

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSIONDOCKETED  
USNRCBEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of )

DUKE POWER COMPANY, et al. )(Catawba Nuclear Station  
Units 1 and 2) )Docket No. 50-413 OL  
50-414 OL

APPLICANTS' SUPPLEMENTAL RESPONSE TO  
 "PALMETTO ALLIANCE AND CAROLINA ENVIRONMENTAL  
 STUDY GROUP'S INTERROGATORIES AND REQUESTS TO PRODUCE  
 DOCUMENTS ON DIESEL GENERATORS CONTENTIONS  
 TO APPLICANTS AND NRC STAFF" AND "CESG'S INTERROGATORIES  
 TO DUKE POWER REGARDING EMERGENCY DIESEL CONTENTIONS ADMITTED  
 BY ATOMIC SAFETY AND LICENSING BOARD."

Pursuant to the discovery schedule established in the Board's conference call held May 21, 1984 and in accordance with their duty to update answers to interrogatories, Applicants hereby file supplemental responses to the interrogatories identified in the caption. Applicants' original responses were filed April 2, 1984.

## I.

Applicants' original responses addressed both the Intervenor's contention on the Catawba crankshaft design and the contention admitted by the Board on its own motion dealing with certain Catawba - specific problems (Memorandum and Order (Referring Certain Diesel Generator Issues to the Appeal Board), February 23, 1984, pp. 4-6; Memorandum and Order (Admitting a Board Contention Concerning Certain Diesel Generator Problems), February 27, 1984, pp. 2-3). Subsequent to the filing of these responses, Intervenor defaulted on a condition imposed by the Board in admitting the crankshaft design contention

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that Intervenor provide the name and expected testimony of a crankshaft expert. As a result, the Board dismissed the crankshaft contention. (Order, April 13, 1984, pp. 1-2). As a consequence of this action, the sole remaining contention on diesel generators is the former Board contention which is now Palmetto Alliance/CESG contention, which as amended in the May 21, 1984 conference call (Tr. 12634), states:

Whether there is reasonable assurance that the TDI emergency diesel generators at the Catawba Station can perform their function and provide reliable service because of the problems that have arisen in the course of testing and inspections of the Catawba diesel generators such as the problems reported in the Applicants' letter to the Board of February 17, 1984.

Applicants, in providing supplemental responses to Intervenor's interrogatories, therefore address only those interrogatories which are directed to that contention. Applicants objected to many of the Intervenor's interrogatories as beyond the scope of the admitted contentions. Applicants hereby preserve their objections to interrogatories which are beyond the scope of the admitted contention.

## II.

### Requests to Produce

Applicants have made documents not subject to privilege available for inspection and copying by Palmetto Alliance and CESG. These documents concerned both the Intervenor's contention and the Board contention. As a result of the Board orders dismissing the Intervenor's contention, Applicants have withdrawn documents which relate to the crankshaft design issue. Only documents relevant to the admitted contention will be available for inspection

and copying.<sup>\*/</sup> The documents identified in Applicant's April 2, 1984 response are, and have been, available to Palmetto Alliance and CESC since that date. The documents identified with this supplemental response will be available to Intervenors for inspection and copying on, and for a reasonable period of time after, June 26 at Duke Power Company's offices at 422 South Church Street, Charlotte, North Carolina.

### III.

#### Responses to Palmetto Alliance Interrogatories

##### A. General Interrogatories

1. Please state the full name, address, occupation and employer of each person answering the interrogatories and designate the interrogatory or the part thereof he or she answered.

The initials of the person or persons providing the primary information used in the answers to interrogatories is indicated in parentheses following each answer.

The business address, occupation and employer of each such person is provided in the attachment to these responses that contains each such person's affidavit.

2. Please identify each and every person whom you are considering to call as a witness at the hearing in this matter on this contention, and with respect to each such person, please
  - a. State the substance of the facts and opinions to which the witness is expected to testify;

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<sup>\*/</sup> Applicants have also agreed, as an accommodation to Intervenors, to provide for their inspection copies of documents generated by the TDI Owners Group for the NRC Staff and are available to applicants by virtue of their membership in the Owners Group.

b. Give a summary of the grounds for each opinion; and

c. Describe the witness' educational and professional background.

(a) Applicants are in the process of developing their direct case on the admitted contention, so that the information necessary to respond completely to this interrogatory does not yet exist. However, Applicants have tentatively identified four witnesses to address that contention: G. Wayne Hallman, Nuclear Maintenance Manager for Duke Power Company, Russell P. Muschick, Maintenance Engineer for Duke Power Company, William R. McCollum, Jr., Schedule Engineer for Duke Power Company, and C. H. Wells, Vice President, Research and Development, for Failure Analysis Associates. Applicants anticipate calling these witnesses to testify as to the testing, disassembly, inspection, component repair/replacement, reassembly, and post-inspection testing aspects of their program to assure the reliability of the Catawba diesel generators. Further information with respect to this interrogatory, including identification of additional witnesses, if any, will be provided as that information becomes available.

