

Docket No. 50-458

APPLICANT: Gulf States Utilities Company (GSU)
FACILITY: River Bend Station (RBS)
SUBJECT: SUMMARY OF MEETING WITH GSU TO DISCUSS RBS
STANDBY DIESEL QUALIFICATION PROGRAM

The meeting was held May 22, 1984, in Bethesda, Maryland. A list of persons attending is included as Attachment 1. Attachment 2 is GSU's presentation on diesel qualification. As a result of problems identified at other facilities with Transamerica Delaval, Inc. (TDI's) diesel engines the staff has initiated a task force to investigate the ability of these engines to be qualified for nuclear service. RBS uses two R-48 diesel engines as standby diesels to provide electrical power to vital loads in the event of loss of offsite power.

GSU initiated their diesel generator program in November 1983. In addition to participating in the owner's group addressing this problem, GSU has initiated internal review and assessment. GSU has, as consultants, the Southwest Research Institute (SRI) providing an independent review of the engine design and testing.

The RBS train "A" diesel is currently disassembled and GSU is conducting non-destructive examination (NDE) including radiography and visual inspection of accessible locations in the engine. Other efforts by GSU and the owner's group are summarized in Attachment 2.

The qualification for nuclear service of the TDI diesel engines will continue to be reviewed by the staff. GSU will be required to meet the final staff position on TDI diesels prior to fuel load, if available by that time, or at a later time as determined by the staff.

E. J. Weinkam III, Project Manager
Licensing Branch No. 2
Division of Licensing

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

MAY 25 1984

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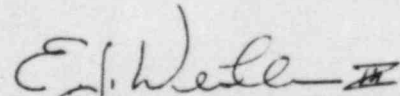
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River Bend

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May 21, 1984

Diesel Generator Program Plan

E. J. Weinkam III	NRC/DL
R. E. Farrell	NRC/I&E
J. R. Hamilton	Gulf States Utilities Co.
J. E. Price	Gulf States Utilities Co.
V. S. Klco	Gulf States Utilities Co.
E. B. Tomlinson	NRC/DSI/PSP
John Schroeder	TDI

