



# MISSISSIPPI POWER & LIGHT COMPANY

*Helping Build Mississippi*

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October 1, 1985

NUCLEAR LICENSING & SAFETY DEPARTMENT

U. S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Washington, D. C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station  
Units 1 and 2  
Docket Nos. 50-416 and 50-417  
License No. NPF-29  
File: 0260/L-860.0  
TDI Diesel Generator Design Review  
and Quality Revalidation (DR/QR)  
Report  
AECM-85/0301

In accordance with the requirements of the Grand Gulf Nuclear Station (GGNS) Operating License, NPF-29, License Condition 2.C.25(b), Mississippi Power and Light Company (MP&L) has completed an evaluation of the recommendations contained in the TDI Diesel Generator Owners Group Design Review/Quality Revalidation (DR/QR) Report for the GGNS TDI Emergency Diesel Generators (EDGs). This report was submitted to the NRC via MP&L letter AECM-84/0525, dated November 28, 1984.

Attachment 1 addresses the information requested by your staff, in a letter to MP&L dated July 23, 1985. This information includes the actions taken concerning 10CFR21 reports issued by TDI since January 1984 and actions taken relative to Clow Williams-Hagar check valves. Actions taken concerning TDI Service Information Memos (SIMs) are also included.

Attachment 2 summarizes the preventive maintenance and surveillance program for the TDI EDG's. A listing of the schedules for various preventive maintenance items and schedules for surveillance tests on the TDI EDGs is included.

Attachment 3 describes the training and trending programs for the TDI EDG's. MP&L is scheduled to have the trending program functional by February 1, 1986.

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Attachment 4 provides MP&L's position on each of the Owners Group's recommendations listed in the DR/QR report. MP&L's position on the recommendations can be categorized as follows:

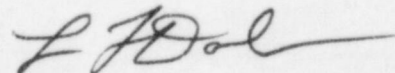
1. Greater than 90% of the Owners Group recommendations are implemented or will be implemented. In some cases the method of implementation was changed from the Owners Group recommended method.
2. For less than 10% of the Owners Group recommendations, an exception was taken. Justification for each exception is enclosed in Attachment 4.

Attachment 5 includes letters from Transamerica Delaval and Mr. Harry W. Falter of Morrison-Knudsen concerning MP&L's response to the GGNS DR/QR report. These letters also include comments on MP&L's maintenance, inspection, training and trending program. Both reviews, as documented with attachments, have concluded that the MP&L proposed program supports the maintenance of EDG reliability.

The Owners Group DR/QR report gives a schedule of priorities for implementation of suggested items. The attached report gives MP&L's position on each of these recommendations.

Implementation of TDI DR/QR items will require detailed scheduling of engineering, craft and procurement of vendor supplied parts. In order to implement the proposed program and any changes thereto during the upcoming refueling outage, comments requiring resolution are requested within 60 days of receipt of this report.

Yours truly,



L. F. Dale  
Director

GCS/MLC/JGC:dmm

Attachment

cc: Mr. J. B. Richard (w/a)  
Mr. O. D. Kingsley, Jr. (w/a)  
Mr. R. B. McGehee (w/a)  
Mr. N. S. Reynolds (w/a)  
Mr. H. L. Thomas (w/o)  
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# ABSTRACT

This report contains information on Grand Gulf Nuclear Station's (GGNS) Unit 1 TDI Emergency Diesel Generators (EDG's). The report includes information on the trending program, design enhancements, training program, preventative maintenance, Clow Williams-Hagar check valves, TDI 10CFR21 reports and TDI Service Information Memos. An MP&L assessment of each Owners Group recommendation and evaluation of these recommendations is also included. This information is provided in accordance with the requirements of GGNS Operating License, NPF-29, Licensing Condition 2.C.(25)(b).

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ATTACHMENT 1

NRC REQUESTED ADDITIONAL INFORMATION



NRC REQUESTED ADDITIONAL INFORMATION

In a letter dated July 23, 1985, the NRC requested Mississippi Power & Light to provide additional information to assist the staff in their review of the GGNS DR/QR and the preparation of an associated SER for the GGNS Unit 1 TDI emergency diesel generators.

The following additional information was requested by the NRC:

- (a) actions taken concerning 10CFR21 reports issued by TDI since January, 1984, and not addressed in the DR/QR report, including:
  - 1. causes of these problems
  - 2. applicability
  - 3. short and long term corrective actions
  - 4. implementation schedules
- (b) actions taken relative to Clow Williams-Hagar check valves located not just in the air start system, but also any such valves located in other EDG systems (e.g., jacket water and lube oil).
- (c) actions taken relative to TDI Service Information Memos (SIMs) issued since January, 1984.

MP&L's response to each request is included in Sections 1.1, 1.2, and 1.3 of Attachment 1, respectively.

SECTION 1.1

TDI ISSUED 10CFR21 REPORTS

From January 1984 through August 1985

During the time frame from January 1984 through August 1985 TDI issued a total of eleven 10CFR21 reportable conditions. MP&L has summarized these reportable conditions on Page 6. A detailed review is provided on Pages 7 through 17 which includes the actions taken by GGNS in response to the requested additional information, i.e., cause, applicability, GGNS short term and long term corrective actions, and implementation status or schedule.

TDI 10CFR21 SUMMARY

TDI #	Date	Subject	Addressed in DR/QR	GGNS Actions/Remarks
120	01/09/84	Overspeed Governor and Fuel Booster Pump Drive Coupling	Yes	Check for proper fit and alignment, use Loctite
121	02/15/84	Turbocharger Thrust Bearing Lubrication	Yes	GGNS already complied with the TDI recommended corrective actions
122	03/07/84	Westinghouse Relay, NRC IEN 83-63	No	Returned to vendor for repair then replace in panels
123	07/13/84	Valve Spring Failure (Non-Nuclear Marine Engine)	No	TDI determined isolated case, no corrective actions required
124	07/13/84	High Pressure Injection Pump	No	TDI determined isolated case, no corrective actions required
125	09/18/84	Generator Voltage Regulator	No	Not applicable to GGNS per TDI
126	10/02/84	Engine Fuel Control Shaft Pinning	No	Verified torque on capscrews, DCP-85/0001 initiated for pinning levers
127	01/22/85	Air Filter - Engine Control Panel Filter Bowl	No	Replaced polycarbonate bowls with metal bowls
128	03/12/85	Starting Air System Check Valve (Clow)	No	Replaced with Unit 2 check valves as interim measure. DCP-85/4028 initiated to replace Clow check valves with TRW Mission DUO Check II check valves
129	03/18/85	Crankshaft Oil Plug Wall Thickness	No	Confirmation inspection of wall thickness to be performed
130	05/17/85	Switchgear Overheating	Yes	DCP-84/4063 issued to install cooling air supply to panels



ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Overspeed Governor and Fuel Booster Pump Drive Coupling

DATE ISSUED: January 9, 1984 ADDRESSSED IN DR/QR: Yes

DESCRIPTION: Reports have been received from the field that the overspeed governor/fuel booster pump drive couplings have worked loose under certain operating conditions. Failure of this coupling will result in a loss of fuel oil pressure and overspeed protection.

CAUSE: Not identified by TDI.

GGNS SHORT TERM ACTIONS: Check for proper coupling to shaft fit and alignment.

GGNS LONG TERM ACTIONS: Install couplings on overspeed governor drive assembly using Loctite 680.

IMPLEMENTATION SCHEDULE: EDG-11 - Complete  
EDG-12 - Scheduled for Refueling Outage #1 (RFO #1)

REMARKS: Rationale for deferring the EDG-12 inspection until Refueling Outage #1 is based on the following:

The engines are arranged so that the engine driven fuel oil pump (fuel booster pump) and the overspeed governor are driven by the overspeed drive assembly interconnected by the subject couplings.

a. Should failure of the engine driven fuel oil pump-to-overspeed governor coupling occur, a d-c booster pump is used in parallel with the engine driven pump. The d-c booster pump is initiated upon loss of engine pump fuel oil pressure. Therefore, engine fuel oil supply would be maintained and the engine would remain functional.

b. Should failure of the overspeed governor-to-overspeed drive assembly coupling occur, there would be a loss of engine overspeed protection. However, the engine would remain functional without the overspeed protection.

In summary, if a loss of either or both couplings were to occur, the engine would remain functional but without overspeed protection.

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Turbocharger Thrust Bearing Lubrication Deficiency

DATE ISSUED: February 15, 1984 ADDRESSSED IN DR/QR: Yes

DESCRIPTION: Potential defect with the EDG turbocharger thrust bearing lubrication. Insufficient lubrication of the turbocharger thrust bearing occurs on a quick start after a prolonged period in the standby mode. The failures were reported at the Shoreham and Catawba sites.

CAUSE: Insufficient lubrication of turbocharger thrust bearing.

GGNS SHORT TERM ACTIONS: Not applicable - See remarks.

GGNS LONG TERM ACTIONS: Not applicable - See remarks.

IMPLEMENTATION SCHEDULE: Not applicable.

REMARKS: The GGNS lube oil system utilizes three pumps, an engine driven pump, an electric driven pump, and an electric driven auxiliary pump. The auxiliary pump is used to prelube the engines and the turbocharger thrust bearings. The Catawba and Shoreham EDG's are not equipped with an auxiliary pump.

Prior to a manual start of the EDG's at GGNS the turbocharger and engine are prelubed for two minutes or less with the auxiliary lube oil pump which pressurizes the turbocharger thrust bearing with lube oil precluding the type of failure reported. The auxiliary lube oil pump was specified in the original purchase order for the GGNS emergency diesel generators.

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Potential Failures of Westinghouse Type SA-1 Differential Relays - NRC IE Notice 83-63

DATE ISSUED: March 7, 1985 ADDRESSSED IN DR/QR: No

DESCRIPTION: Westinghouse Type SA-1 relays with the potential for failure due to (1) random trip created by S.T. Semicon silicon - controlled rectifiers (SCRs) or (2) Tantalum capacitors may leak electrolyte, or (3) insufficient surge-withstand-capability (SWC) may result in incorrect trip signals.

CAUSE: Not identified by TDI.

GGNS SHORT TERM ACTIONS: Investigation revealed that four SA-1 relays are located at GGNS, Unit 1. One each in Panel 1H22-P113 and 1H22-P115 and two each in the Warehouse as spares.

GGNS LONG TERM ACTIONS: Remove the two spare Westinghouse Type SA-1 relays from warehouse stock and return to vendor for rework and upgrading.

Upon receipt of upgraded relays from vendor, remove and replace the original installed relays with the upgraded relays. Return originally installed relays to vendor for upgrading then return to stock.

IMPLEMENTATION SCHEDULE: EDG-11 - Completed 8/23/84  
EDG-12 - Completed 8/23/84.

REMARKS:



ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Potential Problem with an Engine Exhaust or Intake Valve Spring

DATE ISSUED: July 13, 1984 ADDRESSSED IN DR/QR: No

DESCRIPTION: On a non-nuclear marine engine application, a valve spring failed. The failure occurred after 4500 hours of operation. It appears that the failure was caused by a surface imperfection. The valve spring was manufactured by Betts Spring Company, San Leandro, California. The spring was installed by Transamerica Delaval.

For TDI, "we have used approximately 8,224 Betts valve springs on the DSR and DSRV, and this is the only failure of this type that we are aware of. We have reviewed this matter, and feel that no corrective action is required".

CAUSE: Isolated incident.

GGNS SHORT TERM ACTIONS: None required.

GGNS LONG TERM ACTIONS: None required.

IMPLEMENTATION SCHEDULE: Not applicable.

REMARKS:

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: High Pressure Fuel Injection Pumps

DATE ISSUED: July 13, 1984 ADDRESSSED IN DR/QR: No

DESCRIPTION: The fuel injection pumps are manufactured by Bendix Corporation, Sidney, New York. The fuel injection pumps (one per cylinder) are installed by Transamerica Delaval.

Per TDI "At Catawba Nuclear Site, Duke Power, a fuel injection pump recently failed. A review by Bendix (the pump manufacturer) indicates that Transamerica Delaval has used the Bendix high pressure fuel injection on all DSR and DSRV engines manufactured for at least the last 15 years. This is the only failure of this type that we are aware of.

Our evaluation of the matter was completed on July 13, 1984. We feel that no corrective action is required".

CAUSE: Isolated incident.

GGNS SHORT  
TERM ACTIONS: None required.

GGNS LONG  
TERM ACTIONS: None required.

IMPLEMENTATION  
SCHEDULE: Not applicable.

REMARKS:

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Generator Voltage Regulator

DATE ISSUED: September 18, 1984 ADDRESSSED IN DR/QR: No

DESCRIPTION A detailed description was not provided to GGNS.

CAUSE: Not identified by TDI.

GGNS SHORT  
TERM ACTIONS: Not applicable.

GGNS LONG  
TERM ACTIONS: Not applicable.

IMPLEMENTATION  
SCHEDULE: Not applicable.

REMARKS: TDI determined that the Generator Voltage Regulator concern  
is not applicable to GGNS



ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Fuel Control Shaft Levers

DATE ISSUED: October 2, 1984 ADDRESSSED IN DR/QR: No

DESCRIPTION: All the fuel control levers on Transamerica Delaval engines are held by friction generated by tightening a capscrew. As long as the capscrew is properly torqued, the levers will not move. As a safety feature, the levers are also pinned to the control shafts by using a 1/4 roll pin.

At Southern California Edison, San Onofre #1, it was recently discovered that on one of the engines some levers were not pinned. If the levers are not pinned and the torque of the securing capscrew is not properly maintained, the levers could move, resulting in engine non-availability.

The fuel control shafts and levers are manufactured and installed by Transamerica Delaval.

All levers have a 1/4 pilot hole. The pin is installed after drilling a 1/4 hole through the shaft using the pilot hole in the lever as a guide.

CAUSE: Not identified by TDI.

GGNS SHORT  
TERM ACTIONS: Inspected EDG-11 and 12 for roll pins and/or proper torque. Only four roll pins found installed. Verified proper torque of capscrews.

GGNS LONG  
TERM ACTIONS: A nonconformance document was issued to document the condition (MNCR-0414-85). The MNCR has been dispositioned to install the roll pins.

IMPLEMENTATION  
SCHEDULE: EDG-11 and 12 - Implement disposition on MNCR-0414-85 during first refueling outage.

REMARKS: Rationale for deferring the implementing of the disposition of MNCR-0414-85 until refueling outage #1 is based on the verification of capscrews being torqued.

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Engine Control Panel Filter Bowl

DATE ISSUED: January 22, 1985 ADDRESSSED IN DR/QR: No

DESCRIPTION: At Cleveland Electric Perry Nuclear Station, it was recently discovered that the air filter for the engine control panel had a polycarbonate transparent bowl. On November 5, 1978 the filter purchase specification was changed from the polycarbonate transparent bowl to a metal bowl. The polycarbonate bowl is now rated 150 psig at 125°F and the metal bowl is rated 250 psig at 175°F. When the specification was originally issued, the vendor rated the polycarbonate bowl at 250 psi. The air pressure which the filter will see in operation cycles between 200 and 250 at room temperature. New metal bowl filters have been sent to Cleveland Electric to replace the polycarbonate bowls.

CAUSE: The pressure rating of the polycarbonate bowl does not agree with the original design requirement.

GGNS SHORT  
TERM ACTIONS: Inspect to determine if polycarbonate bowls are installed.

GGNS LONG  
TERM ACTIONS: Replace polycarbonate bowls with metal bowls.

IMPLEMENTATION  
SCHEDULE: EDG-11 - Complete 2/14/85.  
EDG-12 - Complete 2/14/85.

REMARKS:

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Air Start Header Check Valve Failure

DATE ISSUED: March 12, 1985 ADDRESSSED IN DR/QR: No

DESCRIPTION: During the removal of an air start valve a cylindrical metal object, approximately 3/8" diameter and 1" long, was found on top of the piston. Further investigation revealed that the right bank rear air start system header check valve was missing the lower disc guide pin.

CAUSE: Low cycle and high cycle fatigue.

GGNS SHORT TERM ACTIONS: (a) The Unit 2 air start header check valves were utilized as interim replacements.

(b) An 800 hour limit has been placed on the use of the replacement valves.

GGNS LONG TERM ACTIONS: Design Change Package (DCP-85/4028) has been issued to replace the existing Clow Williams-Hagar valves with TRW Mission Duo Check II check valves.

IMPLEMENTATION SCHEDULE: EDG-11 and 12 -Implementation of DCP-85/4028 is to be completed prior to restart from first refueling outage.

REMARKS: Reported under 10CFR21 by MP&L.

Rationale for deferring the implementation of DCP-85/4028 until the refueling outage #1 is based on the number of hours of operation prior to failure and the replacement with the Unit 2 air start header check valves.



ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Crankshaft Oil Plug Wall Thickness

DATE ISSUED: March 18, 1985 ADDRESSSED IN DR/QR: No

DESCRIPTION: A failed crankshaft oil plug was recently discovered during routine maintenance. The failed plug was 22 gauge material.

On March 10, 1980, the oil plug material specification was changed from 16 gauge to 22 gauge. On June ??, 1982 the material specification was changed from 22 gauge back to 16 gauge.

The engines manufactured before March 10, 1980 and after June 23, 1982 should have 16 gauge plugs unless for some reason they have been changed after shipment.

CAUSE: Specification change error.

GGNS SHORT TERM ACTIONS:

- (a) TDI did not identify GGNS as being applicable. The GGNS engines were delivered prior to March 10, 1980.
- (b) A review of GGNS documentation did not identify changeout of oil plugs.

GGNS LONG TERM ACTIONS: Measure the oil plug wall thickness to verify the actual wall thickness installed.

IMPLEMENTATION SCHEDULE: EDG-11 and 12 - Prior to restart from first refueling outage.

REMARKS: Rationale for deferring the wall thickness measurement until refueling outage #1 is based on the following:

- (a) delivery date of the GGNS EDG's.
- (b) documentation review did not identify a changeout of oil plugs.

ACTIONS TAKEN BY GGNS RELATED TO TDI 10CFR21 REPORTS  
ISSUED SINCE JANUARY 1984

TITLE: Control Panel Overheating

DATE ISSUED: May 17, 1985 ADDRESSSED IN DR/QR: Yes

DESCRIPTION: Potential problem with control panel overheating could lead to failure of some components.

CAUSE: Inadequate ventilation (air flow) in the control panel.

GGNS SHORT TERM ACTIONS: (a) Replaced the failed components (linear reactors)  
(b) Design Change Package was issued to install a cooling air supply to the control panels (DCP-84/4063).

GGNS LONG TERM ACTIONS: Monitor temperature of control panel.

IMPLEMENTATION SCHEDULE: EDG-11 and 12 - DCP-84/4063 is scheduled to be completed by December 1, 1985.

REMARKS: This was reported by MP&L as a 10CFR21 on May 2, 1985.

## SECTION 1.2

### ACTIONS TAKEN RELATIVE TO CLOW WILLIAMS-HAGAR CHECK VALVES LOCATED IN OTHER EDG SYSTEMS

MP&L evaluated the Clow Williams-Hagar check valve applications on EDG (11 and 12) systems to determine if the valves are suitable for the intended designed system function.

The EDG system drawings were reviewed to determine which systems utilize the Clow Williams-Hagar check valve. As a result of this review the EDG's lube oil system and jacket water cooling water systems, in addition to the previously reported starting air system, were identified as having Clow Williams-Hagar check valves.

To determine suitability of the Clow Williams-Hagar check valves used in the EDG lube oil and jacket water systems, the vendor valve ratings, the operational conditions, and the cause of the starting air system check valve failure were evaluated.

The starting air header check valve (KE-008-000) disc guide pin failed due to rotational bending that resulted from high stress concentrations at a high overstress. The air check valve components were subject to low cyclic stress caused by the sudden burst of 250 psig air during engine startup and high cyclic stress caused by disc vibration (i.e. fluttering) while in the open position. The use of this type of valve in a high pressure air system is considered a misapplication of the valve.