3. Is your position, claim or defense regarding the contention based on one or more calculations? If so:

- a. Describe each calculation and identify any document setting forth such calculation.
- b. Who performed each calculation?
- c. When was each calculation performed?
- d. Describe each parameter used in such calculation and each value assigned to the parameter, and describe the source of your data.
- e. What are the results of each calculation?
- f. Explain in detail how each calculation provides a basis for the contention.

Any of Applicants' positions, claims or defenses relevant to the Board contention, which is based on one or more calculations, is explained in detail in the documents already provided to Intervenor or made available for inspection and copying, such as the results of Applicants' test and inspection program, the results of which have been made available to Intervenor.

4. Is your position, claim or defense regarding the contention based on one or more experiments or tests? If so:
  - a. Describe each experiment or test and identify any document setting forth such experiment or test.
  - b. Who performed each experiment or test?
  - c. When was such experiment or test performed?
  - d. Describe each parameter or variable measured in such experiment or test.
  - e. What are the results of each experiment or test?
  - f. Explain in detail how each experiment or test provides a basis for your position, claim or defense regarding the contention.

Applicants' position, claim or defense with respect to why the ability of the Catawba diesel generators to provide reliable backup power is not compromised by the problems set out in the contention is based upon Applicants' test and inspection program, the results of which have already been made available to Intervenor.

Applicants' testing program is described in the attachment to the February 22, 1984 response to NRC Staff questions, as well as in handouts (previously provided to Palmetto Alliance and CESG) accompanying a presentation made to the NRC Staff in Bethesda on March 21. Applicants provided to the NRC Staff on April 5, 1984 a more detailed description of the test and inspection program. A copy of that document was served upon Palmetto Alliance and CESG. The program of the Owner's Group is described in several Board Notifications



sent out by the NRC Staff. Copies of all those documents have been served on Palmetto Alliance and CESG. The information sought in parts c, d and e of this Interrogatory is and will be contained in the described documents.

The results of Applicants' test program demonstrate that the Catawba diesel generators are capable of providing a reliable source of backup power, as indicated in the June 1, 1984 "Catawba Nuclear Station Diesel Engine 1A Component Revalidation Inspection Report", a copy of which was provided to Intervenor. (GWH)

5. Is your position, claim or defense regarding the contention based upon conversations, consultations, correspondence or any other type of communication with one or more individuals? If so,
  - a. Identify by name and address each such individual.
  - b. State the educational and professional background of each such individual, including occupation and institutional affiliations.
  - c. Describe the nature of each communication with such individual, when it occurred, and identify all other individuals involved.
  - d. Describe the information received from such individuals and explain how it provides a basis for the issues.
  - e. Identify each letter, memorandum, tape, note or other record related to each conversation, consultation, correspondence, or other communication with such individual.

Applicants preserve their objection to this Interrogatory. In Applicants' view it is directed either to the position which Applicants have taken with respect to the Board contention before the Licensing Board in this proceeding, or the manner in which Applicants have interpreted the PA/CESG Interrogatories and furnished these responses thereto. In either event, any conversations, correspondence or any other type of communications are privileged, and thus not subject to discovery.

With respect to the positions Applicants have taken on contention before the Board, such are guided by legal strategy developed in anticipation of litigation after extensive consultation among counsel for Applicants, and between and among Applicants' counsel and members of Applicants' staff, to ascertain the factual matters necessary to formulate that strategy. The positions Applicants have taken with respect to answering the PA/CESG Interrogatories were formulated on the basis of discussions among counsel for the Applicants. Such positions were then communicated, during telephone conference calls and conferences, to members of Applicants' staff to guide and aid those persons in preparing initial drafts of responses to the Interrogatories.

In short, these positions, and thus the communications between and among Applicants' counsel and staff underlying those positions, are a direct result of Applicants' counsel, while preparing the case for litigation, "[A]ssembl[ing] information, sift[ing] what [they] consider [ ] to be relevant from the irrelevant facts, prepar[ing] [their] legal theories and plan[ning] [their] strategy. . . ." Such preparation includes "interviews, statements, memoranda, correspondence, briefs, mental impressions, personal beliefs, and countless other tangible and intangible [actions]." Hickman vs. Taylor, 329 U. S. 495, 511-512 (1945). Applicants' counsel are entitled to conduct this process "without undue and needless interference" and any communications and/or conversations conducted during that process are subject to protection under the attorney work-product privilege. Id. at 511; see Consumers Power Company (Midland Plant, Units 1 and 2) ALAB-691, \_\_\_\_\_ NRC \_\_\_\_\_ (September 9, 1982) slip op. at 33-35.

Thus, Applicants object to this Interrogatory in that it calls for information which is privileged under the attorney work-product doctrine.

Applicants would note, however, that to the extent members of Applicants' staff have communicated with one another, and with other organizations or persons, regarding the subject matter of these contentions, and those communications are reflected in documents, such documents have been made available in accordance with Part II, above, and have been addressed in some Interrogatory responses. Those documents are indexed and a copy of the index has been provided to Intervenor. They range from notes of conversations to final reports of consultants. Therefore Applicants believe that whatever obligation exists under this Interrogatory has been discharged, and object to providing further information in response to it. For Applicants to provide any further information in what could be a myriad of conversations with various individuals would be to impose a substantial and unnecessary burden upon them, which is unwarranted in light of the voluminous information made available to Intervenor.

