

July 24, 1984



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Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Eisenhut:

SUBJECT: ASSESSMENT OF DIESEL ENGINE RELIABILITY/OPERABILITY
(FIN B2952) - MONTHLY REPORT FOR JUNE 1984

Enclosed for your information is a copy of the subject report on activities performed at the Pacific Northwest Laboratory during the month of June. Included on the distribution for the report are the NRC staff members specified in Section F.2, "Monthly Progress Report," of the Statement of Work for this project.

I regret that this monthly report was not submitted by July 15, as called for in the Statement of Work. Pressing project issues requiring priority attention contributed to the delay.

Sincerely,

W. W. Laity
Walter W. Laity
PNL Project Manager

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PNL MONTHLY PROGRESS REPORT
for
ASSESSMENT OF DIESEL ENGINE RELIABILITY/OPERABILITY

MONTH: June 1984

FIN NUMBER: B2952

CONTRACT IDENTIFICATION: DE-AC06-76RLO 1830 (TD 1886)

SPONSOR: Division of Licensing, Office of Nuclear
Reactor Regulation, U.S. Nuclear Regulatory
Commission

PROJECT STATUS

Project Description

PNL is supporting the NRC staff in addressing questions of reliability, operability, and quality assurance for diesel generators manufactured by Trans-america Delaval, Inc. (TDI). A major failure in one TDI diesel at a nuclear utility and less-serious problems in others have raised questions regarding the adequacy of these engines as emergency power sources for safety-related nuclear systems. With the assistance of recognized authorities on diesel engine technology, PNL will assess the TDI Diesel Generator Owners' Group Program Plan and related information submitted to NRC; evaluate the implementation of the Program Plan; and support the NRC staff in hearings and briefings.

Progress During Reporting Period

• Review of Owners' Group Program Plan

The PNL project team and four consultants (A. J. Henriksen, B. J. Kirkwood, P. J. Louzecky, and A. Sarsten) met in Richland, Washington, on June 28 and 29 to finalize PNL's report to NRC, Review and Evaluation of TDI Diesel Generator Owners' Group Program Plan. The meeting participants addressed and resolved questions and issues raised by various NRC and PNL reviewers. The final version of the report, PNL-5161, was submitted to NRC on July 6.

• Consultants

NRC approval was received to contract with Tracor Hydronautics. A contract was placed with Tracor on June 26.

• Plant-Specific Actions

Mississippi Power and Light (MP&L) invited NRC and the PNL team to visit the Grand Gulf Nuclear Power Station on June 4 and 5 to review results of

their recent engine disassembly. The PNL representatives who participated were D. A. Dingee, A. J. Henriksen, J. E. Horner, and P. J. Louzecky. This review led to several recommendations:

1. A method should be applied to assure high surface area contact of the connecting rod serrated joints. This method should be developed in consultation with TDI.
2. MP&L should measure conrod bolt tension via ultrasound, in addition to bolt torque measurements.
3. The linkpin dowel interference should be inspected to assure clearance is to the Owners' Group specifications.
4. The Division I turbocharger should be returned to Elliot for repairs. It should be reconnected to the engine in consultation with TDI.

Mississippi Power and Light data on TDI engine shutdowns were received from NRC for the PNL team to review. An NRC study of these data was also supplied to facilitate the review.

Duke Power has completed inspection of the Unit-1/A-engine at the Catawba Nuclear Power Station following about 800 hours of testing. A meeting was held in Washington, D.C., on June 21 to review their findings and proposed actions with NRC and the PNL team (D. A. Dingee, A. J. Henriksen, J. E. Horner, P. J. Louzecky, and J. Spanner). This meeting led to the following recommendations:

1. A method developed in consultation with the engine manufacturer should be applied to assure high surface area contact of the connecting rod serrated joints.
2. Duke Power should measure conrod bolt tension via ultrasound as well as by bolt torque. Any significant discrepancies in these two independent measurements should be reported to NRC.
3. Provisions should be made for continuous reading of inlet temperature to the turbocharger.

● Document Data Base

Development of an appropriate licensing action tracking system for reporting to NRC was initiated. The Program Activity Tracking System (PATS), developed by the Franklin Research Center, was reviewed and various actions for implementing a similar system were explored.

The document database continues to expand as more reports and correspondence are generated for this project. Currently over 500 documents are catalogued in the database.

TDI Diesel Generator Owners' Group Reports

Drafts of PNL's Technical Evaluation Reports on three Owners's Group reports are currently being finalized:

- Design Review of Connecting Rod Bearing Shells for Transamerica Delaval Enterprise Engines, FaAA-84-3-1, Failure Analysis Associates, March 12, 1984.
- Emergency Diesel Generator Engine Driven Jacket Water Pump Design Review, Stone & Webster Engineering Corp., April 1984.
- Emergency Diesel Generator Engine and Auxiliary Module Wiring and Termination Qualification to IEEE-383-1974, Stone & Webster Engineering Corp., April 1984.

Problems Encountered

For reasons summarized under the following three subheadings, the time required to complete this project and the expenditures for the overall effort are likely to exceed the estimates provided in the PNL proposal for this project. We are setting priorities in response to changing circumstances as they are brought to our attention by NRC, and we are carefully monitoring expenditures as they occur. It has become increasingly apparent that this project is most appropriately viewed as a level-of-effort activity.

During the next reporting period we plan to revise our estimate of the overall cost, and submit an updated proposal to NRC.

