10/27/83	Surv. Test	Yes	1	0		
13	09/26/83	Surv. Test	Yes	1	0		
14	09/14/83	Surv. Test	Yes	1	0		
15	09/08/83	Surv. Test	Yes	1	0		
16	08/22/83	Surv. Test	Yes	1	0		
17	07/22/83	Surv. Test	Yes	1	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
18	07/06/83	Surv. Test	Yes	1	0		
19	06/27/83	Surv. Test	Yes	1	0		
20	05/31/83	Surv. Test	Yes	1	0		
	05/28/83	Loss of 1A System Station Service Transformer	No	N/A	0		
21	05/02/83	Surv. Test	Yes	1	0		
22	04/04/83	Surv. Test	Yes	1	0		
23	03/07/83	Surv. Test	Yes	1	0		
	02/12/83	SIS	No	N/A	0		
24	02/07/83	Surv. Test	Yes	1	0		
25	01/10/83	Surv. Test	Yes	1	0		
26	01/07/83	Loss of 1A System Station Service Transformer	Yes	1	0		
27	12/13/82	Surv. Test	Yes	1	0		
28	11/15/82	Surv. Test	Yes	1	0		
29	10/27/82	Surv. Test	Yes	1	0		
30	09/29/82	Surv. Test	Yes	1	0		
	09/19/82	T.S. 3.8.1.1	No	N/A	0		
31	09/06/82	Surv. Test	Yes	1	0		
32	08/09/82	Surv. Test	Yes	1	0		
33	07/15/82	Surv. Test	Yes	1	0		
34	06/24/82	Surv. Test	Yes	1	0		
35	06/04/82	Surv. Test	Yes	1	0		
36	05/27/82	Surv. Test	Yes	1	0		
	05/26/82	Trouble-shooting	No	N/A	1	Diesel did not start on first attempt.	This event occurred in the process of troubleshooting. No corrective actions taken.
	05/25/82	Trouble-shooting	No	N/A	1	Diesel was manually tripped due to low lube oil pressure.	This event occurred in the process of troubleshooting. No corrective actions taken.