Therefore, for the reasons set forth above, Applicants object to providing further information in response to this Interrogatory. To respond further would cause Applicants annoyance, oppression, undue burden and expense. Further, such information is not relevant to the subject matter of the contention, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

6. Is your position, claim or defense regarding the contention based upon one or more NRC Staff documents? If so, please identify such documents and make them available for inspection and copying.

Applicants have no change to their prior response. Applicants continue to believe that this interrogatory is addressed to the NRC Staff; Applicants would note that NRC Regulatory Guides 1.108, 1.137, 1.41, 1.68 and 1.9 are generally



applicable to diesel generators. These Regulatory Guides will be available for inspection and copying in accordance with Part II. (RPM)

B. Specific Interrogatories

Intervenors filed two sets of interrogatories. The set filed jointly is referred to by the designation PA/CESG. The set filed by CESG uses that designation. PA/CESG Interrogatories 1-12, and 30A, and CESG Interrogatories 1-2 were based upon Intervenors' crankshaft design contention which has been dismissed by the Board. Therefore, Applicants are under no obligation to update these interrogatories.

PA/CESG 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 35A, 36, 39, 41, 42, 44A, 50, 51, 52; CESG 10, 11, 12, 18. Applicants objected to these Interrogatories in whole or in part. Applicants have reviewed their prior objections and hereby preserve their objections.

PA/CESG 19, 31, 33A, 34, 35A, 36, 37, 39A, 40, 43, 44, 45, 45A, 46, 47, 48, 48A, 51, 52; CESG 4, 5, 7, 9, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29. Applicants have reviewed their prior answers to these interrogatories and believe such answers provide a full and complete response to the interrogatories, without further updating.

Upon review Applicants have concluded that the following interrogatories require updating: PA/CESG 14, 26, 33, 35, 38, 49, 49A, 50; CESG 3, 6, 8, 26.

PA/CESG Interrogatories

14. How long will it take for TDI to properly manufacture diesel generators or components? How will this point be identified?

The fabrication of the diesel generators at Catawba began in November of 1976 and the last engine was shipped in December of 1979. In Applicants' view these diesels were "properly manufactured." That view has been confirmed by Applicants' test and inspection program, which is documented in Applicants' June 1, 1984 report to the NRC. (GWH)

Applicants object to providing further information in response to this Interrogatory. Though it is unclear on its face, it appears to seek information related solely to TSI's QA Program, and Applicants object on the ground that it seeks information outside the scope of the contention admitted by the Board. Therefore for the reasons given in Applicants' original response to Interrogatory 13, Applicants object to responding to this Interrogatory. For Applicants to respond would be to cause them annoyance, oppression, undue burden, and expense. Further, the information sought is not relevant to the subject matter of the contention, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

26. The following statement was made in the Owners Group 1/26/84, presentation to the NRC:

. . . we had decided that as part of the design review quality revalidation effort, the quality engineers and indeed the specialists are evaluating the need to perform either inspections or evaluations of components on the basis of their function and their real requirements as opposed to just doing quality assurance program review.

(Tr. 27). Describe in detail, such inspections and evaluations and identify the components and their "function" and "real requirements" as applied to the Catawba diesel generators.

The information sought is contained in updated Attachments 1 and new attachment 5. (RPM)

33. Provide a listing of each 10 C.F.R. Part 21 report with respect to emergency diesel generators.

The 10 CFR Part 21 Report information of which Applicants are aware for TDI diesel generators is provided as a part of Applicants' Response 4-1 to the NRC Staff, dated February 22, 1984. Additional 10 CFR Part 21 reports which have been filed since the February 22 response are: (1) Overspeed Governor and Fuel Transfer Pump Drive (Hubs); (2) Turbocharger Thrust Bearing Lubrication. These should be added to the list in Applicants' Response 4-1.

Applicants object to providing any further information in response to this Interrogatory. Information with respect to 10 CFR Part 21 Reports for diesel generators other than those manufactured by TDI is clearly outside the scope of the contention admitted by the Board. In addition, such information is not readily available to Applicants and to collect it would impose an undue burden.

Therefore, for reasons set forth above, Applicants object to providing further information in response to this Interrogatory. To respond further would cause Applicants annoyance, oppression, undue burden and expense. Further, such information is not relevant to the subject matter of the contention, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

35. List results/recommendations put forth by Owners Group task force. How many would be changed on review? What were the changes? By which reviewer were they suggested? How many reviews left the results/recommendations unchanged? How many recommendations were made less stringent? More stringent? Who made what changes? Identify and describe in detail each.