- Power Plant Hearings

Substantial effort will be required by PNL over the next several months to provide technical support to the NRC staff for the following licensing hearings, which have been scheduled in recent weeks: Grand Gulf, Catawba, Shoreham, Comanche Peak, and San Onofre. The effort will be particularly intense in July and August. It will have some impact on the availability of PNL's consultants to support the preparation of Technical Evaluation Reports on known problems but, through the assignment of a "lead" consultant for each hearing and the use of other consultants only as necessary to support the "lead" consultant, we plan to keep the impact to a minimum.

- Design Review/Quality Revalidation

PNL has received the first DR/QR submittal from the Owners' Group, for TDI diesel generators at the Shoreham Nuclear Power Station. From discussions in recent weeks, PNL understands that this is the first of perhaps 13 plant-specific DR/QR reports that the Owners' Group plans to submit through February 1985. This volume of DR/QR reports is substantially greater than that anticipated by PNL in our proposal for this project. We are taking steps to use the services of NRC-approved consultants other

than those already committed to other tasks of this project to alleviate the impact of the DR/QR reviews on the other tasks.

- Owners' Group Reports

As discussed in previous PNL monthly reports, the reports submitted by the Owners' Group on known problems have generally lacked information needed for a meaningful technical review. Substantial progress toward achieving a better mutual understanding of action taken by Failure Analysis Associates on certain reports, and open items relative to those reports identified by PNL's reviewers, was made during a meeting among representatives of PNL, NRC, and the Owners' Group at FaAA, Palo Alto, on June 22. The Owners' Group is following up with written responses to the open items.

The actual number of reports submitted for review is substantially greater than the number anticipated in PNL's proposal for this project because of the plant-specific scope of many of the reports. To coordinate the effort underway in preparing PNL's Technical Evaluation Reports of the known problems, Dr. Frank Zaloudek has been added to the project team. Dr. Zaloudek is a mechanical engineer with extensive experience as a senior member of the PNL technical staff.

Travel Summary

Three trips/visits were made during June:

- The two trips associated with plant-specific issues are described previously in this report.
- On June 22, PNL project team members J. M. Alzheimer, S. D. Dahlgren, and D. A. Dingee, along with consultants S. H. Bush, A. J. Henriksen, B. J. Kirkwood, P. J. Louzecky, and A. Sarsten, joined Ed Tomlinson of NRC and Owners' Group representatives at Failure Analysis Associates, Palo Alto, California. The meeting was held to discuss Owners' Group reports prepared by FaAA on crankshafts, cylinder heads, turbochargers, piston skirts, connecting rods, push rods, and engine base and bearing caps. This public meeting was transcribed. Transcriptions were distributed to NRC and PNL on June 26/27.

Travel plans for July include the following trips/visits:

- J. Alzheimer, W. Laity, and F. Zaloudek of PNL and five PNL consultants will attend a meeting with representatives of NRC and the Owners' Group in Charlotte, North Carolina on July 11. The principal topic of discussion will be PNL's Review and Evaluation of the Owners' Group Program Plan (PNL-5161).
- A meeting between NRC (C. Berlinger and E. Murphy), PNL, and PNL consultants A. Henriksen, J. Horner, B. Kirkwood, P. Louzecky, and A. Sarsten will be held in Charlotte, North Carolina, on July 12 to

discuss the scheduling of technical support required for hearings on near-term licenses. In addition, PNL's review of a post-inspection report submitted by MP&L for the Grand Gulf Nuclear Station will be discussed.

- PNL representatives and consultants A. Henriksen, J. Horner, B. Kirkwood, and P. Louzecky will attend a meeting with representatives of NRC and MP&L in Bethesda on July 13 to discuss MP&L's report of July 5 on disassembly and inspection of the Division I diesel generator, the post-inspection engine test program, and the MP&L maintenance and surveillance program.
- J. Nesbitt of PNL and PNL consultants B. Kirkwood and P. Louzecky will review the disassembly and inspection of the 1-B diesel generator at the Catawba Nuclear Power Station on July 25 and 26.

Plans for July

- Evaluation of Owners' Group Program Plan

PNL will submit a final Technical Evaluation Report on TDI diesel engines at the Grand Gulf Nuclear Station Unit 1.

- Evaluation of Owners' Group Reports on Generic Issues

Reviews of these reports will continue.

Financial Status

A. Total Cost of Project

<u>Total Projected Project Cost</u>	<u>Funds Obligated To Date</u>	<u>Balance of Funds Required by FY</u>	
		<u>FY84</u>	<u>FY85</u>
974K	287K	598K	89K

B. Funds Expended to Date

	<u>Period</u>	<u>FYTD</u>	<u>Cumulative</u>
1. Direct lab staff effort	7 MM	35 MM	35 MM
2. Funds (\$000)			
Direct salaries	32	152	152
Materials & services	10	30	30
ADP support	0	0	0
Subcontracts (a)	35	81	81
Travel	11	19	19
Indirect labor	10	45	45
Other (F&E, Nucl., O/H, S&A)	7	28	28
General & Administrative	<u>23</u>	<u>109</u>	<u>109</u>
	128	464	464

(a) These expended funds represent actual billings by the project consultants against total committed funds of 175K which appear on open purchase requisitions to the consulting firms working on the project.

C. Funds (\$000) Expended by Task

	<u>Period</u>	<u>Cumulative to Date</u>
Task 1 - Proj. Mgmt.	28	134
Task 2 - Eval. of OGPP	20	75
Task 3 - Eval. of Imple- mentation of OGPP	75	248
Task 4 - Support to NRC	<u>5</u>	<u>7</u>
	128	464

NOTE: The Fee Recovery Cost Status section has been omitted for the reporting period pending further clarification from NRC regarding the added FIN No. B2963 requesting cost breakout for operating reactors. It is expected that the July report will provide the required cost data retroactive to March 1984.