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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, et al.	)	Docket Nos. 50-413
	)	50-414
(Catawba Nuclear Station, Units 1 and 2)	)	

Applicants' Response To "Palmetto Alliance and Carolina Environmental Study Group's Interrogatories and Requests To Produce Documents on Diesel Generator 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 accordance with the Licensing Board's Order dated February 23, 1984, as amended in the telephone conference call of March 14, 1984 (Tr. 12,620-22, 3/14/84), Applicants hereby file their responses to the interrogatories, identified in the caption, filed on March 26 by Palmetto Alliance and the Carolina Environmental Study Group (CESG).

I.

These interrogatories deal both with Intervenors' contention on the Catawba crankshaft issue and the issue 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).

In admitting these two contentions, the Board limited their focus to matters peculiar to Catawba, explicitly rejecting matters

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of generic import. More specifically, though Intervenors had sought in their proposed contention to have the Board accept as issues for litigation the generic issues of deficiencies in quality assurance at TDI and the operating performance of TDI generators at other nuclear facilities (February 23 Memorandum at p. 4), the Board refused to accept these generic issues, admitting only the "crankshaft" portion of Intervenors' proposed contention (February 23 Order, pp 5-7). The Board stated that such issues were rejected for several reasons, including the fact that litigation of the generic matters would inevitably lead to delay of the proceeding. Chief among its reasons for refusing to litigate these generic matters on the Catawba docket is the fact that, as generic issues, they may affect some fifteen different facilities and identical, or substantially identical, contentions had been admitted in at least three other cases. (Id. at pp. 6-7). Clearly, then, under the Board's February 23 Memorandum and Order there is no warrant for discovery on the generic issues of either TDI quality assurance or the operational history of TDI diesel engines in marine applications or at sites other than Catawba.

Nor does the Board's order of February 27 expand the scope of the issues markedly. The Board issued that order, and admitted a limited contention on its own motion, based on a letter to it from Applicants' counsel which outlined several problems which had only recently been discovered. (February 27 Order, p. 2) The Board went on to say that:

> The contention we now admit is site-specific in the sense that it focuses on problems that have actually been experienced at the Catawba facility. Indeed it is because of its site-specific aspect that we felt obliged

> to raise this issue on our own motion, even at this late date. We recognize, however, that this Board contention also has generic aspects because its thrust is more toward operational reliability than design considerations. As the Applicants' letter points out, "these matters are similar in nature to matters found with other TDI diesels." We expect, therefore, that litigation of this contention may involve us in proof of diesel operating histories from other nuclear plants with diesels of the same design. As we indicated in our referral order, we think it would be preferable to litigate the generic aspects of present concerns about TDI diesels in a lead or special proceeding, rather than in many individual operating license cases. [Id. at p. 3] (emphasis added)

Thus it is clear that, at most, the Board's own contention, and the discovery permitted thereunder, may involve some aspects (identified in Applicants' letter of February 17) of diesel operating history at other nuclear plants with diesel engines of the same designs and to that extent may legitimately be said to involve aspects of the generic contention. It does not, however, involve any aspect of the generic issue of TDI QA, and thus discovery is not permitted on that issue, nor does it give license for unrestricted inquiry into matters beyond site-specific issues at Catawba.

One final point should be mentioned. The term "diesel generator" encompasses two separate components, 1) a diesel engine which powers 2) a generator which produces electricity. Both Intervenors' and the Board's contentions concern themselves with the diesel engine as opposed to the generator. No issue has been raised, let alone admitted, respecting any alleged problem with the generator portion of the diesel generator. Therefore discovery is not permissible on any such matter.

The two contentions now at issue in this proceeding are:

1. PA/CESG Contention

The Applicants have not demonstrated a reasonable assurance that the TDI emergency diesel generators at the Catawba Nuclear Station can perform their safety function in service because of:
(1) Inadequate design of the crankshafts.

2. The Board Contention

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

II.

Requests to Produce

Applicants will make available for inspection and copying by Palmetto Alliance and CESG those documents, not subject to privileges or objections asserted by Applicants in the responses to individual interrogatories, identified in the responses to individual interrogatories. Such documents will be available to Palmetto Alliance and CESG on and, for a reasonable period of time after, April 2, 1984 at Duke Power Company's offices at 422 South Church Street, Charlotte, NC.

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 will be indicated in parentheses following each answer.

The business address, occupation and employer of each such person will be 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;

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

   c. Describe the witness' educational and professional background.

(a) Applicants presently plan to call as witnesses on the PA/CESG Contention Eugene W. Thomas and/or Peter J. Carrato, both of whom are employed by the Bechtel Power Corporation. Their testimony will support the document entitled "Evaluation of Crankshaft Stresses, For Duke Power Corporation, Catawba Nuclear Station, by Bechtel Power Corporation, March 19, 1984" (hereinafter "Bechtel Analysis").

The substance of the facts and opinions to which they will testify, and the grounds for each opinion, is set forth in that document. The Bechtel Evaluation is available for inspection and copying in accordance with Part II, supra.

Should applicants decide not to call one of these gentlemen as witnesses, or to add an additional witness, Intervenors will be notified.

(b) Applicants have not yet identified the witnesses to address the Board contention. When such witnesses are identified, Intervenors will be notified.

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.

Applicants' position, claim or defense on Intervenors' contention is contained in the Bechtel Evaluation. That document contains the information with respect to the calculations and parameters relied upon by Applicants. The evaluation is based upon Bechtel calculations 1984-1 through 1984-6 which contain the pertinent parameters. These calculations have been provided to Applicants. The calculations in the "Evaluation of Crankshaft Stresses" dated March 19, 1984 were performed by Bechtel; the calculations in its Appendix, "Torsional and Lateral Speed, Engine Numbers 75017/20, Delaval-Enterprise Engine Model DSRV-16-4, 7000 KW/9770 BHP at 450 RPM, for Duke Power Company, Catawba Nuclear Station" dated October 22, 1975, were performed by the Engine and Compressor Division of Transamerica Delavel, Inc. These documents are available for inspection and copying in accordance with Part II, supra. (EWT, PJC)

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 on Intervenors' contention is not based upon an experiment or test.

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 Board contention will be based upon Applicants' test and inspection program.

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 have committed to provide to the NRC Staff a more detailed description of the test and inspection program by April 4. A copy of that document will be served upon Palmetto Alliance and CESG. As the procedure is developed further submittals will be made to the NRC Staff; those submittals will also be served on PA/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 will demonstrate that the Catawba diesel generators are capable of providing a reliable source of backup power. (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 object to this Interrogatory. In Applicants' view it is directed either to the position which Applicants have taken with respect to the PA/CESG and Board contentions 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 the contentions 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. See pp 50-58, infra. Those documents are indexed and a copy of the index has been provided to Intervenors. 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 Intervenors.

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 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

1. Identify what you believe to be the relevant design standards which apply to diesel generator crankshaft design. Identify any and all documents upon which you base your response.

We believe "Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines" published by the Diesel Engine Manufacturers Association, is an acceptable and relevant standard which applies to stationary diesel generator crankshafts. Although indicated in the foreword of this standard "It is not the purpose of this book to attempt to set forth basic design criteria for engines . . .", it provides design objectives and criteria for crankshafts made of conventional materials subject to torsional vibratory conditions. These design objectives and criteria are generally accepted by the industry and are used to evaluate crankshaft torsional vibratory stresses. (EWT, PJC)

2. What data, experiments, calculations or operational history do you rely upon to support your position, claim, or defense that the Catawba crankshaft design is adequate? State with particularity those data, experiments, calculations or operational history which

you believe to be directly applicable to the Catawba Nuclear Station diesel generator crankshafts.

The adequacy of the Catawba crankshaft design is demonstrated by the Bechtel Evaluation, and its Appendix, both of which are specific to the Catawba crankshafts. Those analyses demonstrate that the stresses are shown to be less than the recommended allowable stresses published by DEMA. (EWT, PJC)

3. State the differences between the data, experiments or operational history identified in the previous answer to that which characterizes the Catawba diesel generator crankshafts. State further the assumptions used to apply this data to the Catawba diesel generator crankshaft.

The analyses in the response to Interrogatory 2 are specifically for the Catawba diesel generator crankshaft. (EWT, PJC)

4. What are the Diesel Engine Manufacturers Association (DEMA) standards? Are the DEMA standards applicable to diesel generator design for use in nuclear power plant application?

   a. If so, are they adequate for such use? Identify and specify the basis for your response.

   b. If not, explain in detail the basis for your conclusions; and identify the standards you believe should be applicable and the basis for their application.

"Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines", published by the Diesel Engine Manufacturers Association indicates in its Foreword that it is ". . . to serve as a reference for consulting engineers, government agencies, users, suppliers, power plant superintendents, and engine operators. It provides generally accepted standards for nomenclature, installation, application, operation,

and maintenance of engines and accessory equipment in various types of stationary engine installations."

This book of standards was originally published chiefly for the application of diesel engines to generator sets. It has been refined over the years to reflect improvements in engines and their application to stationary service. As such this standard is applicable to diesel generators in any stationary application, including nuclear. The Foreword states that "it is not the purpose of this book to attempt to set forth basic design criteria for engines . . ."; however, it does provide design objectives and criteria for crankshafts made of conventional materials subject to torsional vibratory conditions. These design objectives and criteria are recognized as authoritative by the industry and are used to evaluate crankshaft torsional vibratory stress. The adequacy of this standard is demonstrated by its continued publication and revisions for more than forty years. (EWT, PJC)

5. How do the counter weights on the Catawba V-16 crankshaft compare to those on the Shoreham crankshaft?

Catawba has counterweights on crank throws 3, 4, 5 and 6. Each counterweight weighs 828.21 pounds, as shown in "Torsional and Lateral Critical Speed", the Appendix to the Bechtel Evaluation. Delaval drawing 02-310-09, Crankshaft and Bearing Assembly - 13" Pins shows the tolerance on the counterweights to be ±10 pounds for any given engine set.

We have no direct information concerning the use of counterweights on the Shoreham engine. (EWT, PJC)

6. What is the fillet radius on the Catwaba crankshaft?

Both the crankpin and main journal fillet radii on the Catawba crankshaft are .75 inches. These fillets are of the reentry type as described in the minutes of the November 30, 1983 Transamerica Delaval - Nuclear Plant Emergency Standby Diesel Generator Users' Group Meeting. (EWT,PJC)

7. Has the Shoreham crankshaft been shot-peened in the fillet area?

The only information we have regarding the fillets of the Shoreham crankshaft is based on the "Emergency Diesel Generator Crankshaft Failure Investigation Shoreham Nuclear Power Station", prepared by Failure Analysis Associates, October 31, 1983. That report indicates that the fillets of the Shoreham crankshaft were neither shot-peened nor rolled. (EWT, PJC)

8. Please provide the specific documentary basis for your answer to the three proceeding questions.

Documentation is as noted in the responses to questions 5, 6, and 7. (EWT, PJC)

9. Have all DSRV-16 crankshafts in nuclear applications been inspected by one common qualified individual? By an inspection from Failure Analysis Associates? If so, please identify any documents reflecting these inspections.

No. There are no plans to use one common qualified individual to inspect all DSRV-16 crankshafts. It has not yet been decided if Failure Analysis Associates will inspect all DSRV-16 crankshafts. (RPM)

10. Are the DSRV-16 crankshafts nominally identical? If not, detail the differences in these crankshafts.

The DSRV-16 crankshafts used in all TDI nuclear installations are nominally identical. We have no detailed information on all DRSV-16 crankshafts. Data supplied by TDI, in the minutes of the

November 30, 1983 Transamerica Delaval Nuclear Plant Emergency Standby Diesel Generator User's Group Meeting, indicate that all DSRV-16-4 crankshafts are dimensionally similar. (EWT, PJC, RPM)

11. What assurance is there that the conditions of the Catawba DSRV-16 crankshafts are known as to:

    a. metallurgy;
    b. fillet radius;
    c. shot-peening of fillet radius;
    d. web design -- flat-sided or circular-shaped;
    e. use of counter weights?

A metallurgical test on a sample block of the material used in Duke Power's crankshafts was performed by TDI. This test proved that the chemical composition of the shaft was indeed as required by the specifications. In addition, an ultrasonic test was performed by TDI, and a magnetic particle test was performed by TDI.

Inspections by TDI assured that the Duke Power crankshafts were produced within the specifications of the crankshaft drawing. The inspections assured that the fillet radii are within specification, that these radii were shot-peened and that the crank webs are manufactured as per the drawing.

Torsional critical speed and mass elastic system analyses were performed for the Duke engine generator system. The number, location and weight of the counterweights were determined from these analyses. This system is torsionally identical to Grand Gulf, which had a physical torsiograph test to verify system design. (RPM)

12. If the foregoing had been determined and are known, how do they relate to best practice and DEMA standards for each such condition?

"Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines" published by the Diesel Engine Manufacturers Association does not provide specific requirements or recommendations for metallurgy, fillet radius, shot-peening, web design or use of counterweights in crankshaft design. (EWT, PJC)

13. On the basis of the nine NRC inspections at Trans-America Delaval, Inc. (TDI) by the NRC, see, 1/26/84, Meeting on TDI diesel generators, (Tr. 15), what means have been identified or will be employed to effectively correct TDI's performance, i.e., to "shape them up" and "make them fly straight?" How long will it take? Please explain in detail basis for your answers.

Applicants object to responding to this Interrogatory on the grounds that it is outside the scope of the contentions admitted by the Board as issues in this proceeding. As nearly as we can tell, Intervenors seek information relating to the TDI quality assurance program, as reflected in NRC Staff inspections.*/ As explained above (pp. 1-4, supra), that issue has been ruled out of this proceeding by the Board, and thus no discovery may be had on it, as the Commission's rules permit discovery only of information or documents "relevant to the subject matter involved in the proceeding" and further limit the term "subject matter" to the contentions admitted by the presiding officer. 10 CFR (Stanislaus Nuclear Project, Unit 1), LBP-78-20, 7 NRC 1038, 1040-1041 (1978); Pennsylvania Power & Light Company, et al. (Susquehanna Steam Electric Station, Units 1 and 2), ALAB-613, 12 NRC 317, 330 (1980).

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*/ Intervenors have been provided with copies of the nine NRC Inspection Reports, contained in Board Notification 84-021, "Staff Inspection Reports of Transamerica Delaval, Inc., for Inspections Conducted from 3/79 to 7/83."

For the reasons described above, Applicants object to providing the information sought by this Interrogatory. To provide this information would subject Applicants to annoyance, oppression, undue burden and expense. Further, such information is not relevant to the subject matter of this contention, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.*/

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 will be confirmed by Applicants' test and inspection program. (GWA)

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 TDI's QA Program, and Applicants object on the grounds that it seeks information outside the scope of the contentions admitted by the Board. Therefore for the reasons given in the 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 these contentions, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

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*/ In any event it appears that this Interrogatory is more properly directed to the NRC Staff.

15. Describe in detail, and produce for inspection and copying, all documentation required by Applicants from TDI regarding the Catawba diesel generators, including but not limited to those summarized in attachment 12-1 to Applicants February 22, 1984 response to the NRC Staff.

Applicants object to this Interrogatory on the grounds that it seeks information outside the scope of the contentions admitted by the Board. Though the Interrogatory is unclear on its face it appears to seek information related to TDI's QA program. For example, though Applicants do not understand what Palmetto Alliance and CESG mean by "all documentation required by Applicants from TDI", the documents summarized in Attachment 12-1 and referred to in the Interrogatory, relate to TDI and Applicants' QA programs.*/

Therefore for the reasons given in the 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 these contentions, nor would its disclosure be reasonably expected to lead to the discovery of admissible evidence.

16. Identify in detail, and make available for inspection and copying any and all records of Applicants' surveillance performed at TDI with respect to the Catawba diesel generators.

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*/ With respect to the Applicants' QA program, discovery is clearly not permitted. Not only is it not a part of the contentions admitted by the Board, but the subject was not even raised in Intervenors' proposed contention. Such an assertion does appear to be a part of an amended or new diesel generator contention served by Intervenors on March 23; however, that contention has not yet been ruled on by the Board, and clearly discovery related to it is not permissible at this time.

Applicants object to this Interrogatory on the grounds that it seeks information outside the scope of the contentions admitted by the Board, that is, information relating solely to TDI's and/or Applicants' QA programs.

Therefore, for the reasons given in the 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.

17. Identify in detail all records reflecting shop testing, qualification testing, or generic testing with respect to the Catawba diesel generators, including but not limited to the testing identified in attachment 6-2 to the above-referenced submittal. Make available such records for inspection and copying.

To the extent that this Interrogatory is directed toward admitted contentions, Applicants' answer to Interrogatory 49 is responsive. Applicants object to providing further response to this Interrogatory on the grounds that it seeks information outside of the scope of the contention admitted by the Board. The Interrogatory is unclear, but it appears to seek information relating solely to TDI's and/or Applicants' QA programs.

Therefore, for the reasons given in the 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 the

contentions, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

18. Identify in detail, and make available for inspection and copying any records of inspections of the Catawba diesel generators at TDI as well as after receipt at Catawba.

Applicants object to this Interrogatory on the grounds that it seeks information outside the scope of the contentions admitted by the Board. The Interrogatory is unclear, but it appears to seek information relating solely to TDI's and/or Applicants' QA programs.

Therefore, for the reasons given in the 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 the contentions, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

19. Identify any components of the Catawba diesel generators not manufactured by TDI and describe in detail the surveillance and inspection records applicable to each component. Please make available such records for inspection and copying.

All components of the Catawba diesel engines which are the subject of the contentions admitted by the Board were supplied by TDI. All such components were manufactured by TDI with the exception of the turbochargers (manufactured by Elliott Corporation) and the fuel injection pump (manufactured by Bendix Corporation). (GWH)

Applicants object to supplying further information in response to this Interrogatory. As explained above, pp. 1-4, supra., the subject of the PA/CESG contention and the Board's contention is the diesel engine, not the generator. Therefore discovery on the generators is not permitted.

Consequently, 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.

20. With respect to the Catawba diesel generators were any inspection, audit, surveillance or testing hold points or check points missed? Please specify.

Applicants do not understand the Interrogatory. Applicants do not understand the reference to "testing hold points or check points missed" and therefore cannot determine what response, if any, is appropriate. However, it appears that the requests regarding "inspection, audit, surveillance," hold points or check points may seek information related solely to TDI's and/or Applicants' QA programs. Therefore, for the reasons given in the responses to Interrogatories 13 and 15, Applicants object to responding to this Interrogatory.

21. Why did you operate the engines lacking a full QA record? What failures or deficiencies have Applicants or the NRC Staff identified in the Catawba engines in procurement, vendor surveillance, or receiving inspection programs? For other DSRV-16 engines?

Applicants object to this Interrogatory on the ground that it seeks information outside the scope of the contentions admitted by

the Board. The Interrogatory seeks information relating to TDI's and/or Applicants' QA programs.

Therefore, for the reasons given in the 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 the contentions, nor would its disclosure be reasonably calculated to lead to the discovery of admissible evidence.

22. A file was found in the generator associated with one TDI diesel engine during early operation. Could it have been discovered before that point? If so, in what inspection? By whom? Why wasn't it?

23. A second file was found in another generator. Was this found during a QA inspection? If not, how was it found? Why?

24. How did files 1 and 2 come to be in the generators? What has been done to determine the cause of this occurrence? Was this a common cause? What corrective steps, if any, have been taken? Please specify. In how many other generators have files been found?

25. Have any other extraneous items been found in the TDI diesel generators or associated equipment? Please specify circumstances, articles, and consequences.

Applicants object to supplying the information sought in Interrogatories 22-25 on the grounds that it is outside the scope of the contentions admitted as issues in this proceeding by this Board. Interrogatories 22-24 focus on two files found in the generator portions of the diesel generators during testing. Interrogatory 25 seeks information regarding whether "any other extraneous items" have been found in the "TDI diesel generators or associated equipment."

Applicants base their objections on two grounds. First as noted above (pp. 1-4, supra.), the generator portion of the diesel generator is not a part of the diesel engine which is the sole subject of the contention admitted by the Board. The Intervenors' contention and the Board's contention relate solely to the diesel engine, not to the generator portion, of the diesel generators. Thus, the sought discovery is not permissible. Second, the questions appear to seek information as to Applicants' QA program. For the reasons set forth in the responses to Interrogatories 13 and 15, the sought discovery is impermissible.

Therefore, for the reasons set forth above, Applicants object to these Interrogatories. To respond to them would cause Applicants annoyance, oppression, undue burden and expense. Further, such information is not relevant to the subject matter of the contentions, 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 Attachment 1. (RPM)

27. Identify all manufacturers of emergency diesel generators for use in nuclear power plants. Identify plant and type, and principal specifications including

model number, cylinders, configuration, and number at each plant.

Applicants object to this Interrogatory. The interrogatory is unclear, but to address its first sentence, Applicants are not aware, with any degree of certainty, of the identity of "all manufacturers of emergency diesels for use in nuclear power plants." To collect this information would require some sort of survey of all manufacturers of diesel generators. So far as the second sentence is concerned, it appears that Intervenors want an identification, as well as other specific information, of the diesel generators at each nuclear plant, whether operating or under construction, in the country.*/ Applicants do not have this information and cannot obtain it short of conducting an industry-wide survey. Applicants do not intend to conduct such surveys, nor are they obligated to do so. Such would constitute a substantial and unwarranted burden upon Applicants. This is particularly true in light of the fact that the requested information does not relate to the issues admitted for litigation by this Board.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

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*/ We assume, though the Interrogatory does not so state, that the request is limited to this country.

28. With respect to these diesels identify all failures, deficiencies, incidents, licensee event reports (LERs) or other significant operational occurrences. For example, the bearing and shaft failure at Arkansas No. 1.

Applicants object to this Interrogatory So far as the Catawba diesel generators are concerned, the relevant information is identified in the documents provided in the request to produce and in the answers to Interrogatories 49 and 49A. Such information with respect to diesels at other plants is beyond the scope of the contentions admitted by the Board and Applicants object to providing such on those grounds. However, Applicants would point out that the requested information with respect to TDI diesels is contained in the various Board Notifications, which have all been served on Intervenors.

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

29. Identify the nuclear plant where high winds caused damage to the transformer or switch yard. Was off-site power lost? Was the facility operating? Were emergency diesel generators used for a safe shutdown?

Applicants object to this Interrogatory. They have no specific knowledge of such an event and would be required to conduct a survey of the industry to learn of it. Applicants have no intention of conducting such a survey nor are they obligated to

do so. In any event, the information sought is outside the scope of the contentions admitted by the Board.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

30. What instances have emergency diesel generators been required to function in nuclear power plant applications? Please identity in detail including facility name, date and description of circumstances.

Applicants object to this Interrogatory. Applicants do not have this information available and to compile it would require Applicants to survey the entire industry. Applicants have no intention of conducting such a survey, nor are they obligated to do so. In any event, the information sought is outside the scope of the contentions admitted by the Board.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

30A. Why is the measured crankshaft torque ten percent higher than predicted according to Failure Analysis Associates, 1/26/84 (Tr. 38)? What effect does this prediction have on knowledge of the performance of the Catawba crankshaft?

Since we were not involved in either the analysis or testing of the Shoreham crankshaft, or have available details of this

analysis or testing, other than the subject transcript and the Failure Analysis Associates Report "Analysis of the Replacement Crankshafts for Emergency Diesel Generators Shoreham Nuclear Power Station", October 31, 1983, we cannot provide specific reasons why the measured crankshaft torque is ten percent higher than predicted.

The prediction of crankshaft torque on the Shoreham machine has no effect on the knowledge of the performance of the Catawba crankshaft. (EWT, PJC)

31. What replacement options for diesel generators or components are available or are under consideration by the NRC, the Owners Group or any members thereof, or by Applicants? Please describe each including time and availability considerations.

Applicants do not presently have under consideration replacement of the diesel generators.

Applicants object to providing any further information in response to this Interrogatory. PA/CESG call on Applicants to provide information to them respecting replacement options under consideration by other organizations, e.g. the NRC, the Owner's Group, or any members thereof. To obtain such information would require Applicants to conduct a survey of the NRC, the Owner's Group, and members of the Owner's Group. Applicants have no intention of conducting such a survey and are under no obligation to do so. In any event, the information sought is beyond the scope of the contentions admitted by the Board.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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. (GWH)

32. Is Long Island Lighting Company at Shoreham planning to replace or supplement the TDI generators with others supplied by a manufacturer such as Colt Industries? What is the NRC Staff position on this action?

Applicants object to this Interrogatory. It seeks information beyond the scope of the contentions admitted by the Board. Moreover, Applicants have no way of knowing what the NRC Staff position might be on a licensing matter involving another utility.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

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.

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 contentions 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.

33A. With respect to the design review task descriptions, 1/26/84 meeting, (tr. 55), how many tasks were:

a. eliminated;
b. reduced;
c. left unchanged;
d. augmented

Identify the reviewers who participated in each change.

Task Descriptions prepared for use in Design Review and/or Quality Revalidation activities for the Owners' Group member utilities are subject to review and revision in accordance with the Owners' Group Program Procedures prior to their release for implementation. The extent of revision will vary, depending on the specifics of the component and task in question. Statistics for revision, elimination, reduction, expansion, etc., of Task Descriptions in the review and approval process are not maintained by the Owners Group. (RPM)

34. Which task will apply to all components? Or which tasks will a population be sampled for qualification by a sampled surrogate? Identify the number of surrogates and the number of components in the total population in each case. What assurance is there that the populations are sufficiently homogeneous for randomly chosen surrogates to be representative? See, for example, 1/26/84 at (Tr. 77).

