December 3, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322-OL
	)	
(Shoreham Nuclear Power Station, Unit 1)	)	

POST-TEST EXAMINATION of TRANSAMERICA DELAVAL, INC. EMERGENCY DIESEL GENERATOR 103 at SHOREHAM NUCLEAR POWER STATION for U.S. NUCLEAR REGULATORY COMMISSION STAFF

by
A. J. HENRIKSEN, B. J. KIRKWOOD, W. W. LAITY, P. J. LOUZECKY,
J. F. NESBITT, and L. G. VAN FLEET

November 7-12, 1984

POST-TEST EXAMINATION
OF TRANSAMERICA DELAVAL, INC. EMERGENCY DIESEL GENERATOR 103
AT SHOREHAM NUCLEAR POWER STATION

1.0 INTRODUCTION

This report documents the review performed by the Pacific Northwest Laboratory (PNL) on November 7 through 12, 1984, of a post-test disassembly and inspection of the emergency diesel generator (EDG) 103 engine at the Shoreham Nuclear Power Station (SNPS). According to the Long Island Lighting Company (LILCO), the licensee for SNPS, EDG 103 had been operated for at least 740 hours at or above a load of 3300 kW before the engine was shut down for disassembly and inspection in early November.

PNL's review was performed for the NRC staff. The purpose of the review was to determine, through an independent audit of the condition of key engine components, whether or not they exhibited any evidence of abnormal behavior under the conditions imposed during the operational test. This audit was performed by consultants under contract to PNL who have extensive experience in diesel engine technology. Also included on the review team was a PNL specialist in nondestructive testing. He audited the qualifications of the inspectors who performed nondestructive examinations of the engine components for LILCO, the written procedures used, and the inspections performed.

This report addresses two engine components--the crankshaft and the cylinder block--that are currently the subject of contentions before the Atomic Safety and Licensing Board. The report presents PNL's findings and preliminary conclusions drawn from the examination of these components and from a review of LILCO's inspections.

PNL representatives who participated in this review at some time during the visit to Shoreham are as follows:

- J. F. Nesbitt, PNL, technical coordinator of the visit

- A. J. Henriksen, A. J. Henriksen, Inc., PNL consultant - Engineering Graduate of Royal Norwegian Naval Academy. Over 35 years' experience in the design, testing, installation, and field engineering of stationary and marine diesel engines up to 20,000 kW.
- B. J. Kirkwood, Covenant Engineering, PNL consultant - M.S. Engineering, Massachusetts Institute of Technology. Retired in 1982 as a senior partner of A. C. Kirkwood and Associates, where his responsibilities included diesel engine-generator designs involving 19 engines of five different makes, in sizes to 7,000 kW.
- W. W. Laity, PNL manager, TDI Diesel Engine Project
- P. J. Louzecky, Engineered Applications Corporation, PNL consultant - M.S.M.E., Case Western Reserve University. Nearly 50 years' experience in the design and development of gas and diesel engines, ranging up to 11,000 kW.
- L. G. Van Fleet, PNL, specialist in nondestructive testing (NDT) - Level III certification in NDT procedures including liquid penetrant, magnetic particle, ultrasonic and radiography. Ten years' experience.

2.0 BACKGROUND

Three standby emergency diesel generators manufactured by Transamerica Delaval, Inc. (TDI) are installed at the Shoreham Nuclear Power Station to carry emergency service electrical loads. Each engine is a TDI model DSR-48, with a nameplate rating of 3500 kW at 450 rpm. LILCO has designated these engines as EDG 101, EDG 102, and EDG 103. On October 22, 1984, LILCO submitted an FSAR amendment to the NRC staff for a "qualified" engine load of 3300 kW (i.e., the maximum emergency load that would be imposed on any of the three engines under design-basis accident conditions). In a letter to the NRC staff dated October 18, 1984, LILCO described the protocol for a 740-hour confirmatory test of the EDG 103 engine at the qualified load of 3300 kW. The test was completed early in November 1984.

J. F. Nesbitt of PNL, together with PNL consultants B. J. Kirkwood and P. J. Louzecky, arrived at the Shoreham site on November 7 to commence the review discussed in this report. L. G. Van Fleet arrived on November 8. They performed most of the activities associated with the review. A. J. Henriksen and W. W. Laity joined the review team on November 9, and participated in ongoing visual examinations of the engine components. Specific review activities and the reviewers who performed them are discussed in Section 3.0 of this report.