R I V E R B E N D
DIESEL QUALIFICATION PROGRAM

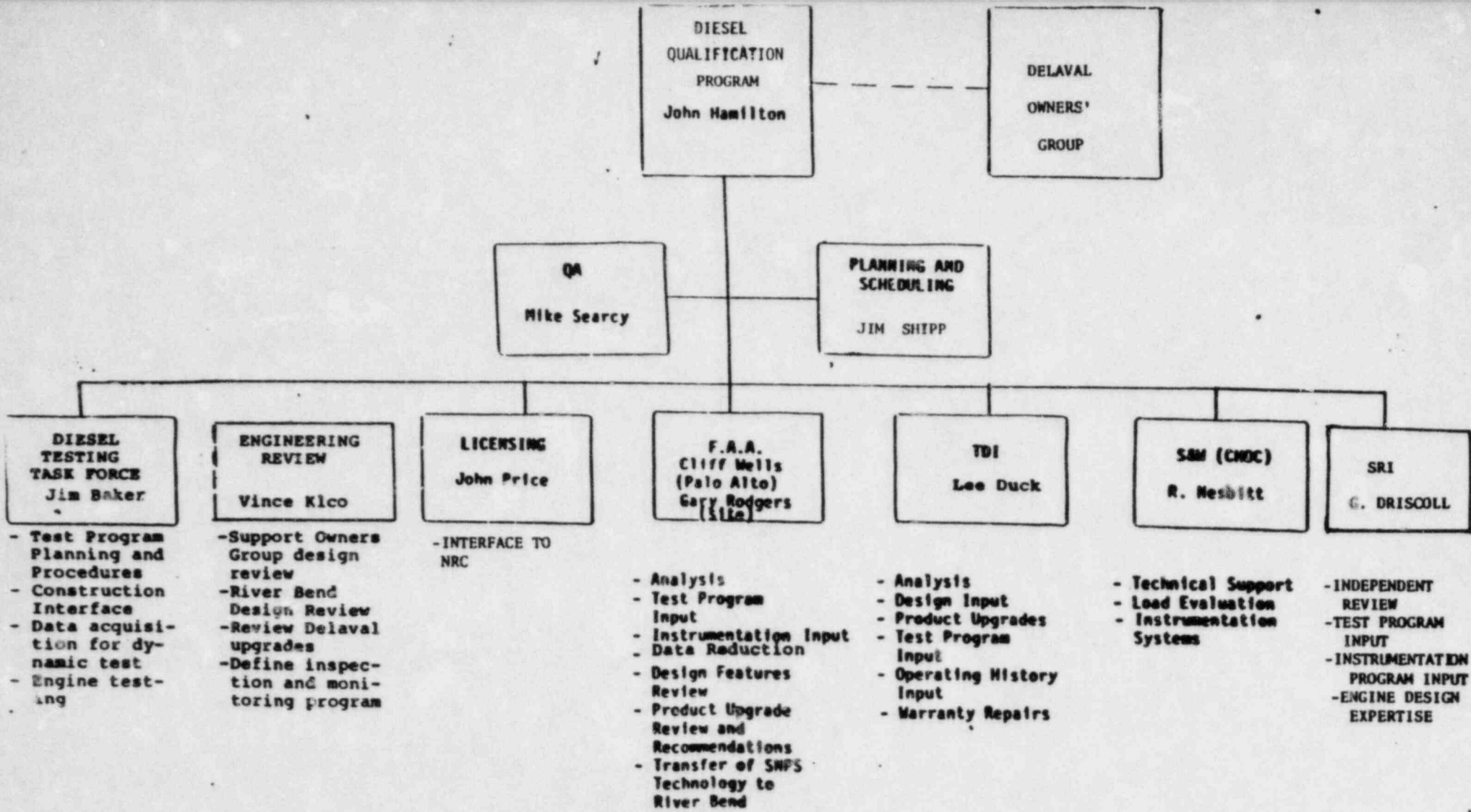
- INITIATED BY GSU IN NOVEMBER 1983

-OBJECTIVES:

- 1) EVALUATE THE TDI DIESELS AT RIVER BEND
- 2) DETERMINE WHAT IS NECESSARY TO ASSURE RELIABLE
STANDBY POWER

-RESOURCES INCLUDE:

- 1) RIVER BEND PROGRAM
- 2) TDI OWNERS' GROUP PARTICIPATION



DIESEL TESTING TASK FORCE
Jim Baker

- Test Program Planning and Procedures
- Construction Interface
- Data acquisition for dynamic test
- Engine testing

ENGINEERING REVIEW
Vince Klco

- Support Owners Group design review
- River Bend Design Review
- Review Delaval upgrades
- Define inspection and monitoring program

LICENSING
John Price

- INTERFACE TO NRC

F.A.A.
Cliff Wells (Palo Alto)
Gary Rodgers (Site)

- Analysis
- Test Program Input
- Instrumentation Input
- Data Reduction
- Design Features Review
- Product Upgrade Review and Recommendations
- Transfer of SNPS Technology to River Bend

TDI
Lee Duck

- Analysis
- Design Input
- Product Upgrades
- Test Program Input
- Operating History Input
- Warranty Repairs