The extent and type of sampling required to validate significant quality attributes for specific engine components is a function of the criticality of the component's design function in supporting the engine's operation, the margin of safety inherent in the component's design, the availability of installed and/or spare components for examination and testing, the known operational history of the components in TDI engine applications, and the judgment of the Owners' Group Technical Staff.

Due to the variances of one or more of the above considerations from component to component, the sampling selected may vary considerably, from very minimal sampling to 100% sampling. Additionally, required sampling for "following" engine components will be modified as appropriate, based upon results of inspections conducted on "lead engine" components. (RPM)

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 Attachment 2. (RPM)

35A. Describe in detail the Catawba maintenance and testing program for emergency diesel generators.

The periodic maintenance and testing program for the Catawba diesel generators is under development. The maintenance program will be based on TDI recommendations, Owner's Group recommendations, and Duke Power engineering review of the Application. The testing program will comply with Regulatory Guide 1.108, Catawba Technical Specifications and Duke Power engineering review. (RPM)

Applicants object to providing further information in answer to this Interrogatory. The Catawba maintenance and testing program for its diesel generators is not an issue encompassed in the contentions admitted by the Board in this proceeding. Applicants have responded only because of potential overlap with their reliability and testing program. To provide further information would be to subject Applicants to unnecessary burden and expense.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

36. For a universe of 100 engines will a single acceptable inspection or test qualify the other 99? Explain fully the basis for your answer.

There is no one single acceptable test or inspection that can qualify a diesel generator for use in a nuclear power plant. (RPM)

To the extent that this Interrogatory seeks information concerning TDI's and/or Applicants' QA programs, Applicants object on the grounds that it seeks information beyond the scope of the contentions admitted by the Board.

For the reasons given in the 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.

37. If the initial sample proves unsatisfactory and the second sample is satisfactory what would the further sampling be? How will it be determined as to size and relation to accepted versus rejected samples?

The results of further inspections combined with engineering review of the inspection would determine the size of the sample. (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 absence of linear indications in the piston-crown stud boss region in all pistons examined. (RPM)

39. Do you assert that authorization for fuel load and operation at any power levels is appropriate prior to full qualification of the acceptability of the emergency diesel generators at the Catawba Nuclear

Station? If so, describe in detail the factual and technical basis for your answer with respect to the protection of the public health and safety at each power level for which such authorization is believed appropriate and given the specific progress achieved in qualification of the emergency diesel generators at such time.

Applicants object to this Interrogatory on the basis that it seeks information beyond the scope of the contentions admitted by the Board. Information relating to Applicants' views regarding fuel load prior to "full qualification of the acceptability of the emergency diesel generators" is not encompassed, directly or indirectly, in either of the contentions admitted by the Board.*/

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

39A. Prior to ordering the TDI diesels did Applicants perform any investigation of customer satisfaction or operating history for TDI supplied engines? If so, explain in detail. If not, explain why and identify any other information relied upon with respect to the acceptability of TDI engines.

Prior to ordering the TDI engines, an evaluation was done of TDI engines. An experience list, which was submitted with TDI's quotation proposal, was evaluated. Other users of TDI engines were contacted and gave favorable responses. (JPV)

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*/ Applicants would also note that this Interrgatory also appears to call for a legal conclusion unrelated to the facts, which is another grounds for objection. See Boston Edison Company, et al. (Pilgrim Nuclear Generating Station, Unit 2), LBP-75-30, 1 NRC 579, 588 (1975); 4A Moores Federal Practice, §3317.

40. Were Applicants aware of the operating experience of TDI engines in marine applications? Describe in detail.

At the time of procurement, we were aware that TDI engines were in use in marine applications as shown by their experience lists submitted with their proposal. We were not aware of specific operating experience in marine applications. (RHW)

41. What information did Applicants have as to the trustworthiness of TDI's QA program, particularly with respect to its quality control inspection program?

42. What information did Applicants have or acquire concerning the qualifications of TDI QA personnel?

These Interrogatories are clearly directed toward a contention which was denied admission. Applicants object to these Interrogatories on the grounds that they seek information outside the scope of the contentions admitted by the Board, that is, information relating solely to TDI's and/or Applicants' QA programs.

Therefore, for the reasons given in the 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.

43. What information did Applicants have or acquire regarding the rated and actual horsepower per cylinder for TDI engines in marine and nuclear applications? Did Applicants have or acquire any information regarding over-rating or under-powering of TDI engines? What is the horsepower rating per cylinder of the Catawba diesels? What is the horsepower per cylinder of the comparable model diesel in use in marine applications?

Horsepower ratings were provided by all bidders with their proposals. These ratings were provided by TDI for engines used in marine applications as well as for stationary power. We did not have or acquire any information regarding over-rating or under-powering of TDI engines. The horsepower rating for the Catawba engines is 610.6 bhp per cylinder. The horsepower rating of the comparable model diesel engine in use in marine application is 677 horsepower per cylinder. (RHW)

44. With respect to the "design improvements" listed in attachment 4-1 to Applicants 2/22/84 submitted to the NRC, why were the failures there reflected not understood as evidence of product immaturity?

In large measure, the "design improvements" were modifications necessary to meet the requirements of the nuclear industry, such as the extra bracing and supports to qualify the diesels for seismic events. Modifications also were made to insure that the diesels would start and be ready to accept loads within a specified (11 seconds) time. These modifications are not necessary or required for commercial application.

Applicants do not believe the "failures," such as they are, indicate "product immaturity." TDI has used commercial operating experience of their engines to improve their design. It is reasonable to expect design improvements after analysis of components with thousands of hours of commercial operation. Such design improvements increase the longevity of the component.

It also should be noted that it is unlikely that the nuclear diesels will ever see the number of hours of operation that is seen in commercial operation or the operating conditions to which a commercial diesel is subjected. (JDH)

44A. What competing bids for emergency diesel generators were solicited and/or received by Applicants in addition to the submission by TDI? Identify and make available for inspection and copying documents reflecting such alternate equipment.

Applicants object to this Interrogatory on the grounds that it seeks information outside the scope of the contentions admitted by the Board, that is, Applicants' procurement procedures which are related to Applicants' QA program.

Therefore, for the reasons given in the 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.

45. With respect to the term "limitless trouble-free service" as employed in item 10 of attachment 4-1 to Applicants' 2/23/84 submittal, provide a detailed definition including precise measurement of service time represented by the term.

Commercial diesels have operated for prolonged periods with the improved exhaust manifold seal rings with trouble free service.

It is expected that the Catawba diesels will be subjected to fewer hours of operation than commercial diesels. Therefore, trouble free service is expected from the exhaust manifold seal ring for the life of the Catawba diesels.

A reasonably precise measurement of time represented by the term would be the life of the Catawba diesels which is based on the 40 year life of the plant. (JDH)

45A. On which diesel generator was the seven day no load Idle Endurance Test performed as referenced in response No. 6 of the above submittal? What is the significance of this test?

The seven day no load Idle Endurance Test was performed by TDI on a DSRV-16-4 engine with a 7000 KW generator used at the Grand Gulf plant.

Extended operation of standby diesel generators at no load may be required if one engine is temporarily inoperable during service or overhaul or if off-site power is being used to circulate coolant water during a loss of coolant accident. This test demonstrates that the engine can idle at no load for 7 days and then successfully accept load. (RHW)

46. What is the basis for asserting that 300 start tests of the Grand Gulf diesel generator adequately qualifies the Catawba engines? Describe in detail and identify all documents reflecting this basis.

The basis for the type qualification program for the 300 start test is contained in IEEE 387-1977 and Regulatory Guide 1.9. (RHW)

47. What is the basis for use of testing and inspection of the Catawba 1-A diesel generator to qualify the other three generators at Catawba? Explain in detail the basis for this answer and identify all documents reflecting such basis.

The basis for use of testing and inspection of the Catawba 1-A diesel generator to qualify the other three generators at Catawba is U. S. Nuclear Regulatory Commission, Regulatory Guide 1.9 entitled "Selection, Design, and Qualification of Diesel - Generator Units Used as Standby (on site) Electric Power Systems at Nuclear Power Plants". The position established by this Reg. Guide is conformance with the requirements of IEEE Standard

387-1977, "IEEE Standard Criteria for Diesel - Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Station". This IEEE standard states,

> "Diesel-generators of types not previously qualified as a standby power source for nuclear power generating stations shall be subject to a "type qualification" testing program consisting of a "load capability qualification, start and load acceptance qualification, and margin qualification . . . " Qualification tests may be performed on one or more units, although qualification of one unit will qualify like units of the "type" for equal or less severe service." (RPM)

48. What relevant statistical information leads to justifying this practice?

Regulatory Guide 1.9 and IEEE Std. 387-1977 do not indicate any statistical information justifying the practice of "type qualification" of diesel generators. (RPM)

48A. What load level was employed in the "24 hour loaded run" included in the testing of the Unit 1 diesel generators?

The "24 hour loaded run" involved 22 hours at 100% rated load and 2 hours at 110% rated load. (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.

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.

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.

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 contentions admitted by the Board.

Therefore, for the reasons given in the 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.

51. With respect to the response to item 13 of Applicants' 2/22/84 submittal to the NRC Staff regarding loss of voltage incidents describe in detail each such incident at Applicants' Oconee and McGuire facilities setting forth the information described in that response with respect to Catawba.

Applicants object to this Interrogatory because it seeks information beyond the scope of the contentions admitted by the Board. Intervenors, noting that Applicants have provided certain information to the NRC Staff regarding an undervoltage incident at Catawba */ request similar information with respect to Duke's Oconee and McGuire facilities.

Without making a point of the fact that it is problematical whether, given the nature of the contentions admitted by the Board, Interrogatories are permissible regarding the Catawba incident, **/ Interrogatories directed to potential incidents at Duke's Oconee and McGuire plants "involving loss of voltage at the emergency bus(es) involving operations of diesel generators" certainly are not relevant. The only conceivable relevance such an inquiry could have is whether if such an event had occurred, the diesel generators operated as required. However,

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*/ The NRC Staff had asked all owners of TDI diesel generators to provide information regarding incidents "in which voltage was lost at the emergency bus(es) requiring operation of the DG(s)." See Applicants' Responses of February 22, 1984, Response 13.

**/ Applicants would note that, rather than require the Board's involvement in that issue Applicants have answered Interrogatories relating to the referenced incident. See Responses to CESG's Interrogatories #s 24 and 25, p. 61, infra.

such information might possibly be within the cognizance of this Board only if the source of backup power at Oconee and McGuire is TDI diesel generators. Such is not the case. Backup power at Oconee is not supplied by diesel generators. The diesel generators at McGuire were not manufactured by TDI. Thus, this Interrogatory is not permissible.

Therefore, for the reasons given in the 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 advisable evidence.

52. Identify by name, title, address and telephone number each and every person responsible for performing the following functions with respect to the Catawba emergency diesel generators:

a. specification design;
b. bid solicitation and analysis;
c. approval of TDI as supplier;
d. QA audit and surveillance of TDI;
e. receiving inspection;
f. diesel generator testing;
g. component inspection;
h. post Shoreham failure TDI liaison;
i. Owners Group liaison and representation;
j. NRC liaison;
k. design qualification;
l. extended operation test of diesel generator 1-A
m. Analysis of options and procurement of replacement components in equipment.

Describe the work experience, training and qualifications of each of these individuals.

The original procurement specification had input from several different groups but at the time of original release, design input was coordinated under the direction of Mr. J. P. Voglewede.

Mr. Voglewede's present title and address is Supervising Design Engineer, P.O. Box 33189, Charlotte, North Carolina 28242, telephone, 704-373-8158.

Mr. H. B. Tucker
Vice President, Nuclear Production
P.O. Box 33189
Charlotte, North Carolina 28242
704-373-4531

Mr. C. J. Wylie
Design Engineering - Electrical-Chief Engineer
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704-373-4438

Mr. R. O. Sharpe
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W. R. McCollum
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R. P. Muschick
Maintenance Engineer
PO Box 33189
Charlotte, NC 28242
704-373-5875

G. W. Hallman
Nuclear Maintenance Manager
PO Box 33189
Charlotte, NC 28242
704-373-2345

Transamerica Delaval Inc. is responsible for the design qualification of the diesel generators.

J. M. Lines
Technical Specialist
P.O. Box 33189
Charlotte, North Carolina 28242
704-373-5591

J. D. Heffner

Technical Specialist
P.O. Box 33189
Charlotte, North Carolina 28242
704-373-4865

J. P. Voglewede
Supervising Design Engineer
P.O. Box 33189
Charlotte, North Carolina 28242
704-373-8158

(JPV)

Applicants have provided responses to those portions of this Interrogatory which are relevant to the admitted contentions. To the extent that this Interrogatory seeks information outside the scope of the contentions admitted by the Board, Applicants object. Applicants object on these grounds to Interrogatory 52 subparts b, c, d, and e.