Upon review of the lube oil system it was concluded that the valves (TDI Part #'s KE-009-000 and F-144-032) located downstream of the lube oil strainers will not be subject to the degree of high and low cyclic stresses experienced by the air check valves. The normal operating conditions of the lube oil system are a temperature of (out of engine) 170°F-180°F and a normal oil pressure of 50 psig. Starting the motor driven lube oil pump gradually opens the valves, therefore, the valve would not be subject to a sudden impact. The lube oil flowing through the check valves acts as a damper to help prevent disc fluttering (high cyclic stress). When reviewing the vendor ratings it was concluded that these check valves were properly selected and are suitable for the lube oil system application.

Jacket water system check valve (TDI Part # KE-017-003) located downstream of the jacket water heater pump is subjected to pressures between 10-30 psig and temperatures between 170°F-180°F. The valve is in a water environment and is subject to a similar opening/closing process as the lube oil check valves. The water acts as a damper to reduce disc fluttering. The vendor ratings for this valve indicate proper selection and suitability for the jacket water system application.

Based on the above, the Clow Williams-Hagar check valves utilized in the GGNS, Unit 1 EDG's lube oil and jacket water systems are considered suitable for use.



Section 1.3

SERVICE INFORMATION MEMOS

The NRC requested that MP&L address the actions taken by GGNS regarding TDI Service Information Memos (SIMs) issued by TDI since January, 1984.

A listing of TDI Nuclear SIMs, including all revisions was reviewed to assure that actions had been taken, if required, for those SIMs affecting GGNS, Unit 1.

The attached is a summary of (a) SIMs issued since January 1984 by TDI, and (b) the actions taken by GGNS.

SUMMARY OF TDI SIMS

SIM #	Rev.	Issue Date	Subject	Type (1)	GGNS Action
99	1	01/08/85	Information on Piston Ring Replacement (Preparation, Fitting, and Seating)	I	Will be added to vendor manual
133	1	02/22/85	Precautions to be Observed During Fabrication of Off Engine Lube Oil Piping Prior to Engine Start	I	Not applicable to GGNS Unit 1. However, transmitted to GGNS Unit 2 for use
324	1	01/08/85	Piston Crown Studs cannot be Reused due to Torquing	I	Will be added to manual
332	1	01/08/85	Connecting Rod Bolt Washer Galling Between Bolt and Rod Face	I	Will be added to manual
335	1	01/08/85	Discontinued the Use of Two Different Liners in RV Engines. Only P/N 02-315-02-OG will be Sold as Replacement (Notched Liners)	I	Verified correct part no. in manual
336	1	01/08/85	Measuring Intake and Exhaust Valve Guide Clearances as Method for Determining Wear	I	Will be added to manual
346	1	12/10/84	Bendix Fuel Injection Pump Vendor Increased Pump Flange Thickness, Timing Window Location, and Possible Pump Follower Bottoming on Retainer	I	Incorporated in procedure
363	0	01/23/84	Overspeed Governor/Fuel Booster Pump Drive Coupling Assembly. Check for Proper Coupling-to-Shaft Fit and Alignment, and use Loctite	M	Incorporated in procedure. Fit and alignment check completed. Reinstalled utilizing Loctite for EDG-11. EDG-12 scheduled for RFO #1.

SUMMARY OF TDI SIMS  
(Continued)

SIM #	Rev.	Issue Date	Subject	Type (1)	GGNS Action
364	0	05/18/84	Connecting Rod Wrist Pin Bushing Bores should be Examined by Liquid Penetrant Examination, if Removed from Engine	I	This examination was performed on EDG-11 during June 84 disassembly inspection and the bushings found acceptable. Will include in inspection when required.
365	1	09/25/84	Intercooler Adapters may Develop Cracks at Welded Joints due to Distortion of Adapter from Turbo Blower Discharge Pressure	M	Weld inspection and repair has been completed on EDG-11. DCP initiated to incorporate SIM on EDG-12.

NOTE 1:

Type of action required by SIM:

I = Information only, no effect on engine operation or design

M = Maintenance action required, potential for affecting engine performance



ATTACHMENT 2

PREVENTIVE MAINTENANCE/SURVEILLANCE PROGRAM

## PREVENTIVE MAINTENANCE/SURVEILLANCE PROGRAM

The GGNS TDI emergency diesel generator preventive maintenance and surveillance program presently in place is based on operating experience, vendor recommendations, DR/QR report recommendations and NRC requirements. The following, which is provided for information only lists preventive maintenance (PM) and surveillance tasks and illustrates the detail and comprehensiveness that the present program has attained. Individual instruments, relays, etc., have not been included in the list due to the number involved ( $\approx 220$ ). It should be noted that the program is constantly subject to change as operating experience at GGNS and/or other utilities dictate the need for revision. Changes may involve the addition or deletion of PMs due to operating experience or regulatory requirements, or implementation of frequency changes due to operating experience or as indicated by trending program data.

GGNS TDI EDG SURVEILLANCE AND PREVENTIVE MAINTENANCE PROGRAM

Description	Frequency
Check for Air Leaks	Daily
Check for Jacket Water System Leaks	Daily
Check for Fuel Oil System Leaks	Daily
Check for Lube Oil System Leaks	Daily
Record Jacket Water Inlet and Outlet Temperatures	Daily
Record Lube Oil Inlet and Outlet Temperatures	Daily
Record Jacket Water Standpipe Level	Daily
Record Generator Bearing Oil Level	Daily
Record Turbo Lube Oil Flow	Daily
Record Starting Air Pressures	Daily
Record Compressor Oil Levels	Daily
Blowdown Air Receivers	Daily
Blowdown Starting Air System Low Points	Daily
Drain Starting Air Distributor Filters	Daily
Drain Crankcase Vent Pipes	Daily
Check Heaters in Auto	Daily
Functional Test Including Vibration Monitoring and Inservice Inspection Requirements	Monthly
Take Lube Oil Sump Sample	Monthly
Inspect Fuel Oil Piping	Monthly
Sample from Bottom of Engine Lube Oil Sump	Monthly
Lubricate Fuel Racks and Linkage	Monthly
Visual Inspection of Engine Block and Base	Monthly
Sample Lube Oil at Lube Oil Filter Inlet	Monthly
Check Fuel Oil Storage Tanks Cathodic Protection	2 Months
Remove Condensate from Fuel Oil Storage Tanks	3 Months
Sample Air Compressors Lube Oil	3 Months



GGNS TDI EDG SURVEILLANCE AND PREVENTIVE MAINTENANCE PROGRAM

Description	Frequency
Clean and Inspect Intake Air Filter on Diesel Driven Air Compressor	3 Months
Inspect Starting Battery-Diesel Driven Air Compressor	3 Months
Clean or Replace Turbocharger Prelube Filters	3 Months
Clean Air Start Wye Strainers	3 Months
Lube Oil Heater Pump Coupling	6 Months
Sample Intake Air Filter Lube Oil	6 Months
Inspect and Clean Filter Air Traps	6 Months
Remove, Inspect the Starting Air Distributor Filters and Replace if Required	6 Months
Clean or Replace Air Dryer Afterfilters	6 Months
Clean or Replace Entrainment Filters	6 Months
Clean, Inspect and Lubricate Air Start Solenoid Valves	6 Months
Lube Selected Manual Valves	6 Months
Inspect and Check Connecting Rod Bolt Preload	9 Months
Clean After Cooler Cooling Fins	12 Months
Clean Air Compressor Inlet Filters, Cylinders and Fins	12 Months
Inspect Air Compressor Bearings and Bushings	12 Months
Check V-Belt Tension Adjustment	12 Months
Clean Engine Cooling Ribs on Diesel Start Air Compressor	12 Months
Adjust Tappet Clearance on Diesel Driven Air Compressor Engines	12 Months
Clean Fuel Oil Inlet Strainers	12 Months
Inspect and Clean Lube Oil Strainers	12 Months
Change Fuel Oil Filter	12 Months
Inspect Generator Brushes and Slip Rings	12 Months

GGNS TDI EDG SURVEILLANCE AND PREVENTIVE MAINTENANCE PROGRAM

Description	Frequency
Clean Generator	12 Months
Change Oil in Generator Pedestal Bearing	12 Months
Calibrate D/G Output Breaker Relays	12 Months
Inspect and Test Output Breakers	12 Months
Retorque Air Compressor Heads and Leak Test Flanges	12 Months
100% Load Rejection Test	18 Months
Simulated Loss of Offsite Power Test	18 Months
Simulated Loss of D/G with Offsite Power Unavailable Test	18 Months
Loss of Offsite Power in Conjunction with ECCS Actuation Test	18 Months
24 Hour Load Test	18 Months
D/G Trip and Response to ECCS Actuation Test	18 Months
Inspect Jacket Water Cooler	18 Months
Inspect L.O. Cooler	18 Months
Lube Fuel Oil Booster Pump Coupling	18 Months
Change Oil and Lube Coupling on Jacket Water Pump	18 Months
Lube L.O. Pump Coupling	18 Months
Partial Disassembly and Cleaning of Turbochargers	18 Months
Inspect/Replace Air Dryer Dessicant	18 Months
Retorque Foundation Bolts	18 Months
Test Injector Nozzles	18 Months
Check Crankshaft Thrust Clearance	18 Months
Check Crankshaft Deflection	18 Months
Replace Governor Drive Element	18 Months
Change Oil in Governor	18 Months
Inspect Crankcase Interior	18 Months

GGNS TDI EDG SURVEILLANCE AND PREVENTIVE MAINTENANCE PROGRAM

Description	Frequency
Inspect Upper Cylinders	18 Months
Inspect and Adjust Lifters	18 Months
Clean Oil Separators	18 Months
Record Cylinder Firing Temperature and Pressure	18 Months
Record Cold Compression Pressure	18 Months
Inspect Overspeed Trip Device	18 Months
Inspect Cams, Tappets and Push Rods	18 Months
Measure Cold Crankshaft Deflection	18 Months
Inspect Turbocharger Rotor Float and Nozzle Ring Bolts	18 Months
Check Head Stud Torque	18 Months
Inspect Gears and L.O. Jet Spray	18 Months
Meggar Starting Air Aftercooler Motor	2 Years
Lube Starting Air Aftercooler Motor	2 Years
Meggar Fuel Oil Transfer Pump Motor	2 Years
Inspect Fuel Oil Booster Pump Motor	2 Years
Lube Fuel Oil Booster Pump Motor	2 Years
Lube Auxiliary Jacket Water Pump Motor	2 Years
Lube Auxiliary Lube Oil Pump Motor	2 Years
Meggar Lube Oil Circ Pump Motor	2 Years
Lube Oil Circ Pump Motor	2 Years
Meggar Jacket Water Heater	3 Years
Meggar Lube Oil Heater	3 Years
Meggar Jacket Water Circ Pump Motor	3 Years
Calibrate Relays	3 Years
Clean and Adjust Fuel Injection Pumps	3 Years
Inspect Main Bearings	3 Years



GGNS TDI EDG SURVEILLANCE AND PREVENTIVE MAINTENANCE PROGRAM

Description	Frequency
Check Gear Backlash	3 Years
Clean, Inspect and Meggar Crankcase Fan Motor	3 Years
Flush Jacket Water System	4 Years
Safety/Relief Valves - Check Setpoint Pressure	4.5 Years
Inspect Air Dryer Breakers	5 Years
Clean and Inspect Turbochargers	5 Years
Meggar Fuel Oil Drip Return Pump Motor	5 Years
Functional Simultaneous Start Test	10 Years

ATTACHMENT 3

TRAINING AND TRENDING PROGRAMS

## TRAINING AND TRENDING PROGRAMS

### Training and Experience

The training program for operations and mechanical, electrical, and I&C maintenance personnel involved with the GGNS TDI Emergency Diesel Generators, consists of a 40 hour course of study and includes the following general areas:

- a. Basic principles of operation.
- b. Description and operating principles for each EDG subsystem.
- c. Description and operating principles for the EDG controls, including governor and engine instrumentation.
- d. Maintenance instruction for major engine components.

All licensed and non-licensed personnel responsible for the safe operation of the emergency diesel generators are provided training in the areas below:

- a. Engine construction and materials.
- b. Auxiliary systems associated with the engine.
- c. Normal and abnormal operating characteristics.
- d. Diesel engine startup and loading procedure.
- e. Diesel engine protective features, overload conditions.
- f. Control systems.
- g. Importance of diesel engine pre-lube system.
- h. Basic troubleshooting.
- i. Importance of trends in the operating logs.
- j. Hazards of no load or low load conditions.

This course of study is designed to give personnel a working knowledge of specific EDG components as well as a broad description of the EDG system. The course is taught by a vendor instructor or an individual with equivalent qualifications.

MP&L, realizing that the EDG's are critical and complex components, has assembled a group of key personnel based on experience and qualifications to act as a focal point for mechanical and engineering support. Engineering support includes a mechanical engineer who has approximately four years' experience in maintenance of the GGNS Emergency Diesel Generators. This individual develops procedures, reviews data and initiates design changes for the Emergency Diesel Generators. Engineering experience is supplemented by a core of mechanical supervisors and journeymen who have a significant amount of diesel/mechanical experience. These personnel have performed several major disassemblies of the GGNS Emergency Diesel Generators.



Based on the formal training and experience described, MP&L feels that our personnel are well qualified to operate and maintain the Emergency Diesel Generators. In addition to the experience and training, these personnel use operation and maintenance procedures prepared per vendor recommendations and utilizing acquired operating experience. MP&L feels that our Emergency Diesel Generator training program is adequate to assure a continued high level of expertise is available to support the operation and maintenance of the diesel generators.

#### Trending Program

Emergency diesel generators at nuclear power stations, such as GGNS, generally experience a low number of operating hours during their normal service life. If the normal testing schedules at GGNS of a one hour run every month and a 24 hour run every refueling outage were maintained, less than 1400 hours of operation in addition to special and preoperational tests would be accumulated on the GGNS engines over a 40 year time period. To assure the reliability of these EDG's an extensive preventive maintenance and surveillance program has been developed by MP&L. Experienced engineers and maintenance personnel maintain the EDG's and monitor their performance. Engine problems are often accompanied by changes in engine operating parameters thus timely detection and corrective actions can prevent potential engine damage or unavailability. MP&L is implementing a trending program for the EDG's to provide greater assurance of detecting changes in engine operating and wear parameters. The objective is to review and trend the performance of major indicators of engine performance.

Careful consideration has been and is being given to the data to be trended and to establish sufficient detail to make the program effective in identifying and correcting potential problems with the diesel engines prior to possible engine malfunction. MP&L has utilized information contained in ANSI-OM-16, Draft 3, Rev. 2, "In Service Testing and Maintenance of Diesel Drives in Nuclear Power Stations" as guidelines in the development of the trending program. Recommendations from an independent consultant that is considered expert on diesel engines have also been factored into the development of the program. Data from the trending program can be used as an indicator to narrow the scope of investigation for a problem and to help pinpoint the problem. An example of this is shown below:

#### High Jacket Water Temperature

##### (A) Check the following

- (a) Jacket water temperature differences
- (b) Cooling water temperature difference across the cooler
- (c) Determine cooler efficiency and compare with previous data
- (d) Compare cooling water inlet temperature with previous data
- (e) Check and compare water pressure

(B) Possible causes

- (a) Thermostatic control valve malfunction
- (b) Low cooling water flow
- (c) Low jacket water flow
- (d) Cooler fouled
- (e) Air in system
- (f) High cooling water inlet temperature

Selected data for this purpose will be collected and compiled into a trending format utilizing computer graphics where feasible. This data and appropriate charts and/or graphics displays will then be routed to the responsible disciplines for their review and determination of acceptability.

Acceptability will be based on data being within vendor recommended normal ranges as modified by previous operating experience. Indicated trends will be investigated and evaluated to determine if a problem exists or if other factors are contributing to the observed trend. Any corrective actions or recommendations will include the consideration of data trending results.

The items presently selected for trending are subject to change based on future determinations that the item may not be an effective parameter to trend, or another parameter may provide more useful information than that presently being trended.

The parameters currently selected for trending are:

1. Lube oil sample results
2. Jacket water sample results
3. Vibration data
4. Lube oil pressure and temperature
5. Lube oil temperature in and out of lube oil cooler
6. Jacket water temperature in and out of jacket water cooler
7. Crankcase pressure
8. Combustion air pressure
9. Lube oil pressure to turbochargers
10. Cylinder temperatures
11. Lube oil additions (Date and amount)
12. Jacket water additions (Date and amount)
13. Lube oil and fuel oil filter and strainer differential pressures as applicable
14. Jacket water pump discharge pressure
15. Firing temperatures and pressures
16. Turbocharger rotor floats
17. Crankshaft thrust clearance and deflection checks
18. Cold compression readings
19. Available dimensional clearances of critical components, i.e., bearings, piston pins, etc.

### Summary

The GGNS trending program for the TDI EDG's, when fully implemented, will enhance the availability and reliability of the TDI EDG's. The trending program data will also provide information that can be referred to when determining schedules for preventive maintenance and inspections. This program in conjunction with the preventive maintenance and surveillance programs provides a high level of confidence that the GGNS TDI EDG's will remain highly reliable engines and continue to adequately perform their design function.

A majority of the parameters or data being selected for trending are presently monitored as part of the normal surveillance testing, preventive maintenance program and inservice inspection requirements. The implementation of the trending program will further enhance the monitoring of EDG parameters and EDG reliability.



ATTACHMENT 4

MP&L EVALUATION OF THE TDI DIESEL GENERATOR OWNERS GROUP  
DESIGN REVIEW/QUALITY REVALIDATION REPORT  
FOR GGNS TDI EMERGENCY DIESEL GENERATORS

## DR/QR REPORT EVALUATION

This report provides an MP&L assessment of each Owner's Group recommendation of maintenance, inspection, or modification. Each recommendation is addressed by either implementation, modified implementation, exception taken, or non-applicability to GGNS. In this assessment, the Owner's Group recommendation and frequency is provided with MP&L's actions and rationale.

The nature of these recommendations indicates that an extremely conservative approach was used by the Owners Group and their consultants during the design review and quality revalidation of the Phase II components. Frequent disassembly of an engine that may accumulate only 50 hours of operating time between refueling outages or only 1500 hours over the 40 year life of the plant increases the potential for human error and equipment damage during the disassembly and reassembly. Typically, engines of this type would normally accumulate thousands of operating hours prior to an inspection or overhaul, and as normal practice, disassembly of this type of engine is only performed in cases of direct cause. This leads MP&L to the conclusion that exception be taken on some Owners Group recommendations.

EPRI NP-3877 Project 2189-1, March 1985, page 7-62 comments on engine teardown support the MP&L approach. It states:

"In general, extensive teardowns of these engines are not performed unless a problem occurs. Experience in the nuclear and other industries has shown that reliability is best maintained by not disturbing equipment which is operating properly unless a good reason exists for suspecting incipient failure or excessive wear of specific components."

ASME Section XI recognizes that operating equipment performance can be evaluated by measuring and monitoring the equipment's operating parameters. MP&L is implementing a trending program where performance parameters (indicators) important to engine operation are monitored, plotted and reviewed to detect changes in engine or component performance.

The Owners Group made 419 recommendations. The recommendations were made from data obtained from the engine teardown inspections, operating history and from studies of drawings, etc. Therefore, recommendations were based upon recorded history or in some cases, upon very conservative judgements arrived at from review of drawings, etc.

MP&L action regarding these recommendations is based upon those acceptable from historical data and applicable to the Grand Gulf engine. Where recommendations were based upon judgement, MP&L did not always agree and therefore, exceptions were taken.