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
	05/24/82	Troubleshooting	No	N/A	1	Output breaker would not close. Two attempts were made.	This event occurred in the process of troubleshooting. No corrective action taken.
37	05/23/82	Surv. Test	Yes	0	1	Output breaker 1E9 would not close. Attempted to close breaker in preferred start 1 and 2.	Repaired faulty magnetic switch on frequency generator.
	04/21/82	Test	No	N/A	0		
38	04/09/82	Surv. Test	Yes	1	0		
39	04/09/82	Surv. Test	Yes	0	2	D.G. failed to start on first attempt. Started on second attempt. D.G. output breaker failed to close (2 attempts). The problem was determined to be the frequency generator magnet not picking up the SSP1 Relay, which, in turn, would not pick up MSR 1.	Three relays were changed out and permanent magnet pick up coils were cleaned.
40							
41	03/10/82	Surv. Test	Yes	1	0		
42	12/24/81	Surv. Test	Yes	1	0		
	12/12/81	T.S. 3.8.1.1	No	N/A	0		
	12/08/81	T.S. 3.8.1.1	No	N/A	0		
43	11/26/81	Surv. Test	Yes	1	0		
44	10/20/81	Surv. Test	Yes	1	0		
45	10/02/81	Surv. Test	Yes	1	0		
46	09/04/81	Surv. Test	Yes	1	0		
47	08/07/81	Surv. Test	Yes	1	0		
48	07/10/81	Surv. Test	Yes	1	0		
	06/25/81	T.S. 3.8.1.1	No	N/A	0		
49	06/16/81	Surv. Test	Yes	1	0		
50	06/08/81	Surv. Test	Yes	1	0		
51	05/22/81	Surv. Test	Yes	1	0		
52	04/22/81	Surv. Test	Yes	1	0		
53	03/22/81	Surv. Test	Yes	1	0		
54	02/23/81	Surv. Test	Yes	1	0		
55	01/23/81	Surv. Test	Yes	1	0		
56	12/26/80	Surv. Test	Yes	1	0		
57	11/25/80	Surv. Test	Yes	1	0		
	11/17/80	SIS	No	N/A	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
58	10/28/80	Surv. Test	Yes	1	0		
59	10/08/80	Surv. Test	Yes	1	0		
60	09/30/80	Surv. Test	Yes	1	0		
61	09/20/80	Surv. Test	Yes	1	0		
62	09/02/80	Surv. Test	Yes	1	0		
63	08/05/80	Surv. Test	Yes	1	0		
64	08/05/80	Surv. Test	Yes	0	1	Output breaker E9 failed to close. The problem was determined to be a dirty contact on the MSR 1 relay which prevented it from sealing in associated auxiliary contacts required to close output breaker E9.	The MSR 1 relay block contact was cleaned and a spare contact block was installed in the MSR 1 relay.
65	07/08/80	Surv. Test	Yes	1	0		
66	06/23/80	Surv. Test	Yes	1	0		
	06/17/80	Loss of 1AE Bus	No	N/A	1	Diesel did not close on the 1AE bus. This was due to output breaker 1E9 being in the "Pull to Lock" position prior to performing an operability OST following design modifications and periodic maintenance.	At the time of the incident, this Diesel Generator was not being used as an operable piece of equipment; therefore, no corrective actions were taken.
67	04/25/80	Surv. Test	Yes	1	0		
68	03/18/80	Surv. Test	Yes	1	0		
69	02/17/80	Surv. Test	Yes	1	0		
70	02/01/80	Loss of Power to the 1A Station Service Bus	Yes	0	1	Failure of the auto load sequencer. The auto load sequencer was found to be mis-wired.	The wiring problem was corrected and five manually initiated timer tests were run with satisfactory results.
71	01/22/80	Surv. Test	Yes	1	0		
72	12/22/79	Surv. Test	Yes	1	0		
73	12/22/79	24 hr. Load Test	Yes	1	0		
74	12/20/79	Surv. Test	Yes	1	0		
75	11/28/79	Surv. Test	Yes	1	0		
76	10/31/79	Surv. Test	Yes	1	0		
77	10/02/79	Surv. Test	Yes	1	0		
	09/20/79	SIS	No	N/A	0		