Therefore, for the reasons given in the 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 admissable evidence.

IV.

Responses to CESG Interrogatories

Crankshaft Contention

1. At the time Catawba DG pistons were removed for further heat treatment of piston skirts, were all crankshaft fillets examined for cracks? What examination methods were used?

Visual inspection using 5X magnification of the crank pin fillets was made. These were the only fillets inspected during that maintenance activity. (RPM)

2. Are the manufacturing drawings, specifications, and metallurgy identical for the Grand Gulf and the Catawba DGs? If not define the difference. Provide serial numbers and dates of manufacture for both.

The crankshafts supplied for the Grand Gulf and Catawba DSRV-16 diesel engines are identical in design. The have the same manufacturing drawings, specifications, and metallurgy requirements. The crankshafts for both job sites are TDI part number 1A-5445. The TDI control numbers for the Duke Power and Mississippi Power and Light crankshafts are as follows:

Duke		MP&L	
S/N	Control #	S/N	Control #
75017	569	74033	425
75018	571	74034	485
75019	593	74035	534
75020	608	74036	533

(RPM)

ASLB's Contention

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 turbocharger bearing failed because the bearing face on the turbine end thrust bearing wiped due to insufficient lubrication.

b. Functionally the turbocharger bearings failed as because loss of bearing metal on the turbine end thrust bearing allowed the back face of the thrust

runner on the blower end to rub the blower end oil seal. This resulted in excessive heating on the blower end oil seal which eventually caused it to crack. When turbocharger oil pressure drops below 15 psi in a routine run, the diesel is automatically shut down. During an actual emergency condition, low turbocharger oil pressure would not shut the diesel engine down. Therefore in an emergency situation the diesel generator would have continued to provide backup power. (JEC)

4. What was wrong with the replaced governor box, response to 8?

The problem with the governor box was identified as a defective internal DC bridge rectifier which allowed AC signals along with the DC signals to pass to the actuator.

As a result, erroneous signals were transmitted to the governor actuator, causing the diesel to oscillate (minor increase/decrease in diesel RPM). This problem was corrected by replacing the control box. (JDH)

5. In view of the response EL40114D/16, define "actual reliability" in the context. What incidents would have a significant bearing on the actual reliability?

"Actual Reliability" in this response means that the incidents, as stated, would not have prevented the diesel from starting and performing its required function during an actual emergency situation. No such incident reported in the referenced response would have a significant bearing on the actual reliability of the diesel. (JDH)

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 turbo-charger 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 a maximum of 75% of rated load. (JEC)

7. Are there any failure modes of a governor box which would interfere with DG reliability? If so, what are they?

A malfunction in the governor box would slightly impact the diesel performance. The electrical governor is backed up by a mechanical governor which operates automatically if the electric governor fails. Therefore, failure of the electrical governor box does not compromise the reliability of the diesel. (JDH)

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 IADG, and/or completed previous DSRV 16-4 inspections.

Tests and inspections of 2A and 2B DG are yet to be determined. (RPM)

9. What design and operability requirements were specifically imposed on TDI in the purchase contract in

regard to reliability and durability? Define reliability and operability as you use these terms. If you use the term durability, please define.

Design and operability requirements imposed on TDI are listed in our procurement specification - Refer to Duke Power's responses to the Nuclear Regulatory Commission's Requests for Additional Information - Delaval Generator Evaluation, Catawba Nuclear Station Units 1 and 2, Question 1.

Reliability:

The ability of the diesel generator to start, accelerate to synchronous speed and accept load in the required time in a reliable manner as determined by the requirements of Regulatory Guide 1.108.

Operability:

Operability is defined in the Catawba Technical Specifications, definition 1.18. (RHW)

10. Did Duke know of the history of TDI diesel performance on the Alaska ferry, Columbia, at the time of executing the purchase contract with TDI? If not, when did DPC learn?

11. Did TDI offer the state of Alaska as a reference during the procurement stage? Did TDI offer references? If so, please list.

Applicants object to Interrogatories 10 and 11. These interrogatories seek information as to Applicants' knowledge of certain TDI engines in marine applications at the time of procurement, as well as other matters existing at that time. Such information is not discoverable for two reasons. First, the knowledge had by Applicants at the time of procurement respecting TDI engines in marine applications, or in other

applications, is irrelevant to the contentions admitted by the Board.

Second, such information treads close to involvement with TDI's quality assurance program, which is an issue ruled out of this proceeding by the Board. Therefore, for the reasons set forth above, Applicants object to these Interrogatories. To respond to them 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.

12. Regarding response 12 to staff; what Catawba DG items were repaired: Used-as-is?

Applicants object to this Interrogatory. The reference to DG items being repaired or used "as-is" is contained in response 12(1) which is concerned with 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 contentions admitted by the Board.

Therefore, for the reasons given in the 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.

13. Define "valid test reliability" as it is used. What assurance is there that 98% valid test reliability will insure safe shutdown?

A valid test for reliability purposes is defined in Reg. Guide 1.108. The 98% reliability provides reasonable assurance that a diesel generator will be available when needed. It should be pointed out that there is a redundant diesel generator set that has 100% backup capability. (LAR)

14. Are the Grand Gulf DG failures: piston crown separations, piston skirt cracks, fuel line failures, cylinder head cracks, turbocharger problems, push rod cracks, air starter valve problems and a generator short, consistent with the reliability required for a safe-shutdown device?

No. The Grand Gulf diesel engine problems have been identified and modifications made to correct and solve the problems. These modifications have been made on the Catawba diesel engines to prevent similar problems. (JDH)

15. Regarding response to 12., how do you reconcile the problems encountered with TDI DG's with your conclusion that "the TDI generators were reliable?" Was this the uniform, unqualified response of those you queried? Specify each individual responding for each concern by name and by job title.

Applicants do not understand the reference to "response 12" with respect to the quote in the question. However, Applicants have or are investigating each problem that has been identified concerning the Delaval diesels. The corrective action to the problems has been or will be evaluated and either is or will be satisfactory to Duke Power. The outcome of Applicants' tests and inspection program will be to reasonably assure that the diesel generators will perform their intended function. (JDH)

16. Do you concur with the conclusion referenced in 15. foregoing?

None of the DG problems encountered on the TDI DG's at Catawba are inconsistent with the reliability required for a safe-shutdown device. (GWH; KPM)

17. Has DPC at any time talked or corresponded with a mechanical supervisor or superintendent or engineer of the state of Alaska in connection with the performance of TDI diesels on the MV Colombia? the operators of the MV Pride of Texas? of the MV E H Gott? If so, provide the complete record of these communications.

Yes.

The summary of communications is as follows:

a. ITEM: Head Cracking

UTILITY/PT. U.S. Steel/MV "E H Gott"; State of Alaska/M.V. "Columbia"

CONTACT (S): E Merry/U S Steel; K. Besselin/Alaska

SUMMARY. During routine annual inspection, cracking was discovered on cylinder heads, primarily between exhaust valves. Infrequent cracking between exhaust valve, intake valve and injection port. The cause of this cracking was determined to be a combination of high stress areas, age, and thin areas due to head design. The cracked heads were replaced. Head longevity is increased by normal engine operation versus overload conditions.

UTILITY/PT. Titan Navigation/MV "Pride of Texas"

CONTACT (S). J McGlashan

SUMMARY. During routine inspections, cylinder heads were found to be leaking water through cracks and pores that were apparently caused by non-uniform castings.

The faulty leaks were replaced with new heads manufactured after 1978.

b. ITEM. Cylinder Head Valve Seats (Exhaust)

UTILITY/PT. Titan Navigation/MV "Pride of Texas"

CONTACT (S). J McGlashan

SUMMARY. During routine inspection some stellite valve seats were found severely cracked to base metal. Some contributing factors are heat removal, seat installation, age and stress. The exact cause is still under investigation by TDI.

The damaged head was replaced and returned for seat replacement.

Prevention of the recurrence of this problem is a function of seat installation and is being evaluated by TDI.

c. ITEM. Cylinder Head Exhaust Valve Seats

UTILITY/PT. State of Alaska/MV "Columbia"

CONTACT (S). K Bessilin/Alaska

SUMMARY. Cylinder head exhaust valve seats were found to be cracked during a routine inspection of the engine. The cause of the failure was determined to be a combination of the seat installation, welding process/technical and the head (base) thickness.

The correction for this problem has been to improve the welding process on newer head designs.

The prevention of recurrence for this problem is a function of the manufacturer's design and has improved with a newer head design.

d. ITEM. Cylinder Liners

UTILITY/PT. Duke Power Company/Catawba; State of Alaska/M.V. "Columbia"

CONTACT (S). Andrew Rush/TDI, Bob Johnston/TDI; K. Besselin/Alaska

SUMMARY. There have been reports from "Columbia" and one occurrence at Catawba of the receipt of cylinder liners that had not been honed. The Catawba incident resulted from the discovery of an unhoned liner originally installed in the 1A diesel and found while removing the pistons for the piston skirt skirt heat treat modification. Those received by "Columbia" were spare or replacement cylinder liners.

The cause of these incidents is an error in shipping and installation by Transamerica Delaval.

To correct these problems, the cylinders were honed to the proper cross hatch pattern.

As a precaution to prevent recurrence, all cylinder liners are inspected for proper surface finish before installation.

ITEM. Cylinder Liner

UTILITY/PT. State of Alaska/M.V. "Columbia"

CONTACT(S). K. Besselin, Max Zbinden/Alaska

SUMMARY. "The Columbia" experienced water leakage into the crankcase through faulty cylinder liner seals.

The cause of the seal leakage was a loss of elasticity in the neoprene O-rings.

The problem was corrected by changing the material of the O-rings from neoprene to viton (which retains its elasticity).

f. ITEM. Cylinder Liner

UTILITY/PLT. Titan Navigation/M.V. "Pride of Texas"

CONTACT (S). John McGlashan

SUMMARY. The cylinder liner (as well as the head, block, piston skirt, and connecting rod) of one cylinder was damaged during a maintenance roll of the engine.

The cause of the damage was determined to be water that had leaked form the turbocharger intercooler, filled the combustion air header and reached the cylinder. During the compression stroke, the water was forced against the head causing the damage of these components.

All affected components were replaced or repaired including the leaking intercooler.

To prevent recurrence, drain cocks were installed in the combustion air header to allow continual removal of moisture prior to and during operation.

g. ITEM. Cylinder Heads

UTILITY/PLT. State of Alaska/M.V. "Columbia"

CONTACT (S). Bob Johnston/TDI; K. Besselin/Alaska

SUMMARY. Scoring, scratching and scuffing of several cylinder liners were observed during inspection. This scuffing was attributed to the chrome flaking from the piston rings, becoming embedded behind the rings. This caused normal ring flexture during travel to cease. The end result being scuffed cylinder liners.

Columbia honed or replaced the liners as needed. TDI recommended the use of another brand of piston ring, "Muskegon", which has virtually stopped the wear induced because of flaking chrome on the piston rings. TDI has worked with Koppers on the chrome plating flaking problem and determined the faulty rings to be of only a certain time frame of manufacture.

h. ITEM. Cylinder Block

UTILITY/PLT. State of Alaska/M.V. "Columbia"

CONTACT (S). K. Besselin/Alaska

SUMMARY. During overhaul of the engines of the "Columbia" the cylinder block bores were observed to be distorted and the cylinder blocks warped. Fretting was discovered in the region where the cylinder block meets the crankcase.

The cause of this warpage was determined to be improperly torqued cylinder block to crankcase thru-bolts allowing misalignment of the block to occur. After several thousand hours of operation, warpage and excessive liner wear including loss of liner crusher were found.

The cylinder blocks and liners were replaced, and the torques were verified. The warpage problems have been eliminated.

i. ITEM. Cylinder Block

UTILITY/PLT. TITAN Navigation/M.V. "Pride of Texas"

CONTACT (S). John McGlashen

SUMMARY. During a maintenance roll of the engine, the cylinder block was cracked.

The cause of the damage was determined to be water that had leaked from the turbocharger intercooler, filled the combustion air header and reached the cylinders. During the compression stroke, water was forced against the head causing damage to several components.

All affected components were replaced or repaired.

To prevent recurrence, the engines were fitted with drain cocks in the combustion air header which allows moisture to be removed through constant venting prior to and during operation.

UTILITY/PT. US Steel/M.V. "E H Gott"; State of Alaska/M.V. "Columbia"

CONTACT (S). Ed Merry/"C.H. Gott"; K. Besselin/Alaska

SUMMARY. During an overhaul, the diesel generators were found to have circumferential surface cracking in the top land of the block where the cylinder liners meet the block.

This surface cracking has been attributed to high stress on the land due to radial thermal expansion of the cylinder liner while in operation.

To solve the problem, the M.V. Gott machined the engine block to remove this surface cracking. The Columbia replaced the blocks because of warpage.