A major disassembly and inspection of both GGNS Unit 1 TDI EDG's was performed in December 1983-January 1984 to address concerns over crankshafts and piston skirts. The piston skirts were replaced with piston skirts of improved design. Improved push rods were also installed. Visual and nondestructive examinations (NDE) of the crankshafts confirmed the adequacy of the crankshafts. Visual and dimensional checks were also made of other major engine components. Various engine components were replaced as normal maintenance practice to ensure that the high reliability of the EDG's was retained. Additional extensive testing of the TDI EDG's was performed in early 1984 including an accumulated seven (7) day test run prior to the above inspection and a one hundred hour test run after the above inspection. These tests demonstrated the ability of the GGNS TDI EDG's to perform their design function. The satisfactory results of those efforts and operating experience were provided to the NRC in meetings and technical submittals.

Subsequent to the January 1984 teardown involving the product improvement replacements of the piston skirts and push rods, the NRC issued an order to MP&L on May 22, 1984 to re-disassemble the engine with the highest number of operating hours to inspect key engine components. At this time the EDG-11 engine had accumulated approximately 1400 hours operation and 550 starts. The adequacy of the second engine was to be verified by assuring that the as-manufactured quality of the key components of the two engines were similar. A comprehensive MP&L inspection program was implemented. The program incorporated NRC inspection order requirements, TDI Owner's Group recommendations, industry practices and MP&L augmented maintenance requirements. The EDG-11 engine was disassembled and examined in detail. Approximately 2000 non-destructive examinations were performed and documented. The condition of key engine components was checked by highly trained, qualified personnel using present day technology, equipment and methods. The general condition of the major key components of the EDG-11 engine was considered to be acceptable for continued service.

Concurrent with the inspections, a comprehensive, detailed review was made of the EDG 11 and 12 engines vendor and site records. A review of manufacturing processes, design drawings, and material property comparisons were made of the key engine components to determine the similarity in as-manufactured quality. It was concluded that there existed sufficient objective evidence that the two engines were of similar quality and that the disassembly of the EDG-12 engine was not required. A comprehensive, augmented program of inspection, maintenance and testing was implemented for the GGNS Unit 1 TDI EDG engines to ensure their continued integrity and operability.

Following reassembly of the TDI EDG-11 engine, the vendor's recommended post-maintenance break-in run and the NRC requested testing were successfully completed. Thirteen (13) NRC required start and load tests were performed successively without engine malfunction or abnormal conditions occurring. This inspection and testing, once again, demonstrated the adequacy of the GGNS TDI EDG engines to perform their intended design function.

In December 1983, the TDI Diesel Generator Owners Group was formed by utilities owning Transamerica Delaval, Inc. (TDI) EDG's to address operational and regulatory issues associated with the use of TDI EDG's in nuclear power plants. The Owners Group established a comprehensive program providing an in-depth assessment of the



adequacy of the TDI EDG's to fulfill their intended function. The program was divided into two (2) phases. Phase I addressed the resolution of sixteen (16) identified generic potential problems of the TDI EDG's on a priority basis. Phase II addressed selected engine components which had the potential for adversely affecting the operation of the EDG's.

Throughout this program, MP&L played an active role in the identification and resolution of the concerns being addressed by the Owners Group. In December 1983 and January 1984, the GGNS TDI EDG's 11 and 12 were disassembled, inspected and satisfactorily tested. Again in June 1984 EDG-11 underwent an additional disassembly, inspection and testing. As a result of close interaction with the NRC Staff and the TDI Owners Group, numerous inspections of EDG's 11 and 12 and an enhanced maintenance/surveillance program, the NRC agreed with MP&L that the GGNS TDI EDG's were adequate for their intended function and issued a license for full power operation on August 31, 1984. The license requires MP&L to submit their actions on the GGNS DR/QR Report recommendations to the NRC prior to restart following the first refueling outage.

The final TDI D/G Owners Group DR/QR Report to MP&L provided the results of extensive investigations of 163 components of the DSRV-16-4 EDG's at GGNS Unit 1. The report consisted of the following design reviews and quality revalidation.

° Design Reviews (D/R)

Selected components were subjected to a detailed design analysis consisting of the following attributes:

- (1) Primary Component Functions
- (2) Applicable Codes and Standards
- (3) Alternative Codes and Standards
- (4) Analysis of Evaluation to be Performed to Assure Satisfactory Design
- (5) Available Verifications of TDI analysis
- (6) Final Documentation Requirements

° Quality Revalidation (Q/R)

In addition to the design review, components were selected, based on the importance of their function, for an independent quality revalidation. After component selection, the following scrutiny was applied.

- (1) Attributes to be Verified
- (2) Methodology to be used (documentation review, NDE techniques, etc.)
- (3) Acceptance Criteria
- (4) Final Documentation Requirements

One of the intense efforts in the performance of D/R and Q/R evaluations was the compilation of the nuclear and non-nuclear industry experience for each component. Of the 163 components reviewed, very few had experienced failure related to design or component quality. In summary, design associated failures were not identified with the mechanical equipment presently installed on the GGNS EDG engines. The majority of industry experience attributed most failures to one or more of the following:

Operator Error  
Debris in Systems  
Vibrations  
Misalignment  
Lack of Maintenance  
Leaks  
Clogged Strainers  
Relaxed or Improper Torque  
Missing Parts not Replaced During Maintenance  
Inadequate Lubrication  
Damage During Maintenance  
Wired Improperly  
Deficient Testing Procedures  
Improper Installation  
Improper Adjustments  
Damage During Installation

Therefore, the majority of industry experience concerning previous failures can be summarized as human error and not necessarily design or component quality related failures.

During MP&L's review and evaluation of the DR/QR report MP&L actions to each recommendation were separated into four general categories.

1. Implemented or will be implemented.
2. Modified and implemented or modified and will be implemented.
3. Exception taken.
4. Long term enhancement to be implemented at MP&L's discretion.

The modification of a recommendation was generally due to frequency, or the intent of the recommendation and was addressed by other means. The frequencies in most instances were considered conservative based on the expected number of run hours to be accumulated as compared to the inspection of the EDG-11 engine at 1400 hours with good results. This engine also had approximately 550 starts at that time which is equivalent to 30-35 years of service at a normal testing schedule. As previously stated, the May-June, 1984 inspection found the engine components to be in a state of quality that would maintain the high reliability of the diesel.

Some recommendations were not implemented due to several considerations.

1. The component was not a GGNS specific component.
2. Review of the lead DSRV-16-4 DR/QR report and the GGNS report did not identify any history of failure indicating a need for the recommendation.
3. Implementation could jeopardize personnel safety.
4. The May-June 1984 EDG-11 engine inspection results did not indicate the need for implementation.

The initial review was performed to identify the DR/QR recommendations contained in the report and to establish the type of recommendation. GGNS surveillance and preventive maintenance procedures, practices and previous inspections or maintenance were then reviewed to determine which recommendations could be considered as implemented, complete or previously completed. An evaluation was then initiated for the remaining recommendations to determine the basis for the recommendation, alternatives to the recommendation, and/or justification for not implementing the recommendation.

#### SUMMARY

The TDI Diesel Generator Owners Group has addressed 16 potential TDI D/G problems in their Phase I program and 163 EDG components considered essential in their Phase II program. Following the completion of the design review and quality revalidation of the identified components a plant specific report was provided to each utility in the Owners Group. The GGNS specific DR/QR report stated:

- (1) the GGNS TDI EDG's presently installed are fully capable of reliably performing their intended safety function,
- (2) the report recommendations were not requirements, but adoption of the recommendations would give added assurance that the GGNS TDI EDG's would perform their intended function for the life of the plant,
- (3) in accordance with the intent of the Owners Group plan, the resolution of the recommendations would be concluded subsequent to commercial plant operation, but prior to restart from the first plant refueling outage,
- (4) the utility could propose alternate means of ensuring reliability of the TDI EDG's.

A review and evaluation of the recommendations contained in the GGNS DR/QR report has been performed by MP&L. These actions, in addition to the extensive actions previously taken by MP&L with regard to disassembly, inspecting, testing, and reverifying the satisfactory condition of the engines, provide a high level of assurance that the engines will perform as well as or better than other comparably sized diesel engines in nuclear service. MP&L's past engine reliability verifications and current program of inspection, maintenance and testing fully demonstrate our commitment to continue to maintain the highest possible level of quality and EDG reliability.

Based on the results of the disassembly and inspection of both GGNS Unit 1 TDI EDG's performed in December 1983-January 1984 and the ordered re-disassembly of the engine with the highest number of operating hours (EDG-11), MP&L does not believe it is prudent to re-disassemble EDG-12. EDG-12 was subjected to a comprehensive, intensive review of manufacturing processes, drawings, and a material property review which verified its similar as-manufactured quality to EDG-11. This review, (Reference AECM-84-345), in conjunction with an improved inspection, preventative maintenance, testing program, trending program, and an excellent history of reliability (100% in accordance with Reg. Guide 1.108) leads to the conclusion that a disassembly of EDG-12 is not warranted.



MT&L's actions for each of the 419 recommendations identified is contained in this Attachment.

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GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 00-420

DESCRIPTION: Lube Oil Pressure Regulating Valve

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Disassemble and clean valve each refueling outage	R-Outage (Refuel Outage)	Monitor oil pressure during tests	Variable	Modified
2. If plugging is a problem, check dimensions of internal parts to ensure proper clearance and increase frequency of disassembly and cleaning	Variable	Monitor oil pressure during tests	Variable	Modified

REMARKS

1. Oil pressure and temperature are monitored during the monthly surveillance test. Fluctuations in oil pressure would indicate a potential malfunction of the regulating valve and the valve investigated at that time and cleaned if needed.
2. Corrective action and frequency will be established based on monitoring of parameters and/or operating history which will provide an accurate indication of potential problems with the oil pressure regulating valve.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 00-700A

DESCRIPTION: Jacket Water Standpipe - Pipe, Fittings, Gaskets

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Add an axial restraint on the jacket water standpipe overflow line to ensure vertical support of the riser	Once	Will add restraint	Once	Scheduled RF01 (Refueling Outage)
2. Add two-way lateral restraints on the jacket water vent lines such that the maximum between-the-support-spans do not exceed 4 ft - 6 in. See Source Document for details	Once	Will add restraints	Once	Scheduled RF01

REMARKS

1. None
2. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 00-700B

DESCRIPTION: Jacket Water Standpipe Valve (Circle Seal)

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Packing should be inspected for leakage on a monthly basis	Monthly	Inspect for leaks daily	Daily	Complete
2. Elastomeric parts should be replaced every 5 years	5 Years	Exception taken	N/A	Not Scheduled See Note 2

REMARKS

1. A daily check is made for leaks on the diesel auxiliary systems.
2. GGNS does not use the Circle Seal valve for the jacket water standpipe valve. A Crane valve without o-rings is used. Therefore this recommendation is not considered applicable to the GGNS TDI diesels.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 00-700C

DESCRIPTION: Jacket Water Standpipe - Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Modify supports associated with SK-01-JW-PSR-7-012 to accept two-directional lateral loading by attachment to a rigid mounting surface	Once	Will modify supports	Once	Scheduled RF01
2. Modify supports associated with SK-01-JW-PSR-7-014 to accept two-directional lateral loading by eliminating the excessive clearance within the bracket	Once	Will modify supports	Once	Scheduled RF01
3. Modify supports associated with SK-01-JW-PSA-7-015 to provide a moment connection between the unistrut and angle, and also between the mounting surface and angle	Once	Will modify supports	Once	Scheduled RF01
<u>REMARKS</u>  1. None  2. None  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 00-700C -- (Continued)

DESCRIPTION: Jacket Water Standpipe - Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Remove supports associated with SK-01-JW-PSR-7-026 and add two-directional lateral restraints at the same locations	Once	Will remove supports	Once	Scheduled RF01
5. Increase the u-bolts on supports listed in the source document from 1/4" to 3/8" diameter. Provide suitable locking devices on all u-bolts	Once	Will increase size and lock	Once	Scheduled RF01
6. Modify the supports associated with SK-02-JW-PSR-014 to accept two-directional lateral loading by providing a more rigid connection to engine	Once	Will modify supports	Once	Scheduled RF01
<u>REMARKS</u>  4. None  5. None  6. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 00-700F

DESCRIPTION: Jacket Water Standpipe

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect jacket water standpipe, pump suction and engine return nozzle welds each engine run and every 100 hours during extended engine runs	Each Run	Daily and monthly leak check	Daily	Modified
<u>REMARKS</u>  1. Daily checks for leakage while in standby and checks for leakage during the monthly surveillance run are performed. Leakage is one of the first visual indications of a cracked weld, therefore, MP&L is considered in compliance with the intent of this recommendation.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-305A

DESCRIPTION: Base & Bearing Caps

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the base each refueling outage, areas include adjacent to the main bearing stud nut pockets of each bearing saddle. Conduct inspection several minutes after a thorough wipedown and use good lighting	R-Outage	Will inspect during main bearing inspection	Main Bearing	Modified
<u>REMARKS</u>  1. Nuclear and non-nuclear experience indicated only one instance of a degraded engine base in a non-nuclear unit. The degradation was in the form of a crack, and was attributed to a reduction of strength in the cast iron, caused by excessive lead in the casting. At GGNS, samples have been removed from both engines and analyzed for lead with satisfactory results. The design and stress analysis of the Owner's Group revealed adequate margins of safety for the base and bearing cap. MP&L will perform this item when main bearings are inspected.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-305C

DESCRIPTION: Base & Bearing Caps -- Studs and Nuts

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Upon removal of bearing caps, clean mating surfaces with a solvent prior to reassembly of the caps to the base	N/A	Added to procedure	N/A	Complete
<u>REMARKS</u>  1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-307B

DESCRIPTION: Lube Oil Fittings - Internal

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check tubing for dents or crimps every outage	R-Outage	Currently addressed in (Preventative Maintenance) PM Program	R-Outage	Complete
2. Perform gear-train spray check	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-307D

DESCRIPTION: Lube Oil Fittings Internal - Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Replace all 1/4" u-bolts with 3/8" u-bolts	Once	Increase u-bolt size	Once	Scheduled RF01
2. Torque u-bolts sufficiently to prevent axial header movement, but do not overstress header or u-bolt material	Once	Do during u-bolt change	Once	Scheduled RF01
3. Fit all threaded fasteners with suitable locking devices	Once	Add locking devices	Once	Scheduled RF01
4. U-bolts should have a radius coincident with the radius of the header to provide a snug fit	Once	Check radius	Once	Scheduled RF01
<u>REMARKS</u>  1. None  2. None  3. None  4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-310A

DESCRIPTION: Crankshaft

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Measure crankshaft web deflection every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Measure diameter of crank journals during major overhauls	Overhaul	Perform at overhaul	Overhaul	Will Implement
3. Perform dimensional checks of sheet metal plugs used on crankshaft oil passages to determine gauge of sheet metal. Gauge of metal should be 16	Once	Will inspect	Once	Scheduled RF01

REMARKS

1. None
2. None
3. Documentation shows that correct plugs are installed in the GGNS Unit 1 TDI engines. However, a confirmatory inspection will be performed.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-310B

DESCRIPTION: Main Bearing Shells

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and measure main bearing shell thickness. Inspection shall evaluate bearing wear and evidence of harmful crankshaft misalignment. If results show evidence of misalignment, implement TDI recommendations for realignment	Alt R-Outage	Currently addressed in PM Program	5 Years	Modified
<u>REMARKS</u>  1. The few problems with the main bearings were attributed to inadequate lubrication and/or installation. In five years the GGNS units will acquire approximately an additional 90 starts and 300 hours of operation. The most recent inspection on a sample basis on EDG-11 with $\approx$ 550 starts and $\approx$ 1400 hours of operation showed little, if any, wear on the main bearings. The use of an excellent oil, such as Mobilgard 446, aids in reducing wear and maintaining engine cleanliness. Lube oil sample results will provide indication of potential problems with the main bearings. Based on the previous inspection results, the use of an excellent engine oil and the use of lube oil analysis to identify potential problems MP&L will inspect main bearings, on a five year schedule.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-310C

DESCRIPTION: Crankcase & Bearings: Thrust Bearing Ring

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect thrust bearing rings for cracks and gouges at alternate refueling outages	Alt R-Outage	Perform when main bearings are inspected	Main Bearing	Modified
2. Prelubricate thrust bearing rings prior to normal engine startup	Variable	In Compliance	Variable	Complete
3. Measure the thrust bearing ring clearance via "bump check" method to be performed in conjunction with crankshaft web deflection measurements at each R-Outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete

REMARKS

1. A review of industry and site experience has not identified any failures of thrust bearing rings to the point of affecting engine performance. GGNS utilizes a prelubricating system for all normal starts. The thrust ring is made from the same material as the main and rod bearings (alloy 850). Abnormal wearing of the thrust ring would be detected by the trending program for oil analysis. Thrust bearing ring clearance is measured every 18 months and maintenance is performed in accordance with the manufacturers instructions. The thrust bearing rings will be checked when the rear main bearing caps are removed for main bearing inspections.
2. None
3. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-311A

DESCRIPTION: Crankcase: Crankcase Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the vertical portion of the crankcase arch wall to the nut pocket area for cracks at each outage. The first inspection after 185 hours at or near full load may be used to discontinue inspections	R-Outage	Will inspect	Once	Scheduled RF01
2. Verify the material of the crankshaft based on foundry records	Once	Complete	Once	Complete
3. Visually inspect the vertical portion of the casting arch wall of the crankcase for machined surfaces with sharp	R-Outage	Will inspect	Once	Scheduled RF01

REMARKS

1. Both the GGNS TDI engines have in excess of 185 hours at or near full load, therefore, the frequency will be once unless inspection results indicate further inspections may be necessary.
2. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-311A -- (Continued)

DESCRIPTION: Crankcase: Crankcase Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
corners in the surface configuration. Inspection after 185 hours may justify discontinuation of inspections				

REMARKS

3. Both the GGNS TDI engines have in excess of 185 hours at or near full load, therefore, the frequency will be once unless inspection results indicate further inspections may be necessary.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-315A

DESCRIPTION: Cylinder Block

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. After the additional operating experience without inspection has been exceeded, perform item (1) or (2) as noted in the source document (GGNS DR/QR Report)	Variable	Will Perform	Variable	Will Implement
<u>REMARKS</u>  1. MP&L has evaluated the block microstructure on both engines. The results indicated an acceptable microstructure typical of grey cast iron, Class 40.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-315C

DESCRIPTION: Cylinder Block Liners & Water Manifold-Cylinder Liner

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the liners for progressive wear each refueling outage. A boroscope may be used if heads are not removed. Complete TDI inspection and maintenance record Form No. 315-1-1	R-Outage	Inspect when injectors are removed at R-Outage	R-Outage	Will Implement
<u>REMARKS</u>  1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-315F

DESCRIPTION: Cylinder Block Liners & Water Manifold - Nuts

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect all nuts for identification markings	Once	Exception taken	Once	Will not Implement
2. Verify the proper installation and torquing of the nuts	Once	Complete	Once	Complete
3. Visually inspect the nuts for signs of forging laps	Once	Exception taken	Once	Will not Implement

REMARKS

1. & 3. The Commanche Peach DR/QR report indicates that these recommendations are the result of the failure of a single cylinder head nut at Shoreham while the nut was being torqued. The failure was determined to be due to a forging lap. A failure due to this type of defect will occur during the torquing or detorquing process due to the forces applied by the torquing tool. Once the nut is under the specified preload it is unlikely that a failure would occur. The GGNS TDI EDG-11 heads have been removed and reinstalled a minimum of three times while the EDG-12 engine heads have been removed and reinstalled at least twice. No failures have occurred at GGNS thus providing evidence that forging laps in the head nuts are not present on the GGNS Unit TDI EDGs. As part of normal maintenance practices the nuts are also visually checked for any damage or discrepancies prior to reinstallation. MP&L plans no further action on these items. The only reported failure at Shoreham also indicates that this was an isolated incident.

2. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-317A

DESCRIPTION: Water Discharge Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Replace the elbow and flange located on both lines between the 3" header and water jacket shroud with 2" 90 degree dresser elbow S (Styles 90 or 165) to mitigate expansion loadings and stresses on the engine	Once	Exception taken	Once	Not Scheduled See Note
2. Add an east-west restraint near the interfacing flange between component #02-317A&B and #02-717C. Support to be added on the #02-317 side of the flange	Once	Exception taken	Once	Not Scheduled See Note

REMARKS

1. and 2.

The GGNS TDI EDG piping configuration does not match that at Commanche Peak which was used as the basis for the DR/QR evaluation of this component and the associated recommendation. MP&L is evaluating the GGNS piping configuration and will make appropriate modifications as required.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-317A -- (Continued)

DESCRIPTION: Water Discharge Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Reinforce support members to provide adequate restraint in the intended directions. See memo from R. Markovich/G. Shears (IMPELL) to J. Kammeyer (SWEC) "Required Modifications for the Validation of Impell's..." 09/17/84	Once	Will perform	Once	Modified Scheduled RF01
4. Visually inspect for leaks on a monthly basis	Monthly	Daily leak checks	Daily	Complete

REMARKS

4. None



GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-317B

DESCRIPTION: Water Discharge Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect for leaks on a monthly basis	Monthly	Daily leak check	Daily	Complete
<u>REMARKS</u> 1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-330B

DESCRIPTION: Flywheel - Bolting

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the torque loads applied to the flywheel bolting meet the latest specified TDI requirements	Once	Verified by Documentation Review	Once	Complete
<u>REMARKS</u>  1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-335B

DESCRIPTION: Front Gear Case - Gasket & Bolting

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect bolting to ensure installation is in accordance with the applicable assembly drawing and that bolts are properly torqued. Inspect internal bolts to verify that positive locking features are installed	Once	Will inspect	Once	Scheduled RF01
<u>REMARKS</u>  1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340A

DESCRIPTION: Connecting Rod

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Ensure proper bolt torque of the bolts above the crankpin as specified by the manufacturer	800 Hours	Measure Preload	9 Months	Complete
2. At major overhauls visually inspect the rack teeth surfaces for signs of fretting	Overhaul	Perform at major overhauls	Overhaul	Will Implement
3. Until 800 hours of operation at loads between 60 and 110% for each engine, inspect bolt holes each refueling outage or after 270 hours at loads between 60% and 110% based on referenced criteria	R-Outage	Exception taken	N/A	Not Scheduled See Note 3

REMARKS

1. & 4

The preload of the connecting rod bolts at GGNS, Unit 1 has been checked by using an ultrasonic bolt gauge at 9 month intervals in accordance with the GGNS augmented surveillance program. To date, preload relaxation has not been identified as a problem at GGNS, thus, the preload check interval will be changed to a refueling outage schedule.

2. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340A -- (Continued)

DESCRIPTION: Connecting Rod

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. During bolt hole inspections measure breakaway bolt torque	N/A	Presently measure preload	9 Months	Modified
5. After 800 hours of operation at loads between 60 and 110% for each engine, inspect bolt holes and bolts above crankpin for fatigue cracks also if the torque is < 2400 ft-lb perform detailed exam of bolts, bolt holes and contact surfaces	800 Hours	Exception taken	N/A	Not Scheduled See Note 5
6. Perform a detailed examination of the bolts, bolt holes and contact surfaces each time the rods are disassembled for any reason	Variable	Will perform	Variable	Will Implement

REMARKS

3. & 5.

The GGNS DR/QR report indicates that failures associated with the threaded areas of the connecting rod box and mating bolts have been attributed to inadequate or relaxed torque. GGNS eliminated the use of torque in reassembly or in checks of the connecting rods in June, 1984. Bolt preload is now controlled and/or checked by bolt stretch and has been measured every 9 months. To date, preload relaxation has not been identified as a problem at GGNS and an inspection of the EDG-11 connecting rod bolt holes at 1400 hours did not identify any indication of cracks. Thus, the preload check interval will be extended to a refueling outage schedule.

6. None

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340A -- (Continued)

DESCRIPTION: Connecting Rod

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
7. Establish the flaw detection ability of the inspection procedure on the GCNS rod box threads	Once	The detection ability has been established	Once	Complete
<u>REMARKS</u>  7. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340A/B

DESCRIPTION: Connecting Rod

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and measure the connecting rods every five years	5 Years	Inspect whenever disassembled	Variable	Modified

REMARKS

1. In five years of normal engine operation the units will acquire approximately 90 starts and 300 hours of operation. These inspections were performed on the Division I D/G previously with approximately 550 starts and 1400 hours of operation on the connecting rods with the results being indicative of a new rod. The trending program will monitor sufficient operating parameters to establish maintenance schedules and needs.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340B

DESCRIPTION: Connecting Rod Bearing Shells

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and measure the bearing shells. Perform inspection at the fuel outage which precedes 500 hours of operation by at least the sum of hours of operation in a LOOP/LOCA event plus the expected hours between R-Outages	Variable	Inspect in conjunction with main bearing inspection	5 Years	Modified
2. Perform an x-ray examination on all replacement bearings	Variable	X-ray replacements	Variable	Will Implement

REMARKS

1. MP&L is implementing a trending program to monitor among other items, the results of lube oil analysis. Abnormal bearing wear would be detected through the trending program. The normal service life of the connecting rod bearings is approximately 35,000 hours. The expected additional total accumulation of operating hours for the life of the GGNS engines is approximately 1,500 hours. For bearing wear to reach an unacceptable state it would be through an abnormal condition, thus usually a sudden change creating abnormal lube oil sample results. The vendor has indicated that to permit access to main bearings on a counter weighted crankshaft, the connecting rods adjacent to the main bearing being inspected need to be disconnected. Thus, at this time, the associated rod bearings will be inspected and measured. This schedule will be adjusted in accordance with previous inspection results and trending program results.
2. Replacement bearings will be x-rayed by TDI upon purchase or by MP&L at the site.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340C

DESCRIPTION: Pistons

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Perform a liquid penetrant test or a magnetic particle test on the rib area near the wrist pin and on the rib at the intersection of the wrist pin boss to check for indications in the casting. Accept criteria in source document	Once	Perform at major overhaul	Overhaul	Modified
2. Inspect and measure skirt and piston data	5 Years	Perform at major overhaul	Overhaul	Modified

REMARKS

1. Based on the analysis and experience on the "AE" piston skirts there is no basis to suspect their integrity to the point of scheduling a major teardown to perform this inspection. GGNS installed new "AE" piston skirts in December 1983 and January 1984. All replacement piston skirts were examined by TDI using the wet fluorescent magnetic particle method. The examination procedure was demonstrated to MP&L on 16 of the 32 piston skirts and was approved for use.
2. The critical clearances of this assembly are the pin to bushing and pin to piston. Insufficient hours will be accumulated during the life of the engines for normal wear to increase the clearances to an unacceptable dimension. For these components to wear beyond acceptable clearances would be through abnormal conditions.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340D

DESCRIPTION: Piston Rings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and measure piston rings every five years per TDI inspection and maintenance record form	5 Years	Exception taken	N/A	Not Scheduled See Note 1
2. Perform ring replacement and cylinder liner honing in accordance with TDI maintenance procedures	Variable	Perform In Accordance With (IAW) vendors manual	Variable	Complete See Vendors Manual
3. If inspection results indicate a need for additional action to improve lubrication and coke buildup use 135 degree fuel spray tips	Once	Complete	Once	Complete See Note 3

REMARKS

1. MP&L regards piston rings as a consumable and replaces them whenever a piston is removed from the engine. In addition, every 18 months cold compression measurements are taken with firing temperatures and pressures. This information will be input to the trending program to monitor for gradual degradation.
2. None
3. Previous inspections do not indicate the need to change fuel spray tips.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340D -- (Continued)

DESCRIPTION: Piston Rings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. When replacing engine oil use H.D. oil that exceeds series 3 standards. Mobilguard 412 or equivalent product may be used to insure improved lubrication. See source document for oil properties	Once	Mobilgard 446 is used	Once	Complete

REMARKS

4. Mobilgard 446 is a premium quality paraffinic marine engine oil that has demonstrated excellent performance in heavy duty turbocharged engines. Recent inspection of the GGNS engines show a lack of wear of critical components and exceptional engine cleanliness.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340E

DESCRIPTION: Piston Pin Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect all pins for chrome plate damage. Perform inspection on a five year basis or whenever pistons are disassembled such that inspection is possible. Visually inspect pin assembly for signs of distress	5 Years	Perform at major overhaul	Overhaul	Modified
2. Inspect end plugs and reroll or replace any that are loose. Perform inspection whenever the pistons are disassembled such that inspection is possible	Variable	Will inspect when possible	Variable	Will Implement

REMARKS

1. A recent inspection of the EDG-11 engine in May-June 1984 with approximately 1400 hours of operation showed that the piston pin chrome plating was in excellent condition. Less than 200 hours of operation will be accumulated in five years at a normal testing frequency. Based on previous inspections, MP&L will perform this inspection when a major overhaul is performed.
2. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-340E -- (Continued)

DESCRIPTION: Piston Pin Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Inspect all new or replacement pins by liquid penetrant test or a magnetic particle test before installation in the engines	Variable	Will inspect	Variable	Will Implement
4. Perform a dimensional check of the one spare pin	Once	Perform check	Once	Complete

REMARKS

3. None

4. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-345A

DESCRIPTION: Tappets & Guides: Intake Exhaust Tappet Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the cam rollers are free to rotate and that no measurable clearance exists between the cam rollers and roller pins	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Inspect condition of assembly	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-345B

DESCRIPTION: Tappets & Guides: Fuel Tappet Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the rollers are free to rotate and that no measurable clearance exists between the pin and roller	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Inspect assembly condition	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  1. None  2. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-350A

DESCRIPTION: Camshaft: Camshaft Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the cam lobes for indications of premature wear	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Visually inspect the cam lobe surfaces for signs of cracking, pitting, or spalling at each fuel outage. If cam lobe surface distress is noted, perform a detailed evaluation to determine expected life and reinspect/replace interval	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-350B

DESCRIPTION: Camshaft Bearings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and measure cam shaft bearing shells every five years	5 Years	Perform at major overhaul	Overhaul	Modified

REMARKS

1. Insufficient operating hours will be accumulated to cause normal wear to the point of degrading the bearings to failure. Only abnormal conditions would be a concern. The trending program for oil analysis will detect degradation to all engine bearings and bushings.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-350C

DESCRIPTION: Camshaft: Supports, Bolting & Gears

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Increase the number of No. 9167 bolts torqued at 70 ft-lb from four to six or increase the initial torque in the four No. 9167 bolts to 80 ft-lb	Once	Reviewed assembly drawings	N/A	Complete See Note 1
2. If the cam gear and hub are disassembled and reassembled, relock the nut at a position within the prescribed torque range. Insert the cotter pin at a torque as specified in the source document for the bolt arrangement	Variable	Perform in accordance with manual upon disassembly	Variable	Complete IAW Manual

REMARKS

1. Assembly drawings show that the GGNS engines have six bolts on the cam gear hub torqued to 70 ft-lbs.
2. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-350C -- (Continued)

DESCRIPTION: Camshaft: Supports, Bolting & Gears

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Visually inspect cam gear for chipped or broken teeth, pittings, excessive wear, or other abnormal conditions at every refueling outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-350C -- (Continued)

DESCRIPTION: Camshaft: Supports, Bolting & Gears

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Verify the proper torque values are applied to the bolts (cam hub to cam gear)	Alt R-Outage	Exception taken	N/A	Not Scheduled
5. Determine the material of the cam gears	Once	Exception taken	N/A	Not Scheduled

REMARKS

4. Industry experience has not indicated any history of gear failure or degradation due to inadequate torque or relaxation of torque on the cam hub bolts. Due to no reported incidents there is insufficient justification to disassemble the engine every alternate outage to verify proper torque if the cam hubs have not been removed. Based on this, MP&L will not perform this recommendation.
5. Industry experience has not indicated any history of inadequate materials or improper hardnesses. Present maintenance practices include a gear inspection every outage and a measurement of gear backlash every alternate outage. If any degradation of gears occurred due to wrong material or improper hardness it would be detected through the existing maintenance program.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-350C -- (Continued)

DESCRIPTION: Camshaft: Supports, Bolting & Gears

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
6. Determine the hardness of the cam gears	Once	Exception taken	N/A	Not Scheduled
7. Measure gear backlash -- See source document	Alt R-Outage	Currently addressed in PM Program	Alt R-Outage	Complete

REMARKS

6. Industry experience has not indicated any history of inadequate materials or improper hardnesses. Present maintenance practices include a gear inspection every outage and a measurement of gear backlash every alternate outage. If any degradation of gears occurred due to wrong material or improper hardness it would be detected through the existing maintenance program.

7. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-355A

DESCRIPTION: Crank to Pump Gear

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect crankshaft to lube oil pump gear during every R-Outage for chipped or broken teeth, excessive wear, progressive pitting or other abnormal conditions. Report indications for engineering evaluation	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. After 100 hour run or pre-operational testing visually inspect the crank to pump gear set teeth for signs of wear, pitting, or other discontinuities	Once	Previous inspection	Once	Complete
3. Determine the hardness of the crank to pump gear	Once	Exception taken	N/A	Not Scheduled

REMARKS

1. None
2. None
3. Industry experience has not indicated any history of inadequate materials or improper hardnesses. Present maintenance practices include a gear inspection every outage and a measurement of gear backlash every alternate outage. If any degradation of gears occurred due to wrong material or improper hardness it would be detected through the existing maintenance program.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-355A -- (Continued)

DESCRIPTION: Crank to Pump Gear

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Determine the material of the crank to pump gear	Once	Exception taken	N/A	Not Scheduled
5. Measure gear backlash every alternate outage	Alt R-Outage	Currently addressed in PM Program	Alt R-Outage	Complete

REMARKS

4. Industry experience has not indicated any history of inadequate materials or improper hardnesses. Present maintenance practices include a gear inspection every outage and a measurement of gear backlash every alternate outage. If any degradation of gears occurred due to wrong material or improper hardness it would be detected through the existing maintenance program.

5. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-355B

DESCRIPTION: Idler Gear Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect the idler gear assembly (especially the jacket water pump gear) at all scheduled fuel outages. Report any progressive pitting for engineering evaluation. Maintain a photographic record at the site	R-Outage	Inspect at outage	R-Outage	Modified
2. If idler gear is disassembled, relock the nut at a position within the prescribed torque range of 70 + or -20 ft-lb. Insert the cotter pin at a torque >50 BUT < 90 ft-lb. If this is not possible use different bolt, nut, or washer	Variable	Perform IAW vendors manual	Variable	Complete

REMARKS

- Present maintenance procedures require gear inspections at each refueling outage and backlash measurements at alternate outages. The recommendation for photographs appears to be for the benefit of the engineer performing the evaluation in the event abnormal conditions are reported. At GGNS, the engineering staff is located on site. Such evaluations will occur after the responsible engineer has made a visual inspection to determine the extent and degree of the reported condition. The GGNS TDI EDG gears have been photographed and the photographs retained for reference for further inspections.
- None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-355B -- (Continued)

DESCRIPTION: Idler Gear Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Determine the material of the crank to pump gear and idler teeth	Once	Exception taken	N/A	Not Scheduled
<u>REMARKS</u>  3. Industry experience has not indicated any history of inadequate materials or improper hardnesses. Present maintenance practices include a gear inspection every outage and a measurement of gear backlash every alternate outage. If any degradation of gears occurred due to wrong material or improper hardness it would be detected through the existing maintenance program.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-355B -- (Continued)

DESCRIPTION: Idler Gear Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Measure gear backlash every alternate outage	Alt R-Outage	Currently addressed in PM Program	Alt R-Outage	Complete
5. Visually inspect crankshaft to lube oil pump gear during every R-Outage for chipped or broken teeth, excessive wear, progressive pitting or other abnormal conditions. Report indications for engineering evaluation	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  4. None  5. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-359

DESCRIPTION: Air Start Valve

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Ensure that TDI's operating instructions are followed	N/A	Will follow	N/A	Will Implement
2. Remove, clean and inspect the air start valves every refueling outage. Replace copper valve to head gasket. Ensure valve installation includes torque requirements	R-Outage	Perform at alternate outage	Alt-Outage	Modified
3. Blow down the air receivers daily and note any moisture content. If moisture is noted take appropriate action	Daily	Daily on rounds	Daily	Complete
4. Inspect the piston, cap, guide and housing sliding surfaces to evaluate wear or corrosion	R-Outage	Perform at alternate outage	Alt-Outage	Modified

REMARKS

1. None
2. The measures presently in place at GGNS - Dessicant air dryers, daily blow downs of low points, air traps, filters, etc., have minimized potential problems with the air start valves. Therefore, MP&L will perform this item at alternate refueling outages.
3. None
4. The measures presently in place at GGNS - Dessicant air dryers, daily blow downs of low points, air traps, filters, etc., have minimized potential problems with the air start valves. Therefore, MP&L will perform this item at alternate refueling outages.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-360A

DESCRIPTION: Cylinder Head

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Blow-over the engine at appropriate intervals after shutdown to ensure against harmful effects of water leaks. If water is detected because of a head leak, replace head or return to vendor for repair	Variable	Currently addressed in PM Program	Variable	Complete
2. Visually inspect the fuel injection port on each cylinder head for water leaks during the normal monthly engine run. If water is detected replace head	Monthly	Inspect for leaks	Monthly	Complete
3. Visually inspect all cylinder heads every five years	5 Years	Inspect when heads removed	Variable	Modified

REMARKS

1. None
2. None
3. Both TDI diesels are air rolled prior to a planned start and 4 hours and 24 hours after the engine has been shutdown. Inspections will be performed when heads are removed for other maintenance activities or at major overhauls.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-360A -- (Continued)

DESCRIPTION: Cylinder Head

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Record cold compression pressures and maximum firing pressures every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-360B

DESCRIPTION: Cylinder Head Valves: Intake & Exhaust Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect subcovers for evidence of valve guide blowby (soot). One time only inspection after 500-600 hours of engine operation or after rebuild of the cylinder head	Once	Currently addressed in PM Program	R-Outage	Complete
2. Visually inspect intake and exhaust valve, discs, stems and seats for wire drawing, pitting, distortion, or any abnormal condition every five years	5 Years	Perform at major overhaul	Overhaul	Modified
3. Measure intake and exhaust valves head thickness	5 Years	Perform at major overhaul	Overhaul	Modified

REMARKS

1. None

2. thru 4.