	09/20/79	SIS	No	N/A	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
78	09/18/79	Surv. Test	Yes	1	0		
79	09/04/79	Surv. Test	Yes	1	0		
80	08/29/79	Surv. Test	Yes	1	0		
81	08/07/79	Surv. Test	Yes	0	1	The second loading sequence was 394 milliseconds out of specification. It was determined that the starting point of the sequences was slightly off zero.	The timer was cycled and adjusted to within specifications.
82	07/31/79	Surv. Test	Yes	1	0		
	07/27/79	Test	No	N/A	0		
83	07/24/79	Surv. Test	Yes	0	2	Failure of No. 1 air start motor. The Diesel started on the No. 2 air start motor. Output breaker failed to close. The air start motor failure resulted from a sticking pinion. A test circuit installed to monitor breaker control circuitry indicated the output breaker failure occurred in the manual start relays.	The pinion assembly was cleaned, exercised, and satisfactorily tested. No manual start relay contact misoperations were found on visicorder traces taken on 7/31/79. As a result of this incident, the test program was revised to 1) monitor the manual start relay coil prior to breaker operation, and 2) record and alternate the position of the start control switch for each manual exercise operation.
84							
85	07/10/79	Surv. Test	Yes	1	0		
86	06/21/79	Surv. Test	Yes	1	0		
87	06/11/79	Surv. Test	Yes	1	0		
88	05/29/79	Surv. Test	Yes	0	1	High crank case pressure. The problem was determined to be caused by a pressure switch which was activated by an air vacuum problem in the D/G room.	Replaced pressure switch.
89	03/20/79	Surv. Test	Yes	1	0		
90	03/20/79	Surv. Test	Yes	0	1	Output breaker failure. Cause of inoperable breaker unknown.	Checked out relays contacts made for MSR1 and VSR1 relays - nothing found wrong.
91	02/20/79	Surv. Test	Yes	1	0		
92	01/23/79	Surv. Test	Yes	1	0		
	01/18/79	SIS	No	N/A	0		
	01/03/79	SIS	No	N/A	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
93	12/26/78	Surv. Test	Yes	1	0		
	12/08/78	Testing	No	N/A	0		
	12/07/78	Testing	No	N/A	0		
	12/06/78	Trouble-shooting	No	N/A	1	#2 Air Start Motor failed.	Installed new motor.
94	12/05/78	Testing	Yes	N/A	1	#2 Air Start Motor locked up.	
	12/05/78	TOP 78-33	No	N/A	0		
95	11/28/78	Surv. Test	Yes	1	0		
	10/24/78	TOP 78-34	No	N/A	0		
	10/18/78	TOP 78-34	No	N/A	0		
	10/10/78	TOP 78-34	No	N/A	0		
96	10/03/78	Surv. Test	Yes	1	0		
	09/25/78	TOP 78-34	No	N/A	0		
	09/19/78	TOP 78-34	No	N/A	0		
	09/19/78	TOP 78-33	No	N/A	0		
97	09/19/78	TOP 78-34	Yes	0	1	Output breaker failed to close.	Retested successfully.
	09/12/78	TOP 78-33	No	N/A	0		
98	09/12/78	TOP 78-34	Yes	0	1	Failure of output breaker to close 4 attempts were made to paralled the diesel with the system.	Approximately one hr. later, another attempt was made to parallel the diesel and troubleshoot, but this time, the output breuker closed. Automatic close-in was then successfully completed. A Test panel to monitor the breaker closing contacts was fabricated and installed on 12/8/78.
99	09/05/78	Surv. Test	Yes	1	0		
100	09/05/78	Surv. Test	Yes	0	1	Failure of output breaker to close using the control switch. The breaker was then manually closed. The diesel generator was then synchronized three times successfully using the control switch.	