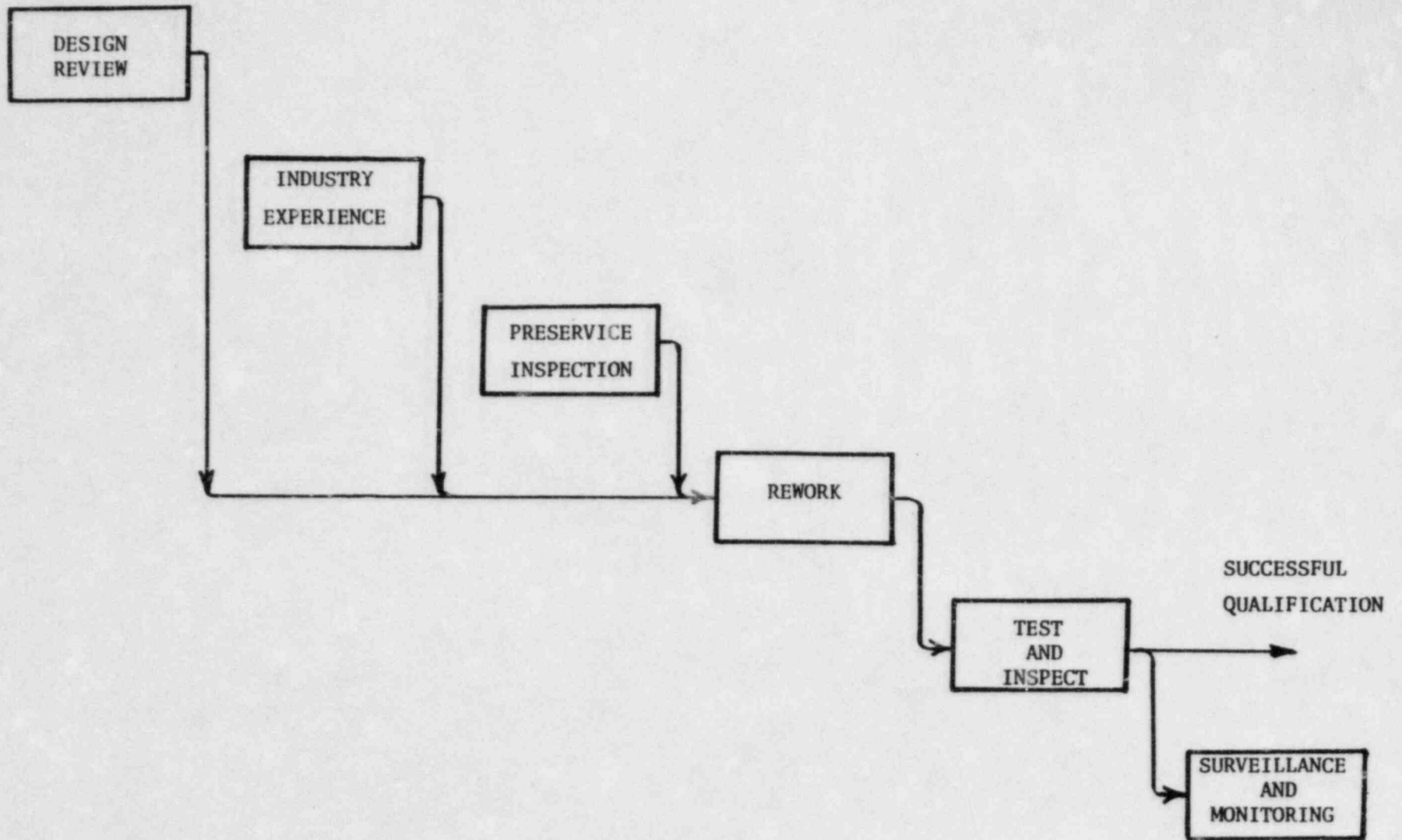
SBM (CHOC)
R. Nesbitt

- Technical Support
- Load Evaluation
- Instrumentation Systems

SRI
G. DRISCOLL

- INDEPENDENT REVIEW
- TEST PROGRAM INPUT
- INSTRUMENTATION PROGRAM INPUT
- ENGINE DESIGN EXPERTISE

RIVER BEND DIESEL ACTIVITIES



SUMMARY OF ACTIVITIES

DESIGN REVIEW

- OWNERS' GROUP

- 1) 16 GENERIC PROBLEMS (PHASE I)
- 2) RIVER BEND SPECIFIC (PHASE II)

- RIVER BEND

- 1) REVIEW OF OWNERS' GROUP REPORTS
- 2) SPECIAL INVESTIGATIONS BY GSU, SWEC, CONSULTANTS

INDUSTRY EXPERIENCE

OWNERS GROUP DATA

OBSERVATION OF INSPECTIONS AT OTHER PLANTS

SUMMARY OF ACTIVITIES (Continued)

PRESERVICE INSPECTION

-VENDOR AND SUBVENDOR INSPECTIONS:

TDI, ELECTRIC PRODUCTS, WOODWARD, RTE DELTA

1/2-1/2 900 500+...