The TDI Owners' Group has provided Duke Power Company with recommendations for inspections of diesel engine parts on the DRSV-16 engine. To the extent that these recommendations are applicable to the specific engines at Catawba Nuclear Station, they have been incorporated into our inspection program. A list of these parts, and a brief description of the inspection to be performed on each part, is contained in updated Attachment 2. (RPM)

38. Three AE pistons are to be inspected at Shoreham after run. With respect to later model engines what test/inspection results would call for a reduced level of inspection? See, 1/26/84 Meeting (Tr. 84).

A reduced level of inspection would be warranted on later model engines whose owners have elected to install AE pistons if inspection results from lead R48 & V-16 engines, following accumulation of 100 hrs. at full load, confirm the absence of linear indications in the piston-crown stud boss region and the wrist pin boss region for all pistons examined. (RPM)

49. With respect to the testing of the Catawba Unit 1 diesel generators described in response to item 7 in Applicants' 2/22/84 submittal explain in detail the results of each of the start-up and pre-operational functional testing. Identify documents reflecting circumstances and conditions of each test as well as the test results. If any test was omitted or modified explain fully the basis for such action.

The information sought in the Interrogatory is contained in Attachment 3, which has been updated. (WRM)\*

The results of the Catawba diesel generator 1A inspection will be used to determine the appropriate tests and inspections for the other diesel units at Catawba. (RPM)

\* This attachment is being prepared and is being transmitted forthwith.

- 49A. Identify in detail any and all documents reflecting the Catawba diesel generators operating history and any problems, deficiencies or unusual or abnormal operations observed. Include each item and event reflected in response No. 8 and Applicants' 2/22/84 submittal. Please update your response to include any subsequent developments.

The information sought in response to this Interrogatory is contained in Attachment 4, which has been updated. (WRM)\*

50. Identify fully the documentary basis for responses No. 11 and 12 in Applicants' 2/22/84 submittal to the NRC Staff. Please make these documents available for inspection and copying.

The documentary bases for response No. 11 are identified in the response itself. Intervenors have been served with copies of the response. The documentary basis for the response to No. 11 is available for inspection and copying. A further documentary basis is the June 1, 1984 inspection result report which has been provided to intervenors.

The documentary bases for responses 12(3), 12(4), 12(5) and 12(6) are identified in the responses themselves. Intervenors have been served with copies of the responses. The documentary bases for these responses is available for inspection and copying. To the extent that specific TDI Owner's Group documents are not identified in the response and are relevant to the admitted contention, such documents are available for inspection and copying. (JDH)

Applicants object to providing any documentary basis or other information related to responses 12(1) and 12(2) because these relate to Applicants' and/or TDI's QA programs. Therefore, Applicants object to this Interrogatory on the grounds that it seeks information outside the scope of the contention admitted by the Board.

\* This attachment is being prepared and is being transmitted forthwith.



Therefore, for the reasons given in the Applicants' original responses to Interrogatories 13 and 15, Applicants object to responding to this Interrogatory. For Applicants to respond would be to cause them annoyance, oppression, undue burden and expense. Further, the information sought is not relevant to the subject matter of these contentions nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

### CESG Interrogatories

3. In regard to the NRC staff's questions of December 30, 1983, specifically Duke Power Company's response to 8, describe fully and completely the failure of the turbo bearing both physically and functionally.

The turbocharger bearing did not fail in the sense that it would have prevented the diesel generator from providing backup power.

- a. Physically, the face of the turbine end thrust bearing exhibited excessive wear due to insufficient lubrication during repetitive cold fast starts of the diesel generator.
- b. Functionally, the turbocharger bearings performed their intended function with no adverse affect on diesel generator operation during the extended operational test.

The diesel control circuits are designed such that during maintenance and test runs, when the turbocharger oil pressure drops below 15 psi, the diesel is automatically shut down. However, during an actual emergency condition, this protective circuit is bypassed and low turbocharger oil pressure would not shut the diesel engine down. Therefore, the diesels would continue to perform during an emergency. (JEC)

6. Would a significantly failed turbocharger bearing make a Catawba DG inoperable? What would the consequence be of a seized turbocharger shaft? What effect would an inoperative turbocharger have on the power output of a Catawba DG--in quantitative terms?

A failed turbocharger would not make the diesel inoperative. A seized turbocharger shaft would stop the turbocharger from rotating. The diesel could then be operated as a normally aspirated engine. An inoperative turbocharger would reduce the load carrying capability of the diesel generator to 70 to 75% of the rated load. (JEC)

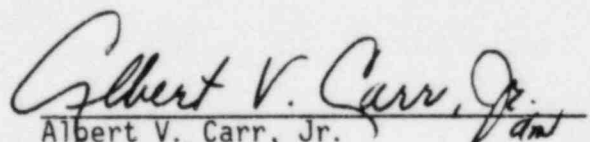
8. Regarding response 9, what additional tests and inspections will be performed on DGs 1B, 2A, and 2B.

Applicants do not understand the reference to "response 9." However, the Catawba Nuclear Station 1B DG will be operated for a total of least 750 hours. It will then be inspected. The extent of the 1B inspection will be based on the results of the previous inspection of the 1A DG, and/or completed previous DSRV 16-4 inspections. The extent of the Catawba DG 1B inspection is covered in the June 1, 1984 inspection report, copies of which have been provided to Intervenor. (RPM)

26. Did DPC require preventive maintenance programs of TDI at the time of procurement? Was such a requirement absent from the purchase requisitions?