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

ATTACHMENT 2

SUMMARY OF DIESEL GENERATOR #2 DEMANDS OCCURRING WITHIN THE TIME PERIOD
OVER WHICH THE LAST 100 VALID DEMANDS WERE PERFORMED

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
1	08/22/84	Surv. Test	Yes	1	0		
	08/22/84	T.S. 3.8.1.1	No	N/A	0		
2	07/25/84	Surv. Test	Yes	1	0		
3	06/26/84	Surv. Test	Yes	1	0		
4	05/30/84	Surv. Test	Yes	1	0		
5	05/02/84	Surv. Test	Yes	1	0		
	04/06/84	Testing	No	N/A	0		
	04/05/84	Testing	No	N/A	0		
6	04/03/84	Surv. Test	Yes	1	0		
7	03/05/84	Surv. Test	Yes	1	0		
8	02/08/84	Surv. Test	Yes	1	0		
	01/25/84	SIS	No	N/A	0		
9	01/11/84	Surv. Test	Yes	1	0		
10	12/09/83	Surv. Test	Yes	1	0		
	12/02/83	Testing	No	N/A	0		
11	11/14/83	Surv. Test	Yes	1	0		
12	10/14/83	Surv. Test	Yes	1	0		
	09/16/83	Testing	No	N/A	0		
	09/15/83	Testing	No	N/A	0		
13	09/12/83	Surv. Test	Yes	1	0		
14	09/08/83	Surv. Test	Yes	1	0		
15	09/04/83	Surv. Test	Yes	0	1	Diesel Generator was shutdown due to high vibrations.	No corrective action was required.
16	08/29/83	Surv. Test	Yes	1	0		
17	08/27/83	Surv. Test	Yes	1	0		
18	07/11/83	Surv. Test	Yes	1	0		
	06/29/83	Loss of 1DF Bus	No	N/A	0		
19	06/13/83	Surv. Test	Yes	1	0		
20	05/24/83	Loss of 1DF Bus	Yes	1	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
21	05/16/83	Surv. Test	Yes	1	0		
22	04/18/83	Surv. Test	Yes	1	0		
23	03/21/83	Surv. Test	Yes	1	0		
24	02/21/83	Surv. Test	Yes	1	0		
	02/12/83	SIS	No	N/A	0		
25	01/24/83	Surv. Test	Yes	1	0		
26	12/27/83	Surv. Test	Yes	1	0		
27	11/29/82	Surv. Test	Yes	1	0		
28	11/01/82	Surv. Test	Yes	1	0		
29	10/20/82	Surv. Test	Yes	1	0		
30	10/18/82	Loss of 1C and 1D 4kv busses	Yes	1	0		
31	09/21/82	Surv. Test	Yes	1	0		
32	09/19/82	Surv. Test	Yes	0	1	Diesel shutdown due to engine cooling water temperatures exceeding maximum allowable values. Problem determined to be caused by fouled heat exchanger tubes.	The heat exchanger tubes were cleaned.
33	08/24/82	Surv. Test	Yes	1	0		
34	07/29/82	Surv. Test	Yes	1	0		
35	06/03/82	Surv. Test	Yes	1	0		
36	06/03/82	Surv. Test	Yes	1	0		
	05/31/82	Loss of 480V Bus	No	N/A	0		
37	05/07/82	Surv. Test	Yes	1	0		
38	03/04/82	Surv. Test	Yes	1	0		
39	02/04/82	Surv. Test	Yes	1	0		
40	01/07/82	Surv. Test	Yes	1	0		
41	12/10/81	Surv. Test	Yes	1	0		
	12/08/81	Testing	No	N/A	0		
42	11/12/81	Surv. Test	Yes	1	0		
43	10/14/81	Surv. Test	Yes	1	0		
44	09/16/81	Surv. Test	Yes	1	0		
	08/28/81	Testing	No	N/A	0		
	08/27/81	Testing	No	N/A	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
45	08/18/81	Surv. Test	Yes	1	0		
46	07/22/81	Surv. Test	Yes	1	0		
47	06/27/81	Surv. Test	Yes	1	0		
48	06/11/81	Surv. Test	Yes	1	0		
49	06/02/81	Surv. Test	Yes	1	0		
50	05/08/81	Surv. Test	Yes	1	0		
51	04/08/81	Surv. Test	Yes	1	0		
52	03/21/81	Surv. Test	Yes	1	0		
53	03/14/81	Surv. Test	Yes	1	0		
54	03/13/81	Surv. Test	Yes	1	0		
55	03/09/81	Surv. Test	Yes	0	1	The diesel was brought to speed and tripped, apparently due to overspeed. The diesel would not re-start. The failure was attributed to a failed taper pin and bent lever in the governor of the diesel. The diesel turbocharger also failed.	The turbocharger and governor taper pin and lever were replaced.
56	02/09/81	Surv. Test	Yes	1	0		
57	01/09/81	Surv. Test	Yes	1	0		
58	12/11/80	Surv. Test	Yes	1	0		
	11/17/80	SIS	No	N/A	0		
59	11/11/80	Surv. Test	Yes	1	0		
60	10/11/80	Surv. Test	Yes	1	0		
61	10/08/80	Surv. Test	Yes	0	1	Diesel would not start in the preferred start #2 position. The diesel did start in the preferred start #1 position.	Replaced two air start motors on preferred start #2.
62	09/04/80	Surv. Test	Yes	1	0		
63	07/18/80	Surv. Test	Yes	0	1	Discharge pressure on fuel transfer pump EE-P-1D not acceptable.	Inspected, cleaned and reset relief valve.
	07/09/80	Testing	No	N/A	0		
	06/07/80	Tornado Watch	No	N/A	0		
64	05/27/80	Surv. Test	Yes	1	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
65	04/29/80	Surv. Test	Yes	0	1	Test terminated due to a minor problem with phase balance voltage and a blown PT fuse alarm.	Replaced PT fuse.
66	04/29/80	Surv. Test	Yes	1	0		
67	04/01/80	Surv. Test	Yes	1	0		
68	03/04/80	Surv. Test	Yes	1	0		
69	02/05/80	Surv. Test	Yes	1	0		
70	01/08/80	Surv. Test	Yes	1	0		
71	12/11/79	24 hr. Load Test	Yes	1	0		
	09/20/79	SIS	No	N/A	0		
	09/20/79	SIS	No	N/A	0		
72	08/09/79	Surv. Test	Yes	1	0		
73	07/24/79	Surv. Test	Yes	1	0		
74	07/10/79	Surv. Test	Yes	1	0		
75	06/29/79	Surv. Test	Yes	1	0		
76	06/02/79	Surv. Test	Yes	1	0		
77	05/01/79	Surv. Test	Yes	1	0		
78	04/13/79	Surv. Test	Yes	1	0		
79	04/03/79	Surv. Test	Yes	1	1	Diesel would not start by engaging the No. 2 set of starting motors. It appeared that the carbon vanes in the air motors failed or were damaged. The diesel was started with the No. 1 set of starting motors and a full surveillance test was performed.	Both air start motors on the "Start 2" system were replaced with new air motors.
80							
81	03/06/79	Surv. Test	Yes	1	0		
82	02/06/79	Surv. Test	Yes	1	0		
	01/18/79	SIS	No	N/A	0		
83	01/09/79	Surv. Test	Yes	1	0		
	01/03/79	SIS	No	N/A	0		
	12/08/78	Testing	No	N/A	0		
84	12/04/78	Surv. Test	Yes	1	0		
	12/04/78	Testing	No	N/A	0		
85	12/04/78	Testing	Yes	0	1	Field flash breaker failed to close. Found FFCO Relay dropped out.	Corrected relay problem.
86	12/04/78	Surv. Test	Yes	1	0		