To prevent further recurrence, TDI has recommended that these cylinder liners be machined to give a slightly greater clearance.

j. ITEM. Connecting Rods

UTILITY/PLT. State of Alaska/MV "Columbia"

CONTACT (S). K Besselin, R Tee/Alaska

SUMMARY. Surface cracking and fretting of connecting rod connections and bolts have been observed during maintenance.

The cause of this damage is believed to be severe engine operations at peak and overload conditions.

The problem was corrected by replacing the damaged rods.

To prevent recurrence of this problem, operation of the engine must be limited to design load or less. TDI rebuilt all but one rod and installed heavier rod bearings.

k. ITEM. Intercooler Failure

UTILITY/PLT. US Steel/MV "E H Gott"

CONTACT (S). E Merry/"E H Gott"

SUMMARY. Water was found in cylinder and traced to a leaking intercooler as the water source.

Inspection of intercooler showed the cause of the leakage to be a loss of tube integrity because of gussett on a baffle plate tubing support was welded on one side and pulled against the tube. The resultant rubbing action wore a hole in the tube.

The gussett was straightened and welded in place and the breached tube was plugged to correct the problem.

The other intercooler was examined and the same condition did not exist.

UTILITY/PLT. Titan Navigation/MV "Pride of Texas"

CONTACT (S). J McGlashan

SUMMARY. Catastropic cylinder failure occurred during an air roll prior to starting the engine.

The cause of this failure was determined to be water in one of several liners. The leakage was caused by severe erosion from water borne metal machine chips which resulted in a breach in the tubing.

The problem was corrected by repairing the engine, plugging the affected tubes, and installing a temporary in line filter to remove any remaining metal chips. The chips were traced to replacement heads.

Recurrence of this problem was prevented by water flushing each head to remove machining waste from the head. This should be done by the manufacture.

1. ITEM. Turbocharger - Nozzle Ring Vane

UTILITY/PLT. State of Alaska - MV "Columbia"

CONTACT (S). K Besselin/Alaska

SUMMARY. During operation turbochargers were checked because of unusual noise and performance. The nozzle ring vane was found to be cracked.

The cause was determined to be a lack of support for the vane during high power/load changing conditions.

The initial correction was to replace that cracked nozzle ring.

TDI evaluated this cracking problem and submitted a 10CFR21 to modify the vane from a four (machine screw) to an eight machine screw mounting configuration. (JDH)

18. Is it possible to assemble individual components each satisfactory in regard to QC into an unsatisfactory diesel engine?

Applicants object to this Interrogatory. It seeks information beyond the scope of the contentions admitted by the Board and in any event would cause Applicants to engage in unwarranted speculation to respond. The Interrogatory asks, assuming all individual components of an engine are proper with respect to QA, whether such components can be assembled into an "unsatisfactory" diesel engine. This Interrogatory thus seeks information directly related to TDI's QA Program, a matter ruled out of this proceeding by the Board. Moreover, though the short answer to the Interrogatories is of course "yes", it

calls for assumptions regarding, among other things, breakdowns in QA by TDI. Those assumptions are unwarranted and in any case are beyond the scope of the contention.

Therefore, for the reasons set forth above, Applicants object to this Interrogatory. To respond 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.

19. Provide the code criteria, all applicable, for diesel cylinder heads; the relation between HP per cubic inch and cylinder head specifications; ditto piston crowns and piston skirts.

There are no specific code criteria which relate to diesel cylinder heads, piston crowns and piston skirts. These parts are designed by the manufacturers based on experience and engineering judgment. (RHW)

20. Were the 1097 hours run by Grand Gulf Div. I DG trouble free? Was operation at any time interrupted by malfunction or anticipated malfunction and increased damage? Please list.

21. Same questions as 20. for Div. II Grand Gulf DG. For both, provide load levels during tests.

The following is a list of the problems experienced at Grand Gulf for Division I and Divsion II diesel generators.

a. Starting Air Valve Failure (LER 83-82) Div I
b. Cracked Welds Turbocharger Jacket Water Discharge Piping (LER-83-107) Div I
c. Voltage Regulatory Failed (LER 83-102) Div I
d. Turbocharger Capscrew Failure (LER 83-107) Div I
e. High Pressure Fuel Oil Line Failure (LER-83-114) Div I
f. LSSS Panel Did Not Operate as Designed (LER 82-83) Div I and II
g. Cracked Weld on Push Rod (LER 83-82) Div I
h. D/G Fire (One Hour Notification, LER 83-126) Div I
i. Trip on High Jacket Water Temperature Signal (LER 83-95) Div I
j. Rear Crankcase Capscrew Failure (LER 82-80) Div II
k. Automatic Voltage Regulatory Failure (LER-83-140) Div I

The testing included a 24 hour run, of which 2 hours was at 110% load and 22 hours at 100% load. A seven day run at 60% load was also completed. (RPM)

22. What parts of Catawba DG 1A were dye penetrant tested at the time of removing piston skirts for further heat treatment?

At the time of the piston skirt removal no dye penetrant testing was done. (RPM)

23. In reference to 12(4)7, what corrective action has been taken in regard to cylinder head cracks? Will cylinder head cracks be dealt with on a case-by-case basis or generically?

In your question you reference 12(4)7. This section does not exist. However, we have based our answer on 12(6)7.

During the years 1974 through 1978, Transamerica Delaval was involved in casting modifications to correct leakage problems which were resolved in 1978. The casting improvements were to correct for porosities, and to increase the thickness of the jacket water walls in the heads.

Maritime units using the same head, manufactured between 1977 and 1978, are changing heads at a rate of 1 to 3 heads per

5000-6000 hours of operation provided they are operated in a continually overloaded condition. These heads are being replaced with heads manufactured after 1978 as failures occur.

Most of the Catawba Unit 1 heads were manufactured between 9/78 and 12/78. The Unit 2 heads were manufactured between 3/79 and 9/79.

Duke Power will replace the 1978 vintage cylinder heads on a case-by-case basis when and if head leakage occurs. The replacement heads will be of post 1978 manufacture. (JDH)

24. What are the relations of Moser Lines, yellow and red buses, and the plant's 22 KV bus? Please provide diagram.

The diagram in Attachment 5 shows the relative locations of the Moser Lines, yellow and red buses, and the unit feeders within the 230 KV switchyard area at Catawba. The unit 22 KV bus is located in the transformer yard, adjacent to the Turbine Building, on the respective unit.

A breaker-and-a-half scheme is used in the Catawba switchyard such that all lines and unit feeders can remain in service with either the red or yellow bus out of service. (KRC)

25. How were the faults that developed as a result of the Moser Pole failure cleared?

The Moser Lines were tripped via protective relaying associated with these lines. Tripping the Moser Lines results in tripping power circuit breakers (PCB's) 26, 27, 29, and 30 in the Catawba switchyard. The yellow bus breakers were tripped via the yellow bus differential relays. (KRC)

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. (RHW)

27. During a blackout, how many DG's are required for the shutdown of one nuclear unit? During a LOCA?

During a blackout (loss of off-site power), one DG is required for shutdown of one nuclear unit.

During a LOCA, the required loads would normally be supplied power from the preferred off-site circuits. If for some reason off-site power were unavailable, one DG would be required to shutdown one nuclear unit. (KRC)

28. Is there a program for regular inspections of the DGs on some predetermined basis? If so what are the intervals and what are the inspection procedures?

This Interrogatory is essentially the same as PA Interrogatory 35A. See the answer provided to 35A. (RPM)

29. What criteria were used to decide that a piston skirt required a second heat treatment from TDI? How many such were there?

TDI has determined that all nodular piston skirts require a two step heat treating process. There was a total of 1499 piston skirts which were identified by heat number and serial number not to have had the required temper or stress relieving process and therefore had to be returned to TDI for this required temper process. (RPM)

Respectfully Submitted,

Albert V. Carr, Jr.
DUKE POWER COMPANY
P. O. Box 33189
Charlotte, North Carolina 28242
(704) 373-2570

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1200 Seventeenth Street, N.W.
Washington, D.C. 20036

Attorneys for Duke Power
Company, et al.

AFFIDAVITS AND RESUMES

The attached Affidavits are provided for Duke Power Company and Bechtel Power Corporation employees who have provided information used in the answers to the foregoing Interrogatories. The resumes provided are for potential witnesses to be called to testify on admitted contentions.

All Duke Power Company employees may be reached at the company's offices in Charlotte, North Carolina.

Both Bechtel Power Corporation employees may be reacned at the company's offices in Gaithersburg, Md.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, L. A. Reed, being duly sworn, hereby state that I am employed by Duke Power Company as Nuclear Engineer.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

L A Reed

Subscribed and sworn to before me this 2 day of April 1984.

Jo Ann D. Bowman
Notary Public

My Commissions expires: 7-12-88

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the matter of	)	
	)	
DUKE POWER CCMPANY, et al.	)	Docket Nos. 50-413
	)	50-414
(Catawba Nuclear Station, Units 1 and 2)	)	

AFFIDAVIT

I, Peter J. Carrato, being duly sworn, hereby state that I am employed by Bechtel Power Corporation as a Senior Engineer.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

Peter J. Carrato
3-29-84

Subscribed and sworn to before me this 29 day of March, 1984.

Roberta B. Currin
Notary Public

My Commission expires: My Commission Expires July 1, 1988

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, Eugene W. Thomas, being duly sworn, hereby state that I am employed by Bechtel Power Corporation as an Engineering Specialist.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

Eugene W. Thomas

3/29/84

Subscribed and sworn to before me this 29 day of March, 1984.

Roberta B. Currin

Notary Public

My Commission expires: My Commission Expires July 1, 1986

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, William R. McCollum being duly sworn, hereby state that I am employed by Duke Power Company as Catawba Unit 1 Schedule Engineer.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

William R. McCollum Jr.

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 5-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, G. Wayne Hallman, being duly sworn, hereby state that I am employed by Duke Power Company as Nuclear Maintenance Manager.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

G. Wayne Hallman

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 8-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, Ronald H. Wright, being duly sworn, hereby state that I am employed by Duke Power Company as Design Engineer I.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

Ronald H. Wright

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 8-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, Robert O. Sharpe, being duly sworn, hereby state that I am employed by Duke Power Company as Nuclear Engineer.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

Robert O. Sharpe

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 9-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, Russell P. Muschick, being duly sworn, hereby state that I am employed by Duke Power Company as Maintenance Engineer.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

Russell P. Muschick

Subscribed and sworn to before me this 9th day of March 1984.

Margaret G. Gerringer (Watson)
Notary Public

My Commissions expires: 9-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, James E. Cooper, being duly sworn, hereby state that I am employed by Duke Power Company as Technical Specialist.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

James E. Cooper

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 8-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, John D. Heffner, being duly sworn, hereby state that I am employed by Duke Power Company as Technical Specialist.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

John D. Heffner

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 8-1-84

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

AFFIDAVIT

I, Kenneth R. Caraway, being duly sworn, hereby state that I am employed by Duke Power Company as Supervising Design Engineer.

I have been responsible for furnishing the basic information used in responding to those Interrogatories by Palmetto Alliance and Carolina Environmental Study Group concerning the diesel generator contentions admitted by the Atomic Safety and Licensing Board by which my initials appear. Those responses are true and correct to the best of my knowledge and belief.

Kenneth R. Caraway

Subscribed and sworn to before me this 30th day of March 1984.

Marguerite J. Jennings (Watson)
Notary Public

My Commissions expires: 8-1-84

NAME E. W. THOMAS
POSITION Civil Staff Supervisor
EDUCATION BSCE, Drexel Institute of Technology
MSME, Drexel Institute of Technology

SUMMARY

1 3/4 Yrs	Civil staff supervisor
2½ Years	Civil group supervisor, nuclear power plant
3½ Years	Deputy civil group supervisor, nuclear power plant
2½ Years	Group leader, nuclear power plant
3½ Years	Engineering specialist, nuclear power plants
6 Years	Senior dynamics engineer and dynamics engineer, aerospace industry

EXPERIENCE

Mr. Thomas is currently serving as a civil staff supervisor. His responsibilities include providing assistance to the chief civil engineer in review of the technical adequacy of engineering design for both fossil and nuclear projects. Mr. Thomas is also a member of Bechtel's Dynamics Committee, which establishes criteria for seismic analyses and design criteria for vibrating and rotating equipment.

Previously, Mr. Thomas was assigned as civil group supervisor for the multi-unit SNUPPS project, 1150 MW PWR nuclear units, involving several utilities. He was responsible for the activities of the civil group, which included design of the powerblock and safety-related site structures, technical resolution of field problems, preparation of specifications and bid packages, technical evaluation of bids, and review of vendor drawings for civil related items.

In earlier assignments to SNUPPS, Mr. Thomas was deputy group supervisor and reactor building group leader.