Yes. This requirement was included in the purchase specification. The preventive maintenance program is still under development. (RPM)

Respectfully Submitted,



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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY, <u>et al.</u>	)	Docket Nos. 50-413
	)	50-414
(Catawba Nuclear Station	)	
Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Supplemental Response To "Palmetto Alliance and Carolina Environmental Study Group's Interrogatories and Requests To Produce Documents On Diesel Generators Contentions To Applicants and NRC Staff" And "CESG's Interrogatories To Duke Power Regarding Emergency Diesel Contentions Admitted By Atomic Safety and Licensing Board" in the above captioned matter have been served upon the following by deposit in the United States mail this 25th day of June, 1984.

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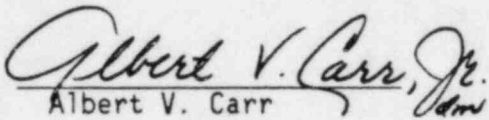
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ATTACHMENT 1  
RESPONSE TO PALMETTO ALLIANCE/  
CESG INTERROGATORY 26

The purpose of this Attachment is to describe such inspections and evaluations and identify the components and their "function" and "real requirements" as a result of Catawba diesel generator operation.

1. Cylinder Heads

Functional Requirements: Provide pressure tight cap for engine cylinder, and provide passages and sealing for cooling water, lube oil, starting air, intake and exhaust gases.

Inspections: The following inspections will be done to evaluate the Catawba cylinder heads.

- A. Visual inspection of intake and exhaust valve seats, and intake and exhaust valves, starting air valves, and fuel injector nozzle holder studs.
- B. Liquid penetrant examination of:
  - Intake and exhaust valve seats
  - Fire deck area between exhaust valves
- C. Ultrasonic thickness measurements of:
  - Fire deck area
  - Injector cavity area
- D. Magnetic particle examination of fuel injector nozzle holder studs.

2. Subcover Assembly

Functional Requirement: Provide structural mounting on top of the cylinder head for rocker arm assembly.

Inspection: The following inspections will be done to evaluate the Catawba subcover assembly.

- A. Visual inspection.
- B. Liquid penetrant inspection of rocker arm mounting surfaces.



### 3. Fuel Injection Pump

Functional Requirement: To convert low pressure fuel delivered by the fuel oil transfer pump to high pressure fuel suitable for injector operation.

Inspection: The following inspections will be done to evaluate the Catawba fuel injection pumps.

- A. Material hardness measurements.
- B. Ultrasonic inspection to test casting integrity.

### 4. Crankcase Covers

Functional Requirements: Provide access to crankcase for inspection and maintenance.

Inspection: The following inspections will be done to evaluate the Catawba crankcase covers:

- A. Bolt torque readings.
- B. Visual inspection of bolt holes for cracks.

### 5. Pushrods

Functional Requirements: The pushrods form a portion of the linkage that transmits camshaft lobe motion to the cylinder intake and exhaust valve, thereby controlling the valve opening and closing cycle.

Inspection: The following inspections will be done to evaluate the Catawba pushrods:

- A. Visual inspection to assure that pushrod of friction welded design.
- B. Visual inspection of spherical surfaces.
- C. Liquid penetrant examination of friction welds.

### 6. Rocker Arm Assembly

Functional Requirement: The rocker arm assembly forms a portion of the valve operating linkage taking rectilinear motion from the pushrod to opening the exhaust and intake valves.

Inspection: The following inspections will be done to evaluate the Catawba rocker arm assemblies:

- A. Visually inspect for signs of distress.
- B. Material tests.

- C. Hardness tests.
- D. Liquid penetrant inspection of adjusting screw swivel pads.
- E. Magnetic particle test of rocker arm capscrews.

7. Fuel Oil Piping and Tubing

Functional Requirements: To transfer fuel oil from one component to another.

Inspection: The following inspections will be done to evaluate the Catawba fuel oil piping and tubing:

- A. Walk down of piping system to confirm that it is in accordance with TDI drawings.
- B. Visual examination of supports to confirm that they are in accordance with TDI drawings.
- C. Eddy-current testing of high pressure tubing to eliminate possibility of cracks.

8. Turbocharger Lube Oil Piping

Functional Requirement: Provide means for supplying lubrication to the turbocharger.

Inspection: The following inspections will be done to evaluate the Catawba turbocharger lube oil piping:

- A. Walkdown of piping system to confirm that is is in accordance with TDI drawing.
- B. Visual examination of supports to confirm that they are in accordance with TDI drawings.

9. Turbocharger and Intercooler

Functional Requirements: Provide means of increasing air volume to cylinder.

Inspection: The following inspection will be done to evaluate the Catawba turbocharger and intercooler.

- A. Visual inspection of turbine parts, bearing, butterfly valves, and intercooler, and mounting hardware.
- B. Visual and dimensional inspection of bearings.
- C. Hardness and material tests of mounting fasteners.