All reviews of the engine block and the crankshaft inspections were performed in the EDG 103 engine bay, where these components remained mounted on the engine base. Components removed from the engine (except for the turbocharger) were examined on the turbine-generator deck of the Shoreham facility, where LILCO had set aside floor space for that purpose.

3.0 COMPONENT EXAMINATIONS

This section identifies the examinations and nondestructive tests known to have been performed on the crankshaft and the engine block. PNL's review of the inspections and preliminary conclusions reached from that review are also presented.

3.1. CRANKSHAFT

3.1.1 Nondestructive Examinations

Liquid penetrant examinations and eddy-current examinations were performed on the crankshaft of the EDG 103. L. G. Van Fleet witnessed several of these examinations between November 8 and November 12, 1984, after having reviewed the pertinent written procedures. These included the liquid penetrant examination procedure (fluorescent technique) provided by LILCO and the eddy-current examination procedure provided by Failure Analysis Associates (FaAA). Mr. Van Fleet also reviewed the records on certification of personnel qualifications for several of the Level II NDE technicians. The above procedures and certifications appeared to Mr. Van Fleet to meet specified requirements.

The technicians who performed the nondestructive examinations witnessed by Mr. Van Fleet kept the appropriate procedure immediately available where the examinations were performed, as is required. It appeared to Mr. Van Fleet that the technicians followed the procedures correctly.

Mr. Van Fleet witnessed liquid penetrant examinations of fillet areas of main and connecting rod journals and of six fillets at the ends of oil holes in the main bearing journals of the crankshaft. No rejectable indications were found in the examinations that he witnessed. However, indications were noted on several main bearing journals at the demarcation line between the peened zone and the journal. These indications were intermittent and typically several inches in length. The Level II technicians (Mr. Pennanen and Mr. Barnes) who performed the examinations considered these indications to be the result of residual penetrant from previous examinations, and not defects in the crankshaft. It was noted by Mr. Van Fleet that removal of residual penetrant would be very difficult in the demarcation line where the indications were

observed. At the time of the review, LILCO had not determined what, if any, additional examinations would be performed to identify the cause of these indications.

Mr. Van Fleet also witnessed the eddy-current examinations of the bores of all of the oil holes in the main bearing journals. No rejectable indications were found.

3.1.2 Visual Examinations of Crankshaft Journals and Bearings

The main and connecting rod journals of the crankshaft were examined visually by Mr. P. J. Louzecky for scratches, surface irregularities, heat-affected zones, bearing pounding areas, and other possible irregularities. In the opinion of Mr. Louzecky, the journal surfaces exhibited no abnormalities. Mr. Louzecky observed very light scratches on the journals, but the scratches were so minor that he found them difficult to see under direct lighting. He considered these scratches to be normal, and attributed them to very small particulates that inevitably enter the lube oil and are too small to be removed by the oil filter.

The top and bottom halves of the connecting rod bearing shells were examined visually by Mr. Henriksen, Mr. Kirkwood, and Mr. Louzecky for any evidence of abnormalities in the wearing surfaces that might be indicative of crankshaft misalignment, deficiencies in lubrication, or other deficiencies. The bearing surfaces exhibited light wear patterns that the reviewers considered to be normal. Further, the reviewers concluded from the excellent condition of the bearing surfaces that the oil used to lubricate the bearings was of good quality, that the amount of oil was adequate to develop a good bearing oil film, and that the oil had not broken down or overheated in the crankshaft/bearing environment.

Although the upper halves of the main bearing shells had been removed from the engine to permit inspection of the main journals of the crankshaft, the PNL reviewers did not inspect them. These shells were stored in boxes to protect their surfaces. The lower halves of the main bearing shells carry the main loads, and they remained in the engine base to support the crankshaft. Because of the excellent condition of the connecting rod bearing shells and the

excellent condition of the main journals of the crankshaft, the PNL reviewers concluded that it was unnecessary to inspect the upper halves of the main bearing shells.

3.1.3 Findings and Preliminary Conclusions

PNL has not yet received the various NDE reports written by LILCO on the examinations performed on the crankshaft. The final determination of acceptability of the areas examined must, of course, be based on data documented in those reports. In Mr. Van Fleet's opinion, the written NDE procedures, the certified technicians performing the examinations, and the examinations he witnessed all met the specified requirements. Visual examinations of the crankshaft journals and bearing shells by PNL reviewers revealed no abnormalities that would be indicative of crankshaft deficiencies.