-PRELIMINARY TEST OF COMPONENTS AND SUBSYSTEMS

-VISUAL INSPECTION OF OVER 60 ITEMS SELECTED,
BASED ON INDUSTRY EXPERIENCE

-PRESERVICE DISASSEMBLY AND INSPECTION,
USING OWNERS' GROUP CRITERIA

SUMMARY OF ACTIVITIES (Continued)

REWORK

- PISTONS AND RINGS
- VALVE PUSHRODS
- CYLINDER HEAD STUDS
- CYLINDER LINERS
- TURBOCHARGER LUBRICATION
- JACKET WATER PUMP
- TURBOCHARGER BRACKET
- FUEL INJECTION TUBING
- FUEL INJECTION PUMP RETURN LINE
- OTHERS BEING EVALUATED

SUMMARY OF ACTIVITIES (Continued)

TESTING

- CRANKSHAFT TORSIONAL VIBRATION
- CRANKSHAFT BENDING STRESS
- ENGINE VIBRATION
- ENGINE PERFORMANCE
- TURBOCHARGER BEARING LUBRICATION AND COOLING
- TURBOCHARGER BRACKET VIBRATION

POST TEST INSPECTION

INSERVICE SURVEILLANCE AND MONITORING.

PHASE I RESULTS

COMPONENT	HISTORY	TEST/INSPECTION RESULTS	ANALYSIS	CONCLUSION
1. PISTONS	<ul style="list-style-type: none"> • AF PISTON SKIRT CRACKING • AN PISTON SKIRT IMPROPER HEAT TREATMENT 	<ul style="list-style-type: none"> • AE INSPECTIONS OK • SIGNIFICANT OPERATING HISTORY • AN INSPECTIONS OK AT CATAWBA 	<ul style="list-style-type: none"> • ADEQUATE • AN ANALYSIS UNDERWAY 	<ul style="list-style-type: none"> • AE&AN DESIGNS ADEQUATE
2. CONNECTING ROD BEARING SHELLS	<ul style="list-style-type: none"> • CRACKED BEARINGS AT SNPS • NO PATTERN OF FAILED BEARINGS 	<ul style="list-style-type: none"> • BEARINGS GENERALLY SERVICABLE WHEN INSPECTED • FLAW SIZES EXCEED O.G. ALLOWABLE IN SOME CASES 	<ul style="list-style-type: none"> • ADEQUATE IF O.G. ALLOWABLE FLAW SIZE NOT EXCEEDED 	<ul style="list-style-type: none"> • ADEQUATE • INSPECTIONS AND SOME REPLACEMENTS REQUIRED
3. ROCKER ARM CAPSCREWS	<ul style="list-style-type: none"> • ISOLATED FAILURES 	<ul style="list-style-type: none"> • SIGNIFICANT POSITIVE OPERATING HISTORY 	<ul style="list-style-type: none"> • ADEQUATE 	<ul style="list-style-type: none"> • ORIGINAL AND MODIFIED DESIGNS ADEQUATE • FAILURES LIKELY CAUSED BY INSUFFICIENT PRELOAD • IMPLEMENT TORQUING REQUIREMENTS
4. AIR START VALVE CAPSCREW	<ul style="list-style-type: none"> • ORIGINAL CAPSCREWS BOTTOMED OUT IN CYLINDER HEAD TAPPED HOLE 10 CFR 21 REPORT 	<ul style="list-style-type: none"> • SIGNIFICANT POSITIVE OPERATION HISTORY 	<ul style="list-style-type: none"> • ADEQUATE 	<ul style="list-style-type: none"> • ADEQUATE WITH DIMENSIONAL VERIFICATION • IMPLEMENT TORQUING REQUIREMENTS