The condition of each cylinder is monitored by cold compression readings, firing temperatures and pressures, and cylinder temperatures. This data will be input into the trending program for the monitoring of long term degradation. Previous inspections of the intake and exhaust valves on the EDG-11 engine showed indications of normal wear and were determined acceptable for further service. The majority of the valves had experienced  $\approx 1400$  hours of operation at the time of the inspection. Normal testing at GGNS would only result in  $\approx 1500$  hours of additional operation over the 40 year life of the plant. Due to the low number of hours expected to be accumulated, MP&L will perform these items when an overhaul is conducted.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-360B -- (Continued)

DESCRIPTION: Cylinder Head Valves: Intake & Exhaust Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Measure intake and exhaust valves - valves to valve guide clearances	5 Years	Perform at major overhaul	Overhaul	Modified

REMARKS

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-360C

DESCRIPTION: Cylinder Head Valves: Bolting & Gaskets

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the proper gaskets are installed in accordance with specification requirements	Once	TDI parts used	Once	Complete
2. Visually inspect the gasket for signs of distress	Once	Replaced	Once	Complete
<u>REMARKS</u> 1. None 2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-362A

DESCRIPTION: Cylinder Head Covers: Subcover Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Perform a liquid penetrant test to the rocker arm pedestals, between counter bores and the top and vertical machined surfaces every five years. Inspection performed in conjunction with rocker arm bushing inspection	5 Years	Will perform once	Once	Modified

REMARKS

1. The GGNS DR/QR report identified the primary experience with the subcovers as shrinkage cracks resulting from the casting process. A one time inspection will be performed in conjunction with rocker arm bushing inspection to determine if shrinkage cracks do exist.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-365A

DESCRIPTION: Fuel Injection Pumps

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Tear down one pump for inspection every alternate outage in accordance with TDI instruction and maintenance manual Volume 1	Alt R-Outage	Currently addressed in PM Program	Alt R-Outage	Complete See Note 1

REMARKS

1. GGNS's present program addresses all 16 pumps every alternate refueling outage.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-365B

DESCRIPTION: Fuel Injection Equipment - Fuel Injection Tips

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect for leaks monthly	Monthly	Currently addressed in PM Program	Monthly	Complete
2. During refueling outage disassemble and inspect, clean, reassemble, pop test, and check spray pattern	R-Outage	Currently addressed in PM Program	R-Outage	Complete
3. Incorporate into the Commanche Peak maintenance procedures, TDI SIM No. 107 and 108	Once	Exception taken	N/A	Complete

REMARKS

1. None
2. None
3. Do not control Commanche Peak maintenance procedures. SIMs No. 107 and 108 are incorporated at GGNS.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-365C

DESCRIPTION: Fuel Injection Equipment - Tube Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check tubing for leaks at the compression fittings on a monthly basis	Monthly	Will perform	Monthly	Complete
2. Check tubing lengths for leaks or cracks on a monthly basis and at first engine operation following installation of tubing	Monthly	Will perform	Monthly	Complete
<u>REMARKS</u>  1. None  2. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-371A

DESCRIPTION: Fuel Pump Linkage - Fuel Pump Cont Shaft & Link Ass & Bearings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and lubricate oil cups on a monthly basis	Monthly	Currently addressed in PM Program	Monthly	Complete
2. Determine the hardness and material of the shaft	Once	Exception taken	N/A	Not Scheduled
3. Visually inspect linkage and bearings for freedom of movement	Once	Inspected	Once	Complete
4. Review site maintenance procedures to ensure adequate lubrication requirements are defined	Once	Complete	Once	Complete

REMARKS

1. None
2. The GGNS and lead DR/QR reports do not provide any basis for the recommendation. The main causes of reported problems with the fuel pump linkage were attributed to an associated lack of maintenance, lubrication and alignment. Engineering analysis determined the linkage assembly to be adequate if properly maintained.
3. None
4. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-3713

DESCRIPTION: Fuel Pump Linkage Assembly & Bearings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Grease swivel link on F.O. pump assemblies all cylinders every R-Outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  1. None				

CGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-375

DESCRIPTION: Intake Manifold Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect all intake manifolds for cracks at the flange faces	N/A	Good maintenance practice	N/A	Complete
2. Other castings may be tried in an attempt at a better fit	N/A	Good maintenance practice	N/A	Complete

REMARKS

1. thru 3.

Improper alignment of the intake manifold to the cylinder heads could result in the initiation of cracks in the manifold. It is not good maintenance practice to attempt to "jack" or force a component into alignment. These recommendations represent good maintenance practices, therefore, MP&L is considered in compliance.



CGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-375 -- (Continued)

DESCRIPTION: Intake Manifold Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Bolt hole diameters on the intake manifold elbows may be increased from 1/16" oversize to 1/8" oversize. Under no circumstances shall any component be jacked to fit	N/A	Good maintenance practice	N/A	Complete
<u>REMARKS</u>				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-380A

DESCRIPTION: Exhaust Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Perform a visual inspection and a magnetic particle test on a sample of the circumferential pipe welds and corresponding heat affected zones every alternate outage	Alt R-Outage	Exception taken	N/A	Not Scheduled
2. Remove the second 6" slip joint from the No. 8 cylinder head on both right and left banks and replace with 6" 150 lb S.O. flanges with A449 bolts	Once	Exception taken	N/A	Not Scheduled

REMARKS

1. thru 5.

A TDI Owners Group Supplement 1 report for the GGNS TDI EDG exhaust manifold concluded that the exhaust manifold piping as designed and installed by TDI is adequate to perform its intended design function. The report concluded that all stress levels remain well below code allowables, nozzle loads were not significantly increased from those approved previously, relative movements at the slip joints are very small and the restraining devices are adequate to prevent any lockup or separation of the exhaust piping. These recommendations which were based upon the original report are no longer considered applicable. MP&L plans no further action on these items.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-380A -- (Continued)

DESCRIPTION: Exhaust Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Remove the first 6" slip joint from the No. 2 cylinder head on both right and left banks and replace with 6" 150 lb S.O. flanges with A449 bolts	Once	Exception taken	N/A	Not Scheduled
4. Remove the first 6" slip joint from the No. 3 cylinder head on both right and left banks and replace with 6" 150 lb S.O. flanges with A449 bolts	Once	Exception taken	N/A	Not Scheduled
<u>REMARKS</u>				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-380A -- (Continued)

DESCRIPTION: Exhaust Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Remove the first 6" slip joint from the No. 4 cylinder head on both right and left banks and replace with 6" 150 lb S.O. flanges with A449 bolts	Once	Exception taken	N/A	Not Scheduled
6. In the event of an SSE, inspect the cap screws which hold the water jacket to the exhaust manifold assembly support	Variable	Will perform	Variable	Will Implement
<u>REMARKS</u>  6. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-380B

DESCRIPTION: Exhaust Manifold

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the proper torques were applied to the exhaust pipe flange capscrews	Once	Verified	Once	Complete
2. Perform a dimensional check of the capscrews	Once	Complete	Once	Complete
3. Verify that the proper gasket material and bolting are installed at the manifold and flange connections	Once	Complete	Once	Complete
4. Verify at reinstallation that no binding exists on the exhaust manifold and no cracks exist at the manifold flange fillets by a visual inspection	Variable	Will perform when disassembled	Variable	Will Implement
<u>REMARKS</u>  1. None 2. None 3. None 4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-385A

DESCRIPTION: Crankcase Relief Valve

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Clean flame arrestors every R-Outage	R-Outage	Add to PMs	R-Outage	Will Implement
2. Inspect seat and disc every R-Outage	R-Outage	Add to PMs	R-Outage	Will Implement
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-385B

DESCRIPTION: Cylinder Block Covers - Gaskets & Bolts

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Ensure that the proper bolt torque is applied by a documentation review	Once	Complete	Once	Complete
2. Visually inspect the gaskets for signs of elastomeric compound breakdown and cracking	Once	Complete	Once	Complete
<u>REMARKS</u>  1. None  2. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-387A

DESCRIPTION: Crankcase Vacuum Fan

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Clean and inspect fan every alternate outage	Alt R-Outage	Add to PM	Alt- R-Outage	Will Implement
2. Clean motor and check bearings for roughness every alternate R-Outage	Alt R-Outage	Retain present PM	Alt R-Outage	Modified

REMARKS

1. None
2. The motor is inspected, cleaned and megged at alternate refueling outages.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-390A/B

DESCRIPTION: Rocker Arms & Push Rods - Rocker Shaft Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the intake, exhaust and intermediate rocker arm assembly for signs of distress, linear indications and chipped pieces in the outer lips of the push rod cups. The lips should be flush in the assembly	Once	Will perform	Once	Will Implement
2. Perform a material comparator test on one intake/intermediate rocker shaft and one exhaust rocker shaft	Once	Will perform	Once	Will Implement
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-390C/D

DESCRIPTION: Rocker Arms & Push Rods - Push Rods

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. In future purchase orders specify destructive verification of weld quality by sectioning random samples from each manufacturing lot	Variable	L.P. prior to installation	Variable	Modified
<u>REMARKS</u>  1. Prior to installing the friction welded push rods in the GGNS TDI D/Gs in 1984 one push rod was destructively examined at that time and the weld quality found to be excellent. The push rods in the Division I diesel were examined again with liquid penetrant following approximately 270 hours of operation and were found to be in excellent condition. One push rod was also tested by the Owner's Group to ten to the seventh cycles with excellent results. The push rods were determined to have an unlimited service life. Based on these inspections and tests, MP&L considers a liquid penetrant inspection sufficient to determine acceptance.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-390E

DESCRIPTION: Rocker Arms & Push Rods - Bushings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect and measure intake rocker arm bushings every 2300 hours - see PM matrix for details	2300 Hours	Perform when disassembled	Variable	Modified
2. Visually inspect and measure exhaust rocker arm bushings every 1300 hours - see PM matrix for details	1300 Hours	Perform when disassembled	Variable	Modified
3. Visually inspect and measure intermediate rocker arm bushings every 730 engine hours see PM matrix for details	730 Hours	Perform when disassembled	Variable	Modified

REMARKS

1. thru 3.

The frequencies for these three recommendations are based on calculated wear rates using journal orbit analysis and appear to be extremely conservative. This conclusion is based on the industry experience listed in the DR/QR reports which did not identify any instance of a bushing out of tolerance on a TDI engine. Inspections at Commanche Peak also indicated essentially no wear and calculations based on the worst measured wear indicates a minimum of 4300 hours of operation prior to being out of tolerance. TDI has also indicated that they have engines with these parts in the field that are approaching 17 years of age. MP&L has concluded, based on operating experience, that the calculated wear rates are overly conservative and will perform dimensional checks on the bushings when these components are sufficiently disassembled for other reasons.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-390F

DESCRIPTION: Rocker Arms & Push Rods - Lifters

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the lifters are properly installed in accordance with TDI procedures for a reassembled engine-lifters to be installed with fill hole up	Once	Exception taken	N/A	Not Scheduled
2. Perform a leak down rate test on two lifters per engine	R-Outage	Exception taken	N/A	Not Scheduled
3. Check valve lash every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete

REMARKS

1. Review of the DR/QR documentation indicates that the recommendation for installing the lifters with the fill hole up was the result of collapsed lifters at Shoreham. Cause was cited as oil draining out of lifter while the engine was in standby. A review of the lifter drawing indicates that oil will not drain out while in standby due to the configuration of the ball and swivel assembly. Collapsed lifters has not been a problem at GGNS and is not expected to be if the proper assembly methods are used. MP&L will further consider this recommendation if additional experience at GGNS indicates a problem does in fact exist.
2. This recommendation appears to be based on a statement of "excessive wear" in the lead V-16 DR/QR report. The only identified problem with the hydraulic lifters were collapsed lifters at Shoreham that were attributed to the lifter draining down after the engine remained in standby for a long period of time. No malfunctions were identified in the nuclear or non-nuclear industry that could be attributed to wear. Also, a leakdown rate test as performed by the lifter manufacturer is not considered practical in the field. MP&L plans no further action on this item at this time and will consider replacement on a frequency based on additional history and performance.

3. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-390G

DESCRIPTION: Rocker Arms & Push Rods - Miscellaneous Bolts & Studs

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the bolts are torqued to 365 ft-lb if rocker arms are disassembled for inspection	R-Outage	Performed when disassembled	Variable	Modified
2. Verify that the rocker arm drive studs are intact and tight	R-Outage	Added to PMs	R-Outage	Complete

REMARKS

1. The GGNS DR/QR report indicates that this recommendation is due to bolt failures that were attributed to insufficient preloading. Any time these bolts are removed on the GGNS TDI diesels and reassembled, the 365 ft-lb torque is witnessed and documented to ensure proper preloading is applied. MP&L considers this to meet the intent of this recommendation and plans no further action on this item.
2. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410A

DESCRIPTION: Overspeed Trip

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that overspeed trip is correctly set to trip at 518 RPM + or -1% at every refueling outage. Ensure that both elect and mech governors are returned to normal setting after test. See source document for test details	R-Outage	Currently addressed in PM Program Set @ 517 RPM	R-Outage	Complete See Note 1
2. After setting the overspeed governor mark the adjustment screw positions with torque-seal	Variable	Add to PMs	Variable	Will Implement
3. Verify proper installation and calibration of the governor overspeed trip	Once	Complete	Once	Complete

REMARKS

1. Mechanical governor settings are checked in an operability test while the electrical governor is automatically prepositioned on an emergency start signal.
2. None
3. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410A -- (Continued)

DESCRIPTION: Overspeed Trip

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Verify proper operational procedures are used on governor	Once	Complete	Once	Complete
<u>REMARKS</u>  4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410B

DESCRIPTION: Overspeed Trip: Governor & Accessory Drive Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Determine the material of the accessory drive gear by a comparator test	Once	Exception taken	N/A	Not Scheduled
2. Determine the hardness of the overspeed trip drive gear. Perform inspection on the outer gear tooth flat	Once	Exception taken	N/A	Not Scheduled
3. Perform a dimensional inspection to determine the shaft to bearing clearance	Once	Implement SIM 363	Once	Will Implement SIM 363

REMARKS

1. A review of industry experience for both nuclear and non-nuclear has not identified any failure of these components or anything specific to improper materials or hardnesses. MP&L has concluded that the material's physical properties are not in question and plans no further action on this item.
2. A review of industry experience for both nuclear and non-nuclear has not identified any failure of these components or anything specific to improper materials or hardnesses. MP&L has concluded that the material's physical properties are not in question and plans no further action on this item.
3. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410B -- (Continued)

DESCRIPTION: Overspeed Trip: Governor & Accessory Drive Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Remove plugs from housing and check for magnetic particles every outage	R-Outage	Add to PMs	R-Outage	Will Implement
5. Check shafts for excessive radial and axial movement every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
6. Visually inspect accessory drive gear for excessive wear	R-Outage	Currently addressed in PM Program	R-Outage	Complete

REMARKS

- 4. None
- 5. None
- 6. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410C

DESCRIPTION: Overspeed Trip: Couplings (Flexible & Spider)

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Replace the lovejoy coupling spiders or test the coupling elastomer for hardness and replace if hardness is 90 shore at every fuel outage	R-Outage	Follow SIM 363 instructions	R-Outage	Modified
2. Verify that the coupling is tight on the shaft at every fuel outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
3. Remove the present L-110 lovejoy couplings and replace them with new units at the first refueling outage. Keep the interference fit below 0.0005". Follow other procedures in SIM 363 except use Loctite 609 instead of 680	Once	Implement SIM 363	Once	Modified

REMARKS

1. The coupling will be inspected in accordance with SIM 363 instructions at every refueling outage.
2. None
3. The couplings will be inspected in accordance with SIM 363 instructions.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410C -- (Continued)

DESCRIPTION: Overspeed Trip: Couplings (Flexible & Spider)

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Visually examine the coupling for signs of wear, deterioration or other discontinuities	Once	Will perform	Once	Will Implement
<u>REMARKS</u>  4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-410D

DESCRIPTION: Overspeed Trip: Vent Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Change the valve "o" rings every five years	5 Years	Add to PMs	5 Years	Will Implement

REMARKS

1. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-411A

DESCRIPTION: Governor Drive - Governor & Tachometer Drive Gear & Shaft

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Determine the material of the governor drive and governor driven parts	Once	Exception taken	N/A	Not Scheduled
2. Perform a liquid penetrant test of the governor drive gear and shaft for fatigue cracks in the following areas: gear and shaft contact surfaces, gear pins and bores, vertical shaft to gear keyway, reduced shaft diameter of coupling	Once	Exception taken	N/A	Not Scheduled

REMARKS

1. A review of industry experience identified one instance of a pinion failure due to binding. Binding does not appear to be a concern inherent to the component material, but rather a mechanical problem associated with the moving parts. The design review has indicated sufficient safety margins to assure satisfactory operation of the components. There is no information provided by the design analysis to support concerns of fatigue associated failures.
2. A review of industry experience identified one instance of a pinion failure due to binding. Binding does not appear to be a concern inherent to the component material, but rather a mechanical problem associated with the moving parts. The design review has indicated sufficient safety margins to assure satisfactory operation of the components. There is no information provided by the design analysis to support concerns of fatigue associated failures.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-411A -- (Continued)

DESCRIPTION: Governor Drive - Governor & Tachometer Drive Gear & Shaft

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Visually inspect drive gear and shaft for signs of wear every R-Outage	R-Outage	Will perform	R-Outage	Will Implement
<u>REMARKS</u>  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-411B

DESCRIPTION: Governor Drive - Couplings, Pins & Keys

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check coupling tightness at refueling outages	R-Outage	Will perform	R-Outage	Will Implement
2. Replace coupling elastomeric insert in koppers coupling at refueling outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
3. Visually inspect the coupling for degradation of material	Once	Complete	Once	Complete
4. Verify that the coupling material is neoprene by reviewing existing documenta- tion	Once	Complete	Once	Complete
<u>REMARKS</u>  1. None  2. None  3. None  4. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-411B -- (Continued)

DESCRIPTION: Governor Drive - Couplings, Pins & Keys

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Visually inspect the set screw and drive pin in accordance with installation instructions	Once	Will perform	Once	Will Implement
6. Replace coupling elastomeric insert prior to placing the engine in standby emergency service	Once	Complete	Once	Complete
<u>REMARKS</u>  5. None  6. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-413A

DESCRIPTION: Governor Linkage

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Perform monthly inspection for loose parts. Include the addition of positive locking hardware to the lever arm clamp bolts and shaft roll pins in future tightening due to loose parts	Monthly	Add to PMs	Monthly	Will Implement
2. Oil the cross shaft bearing cups monthly	Monthly	Currently addressed in PM Program	Monthly	Complete
3. Grease the rod end fittings (especially those at the ends of the cross shaft) at least at every outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  1. None  2. None  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-413A -- (Continued)

DESCRIPTION: Governor Linkage

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Verify that Loctite is present on the governor linkage during installation by reviewing existing documentation	Once	Reviewed documentation	Once	Complete See Note 4
5. Visually inspect the governor linkage for signs of corrosion, wear, pitting and discoloration	Once	Will perform	Once	Will Implement

REMARKS

4. The lead V16 DR/QR report identifies the governor linkage as TDI Part No. 1A-5779. A review of vendor's drawings for this part did not identify any requirement for Loctite. This part uses jam nuts to prevent loosening of parts. There is no reported looseness or malfunction of this part in the DR/QR report for the TDI EDGs. Therefore, no further action is planned by MP&L on this recommendation.

5. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-413B

DESCRIPTION: Automatic Shutdown Cylinder

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check cylinder for extension and return every outage	R-Outage	Added to PMs	R-Outage	Complete
2. Check tailrod vent for air leakage every outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-415A

DESCRIPTION: Governor Assembly: Woodward Governor

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Drain, flush, refill, and vent actuator oil system at alternate fuel outages with new oil from a clean container following appropriate cleanliness procedures	Alt R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Disassemble, clean, and refurbish the actuator every five years as per the TDI Manual, Volume 1, Section 5, Maintenance Schedule	5 Years	Reviewed TDI manual	N/A	Complete See Note 2
3. Replace flex element for governor drive coupling every fuel outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  1. None  2. This recommendation is not contained in the TDI Manual. Performance of recommendation number 1 for drain, flush and refill with new oil is also considered to meet the intent of this recommendation of maintaining the actuator in proper operating condition.  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-415A -- (Continued)

DESCRIPTION: Governor Assembly: Woodward Governor

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Monthly verify all governor control knob settings are in appropriate positions: Load-max, droop-zero, speed-to provide mech gov control at 460 RPM. Secure all knob settings with commercially available product	Monthly	Added to procedure	Monthly	Will Implement
5. Evaluate governor settings every fuel outage by means of two tests described in source document. See source document for evaluation on details	R-Outage	Test IAW in accordance with Tech Specs	R-Outage	Modified
6. Review site procedures to ensure that sufficient detail and clarity exists for setting the governor	Once	IAW vendor's manual	Once	Modified

REMARKS

4. The GGNS TDI EDG mechanical governor control knob settings will be checked for GGNS specific settings. Securing all control knobs is considered overly conservative as these may be used for different activities and will be checked prior to returning the EDG to service.
5. Testing of the diesel's response to transients, load rejection, loading, etc., is performed in accordance with the GGNS technical specifications which provides limits for speed and voltage transients. These limits reflect those contained in Regulatory Guide 1.9 and are considered to meet the intent of this recommendation. MP&L is considered to be in compliance with this recommendation.
6. The governor is set in accordance with the vendor's manual.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-415B

DESCRIPTION: Governor Assembly: Booster Servomotor

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the booster servomotor is mounted at a lower level than governor	Once	Complete	Once	Complete
2. Verify that the inlet booster line is 3/8" and the outlet booster line is 1/4"	Once	All lines 3/8"	Once	Complete See Note 2
3. Verify that oil lines slope upward from the booster to the governor and have a minimum number of loops or bends	Once	Inspected	Once	Complete
4. Clean, inspect, and replace "o"-rings and gaskets every five years	5 Years	Added to PMs	5 Years	Complete
<u>REMARKS</u>  1. None  2. The inspection showed all oil lines on the booster servomotor to be 3/8". The lines are of sufficient size to allow a rapid change in oil pressure to be seen by the governor and insure a rapid start as evidenced by consistent start times of 7-8 seconds. MP&L is considered in compliance with this recommendation.  3. None  4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-415C

DESCRIPTION: Governor Assembly: Heat Exchanger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the heat exchanger is mounted below the oil level in the governor	Once	Complete	Once	Complete
2. Clean and inspect every five years	5 Years	Add to PMs	5 Years	Will Implement
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-425A

DESCRIPTION: Jacket Water Pump

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Revise the maintenance procedure for installing the nut holding the external spline in the shaft taper to provide both a minimum torque value of 120 ft-lb and a maximum value of 660 ft-lb	N/A	Use vendors manual	N/A	Modified
2. Check the key to keyway interface for a tight fit on both the pump shaft to impeller and the spline to pump shaft during reassembly	R-Outage	Good maintenance practice	Variable	Modified
3. Determine the hardness and material of the pump shaft	Once	Exception taken	N/A	Not Scheduled

REMARKS

1. The jacket water pump will be disassembled and reassembled in accordance with the vendors manual.

2., 4. & 7.

These three recommendations represent good maintenance practices to be used prior to the reassembly of any centrifugal pump. Reported problems in the industry have been shaft failures on a water pump with a different designed pump driver. The Phase I report determined that these failures were not applicable to the GGNS TDI engine water pumps. Repeated disassembly and reassembly results in a greater potential for damage to keyways and shafts than substained operation would. MP&L will utilize good maintenance practices whenever the jacket water pump is disassembled.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-425A -- (Continued)

DESCRIPTION: Jacket Water Pump

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Visually inspect the pump shaft for signs of excessive galling wear or scoring	Variable	Good maintenance practice	N/A	Modified
5. Visually inspect the pump driven gears for signs of pitting or galling	Once	Exception taken	N/A	Not Scheduled
6. Perform a liquid penetrant test on the gear teeth and transition area (gear to shaft)	Once	Exception taken	N/A	Not Scheduled
7. Visually inspect the wear ring for evidence of galling or excessive wear	Once	Good maintenance practice	N/A	Modified

REMARKS

3., 5. and 6.

The only reported problem in the non-nuclear and nuclear industry has been with one type of pump that was used on the DSR-48 (in-line 8 cylinder). The DSR-48 pump was of a different design with the driven gear being directly attached to the pump shaft. The GGNS TDI diesels have jacket water pumps that are connected to the driven gear through a coupling arrangement that uses splines. The problem with the DSR-48 jacket water pumps was determined to be not applicable to the GGNS TDI diesels due to the different design and there have been no reported problems with the GGNS design. MP&L plans no further action on these three items.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-437

DESCRIPTION: Turbo Water Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect for leaks monthly	Monthly	Daily leak check	Daily	Complete

REMARKS

1. None

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-441A

DESCRIPTION: Starting Air Manifold: Air Vent

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Insure that the starting air manifold vent is open and effective every month	Monthly	Vent checked	Monthly	Complete

REMARKS

1. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-441A-LB

DESCRIPTION: Starting Air Manifold Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Make support modifications as summarized in memorandum from R. Markovich/G. Shears (IMPELL) to J. Kammeyer (SWEC), "Required Modifications for Validation of Impell's Review for Component No. 02-441A-Grand Gulf" 09/17/84	Once	Will perform	Once	Scheduled RF01
<u>REMARKS</u>  1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-441B

DESCRIPTION: Starting Air Manifold Valves, Strainers & Filters

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Add free flowing drains to the air distributor filter	Once	Drain daily	Daily	Modified
2. Perform the maintenance items in Volume 1 of the TDI instruction manual each outage	R-Outage	Follow manual	N/A	Modified
3. Inspect, clean and lubricate starting air admission valves, also replace o-ring and clean screened fitting at each outage	R-Outage	Perform on 6 months basis	6 Months	Complete
4. Inspect and clean check valve and ball valve in starting air manifold at each outage	R-Outage	Add to PM	5 Years	Modified

REMARKS

1. The air distributor filter is presently drained on a daily basis, therefore, the addition of free flowing drains which increases the potential for air leakage will not be implemented.
2. Engine maintenance is conducted as applicable with the vendors manual.
3. None
4. The ball valve is a manual isolation valve used to isolate the system for maintenance purposes only and provides no function towards starting and operation of the diesel. Starting air is also dried and filtered and low points are blown down daily to maintain the system dry and clean. The check valves will be conservatively scheduled to be inspected on a five year schedule. MP&L plans no further action on this item.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-441B -- (Continued)

DESCRIPTION: Starting Air Manifold Valves, Strainers & Filters

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Inspect tightness of fittings and bolts and apply locking compound as required during reassembly at each outage	R-Outage	Perform when disassembled	Variable	Complete
6. Inspect and clean air start solenoid valves each outage	R-Outage	Current addressed in PM Program	6 Months	Complete
7. Inspect filter elements every month	Monthly	Inspect on 6-month basis	6 Months	Modified
8. Replace filter elements every R-Outage	R-Outage	Replaced if needed @ 6 months	6 Months	Modified
<u>REMARKS</u>  5. None  6. None  7. Experience to date shows that to inspect and replace if needed on a 6 month basis is adequate. Therefore, MP&L will retain present frequency.  8. Inspected and replaced if needed every 6 months.				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO.: 02-441B -- (Continued)

DESCRIPTION: Starting Air Manifold Valves, Strainers & Filters

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
9. Clean and inspect strainer every month	Monthly	Y-strainers cleaned quarterly	Quarterly	Modified
10. Blow down strainer daily	Daily	Performed daily	Daily	Complete
11. Replace the "o"-rings of the shuttle valve every outage	R-Outage	Add to PMs	R-Outage	Will Implement

REMARKS

9. Present experience indicates that cleaning on a quarterly basis is sufficient. Therefore, MP&L will retain the present frequency.

10. None

11. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-441C-SB

DESCRIPTION: Starting Air Manifold - Tubing Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Install a cover plate on an impulse tube support for the Division II diesel to provide for two-way lateral restraint and to maintain consistency between engines	Once	Will install	Once	Scheduled RF01
<u>REMARKS</u>  1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-442A

DESCRIPTION: Starting Air Distributor - Distributor Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Maintain surveillance inspection to ensure that the starting air manifold vent remaining open and unobstructed	Monthly	In surveillance	Monthly	Complete
2. Inspect the poppet valves and cams to assess the degree of wear each refueling outage	R-Outage	Perform at alternate outage	Alt R-Outage	Modified
3. Visually inspect the poppets for signs of wear or scoring after 100 hours run or pre-operational testing	Once	Complete	Once	Complete
4. Dimensionally check the poppets	Once	Will perform when disassembled	Once	Will Implement
5. Verify that the following lobe is installed correctly	Once	Complete	Once	Complete

REMARKS

1. None
2. The Owners Group recommended frequency is based on run hours. The starting air distributor only functions when cranking the engine. Component wear is not affected by hours of operation, but by the number of starts. Inspections at alternate outages will allow for a sufficient number of accumulated starts to warrant an inspection of these components.
3. None
4. None
5. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-450A

DESCRIPTION: Fuel Oil Headers - Piping & Tubing

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Modify support numbers 01-FO-PSA-7-108 and 02-FO-PSA-7-108 as shown on sketch 01-FO-PSA-7-106 from two-directional restraints to three-directional restraints. See Memo #6322 from C. Malovrh dated 09/19/84 for details	Once	Will modify 01-FO-PSA-7-107 and 02-FO-PSA-7-107 to three directional restraints	Once	Modified Scheduled RF01
2. Add two-directional lateral supports on the 1" diameter drip return line between each drip header and the drip header crossover pipe. See source document and Memo #6322 C. Malovrh dated 9/19/84 for details	Once	Will add	Once	Scheduled RF01

REMARKS

- Supports 01-FO-PSA-7-108 and 02-FO-PSA-7-108 are extremely difficult to access for modification. Modification of 01-FO-PSA-7-107 and 02-FO-PSA-107 (shown on 01-FO-PSA-7-107) to three directional restraints meets the support requirements of this owners group recommendation.
- None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-450B

DESCRIPTION: Fuel Oil Headers - Fuel Tubing Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Redesign supports 01-FO-PSA-7-049 on sketch 01-FO-PSR-7-049 and 02-FO-PSR-7-053 on drawing SK-02-FO-PSR-7-053 to increase stiffness and eliminate over- stressed condition in unistrut member and angle member bolted to engine	Once	Will redesign	Once	Scheduled RF01
2. Delete support 02-FO-PSA-7-051 on sketch 02-FO-PSR-7-051 to eliminate tie between tubes	Once	Will delete	Once	Scheduled RF01
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-450B -- (Continued)

DESCRIPTION: Fuel Oil Headers - Fuel Tubing Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Redesign supports listed in source document to allow for differential thermal expansion between engine block and header. Remove tack welds. Install two-directional restraints at all but one location on header. This is clamp type	Once	Will redesign	Once	Scheduled RF01
<u>REMARKS</u>  3. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-455A

DESCRIPTION: Fuel Oil Filters & Strainers: Filters

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Replace filter cartridge according to maintenance procedures as-required based on the differential pressure which is monitored on a monthly basis	As Required	Will perform	As Required	Complete
2. Inspect canister gaskets and replace as necessary	R-Outage	Will perform	Annually	Complete
3. Inspect tubing and mechanical connections for tightness and/or leaks every month	Monthly	Daily and monthly leak check	Monthly	Complete
<u>REMARKS</u>  1. None  2. None  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-455B

DESCRIPTION: Fuel Oil Filters & Strainers: Strainers

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Clean/replace strainer elements at 5 psid in accordance with TDI recommendations. Record strainer D/P monthly	Monthly	Will perform	Monthly	Complete
2. Install vent petcocks in the strainer heads in accordance with manufacturer's recommendations	Once	Will perform	Once	Scheduled RF01
3. Utilize a bowl torque of 120 to 150 ft-lb in accordance with manufacturer's recommendations	Variable	Will perform	Variable	Complete
4. Purge air from standby strainers as required	Variable	Purge when changing	Variable	Modified

REMARKS

1. None
2. None
3. None
4. Air is purged when replacing filter.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-455B -- (Continued)

DESCRIPTION: Fuel Oil Filters & Strainers: Strainers

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Clean strainer elements every R-Outage	R-Outage	Currently addressed in PM Program	Annually	Complete
<u>REMARKS</u>  5. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-465B-SB

DESCRIPTION: Lube Oil Lines External - Supports

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Redesign support 01-LO-PSA-7-423 Division I shown on SK-01-LO-PSA-7-419 to avoid an overstressed con- dition in the 3/8" diameter engine bolt and bent plate	Once	Will implement	Once	Scheduled RF01
<u>REMARKS</u>  1. None				

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-467A

DESCRIPTION: Turbocharger Small Bore Lube Oil Piping & Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect for leaks on a monthly basis	Monthly	Daily leak check	Daily	Complete
<u>REMARKS</u> 1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-467A-SB

DESCRIPTION: Turbocharger Lube Oil Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Add 2-direction, lateral restraints near the horizontal offsets in the 5/8" tubing between the lube oil header and the turbochargers to minimize the effects of engine induced vibration	Once	Will add restraints	Once	Scheduled RF01
<u>REMARKS</u>  1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-475A

DESCRIPTION: Turbocharger Bracket

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Each month for the first three months of commercial operation the turbo base bolts should be inspected to assure no bolt has loosened. If loose bolts found then inspect on annual or plant shutdown basis. See source document	Variable	Bolt material changed	Once	Modified

REMARKS

1. The GGNS D/G turbocharger base bolts were changed to a high strength carbon steel and the torque checked after an extended run. No preload relaxation was found during the check after this design change. The material change and the following torque check are considered to meet the intent of this recommendation.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-475B

DESCRIPTION: Turbocharger Bracket - Air Butterfly Valve Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the butterfly to shaft attachment pins for signs of distress	Once	Exception taken	N/A	Not Scheduled
2. Perform a visual inspection of the shaft for signs of wear. Determine hardness of shaft and roll pin	Once	Exception taken	N/A	Not Scheduled
3. Incorporate SIM 322	Once	Will Implement	Once	Will Implement
<u>REMARKS</u>  1. and 2.  The design review and analysis indicated that the shaft and roll pins are totally adequate to perform their intended function. The experience of this component only shows problems associated with lack of, or improper lubrication and no reported failures of pins or shaft. Lubrication at GGNS is adequate to service the moving parts associated with valve operation.  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-475B -- (Continued)

DESCRIPTION: Turbocharger Bracket - Air Butterfly Valve Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Verify the installation and alignment of the butterfly valve and document any cold spring of piping on valve reinstallation	Variable	Perform IAW vendors manual	Variable	Modified
5. Lube valve shaft via grease fittings every outage	R-Outage	Added to PMs	R-Outage	Complete
6. Check valve disc for freedom of movement every month	Monthly	Perform during 18 month PM or test	R-Outage	Modified
7. Verify that associated locking devices (jam nuts and lock washers) are tight every month	Monthly	Add to PMs	Monthly	Will Implement
<u>REMARKS</u>  4. Installation of the butterfly valve, if removed, will be performed in accordance with the vendors manual. 5. None 6. This recommendation is not considered feasible since the valve only closes on an overspeed signal when used in nuclear applications. To check for freedom of movement would require the insertion of an overspeed signal or the disassembly of the linkage - each of which increases the unavailability and the potential for error. The valve only provides a backup by strangulation in the event closure of the fuel rack did not shut the engine down. Valve closure will be checked during the 18 month test or PM. 7. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-500A

DESCRIPTION: Engine Control Cabinet

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect interior of cabinet for cleanliness and clean as required every outage	R-Outage	Added to PMs	R-Outage	Complete
2. Visually check wiring for insulation degradation	R-Outage	Added to PMs	R-Outage	Complete
3. Visually check instrument tubing for leaks every outage	R-Outage	Added to PMs	R-Outage	Complete
4. Functionally check cabinet heater and calibration of thermostat every outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  1. None 2. None 3. None 4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-500A -- (Continued)

DESCRIPTION: Engine Control Cabinet

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Test pneumatic S/D board logic every outage	R-Outage	In surveillance	R-Outage	Complete
6. Replace o-rings, gaskets and filter in pressure regulator every outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  5. None  6. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-500C

DESCRIPTION: Circuit Breakers and Contact Blocks

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check all terminals, clean/ tighten every outage	R-Outage	Added to PMs	R-Outage	Complete
2. Visually check wiring insula- tion for degradation every R-Outage	R-Outage	Added to PMs	R-Outage	Complete
3. Trip check circuit breakers every outage	R-Outage	Currently addressed in PM Program	6 Months	Complete
<u>REMARKS</u>  1. None  2. None  3. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-500G

DESCRIPTION: Control Panel Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and clean control panel valves every outage	R-Outage	Added to PMs	R-Outage	Complete
2. Inspect and clean the 200 mesh screen of check valve every R-Outage	R-Outage	Added to PMs	R-Outage	Complete

REMARKS

1. None
2. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-500J

DESCRIPTION: Control Panel Assembly - Control Relays

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. If the relays associated with the Syracuse timers should fail, the timer should be replaced with one of the higher rated voltage such as Syracuse timer, Model #TNR-D03813 and TNR-D03820	Once	Exception taken	N/A	Not Scheduled
2. Inspect contacts and clean as required every outage	R-Outage	Added to PMs	R-Outage	Complete
3. Visually check condition of wiring and tightness of terminations every outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  1. The GGNS DR/QR report indicates that the timer rating did not meet the 100 to 141 VDC design requirement, however, the vendor has stated the relays will actually withstand up to 170 VDC. The recommended replacements are of the same voltage rating as these presently used at GCNS. No further action is planned by MP&L on this items.  2. None  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-500N

DESCRIPTION: Control Panel Switches Terminal Boards & Wiring

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Clean terminal boards and switch contacts every outage	R-Outage	Added to PMs	R-Outage	Complete
2. Visually check wire insulation and terminals for tightness and degradation every outage	R-Outage	Added to PMs	R-Outage	Complete
3. Inspect for arcing and over-heating every outage	R-Outage	Added to PMs	R-Outage	Complete
4. Verify that no multi-amp states division terminal blocks manufactured between 1974 and 1976 are installed	Once	Complete	Once	Complete
<u>REMARKS</u>  1. None  2. None  3. None  4. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-515

DESCRIPTION: Thermostatic Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify the Amot (jacket water) valve is orientated IAW vendors manual by field inspection	Once	Complete	Once	Complete
2. Verify body material of the Robertshaw (lube oil) valve by field inspection	Once	Complete	Once	Complete
3. Inspect the jacket water and lube oil system for leakage on a daily basis	Daily	Perform during daily rounds	Daily	Complete
<u>REMARKS</u>  1. None  2. None  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-515 -- (Continued)

DESCRIPTION: Thermostatic Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Replace the thermal power elements at 3 to 5 year intervals	3-5 Years	Perform based on trend data	Variable	Modified
5. Visually inspect valve body for evidence of leakage every month	Monthly	Currently addressed in PM Program	Monthly	Complete

REMARKS

4. Trending data will provide indication of a potential problem with the thermal power elements and the need for inspection and replacement. As a backup, the valves can be manually controlled if the thermal power element should malfunction. MP&L is considered to be in compliance with the intent of this recommendation.
5. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-525B

DESCRIPTION: Barring Device Control Valve & Press Regulator

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Replace control valve "o" rings lube shaft every outage	R-Outage	Perform based on history	N/A	Modified
2. Replace press regulator elastomeric parts every five years	5 Years	Not GGNS component	N/A	Complete See Note 2

REMARKS

1. Will perform based on history. Barring device is for maintenance purposes only and does not affect operation of the engine.
2. Review of applicable drawings did not identify a barring device pressure regulator for the GGNS TDI D/Gs. Therefore, this recommendation is not considered applicable to GGNS.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-525C

DESCRIPTION: Barring Device Air Filter

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Replace filter element every refueling outage	R-Outage	Exception taken	N/A	Complete
2. Drain barring device air filter on a daily basis when barring device is in use	Daily	Exception taken	N/A	Complete See Note 2

REMARKS

1. GGNS does not have a filter on the barring device air supply.
2. The GGNS barring device has no filter to drain.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-540B

DESCRIPTION: Lube Oil Sump Tank

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that the bolted jointed connections are tight using leak tightness criteria	N/A	Leak check daily	Daily	Complete
2. Check lubrication oil with a viscosimeter for fuel oil dilution. Send a sample of oil to laboratory for analysis every month	Monthly	Currently addressed in PM Program	Monthly	Complete
3. Drain lubricating oil system and clean sump tank. Depending on the results of lube oil analysis, refill with new oil every outage	R-Outage	Drained based on oil sample	Variable	Modified
<u>REMARKS</u>  1. None  2. None  3. The lube oil system is drained and refilled based on the results of the monthly lube oil sample analysis.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-540B -- (Continued)