- D. Torque reading on fasteners.
- E. Liquid penetrant inspections of intercooler adapters.

#### 10. Crankshaft

Functional Requirement: The crankshaft converts reciprocating motion, component inertial forces and gas pressure piston forces to rotary motion and torque at the output flange.

Inspection: The following inspections will be done to evaluate the Catawba crankshaft:

- A. Thrust clearance and web deflection measurements.
- B. Visual inspections of main bearings and journals.
- C. Liquid penetrant inspection of bearing caps and base.
- D. Dimension measurement of main bearing shells.
- E. Eddy-current inspection of fillets between crankpins and webs.
- F. Liquid penetrant inspection of main bearing oil holes.
- G. Torsiograph tests.

#### 11. Connecting Rods

Functional Requirements: The connecting rod transmits engine firing force from the pistons and piston pins through the rod to the crankshaft such that the reciprocating motion of the pistons induces rotation and output torque of the crankshaft.

Inspections: The following inspections will be done to evaluate the Catawba connecting rods:

- A. Visual inspection of connecting rods, connecting rod bushings and shells, piston pins, and bolts.
- B. Dimensional measurement of connecting rods, connecting rod bushings and shells, piston pin and link rod pin.
- C. Eddy-current inspection of female thread in rod box and crank pin bearing shells.
- D. Liquid penetrant inspection of rod box and crankpin bearing shells.
- E. Magnetic particle inspection of connecting rod bolts.
- F. X-ray inspection of crank pin shells.

- G. Material and hardness test of connecting rod piston pin bushing, piston pins, rods, linkrod pin and rod box bushings.

## 12. Pistons

Functional Requirement: The pistons react to the cylinder firing pressure and provide a reciprocating mechanism for converting combined inertia and combustion pressure forces into mechanical torque through the connecting rod piston pin, connecting rod and crankshaft.

Inspection: The following inspection will be done to evaluate the Catawba pistons:

- A. Visual inspection of pistons and piston rings.
- B. Dimensional measurements of piston ring axial clearance in piston and piston ring butt gap in cylinder.
- C. Liquid penetrant inspection of stud bosses in piston and external surfaces on skirt portion of piston.
- D. Torque measurement of piston Bellevue studs.
- E. Magnetic particle inspection of piston skirt internal surfaces.

## 13. Cylinder Block and Liner

Functional Requirements: The cylinder block comprises the framework of a liquid cooled engine and provides passages and support for the cylinder liner and camshaft. The cylinder block reacts to the dynamic loads from the cylinder firing pressure and the valve assemblies. The liner forms the walls of the combustion chamber and must provide the guide for the piston motion while reacting to high temperature gas forces and piston skirt side forces without excessive wear or scuffing.

Inspection: The following inspection will be done to evaluate the Catawba cylinder blocks and liners:

- A. Visual inspection of cylinder block liner and cylinder head studs.
- B. Dimensional inspection of cylinder liner and cylinder liner seating area in cylinder block.
- C. Liquid penetrant inspection of top of cylinder block and liner seating area in cylinder block.
- D. Eddy-current examination of stud holes in block.
- E. Materials and hardness tests on cylinder liners.
- F. Material test on cylinder head studs.

14. Air Start Valve Capscrews

Functional Requirement: The air start valve capscrews provide a clamping force to hold air start valves in place on cylinder heads.

Inspection: A dimensional inspection of air start valve capscrews will be accomplished to evaluate their use in the Catawba diesels.

15. Jacket Water Pump

Functional Requirement: The jacket water pump takes suction from the jacket water standpipe and delivers the required pressure and flow to the jacket water header. The jacket water circulates through the engine cylinder jackets, exhaust manifold, the turbocharger water cooler, the turbocharger oil cooler and jacket water cooler.

Inspection: The following will be done to evaluate the Catawba jacket water pumps:

- A. Visual inspection of jacket water pump gearing, jacket water pump wear ring and face seals, and all bolted parts for looseness.
- B. Liquid penetrant of gearing, keyways and impeller.
- C. Material and hardness tests of jackets water pump shaft.

16. Wiring and Termination:

Functional Requirements The wiring and terminations interconnect instrument, control and power circuits on the diesel generator and at the control panels.

Inspection: Walkdown of system to determine if cabling components meet technical standards.

17. Instrumentation Thermocouples:

Functional Requirement: Provides temperature signals for control and monitoring of the diesel engine.

Inspection: Engineering evaluation of thermocouples and their application.