PHASE I RESULTS

COMPONENT	HISTORY	TEST/INSPECTION RESULTS	ANALYSIS	CONCLUSION
5. CYLINDER HEAD STUDS	<ul style="list-style-type: none"> • NO FAILURES IN NUCLEAR APPLICATION • ISOLATED FAILURES IN NON NUCLEAR (STRAIGHT DESIGN) 	<ul style="list-style-type: none"> • SIGNIFICANT POSITIVE OPERATING HISTORY 	<ul style="list-style-type: none"> • ADEQUATE 	<ul style="list-style-type: none"> • BOTH DESIGNS ADEQUATE • NECKED DESIGN IS MORE FATIGUE RESISTANT • FAILURES LIKELY CAUSED BY INSUFFICIENT PRELOAD
6. JACKET WATER PUMP	<ul style="list-style-type: none"> • PREVIOUS PUMP SHAFT FAILURES • TWO REDESIGNS BY TDI FOR SNPS 	<ul style="list-style-type: none"> • SIGNIFICANT POSITIVE OPERATING HISTORY BOTH INLINE AND VEE ENGINES 	<ul style="list-style-type: none"> • ADEQUATE FOR INLINE ENGINES ANALYZED • ANALYSIS CONTINUING FOR RV ENGINES 	<ul style="list-style-type: none"> • SHOREHAM REDESIGN ADEQUATE • RIVER BEND & RANCHO SECO CHANGE IMPELLER MATERIAL ELIMINATE IMPELLER KEYWAY
7. PUSHRODS				
FORGED HEAD DESIGN	<ul style="list-style-type: none"> • ORIGINAL DESIGN 	<ul style="list-style-type: none"> • SOME FAILURES - NOT AFFECTING ENGINE OPERATION 	<ul style="list-style-type: none"> • ADEQUATE 	<ul style="list-style-type: none"> • ADEQUATE WITH INSPECTIONS CALLED FOR
BALL END DESIGN	<ul style="list-style-type: none"> • FIRST TDI REDESIGN FOR COST REDUCTION PURPOSES 	<ul style="list-style-type: none"> • CRACKING IN INTERMEDIATE PUSH RODS 	<ul style="list-style-type: none"> • UNSAT 	<ul style="list-style-type: none"> • REPLACE WITH FORGED HEAD OR FRICTION WELD
FRICTION WELD DESIGN	<ul style="list-style-type: none"> • SECOND REDESIGN DUE TO CRACKING OF BALL END DESIGN 	<ul style="list-style-type: none"> • POSITIVE EXPERIENCE AT CATAWBA & GRAND GULF • FATIGUE TESTS SATISFACTORILY COMPLETED 	<ul style="list-style-type: none"> • ADEQUATE 	<ul style="list-style-type: none"> • MOST RELIABLE DESIGN • INSPECTIONS REQUIRED • RANDOM DESTRUCTIVE TESTS

PHASE I RESULTS

COMPONENT	HISTORY	TEST/INSPECTION RESULTS	ANALYSIS	CONCLUSION
8. CRANKSHAFTS	<ul style="list-style-type: none"> • SNPS FAILURES (3) • V-16 NON NUCLEAR FAILURES 	<ul style="list-style-type: none"> • INSTRUMENTED TESTS SUCCESSFUL • 4 UNITS INSPECTED NO DEFECTS • SIGNIFICANT OPERATING EXPERIENCE 	<ul style="list-style-type: none"> • ADEQUATE—LEAD ENGINES MEET DEMA 	<ul style="list-style-type: none"> • ADEQUATE • CONFIRMATORY ANALYSIS AND TESTING ON ALL ENGINES (1 PER SITE)
9. WIRING AND TERMINATIONS	<ul style="list-style-type: none"> • TWO DEFECTIVE CABLES IDENTIFIED BY TDI 10 CFR 21 REPORT 	<ul style="list-style-type: none"> • ALL SNPS WIRING SURVEYED (2 ADDITIONAL PROBLEMS IDENTIFIED) • FOLLOW ON ENGINE WIRING TO BE SURVEYED 	<ul style="list-style-type: none"> • ADEQUATE FOR LEAD ENGINE 	<ul style="list-style-type: none"> • ADEQUATE WITH ADDITIONAL WIRING REPLACEMENTS
10. CONNECTING RODS	<ul style="list-style-type: none"> • NON NUCLEAR SERVICE FAILURES—BOTH INLINE & VEE ENGINES 	<ul style="list-style-type: none"> • SIGNIFICANT OPERATING EXPERIENCE • LEAD R-48 (3 ENGINES) INSPECTED—NO DEFECTS • 2 VEE ENGINE UNITS INSPECTED NO DEFECTS • WRIST PIN BUSHING INDICATIONS IDENTIFIED 	<ul style="list-style-type: none"> • ADEQUATE FOR LEAD R48 ENGINE • ANALYSIS CONTINUING FOR VEE ENGINES 	<ul style="list-style-type: none"> • ADEQUATE FOR IN-LINE DSR 48 • RECOMMEND REPLACE BUSHINGS FOR INDICATIONS WITHIN $\pm 15^\circ$ BDC