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

Valid Demand/ Failure Number	Date	Reason for D.G. Operation	Valid Demand/ Failure* (Yes/No)	Number of Successful Demands	Number of Failures	Analysis of Failure	Corrective Action
87	12/01/78	Surv. Test	Yes	1	0		
88	11/06/78	Surv. Test	Yes	1	0		
	10/25/78	TOP 78-36	No	N/A	0		
89	10/25/78	TOP 78-36	Yes	0	1	Generator field failed to flash. Diesel taken out of service.	
	08/29/78	Trouble-shooting	No	N/A	0	Troubleshooting output breaker (1F9)	Installed output breaker trouble-shooting circuit to DG#2.
90	08/24/78	Surv. Test	Yes	0	1	Failure of output breaker to close. The breaker was cycled in the test position and it operated correctly. Another attempt was made to close the breaker, but it would not close from the benchboard. No apparent cause for failure.	
91	08/22/78	Surv. Test	Yes	1	0		
92	07/28/78	TS	Yes	0	1	Field flash relay failure. The field was manually flashed. The field flash failures have been attributed to an intermittently sticking field flash cutout relay.	A remote generator field flash control has been installed in the control room to manually flash the diesel generator field. This control bypasses the field flash cutout relay to insure field flashing in an emergency.
93	07/25/78	Surv. Test	Yes	1	0		
94	06/30/78	Surv. Test	Yes	1	0		
95	06/30/78	Surv. Test	Yes	0	1	Trip of field flash breaker.	Checked fuses, reset breakers, checked DC voltage - All OK.
96	06/07/78	Surv. Test	Yes	1	0		
97	06/01/78	Surv. Test	Yes	1	0		
98	06/01/78	Surv. Test	Yes	0	1	Diesel was shut down due to a lube oil leak in the engine control panel. An inspection of the lines revealed that the leak was due to a loose swagelock fitting which had not been tightened following previous maintenance.	The swagelock was assembled and tightened.
99	05/02/78	Surv. Test	Yes	1	0		
100	05/02/78	Surv. Test	Yes	0	1	Generator field failed to flash.	Retested DG #2 and the field flash operated properly.

* Test Qualification determined by Regulatory Guide 1.108, position C.2.e criteria.

ATTACHMENT 3

DIESEL GENERATOR DESIGN CHANGES

The following design changes have been or are planned for implementation at Beaver Valley Unit 1 to improve diesel generator reliability.

Design Change Proposal #	Summary of Design Change	Design Change Status
DCP #025	The diesel generator air drain tanks were upgraded from 150 psig to 275 psig improving the efficiency in which the receiver tanks are blown down.	Complete
DCP #042	The ability to manually synchronize the 4160V Emergency Busses to normal busses is being added. This feature enables synchronizing busses without dropping the emergency bus load or the diesel generator feed. This design change also prevented the possibility of simultaneously connecting more than one potential transformer voltage to an incoming or running synchronizing bus.	4R
DCP #124	The NFLD control relay contact has been permanently disconnected. Prior to this change, the relay caused tripping of the diesel generator output breaker for loss of field when operating in both the emergency and exercise modes. Loss of field protection of the diesel generators still exists during the exercise mode.	Complete
DCP #142	Modifications have been made to the diesel generator alarms in the control room to verify the system operates within the required system parameters.	Complete
DCP #157	The diesel generator output breaker's control circuitry has been provided with new undervoltage relays which prevent the 4160V breakers from closing if the generator does not have a functioning field.	Complete

Design Change Proposal #	Summary of Design Change	Design Change Status
DCP #180	Motor control centers have been installed so that there is no loss of generating capability when the #1 and #2 vital bus inverters are out of service, bypassed or if offsite power is lost. In addition, four AC relays have been replaced with DC relays providing more reliable power supplies to the sequencing circuits.	Complete
DCP #223	The abiiity to manually flash the diesel generator field has been provided.	Complete
DCP #337	The replacement of two cams programmers and the installation of test switches in the coil input and contact output of each cam programer allows verification that the operation of the cam program timer is within the contact acceptance criteria.	Complete
DCP #340	The addition of isolation valves to the engine control panel pressure gages and thermowells to the coolant and lube oil temperature indicators allows the removal of the gages for calibration without removing the diesel generators from service.	Complete
DCP #390	A new 8000 gallon fuel oil storage tank was installed as a holding reservoir while tests (Regulatory Guide 1.137) are performed. An alternate method of level indication has been provided to the existing fuel oil storage tanks to ensure the accuracy of the existing level indicators.	Complete
DCP #443	To prevent control circuit failure due to DC coil supply voltage variations, the "No voltage" relays were replaced with a qualified equivalent unit having a sufficient DC rating for the DC supply voltage range experienced at BVPS.	Complete