3.2 CYLINDER BLOCK

3.2.1 Visual Examinations

As noted in a letter dated October 18, 1984, from LILCO (J. D. Leonard, Jr.) to the NRC staff (H. R. Denton), LILCO's plan for post-test inspection of the cylinder block included nondestructive examination of the complete top of the block and of the areas in camshaft bearing saddles No. 2 and No. 8 where fine, intermittent linear indications had been found during preparation of these saddles for strain gauging. LILCO had completed the nondestructive examinations before the PNL review team arrived on site. M. H. Schuster of LILCO reported orally that no indications were found in the top surface of the block, and that reinspection of the two camshaft bearing saddles showed that the linear indications found previously had not propagated in length nor observable severity.

Camshaft bearing saddles No. 2 and No. 8 were examined visually by the PNL review team. Two members of the team, B. J. Kirkwood and W. W Laity, could barely discern a linear indication in saddle No. 2, but it was only faintly visible. Its visibility may have been enhanced by residual penetrant from the

liquid penetrant examination conducted earlier by LILCO. Other members of the review team did not detect the known indications in the cam saddles with the naked eye.

PNL review team members Kirkwood and Louzecky visually examined the top surface of the block. Team members Henriksen, Laity, and Nesbitt also observed the top surface, but less thoroughly. At the time this examination was performed, the materials from the nondestructive tests performed by LILCO had been removed. The PNL reviewers saw no defects visible to the naked eye.

Neither the PNL reviewers nor LILCO representatives examined the cylinder liner landings in the block for possible circumferential indications, nor did LILCO's post-test inspection plan referenced earlier in this section call for such an examination. The cylinder liners were left in place in the block; therefore, the cylinder liner landings were not visible.

3.2.2 Findings and Preliminary Conclusions

PNL has not yet received the various NDT reports written by LILCO on the examinations performed on the cylinder block. As with the crankshaft, a final determination of the acceptability of the areas examined will depend on data documented in these reports.

Although no member of the PNL review team witnessed any of the nondestructive tests of the block performed by LILCO, L. G. Van Fleet of PNL audited LILCO NDE procedures for certain other components, the qualifications of the NDE inspectors, and the inspections performed. He found nothing contrary to accepted practice in this audit.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MEMORANDUM FOR: Thomas M. Novak, Assistant Director for Licensing
Division of Licensing

FROM: Dennis M. Crutchfield, Assistant Director for Safety Assessment
Division of Licensing

SUBJECT: SAFETY EVALUATION REPORT - SHOREHAM NUCLEAR POWER STATION EMERGENCY LOAD REQUIREMENTS FOR EMERGENCY DIESEL GENERATORS

The TDI Project Group, Division of Licensing, has completed its review of the emergency service load requirements to be placed on the Shoreham EDGs and the adequacy of these loads relative to the 3300KW "qualified load" rating for these engines. Our review has incorporated SER input from the Power Systems Branch concerning the emergency load requirements for the Shoreham EDGs which was provided by memorandum, L. S. Rubenstein to D. M. Crutchfield, dated November 29, 1984.

Our SER is attached.

Dennis M. Crutchfield

Dennis M. Crutchfield, Assistant Director
for Safety Assessment
Division of Licensing

Enclosure:
SER

cc w/encl:
See next page

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SUPPLEMENTAL SAFETY EVALUATION REPORT
SHOREHAM NUCLEAR POWER STATION
DOCKET NO. 50-322

Introduction and Background

As specified in the original FSAR, Section 8.3.1, the TDI Emergency Diesel Generators at Shoreham have a continuous rating of 3500 KW and an overload rating of 3900KW. These ratings are as defined in IEEE 387-1977.

In testimony presented during the ASLB hearings regarding the Shoreham crankshafts, the staff and its PNL consultants concluded that there was insufficient evidence to either approve or disapprove the crankshaft for operation at engine loads at or above 3500KW continuous rating. The staff testimony suggested, consistent with its generic SER addressing the TDI Owners Group Program Plan dated August 13, 1984, that unlimited fatigue life of the Shoreham crankshafts could be demonstrated by testing an engine for 10^7 engine stress cycles (750 hours). That testing would be conducted at a load at or above the maximum emergency service load. The test load would be designated at the "qualified load" for the engine. Successful completion of such a test would be sufficient to demonstrate the adequacy of the crankshaft for unlimited fatigue life at its "qualified load."