As an engineering specialist, Mr. Thomas was involved in pipe whip restraint design, miscellaneous concrete and structural steel design, and FSAR preparation for Millstone Nuclear Power Plant's 830 MW PWR Unit 2 for Northeast Nuclear Energy Company. During this time he was a member of the committee writing Bechtel Topical BC-TOP-9. He also worked on pipe whip restraint design for Davis-Besse Nuclear Power Station, Unit 1, 900 MW PWR project for The Toledo Edison Company/The Cleveland Electric Illuminating Company; seismic analysis of the auxiliary and control buildings, pipe hanger design and miscellaneous concrete and structural steel design for the 760 MW PWR Turkey Point Power Plant's Units 3 and 4 for Florida Power & Light Company; and seismic analysis of the containment for the Edwin I. Hatch Nuclear Plant, two 800 MW BWR units for Georgia Power Company.

Prior to joining Bechtel, Mr. Thomas was a senior dynamics engineer and dynamics engineer. Using flight test data, finite element and other analytical methods, he determined dynamic characteristics of air frames. He also prepared computer programs for predicting rotor dynamic loads on helicopters and for determining structural natural frequencies for large models.

PROFESSIONAL MEMBERSHIPS National Society of Professional Engineers

REGISTRATION Registered Professional Engineer in Maryland, Missouri, and Kansas

3/84

NAME	P. J. CARRATO
POSITION	Senior Engineer
EDUCATION	BS, Civil Engineering, Bucknell University MS, Civil Engineering, Bucknell University PhD, Duke University

SUMMARY

2 Years	Civil/structural staff engineer
4 Years	Civil/structural design engineer, nuclear power plant

EXPERIENCE

Dr. Carrato is currently serving on the staff of the chief civil engineer for the Gaithersburg Power Division, primarily involved in structural mechanics. He is the staff specialist for masonry wall analysis and anchorage to concrete. Some of the more in-depth investigations in which he has been involved include the effect of embedment on soil-structure interaction in seismic analysis of structures, and harmonic analysis of torsional vibrations in the crankshafts of diesel engines.

Dr. Carrato also served on a part-time basis as a visiting professor at the University of the District of Columbia, where he instructed a course in foundation design.

Previously, Dr. Carrato was assigned to the Grand Gulf Nuclear Power Station, two 1300 MW BWR units for Mississippi Power & Light Company as a design engineer. In this capacity, he served in both the light structures group and the containment group. Design responsibilities included cable tray supports, HVAC duct supports, pipe anchors, main steam relief valve pipe supports and supports for submerged piping.

PROFESSIONAL MEMBERSHIPS

American Society of Civil Engineers, American Welding Society, American Concrete Institute, American Institute of Steel Construction

REGISTRATION

Registered Professional Engineer in Virginia

PUBLICATIONS

J. B. Kim, W. Hollings, III, P. J. Carrato "Final Report on Full Scale Lateral Load Test on Pile Caps to Penn. DOT," 1975

J. F. Wilson, P. J. Carrato "Approaches to High Efficiency Design of Elevated Concrete Guideways," in Journal of Advanced Transportation, Spring 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY, et al.	)	Docket No. 50-413
	)	50-414
Catawba Nuclear Station	)	
Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Response To "Palmetto Alliance and Carolina Environmental Study Group's Interrogatories and Requests To Produce Documents on Diesel Generator Contentions to Applicants and the 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 2nd day of April, 1984.

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Atomic Safety and Licensing Board
Panel
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. Paul W. Purdom
235 Columbia Drive
Decatur, Georgia 30030

Dr. Richard F. Foster
P. O. Box 4263
Sunriver, Oregon 97702

Chairman
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U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Chairman
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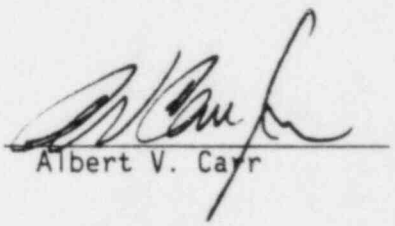


Albert V. Carr

*Designates hand delivery on April 2, 1984.

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
- Valve guide mating area

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

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 assemblies:

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 Requirement: 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.

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. 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.

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, bearings, butterfly valves, and intercooler.

B. Dimensional inspection of bearings.

C. Hardness and material tests of butterfly shafts and mounting fasteners.

D. Torque readings on fasteners.

E. Liquid penetrant inspection 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.

D. Dimension measurement of main bearing shells.

E. Eddy current inspection of fillets between crankpins and webs.

11. Connecting Rods

Functional Requirement: 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 threads in rod box and crank pin bearing shells.

D. Liquid penetrant inspection of rod box sides 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 and piston pins.

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 piston pin bosses in piston.

D. Torque measurement of piston bellevue studs.

E. Materials test of piston rings.

13. Cylinder Block and Liner

Functional Requirements: The cylinder block comprises the framework of 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. Ultrasonic examination of top of cylinder block and liner seating area 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 inspections will be done to evaluate the Catawba jacket water pumps:

A. Visual inspection of jacket water pump gearing.

B. Visual inspection of jacket water pump wear ring and face seals.

C. Visual inspection of all bolted parts for looseness.

D. Material and hardness tests of jacket water pump impeller and shaft.

16. Wiring and Termination

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

Inspection: Under development.

17. Instrumentation Thermocouples

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

Inspection: Under development.

ATTACHMENT 2
RESPONSE TO PALMETTO ALLIANCE/
CESG INTERROGATORY 35

CATAWBA DIESEL INSPECTION PARTS LIST

03-30-1984 AT 11:36

PARTNAME	COMMENTS
MAIN BEARING CAP BASE ASSEMBLY	PT OF #5 SADDLE AREA, VISUAL OF CAP SURFACE
MAIN BEARING CAPS	VISUAL OF CAP MATING SURFACE FOR FRETTING
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 OF CRANKSHAFT FILLETS
CRANKSHAFT BEARING SHELL	VISUAL ON #5 FOR EXCESS WEAR, CRACKING, ETC
CRANKCASE ASSEMBLY	MATERIAL CHECK FROM RECORDS, VIS NUT POCKET AREAS
CYLINDER BLOCK	PT OF LINER LANDING, BLOCK TOP, 3 ADJACENT CYL
CYLINDER LINER	3 LINER SAMPLE-VISUAL, DIMENSIONAL, MATERIAL
CYLINDER BLOCK JACKET WATER MANIFOLD	AS BUILT SYSTEM WALKDOWN PER DRAWINGS
CYLINDER BLOCK STUDS	4 CYLINDER SAMPLE-VISUAL, MATERIALS, HARDNESS
CYL BLOCK JACKET WTR MANIFOLD NUTS	REMOVAL TORQUE, NUT MARKINGS, FORGING LAPS
FLYWHEEL BOLTING	VERIFY TORQUES MEET TDI REQUIREMENTS
FRONT GEAR CASE BOLTING	VERIFY AS BUILT OF ACCESSIBLE PER DRAWING
CONNECTING RODS AND BUSHINGS	ACCESSIBLE AREAS-MT, PT ,MATERIALS HARDNESS
CONNECTING ROD BEARING SHELLS	100% INSP, RT, ECT, PT, VISUAL, DIMENSIONS
PISTON	PT STUD BOSS AREA AND SKIRT
PISTON RINGS	MATERIAL CHECK, ONE SET, VISUAL OF INSTALLATION
PISTON PIN ASSEMBLY	VISUAL FOR WEAR, ROLLED IN OIL PLUGS
INTAKE TAPPETS	DIMENSIONAL CHECK OF ROLLER CLEARANCE
FUEL TAPPETS	DIMENSION ROLLER CLEARANCE, FREE TO ROTATE
CAMSHAFT ASSEMBLY	VISUAL FOR WEAR, PT IF EXCESSIVE
CAMSHAFT SUPPORTS, BOLTING AND GEAR	AS FOUND TORQUES, VISUAL ON GEAR
IDLER GEAR ASSEMBLY (CRANK TO PUMP)	VISUAL FOR WEAR, MATERIALS AND HARDNESS COMPARISON
IDLER GEAR ASSEMBLY	VISUAL FOR WEAR, MATERIALS AND HARDNESS COMPARISON
AIR START VALVE	VIS OF SEAT, DIMEN OF CAPSCREW
CYLINDER HEAD	PT VALVE SEATS, UT FIRE DECK 3 PLACES
INTAKE AND EXHAUST VALVES	VIS OF SEAT, STEM, PT WELD HEAD TO STEM
VALVE SPRINGS	SPRINGS SHOULD BE BLACK WITH WHITE STRIPES
SUBCOVER ASSEMBLY	VIS WEB AREA FOR CRACKS, PT BOLT SEAT AREA
FUEL PUMP LINKAGE AND CONTROL SHAFT	MATERIAL OF LINKAGE, HARDNESS OF SHAFT
FUEL PUMP, LINKAGE, BEARINGS AND SHAFT	VIS FOR FREEDOM OF MOVEMENT, ADEQUATE LUBRICATION
INTAKE MANIFOLDS	VIS FOR CRACKS, ALIGNMENT AT REINSTALLATION
EXHAUST MANIFOLD BOLTING	BOLT MARKINGS, PROPER LENGTHS, ALIGNMENT
CYLINDER BLOCK COVER, GASKETS AND BOLTS	VERIFY TORQUE, CONDITION OF GASKET
CRANKCASE COVERS	VERIFY TORQUE, VIS FOR BOLT HOLE CRACKS
ROCKER ARM ASSEMBLY	GENERAL VIS, MATERIALS ON ONE, DIMEN SOCKET LIP
EXHAUST ROCKER ARM ASSEMBLY	VIS FOR CRACKS IN SOCKET AREA, DIMEN SOCKET LIP
PUSHRODS	VERIFY FRICTION WELDED PUSHRODS INSTALLED
CONNECTOR PUSHROD	VERIFY FRICTION WELDED PUSHRODS INSTALLED
ROCKER ARM BOLTING	VERIFY TORQUE, MT SAMPLE CAPSCREWS
GOVERNOR DRIVE GEAR AND SHAFT	MATERIAL AND HARDNESS OF SHAFTS AND GEARS
GOVERNOR DRIVE COUPING	VERIFY CONDITION OF COUPLING MATERIAL
GOVERNOR OVERSPEED TRIP	VERIFY PROPER INSTALLATION PER WOODWARD
GOV OVERSPEED TRIP AND ACCESSORY DRIVE	VISUAL, PT, MATERIALS MOVING PARTS, GEAR HARDNESS
OVERSPEED TRIP COUPLINGS	VERIFY MATERIAL IS NEOPRENE, VIS FOR CONDITION
GOVERNOR LINKAGE	VISUAL FOR CORROSION OR WEAR, USE LOCTITE IN ASSEM
SPEED REGULATING GOVERNOR	VERIFY PROPER INSTALLATION AND SETTING
GOVERNOR HEAT EXCHANGER ASSEMBLY	VERIFY MOUNTED POSITION OF COOLER
JACKET WATER PUMP	IMPELLER AND SHAFT MATERIALS, WEAR RING, PT GEAR
INTERCOOLER PIPING-COUPLING, BOLTING, GSKT	DRESSER #90 AT JW RETURN FROM TURBO, #75 ELSE
STARTING AIR DISTRIBUTOR ASSEMBLY	MEASURE WEAR ON POPPETS, HARDNESS IF EXCESSIVE

PARTNAME	COMMENTS
TURBOCHARGER AIR BUTTERFLY VALVE	VISUAL, MATERIALS, HARDNESS ON SHAFT AND PINS
TURBOCHARGER BRACKET BOLTING	VERIFY TORQUE, MATERIALS, CAPSCREW INSTALLATION
CONTROL PANEL WIRING	AS BUILT WALKDOWN, CHECK FOR OVERHEAT DAMAGE
LUBE OIL SUMP TANK BOLTING	VERIFY BOLTED CONNECTIONS ARE TIGHT
LUBE OIL SUMP TANK MOUNTING HARDWARE	VERIFY TANK MOUNTING HARDWARE TIGHTENED
TURBOCHARGER	VISUAL ON FAN BLADES, NOZZLE RINGS, BEARINGS

TOTALS:

Printed 59 of the 138 records.