DESCRIPTION: Lube Oil Sump Tank

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Visually inspect lube oil sump tank level switch floats. Check switch set points every R-Outage	R-Outage	Retain present PM	Alt R-Outage	Modified

REMARKS

4. The level switches are presently calibrated on an alternate refueling outage schedule. This switch provides a level alarm only. With the daily checks in effect MP&L will retain the alternate refueling outage schedule unless operating history demonstrates otherwise.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-550

DESCRIPTION: Foundation Bolts

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Retorque generator bolts after a generator short circuit if the bolts were initially to 480 ft-lb. If initial bolt torque was 600 ft-lb no retorque is required	N/A	Replace generator	N/A	Modified
2. Visually inspect foundation for breaks in the bond between the sole plates and grout every R-Outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
3. Check foundation bolts for correct torque. Retorque as necessary then recheck crank-shaft web deflection	R-Outage	Currently addressed in PM Program	R-Outage	Complete

REMARKS

1. A generator damaged by a short circuit is generally replaced which requires removal and reinstallation and torquing of foundation bolts. Design features such as synchronization check relays, interlocked breakers and load sequencing also protect against an inadvertent instantaneous application of large inductive loads to the GGNS TDI EDGs. Thus, MP&L is considered to be in compliance with this recommendation.
2. None
3. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-630A

DESCRIPTION: Engine & Auxiliary Module Wiring Material

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Perform an upgrade to tighten, fix, replace, or add missing conduit supports as required	Once	Will perform	Once	Will Implement
2. Add supports to all Category I flexible conduits so that the maximum length between terminal points and supports is 3 feet	Once	Will perform	Once	Will Implement
<u>REMARKS</u>  1. None  2. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-630D

DESCRIPTION: Pyrometer Conduit Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check that each thermocouple's indicated temperature is consistent with the engine's ambient temperature when the engine is cold. Replace thermocouple if necessary. Perform every 18 months maintenance outage	R-Outage	Will perform	R-Outage	Will Implement
2. Remove, clean and inspect each thermocouple and thermocouple shield for indications of fatigue. Replace thermocouple shield if necessary	Alt R-Outage	Monitor via trending program	N/A	Modified

REMARKS

- None
- The lead DR/QR report indicates that a fatigue analysis was performed using the Goodman criteria and allowing for elevated temperature effects. The analysis found that a minimum factor of safety of 20.2 in the area of highest stress and concluded that the thermocouples were adequate for their intended function. The only other operating experience was damaged thermocouples during installation while the two failures were listed as cause unknown. Cylinder temperatures will be included in the trending program which would identify a malfunction or failure of a thermocouple. MP&L plans no further action on this item.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-630D -- (Continued)

DESCRIPTION: Pyrometer Conduit Assembly

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Pyrometer wiring-check that terminations are tight during control panel checkout and initial operation inspection	Once	Complete	Once	Complete
<u>REMARKS</u>  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-650B

DESCRIPTION: Control Panel Terminal Blocks

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify that no multi-amp states division terminal blocks manu- factured between 1974 and 1976 are installed	Once	Complete	Once	Complete
<u>REMARKS</u>  1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-695A

DESCRIPTION: Engine Shutdown Equipment - Tubing/Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Add two direction lateral restraints on Lines E16, E45, E46, E20, E89, E53, and E31R. See source document for details	Once	Will perform	Once	Scheduled RF01
2. Modify supports associated with SK-01-FO-PSR-7-041, 042, SK-01-60-PSR-7-210 and 211 to accept two-directional lateral loading by attaching to a rigid mounting surface	Once	Will perform	Once	Scheduled RF01
<u>REMARKS</u>  1. None  2. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-695A -- (Continued)

DESCRIPTION: Engine Shutdown Equipment - Tubing/Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Modify supports associated with SK-02-FO-PSR-7-040, 042, 043, 044, 045, 046, and 047 to accept two-directional lateral loading by (a) adding plates, (b) adding spacers, and (c) eliminating bending. See document for details	Once	Will perform	Once	Scheduled RF01
4. Modify supports associated with SK-01-LO-PSR-7-037 to accept two-directional lateral loading by increasing the cover plate thickness and tightening the screws to a minimum torque of 21 in-lb to develop proper friction	Once	Will perform	Once	Scheduled RF01
<u>REMARKS</u>  3. None  4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-695A -- (Continued)

DESCRIPTION: Engine Shutdown Equipment - Tubing/Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Modify supports associated with SK-01-JW-PSR-7-039 to accept two-directional lateral loading by adding a cover plate and spacers to provide proper bearing	Once	Will perform	Once	Scheduled RF01
6. Modify supports associated with SK-01-LO-PSR-7-036 to accept two-directional lateral loading by adding a plate on each screw in order to provide a maximum clearance of 1/16" on each end	Once	Will perform	Once	Scheduled RF01
<u>REMARKS</u>  5. None  6. None				

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-695A -- (Continued)

DESCRIPTION: Engine Shutdown Equipment - Tubing/Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
7. Modify supports associated with SK-01-FO-PSR-7-201 be replaced with a bracket which will eliminate excessive clearance around tubes. Two screws are to be used for mounting the bracket	Once	Will perform	Once	Scheduled RF01
<u>REMARKS</u>  7. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-695B

DESCRIPTION: Engine Shutdown Equipment - Valves, Regulators, Orifices

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect and clean the engine shutdown equipment. The elastomeric parts in the pressure regulator and all valves be replaced during the refueling outage. Reassess the inspection interval depending on the degree of fouling	R-Outage	Add to PMs for 5 years	5 Years	Modified

REMARKS

1. Replacement of elastomeric elements in the pneumatic shutdown system on a refueling outage frequency is not consistent with the 5 year maintenance interval for other control devices and is considered to be overly conservative. Also, any disassembly of components of this hybrid pneumatic control system increases the potential for malfunction due to possible human error and particle contamination. MP&L will perform this function at 5 years.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-695C

DESCRIPTION: Engine Control Pneumatic Trip Switches

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check switch setpoints every R-Outage	R-Outage	Retain present PM schedule	R-Outage and Alt- Outage	Modified
2. Replace elastomeric parts every five years	5 Years	Add to PMs	5 Years	Will Implement

REMARKS

1. Switch setpoints are presently functional checked or calibrated on a refueling outage or alternate refueling outage basis depending on the particular function of the switch and past experience. This has been satisfactory to date, therefore, MP&L plans no further action on this item.
2. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717B

DESCRIPTION: Oil and Water Piping Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Packing should be inspected for leakage on a monthly basis	Monthly	Daily leak checks	Daily	Complete
2. Elastomeric parts should be replaced every five years	5 Years	Exception taken		Not Scheduled

REMARKS

1. None
2. Review of the lead DSRV-16 DR/QR Report indicates that this recommendation was based on the presence of a Circle Seal valve in the jacket water system for that diesel. Review of documentation for the GGNS diesels did not identify Circle Seal valves in the jacket water systems of the GGNS TDI diesels. Based on this, MP&L plans no further action on this item.



GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717C

DESCRIPTION: Auxiliary Sub-Base and Oil and Water Small Bore Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect for leaks on monthly basis. See source document	Monthly	Daily leak check	Daily	Complete
<u>REMARKS</u> 1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717F

DESCRIPTION: Auxiliary Sub-Base Lube Oil Pipe & Fittings

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Clean and inspect L.O. keep-warm pump suction strainer every outage.	R-Outage	Cleaned at oil change	Variable	Modified
2. Visually inspect for leaks on a monthly basis. See source document	Monthly	Daily leak check	Daily	Complete

REMARKS

1. The sump strainer which could be considered the L.O. keep-warm pump suction strainer is inspected and cleaned when the lube oil is changed.
2. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717G

DESCRIPTION: Auxiliary Sub-Base and Oil and Water Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check lift pressure for the relief valves on a five year basis	5 Years	Currently addressed in PM Program	54 Months	Complete
<u>REMARKS</u>  1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717H

DESCRIPTION: Auxiliary Sub-Base and Oil and Water Piping

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. To verify leak tightness of the lube oil piping flanges, walk down the auxiliary piping daily	Daily	Leak check daily	Daily	Complete
<u>REMARKS</u>  1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717K

DESCRIPTION: Auxiliary Sub-Base and Oil and Water Piping - Fuel Oil: Valves

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Verify the proper orientation of the check valves, relief valves, and a three-way valve for the fuel oil system by a field inspection	Once	Complete	Once	Complete
2. Inspect, clean, and lubricate (as necessary) the check valves relief valves, and a three-way valve annually or during each shutdown	R-Outage	Retain present PMs	Variable	Modified
3. Check the relief valve lift pressure every five years	5 Years	Currently addressed in PM Program	54 Months	Complete

REMARKS

1. None
2. These valves are installed in the fuel oil system. The check valves are included in the ISI program and the reliefs removed and setpoint pressure set every five years. Since the valves are in the fuel oil system lubrication should not be necessary with the possible exception of the relief valves which would be identified during the setpoint check. A three-way valve is on the duplex filter, however, this recommendation is not considered feasible for this application. MP&L considers the present PMs sufficient to meet the intent of the recommendation.
3. None

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-717L

DESCRIPTION: Auxiliary Sub-Base and Oil and Water Piping - Fuel Oil: Gaskets & Bolt

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Daily walkdown the auxiliary piping to verify leak tightness of the fuel oil piping flanges	Daily	Will perform	Daily	Complete
<u>REMARKS</u> 1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-810A

DESCRIPTION: Misc Equipment - Heater, Jacket Water Standpipe

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Measure heater insulation resistance and replace heater if degradation of insulation resistance is noted at 18 month intervals	R-Outage	Retain present frequency	Alt R-Outage	Modified
2. Thoroughly clean heater element of deposits and inspect for signs of deterioration at 18 month intervals	R-Outage	Added to PMs	R-Outage	Complete
3. Check the calibration and inspect condition of thermostat and recalibrate or replace thermostat when necessary at 18 month interval	R-Outage	Retain present frequency	Alt- R-Outage	Modified
<u>REMARKS</u>  1. Temperature alarms are provided for indication of thermostat or heater malfunction and will indicate if the present frequency needs to be shortened or lengthened, therefore, MP&L will retain their present frequency for this PM.  2. None  3. Temperature alarms are provided for indication of thermostat or heater malfunction and will indicate if the present frequency needs to be shortened or lengthened, therefore, MP&L will retain their present frequency for this PM.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-820A

DESCRIPTION: Misc Equipment - Heater Lube Oil Sump Tank

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Perform maintenance included in the TDI Manual during the lube oil sump cleaning	N/A	IAW vendors manual	N/A	Complete
2. At 18 month intervals, measure heater insulation resistance and replace heater if degradation of insulation resistance is noted	R-Outage	Retain present frequency	Alt R-Outage	Modified
<u>REMARKS</u>  1. None  2. The GGNS and lead DR/QR reports both state that there is no history of component malfunction or failure in the nuclear or non-nuclear industries, therefore MP&L will retain the present frequency for this recommendation.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-820A -- (Continued)

DESCRIPTION: Misc Equipment - Heater Lube Oil Sump Tank

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. At 18 month intervals, thoroughly clean heater element of coking and other deposits and inspect for signs of deterioration	R-Outage	Added to PMs	R-Outage	Complete
4. At 18 month intervals, check calibration and inspect condition of thermostat and recalibrate or replace thermostat when necessary	R-Outage	Retain present frequency	Alt-Outage	Modified
<u>REMARKS</u>  3. None  4. Temperature alarms are provided for indication of thermostat or heater malfunction and will indicate if the present frequency needs to be shortened or lengthened, therefore, MP&L will retain their present frequency for this PM.				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: 02-820B

DESCRIPTION: Full Flow Lube Oil Filter

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. When the filter is replaced, visually inspect it to determine the nature of the material caught in the filter	Variable	Add to PM	Variable	Will Implement
2. Check the differential pressure on a monthly basis and change the filter cartridge at 20 psid	Monthly	In surveillance test	Monthly	Complete
3. Drain water and/or sludge from lubricating oil full flow filter every month	Monthly	Sump sampled for water	Monthly	Modified
4. Lube oil filter gauge - calibration check every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
<u>REMARKS</u>  1. None 2. None 3. A sample is pulled from the bottom of the lube oil sump on a monthly basis to determine if there is an accumulation of water. 4. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: E001

DESCRIPTION: Diesel Generator

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Observe and record lubricating oil and jacket water temperatures. Keep warm pump running	Daily	Will perform	Daily	Complete
2. Drain all low point water collectors, barring device air filter, and air receiver tank float traps in the air start system	Daily	Will perform	Daily	Modified
3. Check engine and auxiliary equipment and piping connections for oil, water, and fuel oil leaks	Daily	Will perform	Daily	Complete
<u>REMARKS</u>  1. None  2. GGNS does not have a filter on the barring device.  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: E001 -- (Continued)

DESCRIPTION: Diesel Generator

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Check level of lubricating oil in the governor and pedestal bearing. Add oil as needed	Daily	Will perform	Daily Monthly	Modified
5. Check fuel oil pump rack for freedom of movement through full limit of travel. Do not disconnect from governor	Daily	Will perform	Daily	Complete
6. Drain water from crankcase vent piping drip legs	Daily	Will perform	Daily	Complete
7. Verify all controls in proper position for standby mode	Daily	Will check monthly	Monthly	Modified
<u>REMARKS</u>  4. Pedestal bearing oil level is checked daily and governor oil level checked monthly. Daily checks are also made for any oil leaks on the engine. Leakage can be identified, corrected and oil added as necessary. MP&L considers this to meet the intent of this recommendation.  5. None  6. None  7. Following the completion of the monthly surveillance test all controls are checked for proper position for the standby mode and are independently verified as being in the correct position. Sufficient procedural controls are in place to address the intent of this recommendation therefore MP&L will retain the present monthly verification.				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: E001 -- (Continued)

DESCRIPTION: Diesel Generator

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
8. Check all governor knob settings: Load maximum droop zero, speed to provide mechanical governor control at 450 RPM	Daily	See Part No. 02-415A	N/A	See Part No. 02-415A
9. Visually inspect lube oil heat exchanger and jacket water heat exchanger for signs of leakage from the latern ring leakoff ports indicating leaking packing rings	Daily	Daily leak check	Daily	Complete
10. Record all operating parameters Compare with baseline data to ensure engine is operating properly every month	Monthly	Will perform	Monthly	Complete
<u>REMARKS</u>  8. None  9. None  10. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: E001 -- (Continued)

DESCRIPTION: Diesel Generator

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
11. Inspect, clean and as applicable, lubricate manual valves on skid every outage	R-Outage	Will perform	R-Outage	Complete
12. Remove alternate left side doors and examine the inside of the engine for any abnormal conditions. Check with a good light for evidence of babbitt flakes	R-Outage	Currently addressed in PM Program	R-Outage	Complete
13. Modify system or procedures to perform a modified air roll of the diesels when required	Once	Exception taken	N/A	Not Scheduled

REMARKS

11. None

12. None

13. The Owners Group recommends performing a modified air roll while the D/G is in standby. A diesel in standby with the cylinder cocks open is considered a potential safety hazard to personnel doing the air roll if an auto start signal is received at the time. MP&L will not implement this recommendation due to the potential personnel safety hazard. However, MP&L performs air rolls with the D/G in the Maintenance Mode.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: F-068

DESCRIPTION: Intercooler

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Disassemble and clean inter-cooler at each refueling outage or as necessary. Inspect shell and tube sides	R-Outage	Clean based on trend data	Variable	Modified
2. Verify open and clean daily the drain connection on the air intake system low point	Daily	Perform during monthly surveillance	Monthly	Modified
3. Evaluate intercooler heat exchanger performance by checking engine operating parameters on a monthly basis	Monthly	Recorded monthly	Monthly	Complete
4. Visually inspect intercoolers for external leaks on a monthly basis	Monthly	Daily leak check	Daily	Complete
<u>REMARKS</u>  1. The intercooler will be cleaned based on trend data.  2. Verification of the drain being open will be done when the intake header is pressurized during the monthly test run.  3. None  4. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-101A

DESCRIPTION: Emergency Generator

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check operation of brushes and slip rings every month	Monthly	Inspect and clean annually	Annually	Modified
2. Clean/inspect all accessible parts of the generator every R-Outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
3. Megger rotor and stator every R-Outage	R-Outage	Added to PMs	R-Outage	Complete
4. Verify operation of space heaters every month	Monthly	Added to PMs	Monthly	Complete
5. Measure vibration and check against base line data every R-Outage	R-Outage	Vibration data monthly	Monthly	Modified

REMARKS

1. Based on an average run time of 12 to 30 hours a year the annual inspection and cleaning of the generator brushes and slip rings is considered adequate and meets the intent of this recommendation. MP&L plans no further action on this item.
2. None
3. None
4. None
5. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-101B

DESCRIPTION: Emergency Generator Pedestal Bearing

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Drain flush refill bearing housing every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Measure bearing housing insulation resistance every outage	R-Outage	Added to PMs	R-Outage	Complete
3. Disassemble and inspect clearances every five years	5 Years	Added to PMs	5 Years	Will Implement
4. Check ring oilers for proper operation and verify oil level during every test run	Monthly	Oil level verified Add ring oilers to PM	Monthly	Will Implement

REMARKS

1. None
2. None
3. None
4. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-103

DESCRIPTION: Jacket Water Heat Exchanger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Flush jacket water heat exchanger and associated service water piping on a daily basis in the engine standby mode. (Continuous service flow is sufficient) or control service water chemistry	Daily	Control water chemistry	Variable	Complete
2. Replace the packing rings when packing becomes hard or leakage at the packing is noted and cannot be stopped by tightening	Variable	Replace at outage	R-Outage	Modified

REMARKS

1. Service water chemistry is controlled therefore MP&L is considered in compliance with this recommendation.
2. The packing rings are replaced when the exchanger is inspected at each outage and leak checks are made on a daily basis therefore MP&L is considered in compliance with this recommendation.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-103 -- (Continued)

DESCRIPTION: Jacket Water Heat Exchanger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
3. Record heat exchanger performance by checking engine operating parameters every month	Monthly	During monthly surveillance	Monthly	Complete
4. Evaluate heat exchanger performance data every outage	R-Outage	Evaluate via trending	Variable	Modified
5. Inspect tubes, and tube sheet for fouling and erosion - remove entrance and exit covers	R-Outage	Currently addressed in PM Program	R-Outage	Complete
6. Check pH factor of jacket water and correct as recommended by chemical supplier every month	Monthly	Sampled monthly	Monthly	Complete

REMARKS

- 3. None
- 4. The heat exchanger performance will be monitored through the use of a trending program.
- 5. None
- 6. None

GCNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-103 -- (Continued)

DESCRIPTION: Jacket Water Heat Exchanger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
7. Perform daily inspection for leaks at packing when D/G is in standby mode	Daily	Daily leak check	Daily	Complete
8. Inspect and clean lantern ring at outage. Verify leak-off holes are not plugged	R-Outage	Included in PMs	R-Outage	Complete

REMARKS

7. None

8. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-104

DESCRIPTION: Lube Oil Heat Exchanger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Inspect the tubes and tube sheet of the heat exchanger tube side for signs of fouling, corrosion, etc.	R-Outage	Currently addressed in PM Program	R-Outage	Complete
2. Perform spectrochemical analysis of the lube oil on a quarterly basis	Quarterly	Sampled monthly	Monthly	Complete
3. Record heat exchanger performance by checking engine operating parameters every month	Monthly	Recorded during surveillance	Monthly	Complete
<u>REMARKS</u>  1. None  2. None  3. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-104 -- (Continued)