LILCo is expected shortly to submit a test/inspection report demonstrating satisfactory completion of an engine test conducted at 3300KW for 750 hours. Contingent upon successful completion of the test, 3300KW would become the "qualified load" rating for the Shoreham engines. The staff is scheduled to issue an SER addressing the adequacy of the TDI EDGs on December 18, 1984, which will in part include a detailed evaluation of this test/inspection report.

This SER addresses the emergency load requirements to be placed on the Shoreham EDGs and the acceptability of these loads when considered against the 3300KW "qualified load" rating for these EDGs. Information pertaining to the emergency load requirements was submitted by LILCo in letters dated July 3, August 22, September 11, November 19, and November 29, 1984.

Evaluation

In order to reduce the emergency service load requirements, included in Section 8.3.1 of the FSAR, the applicant removed selected loads from the automatic start category. The staff concluded, as indicated in the attached memorandum from O. Parr to M. Srinivasan dated October 12, 1984, that this removal of loads is acceptable. Thus, based on information presented, the staff finds that the total continuous loading for the diesel generator (given a loss of coolant accident concurrent with a loss of offsite power) does not exceed 3300KW. Design features such as alarms have not been provided to assure that

the control switch for one of two divisions III service water pumps will remain in the manual mode or the pull to lock position. To obtain the needed assurance, the staff will include a once per shift periodic verification of this switch position in the Shoreham Technical Specifications. Pending revision of the specifications to include this change as well as the change referenced in the attached memorandum, the staff considers this item to be acceptably resolved.

With respect to diesel generator loading when there is only a loss of offsite power (no loss of coolant accident), the applicant implied by letter dated November 19, 1984, that the worst case continuous loading on any one of the three diesel generators is 2786KW. This value was confirmed in the applicant's November 29, 1984 letter. Because 2786KW is below the 3300KW qualified load, the staff considers this item to be acceptably resolved.

The staff has identified a number of short term operating conditions which may cause the Shoreham engines to be loaded above the qualified load rating of 3300KW for brief periods. It has been general industry practice to use the overload rating to justify short term operation (2 hours) at loads exceeding the nameplate continuous rating. The staff has no basis by which to define a "qualified overload" rating (in excess of the qualified load rating) at which the engines can be operated for in excess of two hours out of 24 consecutive operating hours and at which the crankshafts can be shown to have unlimited fatigue life. However, based on consideration of the nature of the short term operating conditions above 3300KW (discussed below), the staff and its PNL consultants have concluded that these conditions are very unlikely to induce a fatigue failure of any of the Shoreham crankshafts. This conclusion is based on the short duration of these operating conditions combined with the assumption that crankshaft inspections will have verified the crankshafts to be initially free of cracks. The redundancy among the Shoreham EDGs provides added assurance that the EDGs will provide the necessary emergency power during LOOP/LOCA events. The staff concludes, however, that in the absence of a "qualified overload" rating, the crackshaft should be periodically inspected to verify the continued absence of cracks.

The 3300KW "qualified" load is to be considered as the only diesel generator rating. Thus, the rated load test required by Section 6.4.3 of IEEE Standard 387-1977 as augmented by R.G. 1.9 and the full load carrying capability test required by position C.2.a(3) of R.G. 1.108 is to be performed at 3300KW. The Technical Specifications for the Shoreham plant will be changed to permit a 3300KW load test (once per 18 months) for 24 hours versus a 3500KW load test for 22 hours followed by 3900KW load test for two hours.