ATTACHMENT 3
RESPONSE TO PALMETTO ALLIANCE/
CESG INTERROGATORY 49

RESPONSE TO #49

TP/1/A/1100/02A - DIESEL GENERATOR 1A PREOPERATIONAL FUNCTIONAL TEST

PURPOSE	RESULTS
1.) To demonstrate that the Diesel Generator 1A Auxiliary Systems, Cooling Water (KD), Lube Oil (LD), Fuel Oil (FD), Starting Air (VG), and Building Ventilation (VD) perform in accordance with Design.	Refer to the respective functional test for specifics.
2.) A. To demonstrate the proper logic, proper operation of the following trip devices: Trip High Temp Lube Oil Outlet Alarm Trip High Temp Bearings Alarm Trip High Temp Jacket Water Out Alarm Trip Low Press Turbo Oil Alarm Trip Low Press Lube Oil Alarm Trip Vibration Alarm Trip High Press Crankcase Alarm Trip Overspeed Alarm Trip Low Low Press Lube Oil Alarm Trip Generator Fault Alrarm	On 9/24/83 and 9/25/83 Each of the these trip functions were successfully tested to show that upon an alarmed condition the Diesel Generator 1A would shutdown, if running on a manual start signal. Each of these trip functions were successfully tested to show that upon an alarmed condition the Diesel Generator 1A would continue to run, with the exception of Trip Overspeed Alarm, Trip Low Low Press Lube Oil Alarm, Trip Generator Fault Alarm, if running on an emergency start signal. The Trip Overspeed Alarm, Trip Low Low Press Lube Oil Alarm, and Trip Generator Fault Alarm Trip functions were successfully tested to show that upon an alarmed condition the Diesel Generator 1A would shutdown, if running on an emergency start signal.
B. Proper operation of the following initiating devices and permissive and prohibit interlocks: Diesel Generator Governor Control RAISE and LOWER (Local and Remote) Diesel Generator Voltage Control RAISE and LOWER (Local and Remote) Diesel Generator STOP and EMERGENCY STOP (Local and Remote) Diesel Generator Breaker Diesel Generator Control Room Override Diesel Generator Local and Remote	On 9/24/83, 9/25/83 and 9/27/83 The Diesel Generator 1A controls were successfully tested to show that while positioned to LOCAL all REMOTE controls except STOP, were inactive. The Diesel Generator 1A controls were successfully tested to show that while positioned to REMOTE all LOCAL controls, except STOP and EMERGENCY STOP, were inactive. The Diesel Generator 1A controls were successfully tested to show that when Control Room Override was actuated all REMOTE controls were inactive. This test proved that the Diesel Generator 1A could be controlled properly during all modes of operation, LOCAL (Diesel Room), REMOTE (Control Room), Control Room Override (Diesel Room).
3.) To demonstrate that the Diesel Generator can be started and loaded to 7000 KW in $\leq$ 60 seconds, and operates with this load for $\geq$ 60 minutes.	On 9/24/83 The Diesel Generator 1A was shown to start and be loaded to 7000 KW in 51.24 seconds, and then operated with this load for 65 minutes.

PURPOSE	RESULTS
4.) To demonstrate that the Diesel Generator and its load group can function without any dependence upon any other load group or portion thereof.	On 3/22/84 The ability of the Diesel Generator 1A and its load group to function without any dependence upon any other load group or portion thereof was successfully testing as part of the Engineered Safeguard Features Actuation Functional Test. This was demonstrated by verifying absence of voltage on the Train B essential switchgear during the Train A essential switchgear loading sequence.
5.) To demonstrate that 1) Diesel Generator is capable of starting and accelerating to rated speed, in the required sequence, all of the Engineered Safeguard Feature Loads, 2) at no time during the loading sequence that the frequency and voltage decreases to less than 95% of nominal and 75% of nominal, respectively, and 3) the frequency is restored to within 2% of nominal, and the voltage is restored to within 10% of nominal within 60% of each load-sequence time interval.	On 3/22/84 The Engineered Safeguard Features Actuation Functional Test successfully tested this requirement by showing that voltage dips due to loading did not go below 6% of nominal at any time. Frequency changes due to loading did not vary by more than 1%.
6.) To demonstrate, by simulating loss of all AC voltage, that the Diesel Generator can start automatically and attain the required voltage and frequency and maintain them within the required limits.	This test has not been completed as of yet.
7.) To demonstrate the proper operation of the Diesel Generator during the Design-Accident-Loading Sequence and to verify that the voltage and frequency are maintained within required limits.	This test has not been completed as of yet.
8.) To demonstrate the Full-Load-Carrying capability of the Diesel Generator for an interval of > 24 hours, of which 22 hours shall be at 100% load at least 2 hours shall be at 110% load.	On 3/17/84 The Diesel Generator 1A was started and loaded to 7000 kW (100%) until engine equilibrium temperature was reached. Next the load was increased to 7700 KW (110%) for 2 hours and 5 minutes as the start of the Full-Load Carrying Capability Test. Then load was reduced to 7000 KW (100%) for 27 hours and 5 minutes. The Diesel Generator 1A was able to complete this test successfully but Design Engineering is reviewing data to determine acceptability of the Jacket Water temperatures that were recorded.

PURPOSE	RESULTS
9.) To demonstrate that the Fuel Oil Filter can be changed with the Diesel Generator operating, using the diverter valve, without a drop of loss of fuel oil pressure.	On 3/11/84 and 3/17/84 With the Diesel Generator 1A loaded to 7000 KW (100%) the ability to swap from one fuel oil filter to the other was successfully tested. By using the diverter valve it is possible to change to the other fuel oil filter without a drop or loss of fuel oil pressure.
10.) To demonstrate that the Fuel Oil Strainer can be changed with the Diesel Generator operating, using the diverter valve, without a drop of loss of fuel oil pressure.	On 3/11/84 and 3/17/84 With the Diesel Generator 1A loaded to 7000 KW (100%) the ability to swap from one fuel oil strainer to the other was successfully tested. By using the diverter valve it is possible to change to the other fuel oil strainer without a drop or loss of fuel oil pressure.
11.) To verify the fuel oil storage capacity of seven days at full load by measuring the Diesel Generator's fuel consumption rate at full load.	On 3/18/84 With the Diesel Generator loaded to 7000 KW (100%) the fuel oil consumption rate was measured to be 510 gal/hr. This does not meet initial acceptance criteria of < 488.5 gal/hr. Therefore, Design Engineering is evaluating the results to determine acceptability.
12.) To demonstrate the functional capability of the Diesel Generator, at full-load temperature, to operate properly. By simulating a Black Out concurrent with a LOCA signal, verify that the Diesel Generator can start, in the required time and sequence loads automatically while maintaining voltage and frequency within required limits.	On 3/22/84 The Engineered Safeguard Features Actuation Functional Test successfully tested this requirement by showing that the D/G can be started with 5 minutes of being shutdown from a run of greater than one hour. The D/G accepted the combined B/O and LOCA loading while maintaining voltage and frequency within limits. This requirement has been reworded to agree with our current Technical Specifications.
13.) To demonstrate the capability of the Diesel Generator, to start and accept $\geq$ 50% rated load $\geq$ 1 hour, 35 consecutive times.	The Diesel Generator 1A was successfully tested to show the 35 consecutive starts as follows:

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
1	9-24-83/11:35	4.05 Sec	7000 KW	65 Min	Valid/Success	
2	9-24-83/13:25	3.15 Sec	0 KW	0 Min	Invalid Success	Did not attempt to load, testing trips
3	9-24-83/13:30	3.35 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
4	9-24-83/13:35	3.47 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
5	9-24-83/14:25	3.24 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
6	9-24-83/14:30	3.50 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
7	9-24-83/14:35	3.95 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
8	9-24-83/14:40	4.18 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
9	9-24-83/15:30	3.15 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
10	9-24-83/15:35	3.40 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
11	9-24-83/15:40	3.45 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
12	9-24-83/15:45	3.89 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
13	9-24-83/16:45	2.98 Sec	4000 KW	80 Min	Valid/Success	
14	9-24-83/19:45	3.03 Sec	4500 KW	70 Min	Valid/Success	

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
15	9-25-83/08:35	6.25 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
16	9-25-83/10:50	2.93 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
17	9-25-83/12:40	2.97 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
18	9-25-83/13:30	3.96 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
19	9-25-83/16:45	6.11 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
20	9-25-83/17:00	3.25 Sec	4000 KW	90 Min	Valid/Success	
21	9-25-83/19:45	3.03 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing controls
22	9-25-83/20:25	3.00 Sec	4000 KW	65 Min	Valid/Success	
23	9-26-83/10:05	3.03 Sec	4000 KW	70 Min	Valid/Success	
24	9-26-83/13:05	3.05 Sec	4000 KW	75 Min	Valid/Success	
25	9-27-83/09:50	3.12 Sec	4000 KW	65 Min	Valid/Success	
26	9-27-83/13:15	3.05 Sec	4000 KW	60 Min	Valid/Success	
27	9-27-83/15:10	3.06 Sec	4000 KW	65 Min	Valid/Success	
28	9-28-83/10:45	3.08 Sec	4000 KW	65 Min	Valid/Success	
29	9-28-83/13:10	3.05 Sec	7000 KW	65 Min	Valid/Success	
30	9-28-83/15:05	3.09 Sec	4000 KW	70 Min	Valid/Success	
31	9-29-83/08:15	3.05 Sec	4000 KW	60 Min	Valid/Success	
32	9-29-83/10:20	3.04 Sec	7000 KW	65 Min	Valid/Success	
33	9-29-83/12:45	3.06 Sec	4000 KW	65 Min	Valid/Success	

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
34	9-29-83/14:30	3.06 Sec	7000 KW	90 Min	Valid/Success	
35	9-30-83/08:35	3.10 Sec	4000 KW	60 Min	Valid/Success	
36	9-30-83/10:35	3.07 Sec	7700 KW	65 Min	Valid/Success	
37	9-30-83/13:10	3.05 Sec	4000 KW	65 Min	Valid/Success	
38	9-30-83/15:30	3.00 Sec	4000 KW	60 Min	Valid/Success	
39	10-1-83/09:00	2.96 Sec	4000 KW	60 Min	Valid/Success	
40	10-1-83/11:30	3.09 Sec	4000 KW	60 Min	Valid/Success	
41	10-1-83/13:40	3.04 Sec	4000 KW	60 Min	Valid/Success	
42	10-1-83/15:55	3.05 Sec	4000 KW	60 Min	Valid/Success	
43	10-1-83/18:00	3.10 Sec	4000 KW	60 Min	Valid/Success	
44	10-1-83/19:55	3.05 Sec	4000 KW	60 Min	Valid/Success	
45	10-1-83/21:50	3.11 Sec	4000 KW	60 Min	Valid/Success	
46	10-2-83/09:00	3.06 Sec	4000 KW	60 Min	Valid/Success	
47	10-2-83/11:05	3.14 Sec	4000 KW	60 Min	Valid/Success	
48	10-2-83/13:10	3.12 Sec	4000 KW	60 Min	Valid/Success	
49	10-2-83/15:10	3.12 Sec	4000 KW	60 Min	Valid/Success	
50	10-3-83/09:25	3.04 Sec	5000 KW	60 Min	Valid/Success	
51	10-3-83/11:20	3.09 Sec	4000 KW	70 Min	Valid/Success	
52	10-3-83/13:35	3.08 Sec	4000 KW	60 Min	Valid/Success	
53	11-6-83/17:16	6.15 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, simultaneous starts
54	11-6-83/17:35	6.12 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, simultaneous starts

PURPOSE	RESULTS
14.) To demonstrate that the transient following the complete loss of load would not cause the Diesel Generator to reach 500 RPM.	This test has not been completed as of yet.
15.) To demonstrate that the capability of the Diesel Generator to supply emergency power within the required time is not impaired during testing.	This was successfully demonstrated during the Diesel Generator 1A Load Sequencer Functional Test. This test showed that if the Diesel Generator 1A was 1.) Paralleled to the system grid and 2.) An emergency signal was received, that the Diesel Generator 1A Breaker would open and the Diesel Generator 1A would continue to operate ready to accept loads if necessary.
16.) To demonstrate that 1) the Diesel Generator is capable of starting and accelerating to rated speed, in the required sequence, all of the Black Out Loads, 2) at no time during the loading sequence that the frequency and voltage decrease to less than 95% of nominal and 75% of nominal, respectively, and 3) the frequency is restored to within 2% of nominal, and the voltage is restored to within 10% of nominal within 60% of each load sequence time interval.	This test has not been completed as of yet.
17.) To demonstrate the capability of the Diesel Generator to reject a load of ~ 825 KW and maintain voltage at 4160 ± 416 volts and frequency at 60 ± 1.2 HZ.	This test has not been completed as of yet.
18.) To demonstrate the ability to 1) synchronize the Diesel Generator while connected to the emergency load, with offsite power, 2) transfer the emergency load to the offsite power, 3) isolate the Diesel Generator, and 4) restore the Diesel Generator to standby status.	This test has not been completed as of yet.
19.) To demonstrate the capability to simultaneously start both Diesel Generators without a common failure.	On 11/6/83 Diesel Generator 1A and Diesel Generator 1B were started simultaneously on each of the 2 redundant electrical circuits without a common failure. Refer to #13 response for start times and dates.