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PHASE I RESULTS

COMPONENT	HISTORY	TEST/INSPECTION RESULTS	ANALYSIS	CONCLUSION
11. FUEL OIL INJECTION TUBING	<ul style="list-style-type: none"> •NON NUCLEAR ISOLATED FAILURES •FAILURES AT SNPS AND MP & L (DRAW SEAM ON ID) 	<ul style="list-style-type: none"> •GOOD OPERATING HISTORY PAST "BREAK IN" HOURS 	<ul style="list-style-type: none"> •ADEQUATE IF O.G. ALLOWABLE FLAW SIZE NOT EXCEEDED 	<ul style="list-style-type: none"> •ADEQUATE IF INSPECTION ACCEPTANCE CRITERIA MET •ADDITIONAL INSPECTIONS REQUIRED (EDDY CURRENT TO DETECT FLAWS)
12. ENGINE BASE AND BEARING CAPS	<ul style="list-style-type: none"> •ISOLATED NON NUCLEAR CRACKING EXPERIENCE •NON SERVICE RELATED CRACKING AT SNPS 	<ul style="list-style-type: none"> •SIGNIFICANT OPERATING EXPERIENCE 	<ul style="list-style-type: none"> •ADEQUATE 	<ul style="list-style-type: none"> •ADEQUATE •CRACKING AT SNPS DUE TO IMPROPER TORQUE NON SERVICE INDUCED
13. CYLINDER HEADS	<ul style="list-style-type: none"> •FLAWS FOUND AT SNPS, COMANCHE, CATAWBA, GRAND GULF A) CASTING DEFECTS IN OLD HEADS B) LACK OF HEAT TREATMENT OF VALVE SEATS IN OLD HEADS •NUMEROUS PROBLEMS IN NON NUCLEAR SERVICE 	<ul style="list-style-type: none"> •DEFECTS TO DATE ARE IDENTIFIED AS POOR MANUFACTURING TECHNIQUES •NEW HEADS HAVE BEEN SATISFACTORY 	<ul style="list-style-type: none"> •ADEQUATE 	<ul style="list-style-type: none"> •ADEQUATE •FIRE DECK THICKNESS AND CASTING QUALITY TO BE VERIFIED FOR OLD HEADS •NEW HEADS INSPECTED BEFORE INSTALLATION

PHASE I RESULTS

COMPONENT	HISTORY	TEST/INSPECTION RESULTS	ANALYSIS	CONCLUSION
14. TURBOCHARGER	<ul style="list-style-type: none"> • FAILURES AT SNPS, CATAWBA, GRAND GULF • NON NUCLEAR FAILURES 	<ul style="list-style-type: none"> • INSPECTION AT SNPS & CATAWBA—THRUST BRG FAILURE DUE TO LOSS OF LUBRICATION DURING FAST START • GOOD OPERATIONAL EXPERIENCE SINCE PRELUBE MODIFICATION 	<ul style="list-style-type: none"> • ADEQUATE IF PROPERLY LUBRICATED 	<ul style="list-style-type: none"> • ADEQUATE • PRELUBE MODIFICATION REQUIRED ON SOME UNITS
15. CYLINDER BLOCK AND LINER	<ul style="list-style-type: none"> • BLOCK CRACKING AT SNPS • NON NUCLEAR BLOCK CRACKING ON INLINE AND VEE ENGINES 	<ul style="list-style-type: none"> • CRACKS AT SHOREHAM A) PROPAGATED IN ONE ENGINE B) NO CRACK GROWTH IN 2 ENGINES • CATAWBA—NO CRACKS • RIVERBEND—NO CRACKS 	<ul style="list-style-type: none"> • HIGH BLOCK STRESSES RESULT FROM OPERATION AT HIGH LOADS AND STUD PRELOAD • CRACKS CAUSED BY LINER THERMAL EXPANSION AND STUD LOADING • LOW CYCLE FATIGUE MECHANISM 	<ul style="list-style-type: none"> • ADEQUATE PROVIDED • AVOID HIGH CYLINDER PRESS/TEMP • RELAX LINER INTERFERENCE • LOWER STUD TIGHTENINGS • V-16'S ADEQUATE FOR INTERIM USE • STRESS REDUCTION MODIFICATIONS MAY BE RECOMMENDED • INLINE ENGINES UNDER EVALUATION

C O N C L U S I O N S

1. RESOLUTIONS OF MAJOR FAILURES WILL BE PROVIDED BY OWNERS' GROUP
2. ADDITIONAL KNOWN AND LATENT PROBLEMS CAN BE RESOLVED BY DESIGN REVIEW, INSPECTION, REWORK, AND TESTING.
3. SURVEILLANCE AND MONITORING PROGRAM WILL BE DEVELOPED.