ATTACHMENT 2  
RESPONSE TO PALMETTO ALLIANCE/  
CESG INTERROGATORY 35

Catawba 1A Diesel Inspection Plan

Part Name	Comments
Main Bearing Cap Base Assembly	Visual, PT,
Main Bearing Caps	Visual, PT
Lube Oil Internal Headers	Verify As Built With Walkdown to Drawing
Lube Oil Tubing and Fittings	Verify As Built With Walkdown to Drawing
Lube Oil Line Supports	Verify As Built With Walkdown to Drawing
Crankshaft and Turning Gear	ECT, PT, Visual
Crankshaft Bearing Shell	Visual, Dimensions
Crankcase Assembly	Visual
Cylinder Block	PT, ECT, Dimensions
Cylinder Liner	Visual, Dimensions, Material, Hardness
Cylinder Block Jacket Water- Manifold	As Built System Walkdown per Drawings
Cylinder Head Studs	Visual, Materials, Hardness
Cyl. Block Jacket Wtr. Man. Nuts	Visual
Flywheel Bolting	Verify Torques Meet TDI Requirements, Visual
Front Gear Case Bolting	Visual
Connecting Rods and Bushings	Visual, Dimen., Materials, Hardness, PT, ECT, MT
Connecting Rod Bearing Shells	Visual, Dimensions, RT, ECT, PT
Piston	MT, PT, Visual, Dimensions
Piston Rings	Visual
Piston Pin Assembly	Visual, Dimensional, Material, Hardness
Intake Tappets	Visual
Fuel Tappets	Visual
Camshaft Assembly	Visual
Camshaft Supports, Bolting & Gear	As Found Torques, Visual, Material, Hardness
Idler Gear Assembly (Crank to Pump)	Visual, Materials, Hardness
Idler Gear Assembly	Visual, Materials, Hardness
Air Start Valve	Visual, Dimensions
Cylinder Head	Visual, PT, UT,
Intake and Exhaust Valves	Visual, Materials, PT
Valve Springs	Visual
Subcover Assembly	Visual, PT
Fuel Pump Linkage and Control Shaft	Visual, Material, Hardness
Fuel Pump, Linkage, Bearings & Shaft	Visual
Intake Manifolds	Visual
Exhaust Manifold Bolting	Visual
Cylinder Block Cover, Gskts. & Bolts	Visual
Crankcase Covers	Verify Torque, Visual

Rocker Arm Assembly	Visual Materials, Hardness, PT, Dimen.
Exhaust Rocker Arm Assembly	Visual, Dimensions, PT, Materials
Pushrods	Verify Friction Welded Pushrods Installed, PT
Connector Pushrod	Verify Friction Welded Pushrods Installed, PT
Rocker Arm Bolting	Verify Torque, MT, Materials, Hardness
Governor Drive Gear and Shaft	Vis., PT, Material, Hardness
Governor Drive Coupling	Verify Condition of Coupling Material
Gov. Over-speed Trip & Acc. Drive	Visual, PT, Materials, Hardness
Overspeed Trip Couplings	Visual
Governor Linkage	Visual
Governor Heat Exchanger Assemb.	Visual
Jacket Water Pump	Materials, Hardness, Visual
Intercooler Piping-Coupling, -	Visual
Bolting, Gasket	
Starting Air Distributor Assemb.	Dimensional, Hardness
Turbo Air Butterfly Valve	Visual
Turbocharger Bracket Bolting	Verify Torque, Materials, Visual
Lube Oil Sump Tank Bolting	Verify Bolted Connections are Tight.
Lube Oil Sump Tank Mounting -	Verify Tank Mounting Hardware Tightened.
Hardware	
Turbocharger	Visual
Rocker Arm Bushings	Visual
Crankshaft Thrust Bearing	Measure Thrust Clearance
Main Bearing Studs & Nuts	Visual, Dimensional
Gear Case Covers Bolting	Visual
Fuel Injection Pump	Hardness, UT
Fuel Filter Mtg. Hardware	Visual, Verify Torque
External Lube Oil Lines	Verify As Built with Walkdown to Drawing
External Lube Oil Supports	Verify As Built with Walkdown to Drawing
Lube Oil Sump Tank	Verify As Built with Walkdown to Drawing
Jacket Water Discharge Manifold	Visual, Verify As Built with Walkdown
Camshaft Bearing	Visual
Exhaust Manifold	Visual, Verify As Built with Walkdown
Fuel Pump Linkage	Visual
Turbo. Bracket	Visual
Intercooler	Visual, PT, MT
Fuel Inj. Tubing	ECT, Verify As Built with Walkdown
Jacket Water Stdpipe Fittings &	Verify As Built with Walkdown to Drawing
Gasket	
Jacket Water Standpipe Supports	Verify As Built with Walkdown to Drawing
Jacket Water Standpipe Bolting	Verify As Built with Walkdown to Drawing
Jacket Water Manifold Assembly	Verify As Built with Walkdown to Drawing
Jacket Water Inlet Manifold	Verify As Built with Walkdown to Drawing
Jacket Water Manifold Coupling	Verify As Built with Walkdown to Drawing
Jacket Water Discharge Manifold	Verify As Built with Walkdown to Drawing
Turbo Cooling Water Piping	Verify As Built with Walkdown to Drawing
Turbo Cooling Water Supports	Verify As Built with Walkdown to Drawing
Start Air Manifold Tubing	Verify As Built with Walkdown to Drawing
Start Air Manifold Supports	Verify As Built with Walkdown to Drawing
Start Air Dist. Tubing & Ftnngs.	Verify As Built with Walkdown to Drawing
Fuel Oil Piping and Tubing	Verify As Built with Walkdown to Drawing
Fuel Oil Piping Supports	Verify As Built with Walkdown to Drawing
Turbo Lube Oil Piping	Verify As Built with Walkdown to Drawing