DESCRIPTION: Lube Oil Heat Exchanger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Evaluate heat exchanger performance data every outage	R-Outage	Monitor by trending	Variable	Modified
5. Replace packing rings at the floating tube sheet during reassembly after each inspection	R-Outage	Currently addressed in PM Program	R-Outage	Complete
6. Perform daily inspection for leaks at packing when D/G is in standby mode	Daily	Daily leak check	Daily	Complete
7. Inspect and clean lantern ring at outage. Verify leak-off holes are not plugged	R-Outage	Included in PMs	R-Outage	Complete

REMARKS

4. The lube oil heat exchanger performance will be monitored through the use of a trending program. Therefore MP&L is considered in compliance with this recommendation.
5. None
6. None
7. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-109

DESCRIPTION: Lube Oil System - Aux Lube Oil Pump

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check mechanical seal leakage every month	Monthly	Daily leak check	Daily	Complete
2. Check operation of pump/motor bearings every month	Monthly	Record operating parameters	Monthly	Modified
3. Clean, inspect and megger motor every outage	R-Outage	Meggar at 2 years	2 Years	Modified
4. Check coupling alignment every R-Outage	R-Outage	Check when disassembled	Variable	Modified
5. Record pump discharge pressure every month	Monthly	Will perform	Monthly	Complete

REMARKS

1. None
2. Deterioration of the pump or pump motor and bearings will be detected by the trending of the data taken during the monthly run for the ISI program and the trending program. MP&L considers this to met the intent of this recommendation and plans no further action on this item.
3. Past operating history has not indicated any need to shorten this frequency, therefore, MP&L will retain the present frequency for this task.
4. Coupling alignment is checked whenever the pump is being reassembled as standard practice.
5. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-109 -- (Continued)

DESCRIPTION: Lube Oil System - Aux Lube Oil Pump

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
6. Measure unit vibration (pump/motor) every outage	R-Outage	Utilize trend data	Monthly	Modified
7. Daily inspect the pump for signs of leakage and modifications be implemented as necessary	Daily	Daily leak checks	Daily	Complete
8. The pump should be inspected for signs of leakage and corrective modifications made as necessary. To be performed daily	Daily	Daily leak check	Daily	Complete

REMARKS

6. ISI data is acquired on the pump on a monthly basis and provides an indication if the condition of the pump is deteriorating. MP&L considers this to meet the intent of this recommendation.
7. None
8. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-111

DESCRIPTION: Flex Connection-Turbo Intake, Intercooler, Exhaust

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect for evidence of cuts, holes, or dents every alternate outage	Alt R-Outage	Include in PMs	Alt R-Outage	Will Implement
<u>REMARKS</u>  1. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-113/14

DESCRIPTION: Diesel Starting Air Compressors

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Check operating oil pressure every month and perform overall visual inspection	Monthly	Check when operating	N/A	Modified
2. Clean fins on inter and after coolers every outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
3. Replace intake filter elements every outage	R-Outage	Cleaned quarterly	Quarterly	Modified
4. Change compressor oil every R-Outage	R-Outage	Change based on oil sample	Variable	Modified

REMARKS

1. Check when compressor is run.
2. None
3. Cleaning quarterly is considered more conservative than replacement on an outage basis.
4. The oil is changed based upon the results of the quarterly oil samples. This is considered the superior approach to oil changes on the compressors.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-113/14 -- (Continued)

DESCRIPTION: Diesel Starting Air Compressors

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
5. Check belt tension every R-Outage	R-Outage	Currently addressed in PM Program	Annually	Complete
6. Check pulley clamp bolts/set screws tight	R-Outage	Currently addressed in PM Program	Annually	Complete
7. Inspect filter felts on unloader system every outage	R-Outage	Exception taken	N/A	Not Scheduled

REMARKS

5. None

6. None

7. Review of documentation on compressors did not identify filter felts as a GGNS component. MP&L plans no further action on this item.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-115

DESCRIPTION: Air Dryers & Moisture Traps

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Blow down trap sediment bowls every month	Monthly	Will perform	Monthly	Will Implement
2. Inspect and service moisture traps every outage	R-Outage	Currently addressed in PM Program	6 Months	Complete
3. Check proper operation of desiccant dryer every month	Monthly	Will perform	Daily	Complete
<u>REMARKS</u>  1. None  2. None  3. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-118

DESCRIPTION: Intake Air Filters

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Visually inspect the oil distribution plate and change the filter oil	R-Outage	Based on oil sample taken every 6 months	6 Months	Modified

REMARKS

1. The above recommendation is performed based on oil sample results which is considered more conservative than every outage. Therefore, MP&L will retain the present PM.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Monitor diode temp (275°) before and after running engine If temperature exceeded, per- form electrical test of diode remove diode from heatsink and inspect threads. Replace diode and heat sink as required. Assure 300 in-lb	Variable	Implemented	Variable	Complete
<u>REMARKS</u>  1. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
2. Monitor SCR temp (200°) before and after running engine. If temperature exceeded, perform electrical test of SCR, remove SCR from heatsink and inspect threads. Replace SCR and heat sink as required. Assure 275 in-lb	Variable	Implemented	Variable	Complete
3. Coat heatsink lugs and mounting bolt for lugs with glyptol lacquer and inspect connections after each monthly test. Re-tighten loose connections and remove and reapply glyptol if connections are retightened	Monthly	Monthly task	Monthly	Complete

REMARKS

2. None

3. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Coat adjustment screw for each of 5 adjustment potentiometers with glyptol lacquer and inspect after each monthly run to ensure no motion. If adjustments are needed remove and reapply lacquer	Monthly	Monthly task	Monthly	Complete
5. After each monthly run inspect the components mounted on the printed circuit board for cleanliness and proper mounting Report any abnormal conditions to engineering for evaluation	Monthly	Monthly task	Monthly	Complete
6. Maintain an adequate supply of spare parts	N/A	Spare parts by usage	N/A	Complete

REMARKS

- 4. None
- 5. None
- 6. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
7. Replace FF relay by an equivalent DC contactor rated as follows: Coil voltage 90-140 V contact voltage 140 V DC; contact current 90 A DC. Relay should be enclosed type. Voltage reduction circuit may be needed	Once	Present design adequate	N/A	Not Scheduled
8. Remount linear reactors so that cooling slots in the coils are vertically oriented in accordance with Portec recommendations Remounting not needed if forced ventilation provided through slots or air cooled to 40° C	Once	Provide cooling	Once	Complete

REMARKS

7. This DR/QR recommendation was based on the specifications contained in the procurement document for the DC power supply. Subsequent correspondence with Peebles-Electric Products Inc. indicates that the field flashing relay is adequately rated and that operation of the relay at voltage between 90 and 105 VDC is not a valid operational requirement. Also the minimum voltage at GGNS is 105 VDC which insures operation of the field flashing relay. MP&L has also contacted the manufacturer of the relay, ITE Corp., and confirmed that the contactor would pickup at 90 VDC. Therefore, MP&L has concluded that replacement of the contactor is not required and plans no further action on this item.

8. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
9. Ventilate bridge rectifier assemblies in exciter cabinet so that air temp does not exceed 10°C above air temperature in diesel room. Take care to avoid condensation	Once	Provide cooling to panel	Once	Complete
10. Mount diodes and SCRs on the heat sinks with drilled holes, nuts, and lockwashers and tightened to proper torque	Once	Inspected	Once	Will Implement
<u>REMARKS</u>  9. None  10. None				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
11. Redesign bolted-on lug arrangement so that there are no more than two lugs on each bolt	Once	Inspected	Once	Will Implement
12. Remove anodizing in the contact areas of all bolts and bus bar studs	Once	Will perform at R-Outage	Once	Will Implement
13. Do not separate the current carrying surfaces of lugs by washers or nuts	Once	Inspected	Once	Not Scheduled

REMARKS

11. None

12. None

13. The current carrying surface of the lugs is directly mounted on the back side of the diode assembly without washer or nut. The bolt mounted on the front of the diode is used as if it is a bus bar for other lug's connections which are separated by nuts and washers. Thus, MP&L will not implement this recommendation.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
14. Replace 500 OHM, 25 W resistor in accordance with IEEE 650-1979. Mount resistor so that it is not directly below the circuit board	Once	Will perform	Once	Scheduled RF01
15. Modify bottom section of potentiometer enclosure to provide slots which support convection air exchange	Once	Will modify	Once	Scheduled RF01
16. Replace any integrated circuit in the TO-5 package with those of the dip or mini-dip package	Once	Inspected	N/A	Not Scheduled

REMARKS

14. None

15. None

16. The voltage regulator boards for both TDI EDG's were inspected to determine mounting of integrated circuits in the TO-5 packages. For EDG-11 the TO-5 package is only used on the manual voltage regulator board which is isolated from the automatic voltage regulator board. These are secured adequately. Dual-in-line packages are used on the automatic voltage regulator board and are directly soldered to the printed circuit board. For EDG-12 both the manual and automatic voltage regulator boards have the TO-5 metal can packages however, they are soldered directly to the printed circuit boards which complies with the intent of these recommendations. MP&L plans no further action on this item.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
17. Remount the PTs and CTs so that cooling slots in the coils are vertically oriented in accordance with Portec recommendations	Once	Cooling being provided to panel	Once	Modified
18. Bypass power supply terminals of each individual IC with a 0.01-0.1 $\mu$ F ceramic capacitor from supply terminal to ground. Bypass high current buffers with 0.1 $\mu$ F capacitors	Once	None required	N/A	N/R

REMARKS

17. Cooling being provided to panel, will re-evaluate after further temperature data obtained.

18. Long term enhancement left to MP&L's discretion.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
19. A large value capacitor (approximately 10 $\mu$ F) is required for voltage regulator of AMP U1 with paralleling due to presence of CR31 and CR32	Once	None required	N/A	N/R
20. Use shielded signal leads for the connections between the motor-driven potentiometer and the voltage regulator	Once	None required	N/A	N/R

REMARKS

19. Long term enhancement left to MP&L's discretion.

20. Long term enhancement left to MP&L's discretion.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
21. Install a high frequency bypass capacitor providing an in-circuit low frequency cutoff of no less than 1KHZ to reduce high frequency noise on the feedback signal without interfering with the feedback loop operation	Once	None required	N/A	N/R
22. Run the leads for the SCR gate signals in separate bundles away from the current carrying leads	Once	None required	N/A	N/R

REMARKS

21. Long term enhancement left to MP&L's discretion.

22. Long term enhancement left to MP&L's discretion.



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
23. Replace the single-phase current sensing circuit with a three-phase current sensing circuit	Once	None required	N/A	N/R
24. Solder the eight integrated circuits on the PC board which are presently mounted in sockets directly to the PC board	Once	None required	N/A	N/R
25. Replace voltage range and stability adjustment potentiometers (R4 and R5) with Mil style, sealed, multi-turn potentiometers	Once	None required	N/A	N/R

REMARKS

23. Long term enhancement left to MP&L's discretion.
24. Long term enhancement left to MP&L's discretion.
25. Long term enhancement left to MP&L's discretion.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
26. Use a Nema Grade 6-10 glass epoxy board for the PC board	Once	None required	N/A	N/R
27. Use a double sided PC board	Once	None required	N/A	N/R
28. Conformally coat the PC board	Once	None required	N/A	N/R
29. Mount the PC board in metallic enclosure that is electrically grounded and constructed of high magnetic permeability material	Once	None Required	N/A	N/R

REMARKS

26. Long term enhancement left to MP&L's discretion.
27. Long term enhancement left to MP&L's discretion.
28. Long term enhancement left to MP&L's discretion.
29. Long term enhancement left to MP&L's discretion.

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GC-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
30. Solder components directly to PC board. If sockets are used, retaining mechanisms must be provided to hold the components in the sockets	Once	None required	N/A	N/R
31. Inspect panel for cleanliness and clean as required	R-Outage	Added to PMs	R-Outage	Complete
32. Check terminal boards for loose wiring every outage	R-Outage	Added to PMs	R-Outage	Complete
33. Visually check condition of wire insulation for degradation every outage	R-Outage	Added to PMs	R-Outage	Complete
<u>REMARKS</u>  30. Long term enhancement left to MP&L's discretion.  31. None  32. None  33. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-119 -- (Continued)

DESCRIPTION: Generator Controls

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
34. Clean and inspect relay contacts every outage	R-Outage	Added to PMs	R-Outage	Complete
35. Check meter calibrations every R-Outage	R-Outage	Perform at alternate outage	Alt- R-Outage	Modified
<u>REMARKS</u>  34. None  35. GGNS presently checks meter calibrations on an alternate outage basis. To date operating history has not indicated a need to increase this frequency, therefore, MP&L plans no further action on this item.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: GG-121

DESCRIPTION: Oil Prelube Filter

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Change out the filter element when the differential pressure reaches the manufacturers recommended maximum D/P. Record the differential pressure on a monthly basis	Monthly	Record pressure	Monthly	Modified
<u>REMARKS</u>  1. The differential pressure is not directly recorded. The prelube filter inlet and outlet pressures are recorded during the monthly surveillance test. Therefore, MP&L is considered in compliance with this recommendation.				

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: MP-022/023

DESCRIPTION: Turbocharger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Initiate the lube oil pump flow prior to engine starting and stop when full oil pressure is obtained	Engine Start	Prior to planned start	Engine Start	Complete
2. Retain the drip lube system and maintain 0.1 GPH flow of oil through turbocharger	N/A	Drip flow of .06 GPM retained	N/A	Modified
3. Measure rotor end play (axial clearance) in accordance with TDI instruction manual at each R-Outage	R-Outage	Measure rotor end play	R-Outage	Complete

REMARKS

1. None
2. Past inspection results have demonstrated that the present drip flow at GGNS is sufficient for the turbochargers. Increasing the flow increases the potential for oil in the exhaust manifold and thus fires. Also, the engine oil is sampled on a monthly basis at the inlet to the oil filter while the engine is running. This will identify any abnormal wear or problems with the turbocharger thrust bearing. Therefore, GGNS will retain the present drip system and flow.
3. None



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: MP-022/023 -- (Continued)

DESCRIPTION: Turbocharger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
4. Visually inspect and blue all thrust bearings for excessive wear and (if necessary) replace after 40 non-lubed (automatic) fast starts. Otherwise perform every five years	5 Years	5 Year PM	5 Years	Modified
5. Review rotor axial clearances for trends of increasing clearance indicating thrust bearing degradation following measurement	N/A	Establish trend program	N/A	Will Implement

REMARKS

4. The turbochargers are inspected on a five year PM and rotor floats are measured every outage. Trending of the rotor float clearances on an 18 month basis will provide an accurate indication of thrust bearing wear and is more conservative than after 40 non-prelubed starts. During the monthly surveillance test the engine oil is sampled at the inlet to the oil filter while the engine is running. Any abnormal wear of the thrust bearing will be indicated by the analysis of this sampling. Therefore, the five year inspection of the turbocharger will be retained.
5. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: MP-022/023 -- (Continued)

DESCRIPTION: Turbocharger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
6. Incorporate Spectrochemical engine oil analysis into the TDI Instruction Manual and perform ferrographic engine oil analysis with attention to copper and particulate size. Perform during last run prior to oil change. Sample upstream of filter	Oil change	Sample monthly while running	Monthly	Modified
7. Check turbocharger bearing lubricating oil system sight glass for oil flow	Daily	Will perform	Daily	Complete

REMARKS

6. Oil is presently sampled on a monthly basis at the inlet to the oil filter while the engine is running. MP&L considers this frequency to be more conservative than the above recommendation. This frequency will be evaluated in the future and adjusted accordingly as operating history indicates.
7. None

GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: MP-022/023 -- (Continued)

DESCRIPTION: Turbocharger

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
8. Clean impeller and diffuser at each outage	R-Outage	Currently addressed in PM Program	R-Outage	Complete
9. Disassemble, inspect and refurbish every five years	5 Years	Currently addressed in PM Program	5 Years	Complete
10. Measure vibration and check with base line data at each R-Outage. Perform during 24 hour test run	R-Outage	Vibration data monthly	Monthly	Complete
<u>REMARKS</u>  8. None  9. None  10. None				



GGNS TDI DIESEL GENERATOR FINAL DRQR REPORT  
Summary of OG Recommendations and MP&L Actions

PART NO: SE-025

DESCRIPTION: Lube Oil Full Pressure Strainer

OWNERS GROUP RECOMMENDATION	OG FREQUENCY	MP&L ACTION	MP&L FREQUENCY	IMPLEMENTATION STATUS
1. Record strainer differential pressure on a monthly basis for use as trend data	Monthly	In surveillance	Monthly	Complete
2. Inspect and clean the strainer at each outage or when the differential pressure increases significantly as indicated by trend data	R-Outage	Performed on annual basis	Annually	Complete
3. Lube oil strainer pressure gauge - calibration and check every outage	R-Outage	Calibrate alternate outage	Alt R-Outage	Modified
<u>REMARKS</u>  1. None  2. None  3. Numerous oil pressure readings are taken for trending purposes and will indicate any need for gauge calibration more frequent than every alternate outage.				

ATTACHMENT 5.

LETTERS FROM TRANSAMERICA DELAVAL  
AND MORRISON-KNUDSEN

**Transamerica  
Delaval**



Transamerica Delaval Inc.  
Engine and Compressor Division  
550 85th Avenue  
P.O. Box 2161  
Oakland, California 94621  
(415) 577-7400

September 24, 1985

Mississippi Power and Light  
Grand Gulf Nuclear Station  
Grand Gulf Road  
Energy Services Center  
Port Gibson, Mississippi 39150

Attention: Mr. C.W. Angle

Subject: Transamerica Delaval Engines S/N 74033/36  
DR/QR Report For Grand Gulf Nuclear Station

Gentlemen:

We have completed our review of MP&L's evaluation and actions for each of the recommendations contained in the G.G.N.S. DR/QR report. We believe that this program as presented and modified during subsequent phone conversations is a comprehensive and conservative inspection and maintenance program to insure the reliability of the emergency diesel generators. We would appreciate it if you could send us a copy of the final report when it's completed.

It has been a pleasure to be of service, if this office can be of any further assistance, please do not hesitate in contacting us.

Very truly yours

Robert Johnston  
Field Engineer  
Engineering Resources Group

RJ:krr



**MORRISON-KNUDSEN COMPANY, INC.**  
POWER SYSTEMS DIVISION

REFERENCE: MK/PSD IWO 6951  
MP&L Order M-98728

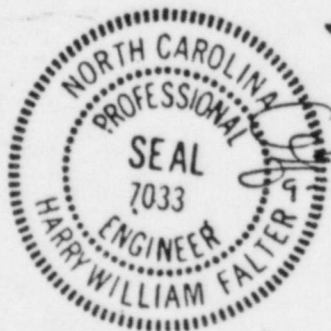
SUBJECT: Grand Gulf Nuclear Station - Unit 1  
MP&L Evaluation of the TDI Diesel  
Generator Owners Group Design Review/Quality  
Revalidation Report for the GGNS TDI Diesel Generator

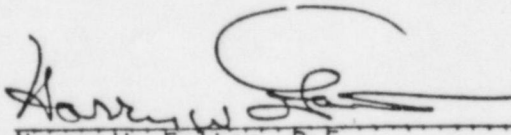
I have reviewed the MP&L evaluation of the TDI Diesel Generator Owners Group Diesel Review/Quality Revalidation Report for the GGNS TDI Diesel Generator.

As I reviewed the MP&L report, I was impressed by the effort expended and the attention given to each of the Owners Group recommendations.

In addition to the Owners Group recommendations, MP&L will implement a Trending Program and a Training Program. Only the general outlines have been established at this time from which the detailed programs will be developed.

In my judgement, the MP&L plan relative to the Owners Group recommendations, together with the Trending and Training Programs, is designed to maintain the TDI Diesel Generator in a state of high reliability ready to perform the safety function.



  
Harry W. Falter, P.E. 9-24-85  
Date