The following items are short term operating conditions identified by the staff which may cause the diesel engine to supply a load greater than its qualified load rating of 3300KW:

1. Inrush current due to starting of large motors will cause very short duration KW spikes (less than one second) that are greater than the 3300KW "qualified load." The applicant was requested by telecon on October 26, 1984, to describe what effect this inrush current had on the diesel engine. The applicant by letter dated November 19, 1984, provided the following response:

> "There is no adverse effect due to inrush current. The phenomena of inrush current (due to starting large motors) causing short duration KW spikes is typical and not unique to the Shoreham diesel generators. In order to minimize the effect of these spikes on the diesels, large motor loads are started in a predetermined sequence. FSAR Table 8.3.1-2 tabulates the various inrush currents and describes the large motor start sequence. Such sequencing allows a spike to occur and to dissipate prior to the start of the next load usually 5.5 to 6 times the full load current but the power factor at that instant is approximately .35 and the net effect on the DG is reduced significantly. The inertia of the flywheel minimizes the effect of these spikes on the diesel due to their short duration. These spikes were considered in FAA's analysis and it was determined that they have no adverse effect on the diesel's capability to perform their intended function. In addition, diesel factor test, preoperational test and periodic operational surveillances (see Technical Specifications Section 4.8.1.1.2.e) have demonstrated and continue to demonstrate the diesel's capability in this area."

The staff agrees with the applicant's assessment that there is no adverse effect due to inrush current. Apart from inertial considerations, the staff also notes that the effect of the electrical transient on the BMEP response of the engine would be further flattened by the fact that the turbocharger cannot respond quickly enough to a full opening of the fuel rack to provide sufficient air to take full advantage of the additional fuel. (This is the cause of engine smoke produced under these conditions.) The electrical spike would be on the order of a hundredth of a second in duration, and in the staff's judgment would not increase the engine BMEP response significantly above that equivalent to engine operation at 3300KW continuous load. Irrespective of the transient BMEP peak, however, the short duration of these transients coupled with the assumption that inspections will have verified the initial condition of the crankshafts as being free of cracks ensures that these transients will not induce a fatigue failure of the crankshafts. The load acceptance test of Section 4.8.1.1.2.e of the Technical Specification will be supplemented such that the voltage and frequency for each load step will be monitored and shown to be within the required design limits specified in R.G. 1.9.

2. By letter dated November 19, 1984, the applicant identified the following loads that are automatically actuated, are intermittent/noncontinuous, and are not considered to be part of the qualified load level:

   a. diesel generator air compressor (12KW)
   b. diesel generator fuel oil transfer pump (0.4KW)
   c. motor operated valves (176KW)

   Based on information presented in Table 8.3.1-1 of revision 34 to the FSAR, the staff concludes that the worst case maximum coincident demand of these loads will be 188.4KW. The 188.4KW, when added to the total maximum emergency service loads tabulated in Table 8.3.1-1A of revision 34 to the FSAR, is 3413.9KW. Because the majority of those loads are automatically actuated motor operated valves, they are short duration loads on the order of one to three minutes. Also, automatic actuated valves do not operate simultaneously; therefore, the actual diesel generator loading should be less than the aggregate value of 3413.9KW but may be greater than 3300KW for one to three minutes. Considering the limited time interval involved and the initial uncracked condition of the crankshafts, this load would be very unlikely to produce a fatigue failure of the crankshafts.

3. In order for the diesel generator to reach its required design basis voltage and frequency limits within the required time of ten seconds, the diesel engine's fuel rack position or fuel setting will move to the wide open position. This wide open fuel setting is greater than the fuel setting which would exist when the diesel generator is delivering steady state power at 3300KW load. Thus, during this ten second plus time period, the diesel engine may be loaded such that its BMEP may be greater than that corresponding to a continuous electrical load of 3300KW. Similarly, when individual loads or a block of loads are connected to the generator, the diesel engine's fuel setting will move towards the wide open position. This fuel setting movement maintains the frequency of the generator within required limits specified in R.G. 1.9. Even though the output of the generator is less than 3300KW, the diesel engine will be loaded for a short time (estimated to be less than 15 seconds) such that its BMEP may be greater than that corresponding to a continuous electrical load of 3300KW. The staff's consultants estimate that the BMEP response could be up to approximately that corresponding to 3800KW. Again, however, considering the short duration of these transients and the initially crack-free condition of the crankshafts, these transients are very unlikely to induce a fatigue failure of the crankshafts.