Turbo Lube Oil Supports	Verify As Built with Walkdown to Drawing
Pyrometer Conduit	Verify As Built with Walkdown to Drawing
Pyrometer Conduit Fittings	Verify As Built with Walkdown to Drawing
Pyrometer Conduit Supports	Verify As Built with Walkdown to Drawing
Engine and Aux. Mod. Wiring - Conduit	Verify As Built with Walkdown to Drawing
Engine Shutdown Tubing & Fittings.	Verify As Built with Walkdown to Drawing
Turbo Thrust Bearing Tubing & Fittings	Verify As Built with Walkdown to Drawing

Notes:

PT = Liquid Penetrant Test

MT = Magnetic Particle Test

ECT = Eddy-Current Test

RT = X-ray Test

UT = Ultrasonic Test

Visual = Visual inspection of part to prescribed acceptance standards.

Dimen., Dimensions = Dimensional inspection of part.

Material = Material tests to determine parts material composition.

Hardness = Hardness tests to determine parts hardness or tensile strength.

ATTACHMENT 5  
RESPONSE TO PALMETTO ALLIANCE/  
CESG INTERROGATORY 35

Catawba 1B Diesel Inspection Plan

Part Name	Comments
Lube Oil Internal Headers	Verify As Built With Walkdown to Drawing
Lube Oil Tubing and Fittings	Verify As Built With Walkdown to Drawing
Lube Oil Line Supports	Verify As Built With Walkdown to Drawing
Crankshaft and Turning Gear	ECT, Visual
Cylinder Block	PT, ECT, Dimensions
Cylinder Liner	Visual
Cylinder Block Jacket Water- Manifold	As Built System Walkdown per Drawings
Cylinder Head Studs	Visual
Cyl. Block Jacket Wtr. Man. Nuts	Visual
Flywheel Bolting	Verify Torques Meet TDI Requirements, Visual
Front Gear Case Bolting	Visual
Connecting Rods and Bushings	Visual, PT, ECT, MT
Connecting Rod Bearing Shells	Visual, Dimensions, RT, ECT, PT
Piston	MT, PT, Visual,
Piston Rings	Visual
Piston Pin Assembly	Visual
Intake Tappets	Visual
Fuel Tappets	Visual
Camshaft Assembly	Visual
Camshaft Supports, Bolting & Gear	As Found Torques, Visual, Material,
Idler Gear Assembly (Crank to Pump)	Visual
Idler Gear Assembly	Visual
Air Start Valve	Visual, Dimensions
Cylinder Head	Visual, PT, UT,
Intake and Exhaust Valves	Visual
Valve Springs	Visual
Subcover Assembly	Visual, PT
Intake Manifolds	Visual
Exhaust Manifold Bolting	Visual
Cylinder Block Cover, Gskts. & Bolts	Visual
Crankcase Covers	Visual
Rocker Arm Assembly	Visual, PT
Exhaust Rocker Arm Assembly	Visual, PT
Pushrods	Verify Friction Welded Pushrods Installed, PT
Connector Pushrod	Verify Friction Welded Pushrods Installed, PT
Rocker Arm Bolting	Verify Torque, MT, Materials, Hardness
Governor Drive Coupling	Verify Condition of Coupling Material
Overspeed Trip Couplings	Visual
Starting Air Distributor Assemb.	Dimensional, Hardness



- Turbocharger
- Rocker Arm Bushings
- Crankshaft Thrust Bearing
- Fuel Injection Pump
- External Lube Oil Lines
- External Lube Oil Supports
- Lube Oil Sump Tank
- Jacket Water Discharge Manifold
- Camshaft Bearing
- Exhaust Manifold
- Fuel Pump Linkage
- Turbo. Bracket
- Intercooler
- Fuel Inj. Tubing
- Jacket Water Stdpipe Fittings & Gasket

**Notes:**

PT = Liquid Penetrant Test  
MT = Magnetic Particle Test  
ECT = Eddy-Current Test  
RT = X-ray Test  
UT = Ultrasonic Test

Visual = Visual inspection of part to prescribed acceptance standards.

Dimen., Dimensions = Dimensional inspection of part.

Material = Material tests to determine parts material composition.

Hardness = Hardness tests to determine parts hardness or tensile strength.

Visual  
Visual  
Measure Thrust Clearance  
Hardness, UT  
Verify As Built with Walkdown to Drawing  
Verify As Built with Walkdown to Drawing  
Verify As Built with Walkdown to Drawing  
Visual, Verify As Built with Walkdown  
Visual  
Visual, Verify As Built with Walkdown  
Visual  
Visual  
Visual, PT, MT  
ECT, Verify As Built with Walkdown  
Verify As Built with Walkdown to Drawing

[illegible]

Verify As Built with Walkdown to Drawing  
Verify As Built with Walkdown to Drawing