Design Change Proposal #	Summary of Design Change	Design Change Status
DCP #452	As a result of the March 1981 failure of one diesel generator due to turbo-charger problems, several vendor-recommended product modifications were implemented to improve reliability and performance. Included were turbo-charger gear ratio change from 18:1 to 17.9:1 and a second auxiliary lube oil pump.	Complete
DCP #458	Air compressor modifications were made by adding unions in the piping to facilitate maintenance of the air compressor discharge valves.	Complete
DCP #478	The air start compressor check valves were replaced with new horizontal piston type check valves.	Replace as fail
DCP #556	To ensure continuity of electrical power in the event of a plant fire and concurrent loss of electrical power, relays and cables currently in the same fire area have been separated into different fire areas.	4R
DCP #576	In order to simplify and streamline the air start compressors the centrifugal unloader, pilot valve and relief line have been eliminated. Also additional check valves have been added in series with existing check valves.	1984
DCP #560	To prevent all four motor-operated diesel generator river water supply inlet valves, which are located in the same fire area, from being rendered inoperable because of fire, a new valve has been installed in another fire area. One of the supply inlet valves is now in a permanently locked open position.	Complete
DCP #601	Due to corrosion of the trim of the relief valves for the air starting system, the relief valves have been replaced by valves constructed of standard material with type 316 stainless steel trim.	4R

Design Change Proposal #	Summary of Design Change	Design Change Status
DCP #652	To prevent failures that may occur due to dirty, corroded or pitted relay contacts the diesel generator excitation cabinets will be modified to provide a dust free environment. This is to be accomplished by providing gaskets on the front doors, filters on louvers, and an air-tight seal on the cable trench beneath the cabinet.	To be implemented by sixth refueling
DCP #614	Permanent breaker test circuits have been installed to make diesel generator breaker testing more efficient.	1985

ATTACHMENT 4

General Comments on Example Performance Specification

1. The test frequencies and allowable out-of-service intervals for diesel generators should be based not only on the number of failures per demand but include items such as:

   a. related failures occurring with the past (100) tests.

   b. historical grid stability where:

      (i) partial losses of offsite power should not be weighted as heavily as complete losses of offsite power

      (ii) the duration of the events should also be a consideration.

   c. the time the diesel generator is out-of-service for maintenance during a required mode.

   We believe that this type of methology would be more responsive in addressing USI A-44 because it would provide additional incentives for Licensees to improve their overall performance in many aspects associated with blackout events. This would also insure that all service-related factors affecting the diesel, such as operating, maintenance practices and environmental conditions, are evaluated to enhance reliability of both IE and non-IE power systems.

2. We do not believe that the diesel requalification program, as presented, is usable because a diesel generator could be unnecessarily placed into a requalification program due to conditions external to and unrelated to its specific performance. For example, the failure of the generator output breaker to close due to a mechanical breaker problem or relay failure could force requalification of the entire diesel generator and place unnecessary cycles on the entire system.

   We believe that the source of any recurrent failure(s) should be requalified where possible and not force disqualification and requalification of the entire diesel system unless the failure is strictly associated with degraded engine or generator performance.

   In addition, the requalification program does not address load shedding and sequencing as these are vital aspects to diesel generator reliability. However, having to requalify this function during power operation would decrease overall plant reliability by causing safety system challenges.

   In summary, we believe that requiring seven demands within 20 days and fourteen demands in 75 days will increase degradation of the system and the program may not verify operability of the source (root cause) of the failures.

3. The example performance specification (item 3.b) indicates, "two failures in the last 20 demands may only be a statistically probable distribution of two random events". For this reason, we believe that two failures in 20 demands does not justify a seven-day surveillance frequency unless the two failures are related.

4. We concur with the NRC's determination that the out-of-service time should be in excess of the current 72-hour Technical Specification limit (item 7) and for a cumulative outage time, we recommend that licensees responses to NUREG-0737 item II.K.3.17 on ECCS outages be consulted. A flexible cumulative outage time based on grid stability, diesel generator failure history, and manufacture recommended preventative maintenance appears more appropriate than a fixed time.