By letter dated November 19, 1984, the applicant (in response to an October 26, 1984 telecon), indicated that the 3300KW "qualified load" for the diesel generator would be exceeded if one assumed a single operator error. For a loss of coolant accident with a concurrent loss of offsite power, the worst case loading due to a single operator error was identified to be 3583.5KW though no operator action is required to mitigate this event. For a loss of offsite power event only (no loss of coolant accident), the worst case loading due to single operator error was identified to be 3784KW. Plant procedures and training are to be used to prevent an operator error from causing the 3300KW "qualified load" from being exceeded. In addition, the applicant proposed a change in the plant Technical Specification (specifying 3300KW limit) to further aid in keeping the diesel generator loads below its 3300KW "qualified load." The staff will include this proposed 3300KW limit as part of the Technical Specifications. Pending inclusion of this item in the Shoreham Technical Specifications, the staff concludes that there is reasonable assurance that loading of the diesel generator beyond its 3300KW limit will be prevented. However, the staff finds, based on information presented by letter dated November 19, 1984, that the Shoreham plant procedures call for the manual connection of nonsafety loads to the diesel generator. If these nonsafety loads are connected prior to the removal of safety loads, the 3300KW limit may be exceeded. The staff, therefore, concludes that strict adherence to plant procedures is essential to preventing the 3300KW limit from being exceeded. The adequacy of these procedures will be reviewed and reported in a later report. However, it should also be noted that if one assumes a single operator error which would cause the failure of an engine, such an error could only result in the loss of one diesel generator due to overload and the two remaining diesel generators are sufficient to safely shutdown the plant for any postulated event.

Conclusion

A "qualified load" rating of 3300KW adequately envelopes the maximum continuous emergency load requirements associated with LOOP/LOCA events. Although transient and intermittent, non-continuous loads could briefly increase engine loadings slightly above 3300KW, these loads are of such a limited duration that they are not considered as a credible cause of a fatigue failure of the crankshafts during LOOP/LOCA events. The redundancy among the Shoreham EDGs provides added assurance that the EDG will provide the necessary emergency power during such events.

As a precautionary measure, the staff has concluded that the Shoreham EDG crankshafts should be inspected periodically. The staff will address the appropriate inspection interval in a forthcoming SER addressing the adequacy of the Shoreham EDGs which is scheduled for issuance by December 18, 1984. The staff findings are also conditioned to the Technical Specification changes which have been identified above.

Attachment

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 12 1984

Docket No. 50-322

MEMORANDUM FOR: M. Srinivasan, Chief, Power Systems Branch, Division of Systems Integration

FROM: O. Parr, Chief, Auxiliary Systems Branch, Division of Systems Integration

SUBJECT: MANUAL INITIATION OF SELECTED PUMPS - SHOREHAM NUCLEAR POWER STATION

As per your memorandum dated October 10, 1984, we have reviewed the applicant's submittal dated July 3, 1984. Our evaluation of the acceptability of manually starting one out of four (1/4) Reactor Building Service Water System (RBSWS) pumps, 1/3 Reactor Building Closed Loop Cooling Water System (RBCLCWS) pumps, and 1/2 Spent Fuel Pool Cooling Water System (SFPCWS) pumps is addressed below.

The SFPCWS is not necessary for reactor safety or accident mitigation. The applicant has proposed maintaining 1/2 pumps as automatically restarted when the bus is re-energized. Assuming the failure of this pump, it is anticipated that the pool temperature would take more than one hour to reach boiling. This is ample time to manually start the other SFPCW pump. Thus, we conclude that the manual initiation of 1/2 SFPCWS pumps is acceptable.

The RBCLCWS consists of three full capacity pumps feeding two redundant loops. Although 2/3 pumps are normally operating (the third pump is a swing spare pump), only one pump is required during accident conditions. Thus, we conclude that making the swing spare pump manually initiated is acceptable. It should be noted that with the single failure of the pump which services the operating loop of the SFPCWS, there would be no cooling to the SFP. Our evaluation of this event/failure would be identical to the aforementioned failure of the auto initiated SFPCWS pump.

The RBSWS consists of four pumps powered by three diesel generators. One diesel generator supplies power to two pumps. Therefore manually starting one of these two pumps will not have any adverse effect on our previous accident evaluations, since any single failure will not prevent at least two pumps from operating. However, the Technical Specification 3/4.7.1 should be revised to allow only the manually started pump to be inoperable

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for up to 30 days (3.7.1.1 Action a.). Any other pump should only be inoperative for up to seven days (3.7.1.1 Action b.). With these changes to the Technical Specifications, we conclude that manually starting 1/2 pumps powered by diesel 103 is acceptable.

Jerry K. Wilson for
Olan D. Parr, Chief
Auxiliary Systems Branch
Division of Systems Integration

cc: R. Bernero
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