PURPOSE	RESULTS
20.) To verify that the auto-connected loads to the Diesel Generator do not exceed 7700 KW.	On 3/22/84 During loading of D/G on a combination B/O and LOCA signal the maximum load applied to the D/G was below 4450 KW.
21.) To demonstrate the Diesel Generator 1) starts from ambient conditions and accelerates to at least 427 RPM in $\leq$ 11 seconds, 2) the generator voltage and frequency shall be 4160 ± 420 volts and 60 ± 1.2 HZ within 11 seconds after the start signal on an ESF Actuation Test Signal.	The wording of the requirement was changed after discussions with the NRC during ESF testing. According to the Technical Specifications and the NRC, only one test signal needed to be verified, based upon the conditions set forth. This test was successfully completed 3/27/84 by simulating a ESF Actuation Signal and verifying the Diesel Generator 1A started in 6.15 seconds as obtained by the D/G 1A start timer. The D/G reached its nominal value for frequency and voltage in less than 6 seconds.
22.) To demonstrate on a simulated loss of offsite power. 1) The de-energization of the emergency buses and. 2) load shedding from the emergency buses.	This test has not been completed as of yet.

TP/1/A/1550/01A - DIESEL GENERATOR 1A FUEL OIL SYSTEM COLD FUNCTIONAL TEST

PURPOSE	RESULTS
1.) To verify proper operation of the following alarms: A. High ΔP Fuel Filter B. High ΔP Fuel Pump Strainer C. High ΔP DC Pump Strainer D. Low Press Fuel Oil E. High Level Main Fuel Tank F. Low Level Main Fuel Tank G. Main FO Tank Tech Spec Warn H. High Level Fuel Day Tank I. Low Level Fuel Day Tank J. Fuel Pump O/S Drive Failure K. Hi Level FO Retaining Wall	On 7/6/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. High ΔP Fuel Filter B. High ΔP Fuel Pump Strainer C. High ΔP DC Pump Strainer D. Low Press Fuel Oil E. High Level Main Fuel Tank F. Low Level Main Fuel Tank G. Hi Level FO Retaining Wall The remainder of the alarms have not been tested as of yet.
2.) To verify the interlock between the Diesel Generator 1A Fuel Oil Day Tank Retaining Wall Drain Valve and the Lube Oil Transfer Pump.	On 7/6/83 the interlock between the Diesel Generator 1A Fuel Oil Day Tank Retaining Wall Drain Valve (1FD81) and the Lube Oil Transfer Pump was successfully tests. This test verified that upon receipt of an increasingly high level in the retaining wall, that 1FD81 would open and the Lube Oil Transfer Pump would automatically start. It also verified that once the high level condition was cleared, that 1FD81 would close and the Lube Oil Transfer Pump would stop automatically.
3.) To establish operating data on the Motor Driven Fuel Oil Booster Pump.	On 7/6/83 operating data was recorded for the Diesel Generator 1A Motor Driven Fuel Oil Booster Pump. This data will be used as part of the Performance Monitoring Program to trend pump performance. Since this was performed the function of the Motor Driven Fuel Oil Booster Pump has been deleted from system design.
4.) To establish operating data on the Fuel Oil Recirculation Pump.	On 7/6/83, operating data was recorded for the Fuel Oil Recirculation Pump. This data will be used as part of the Performance monitoring Program.
5.) To verify the interlock between the Main FO Tank Tech Spec Warn Alarm and the Fuel Oil Recirculation Pump.	This test has not been completed as of yet.

TP/1/A/1400/07A - DIESEL GENERATOR 1A COOLING WATER SYSTEM COLD FUNCTIONAL TEST

PURPOSE	RESULTS
1.) To verify proper operation of the following alarms. A. Low Temp Jacket Water In B. Low Temp Jacket Water Out C. High Temp Jacket Water In D. High Temp Jacket Water Out E. High Temp Aftercooler Water In F. Low Press Jacket Water G. Low Level Jack Water	On 7/11/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. Low Temp Jacket Water In B. Low Temp Jacket Water Out C. High Temp Jacket Water In D. High Temp Jacket Water Out E. High Temp Aftercooler Water In F. Low Press Jacket Water G. Low Level Jack Water
2.) To verify the interlock between the Jacket Water Keep Warm Pump and the Jacket Water Keep Warm Heater.	On 7/11/83 the interlock between the Diesel Generator 1A Jacket Water Keep Warm Pump and the Diesel Generator 1A Jacket Keep Warm Heater was successfully tested. This test verified when the Jacket Water Keep Warm Pump stops, the Jacket Water Keep Warm Heater de-energizes.
3.) To verify the capability of the KD System to maintain the Diesel in a warm condition during standby operation.	On 7/11/84 the capability of the KD system to maintain the Diesel Generator 1A in a warm condition during standby operation, was successfully tested. The final acceptance criteria was the Jacket Water temperature was maintained at 150°F ± 10°F during standby operation. The KD system tested out to be 150°F which meets the acceptance criteria. However, it was noted later that the thermostat has a 50°F deadband which would allow the system to cool to ~ 100°F. An IPR has been written to correct this problem. When the new thermostat is installed this requirement will be retested.

TP/1/A/1700/01A - DIESEL GENERATOR 1A LUBE OIL SYSTEM COLD FUNCTIONAL TEST

1.) To verify proper operation of the following alarms: A. Low Temp Lube Oil Inlet B. Low Temp Lube Oil Outlet C. High Temp Lube Oil Inlet D. High Temp Lube Oil Outlet E. High ΔP Lube Filter F. High ΔP Lube Strainer G. Low Press Lube Oil H. Low Press Trubo Oil Right Front I. Low Press Turbo Oil Left Front J. Low Lube Tank Level	On 7/11/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. Low Temp Lube Oil Inlet B. Low Temp Lube Oil Outlet C. High Temp Lube Oil Inlet D. High Temp Lube Oil Outlet E. High ΔP Lube Filter F. High ΔP Lube Strainer G. Low Press Lube Oil H. Low Press Turbo Oil Right Front I. Low Press Turbo Oil Left Front J. Low Lube Tank Level

PURPOSE	RESULTS
2.) To verify the interlock between the Pre-Lube Oil Pump and the Lube Oil Sump Tank Heaters.	On 7/11/83 the interlock between the Diesel Generator 1A Pre-Lube Oil Pump and the Diesel Generator 1A Lube oil Sump Tank Heaters were successfully tested. This test verified when the Pre-Lube Oil Pump stops, the Lube Oil Sump Tank Heaters de-energize.
3.) To verify the capability for the LD System to maintain the Diesel in a warm condition during standby operation.	On 7/11/83 the capability of the LD System to maintain the Diesel Generator 1A in a warm condition during standby operation, was successfully tested. The final acceptance criteria was the Lube Oil Temperature is maintained at 155°F ± 5°F during standby operation. The LD System tested out to be 150°F which meets the acceptance criteria. However, it was noted later the thermostats have a 50°F deadband which would allow the system to cool to ~105°F. An IPR has been written to correct this problem. When the new thermostats are installed this requirement will be retested.

TP/1/A/1450/08A - DIESEL GENERATOR 1A ENGINE STARTING AIR SYSTEM COLD FUNCTIONAL TEST

1.) To verify proper operation of the following alarms: A. Low Press Starting Air B. Low Press Control Air	On 8/6/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. Low Press Starting Air B. Low Press Control Air
2.) To verify that Starting Air Compressor 1A1 operates automatically to maintain adequate starting Air Tank 1A1 pressure.	On 8/6/83 the Diesel Generator 1A Engine Starting Air System 1A1 was verified to maintain the starting Air Tank 1A1 pressure at 250 ± 15 psig. The automatic function of the starting Air Compressor 1A1 was demonstrated 3 times to maintain the starting Air Tank 1A1 pressure between 242.5 psig and 255 psig.
3.) To verify that Starting Air Compressor 1A2 operates automatically to maintain adequate Starting Air Tank 1A2 pressure.	On 8/6/83 the Diesel Generator 1A Engine Starting Air System 1A2 was verified to maintain the starting Air Tank 1A2 pressure at 250 ± 15 psig. The automatic function of the starting Air Compressor 1A2 was demonstrated 3 times to maintain the starting Air Tank 1A2 pressure between 242 psig and 257 psig.

TP/1/A/1100/02B - DIESEL GENERATOR 1B PREOPERATIONAL FUNCTIONAL TEST

PURPOSE	RESULTS
1.) To demonstrate that the Diesel Generator 1A Auxiliary Systems, Cooling Water (KD), Lube Oil (LD), Fuel Oil (FD), Starting Air (VG), and Building Ventilation (VD) perform in accordance with Design.	Refer to the respective functional test for specifics.
2.) A. To demonstrate the proper logic, proper operation of the following trip devices: Trip High Temp Lube Oil Outlet Alarm Trip High Temp Bearings Alarm Trip High Temp Jacket Water Out Alarm Trip Low Press Turbo Oil Alarm Trip Low Press Lube Oil Alarm Trip Vibration Alarm Trip High Press Crankcase Alarm Trip Overspeed Alarm Trip Low Low Press Lube Oil Alarm Trip Generator Fault Alrarm	On 11/30/83 Each of the these trip functions were successfully tested to show that upon an alarmed condition the Diesel Generator 1B would shutdown, if running on a manual start signal. Each of these trip functions were successfully tested to show that upon an alarmed condition the Diesel Generator 1B would continue to run, with the exception of Trip Overspeed Alarm, Trip Low Low Press Lube Oil Alarm, Trip Generator Fault Alarm, if running on an emergency start signal. The Trip Overspeed Alarm, Trip Low Low Press Lube Oil Alarm, and Trip Generator Fault Alarm Trip functions were successfully tested to show that upon an alarmed condition the Diesel Generator 1B would shutdown, if running on an emergency start signal.
B. Proper operation of the following initiating devices and permissive and prohibit interlocks: Diesel Generator Governor Control RAISE and LOWER (Local and Remote) Diesel Generator Voltage Control RAISE and LOWER (Local and Remote) Diesel Generator STOP and EMERGENCY STOP (Local and Remote) Diesel Generator Breaker Diesel Generator Control Room Override Diesel Generator Local and Remote	On 12/1/83, 12/2/83 and 12/3/83 The Diesel Generator 1B controls were successfully tested to show that while positioned to LOCAL all REMOTE controls except STOP, were inactive. The Diesel Generator 1B controls were successfully tested to show that while positioned to REMOTE all LOCAL controls, except STOP and EMERGENCY STOP, were inactive. The Diesel Generator 1B controls were successfully tested to show that when Control Room Override was actuated all REMOTE controls were inactive. This test proved that the Diesel Generator 1B could be controlled properly during all modes of operation, LOCAL (Diesel Room), REMOTE (Control Room), Control Room Override (Diesel Room).
3.) To demonstrate that the Diesel Generator can be started and loaded to 7000 KW in $\leq$ 60 seconds, and operates with this load for $\geq$ 60 minutes.	On 11/29/83 The Diesel Generator 1B was shown to start and be loaded to 7000 KW in 30.6 seconds, and then operated with this load for 65 minutes.

PURPOSE	RESULTS
4.) To demonstrate that the Diesel Generator and its load group can function without any dependence upon any other load group or portion thereof.	This test has not been completed as of yet.
5.) To demonstrate that 1) Diesel Generator is capable of starting and accelerating to rated speed, in the required sequence, all of the Engineered Safeguard Feature Loads, 2) at no time during the loading sequence that the frequency and voltage decreases to less than 95% of nominal and 75% of nominal, respectively, and 3) the frequency is restored to within 2% of nominal, and the voltage is restored to within 10% of nominal within 60% of each load-sequence time interval.	This test has not been completed as of yet.
6.) To demonstrate, by simulating loss of all AC voltage, that the Diesel Generator can start automatically and attain the required voltage and frequency and maintain them within the required limits.	This test has not been completed as of yet.
7.) To demonstrate the proper operation of the Diesel Generator during the Design-Accident-Loading Sequence and to verify that the voltage and frequency are maintained within required limits.	This test has not been completed as of yet.
8.) To demonstrate the Full-Load-Carrying capability of the Diesel Generator for an interval of > 24 hours, of which 22 hours shall be at 100% load at least 2 hours shall be at 110% load.	On 3/22/84 The Diesel Generator 1B was started and loaded to 7000 kW (100%) until engine equilibrium temperature was reached. Next the load was increased to 7700 KW (110%) for 2 hours as the start of the Full-Load Carrying Capability Test. Then load was reduced to 7000 KW (100%) for 48 hours. The Diesel Generator 1B was able to complete this test successfully but Design Engineering is reviewing data to determine acceptability of the Jacket Water temperatures that were recorded.

PURPOSE	RESULTS
9.) To demonstrate that the Fuel Oil Filter can be changed with the Diesel Generator operating, using the diverter valve, without a drop of loss of fuel oil pressure.	On 3/22/84 With the Diesel Generator 1B loaded to 7000 KW (100%) the ability to swap from one fuel oil filter to the other was successfully tested. By using the diverter valve it is possible to change to the other fuel oil filter without a drop or loss of fuel oil pressure.
10.) To demonstrate that the Fuel Oil Strainer can be changed with the Diesel Generator operating, using the diverter valve, without a drop of loss of fuel oil pressure.	On 3/22/84 With the Diesel Generator 1B loaded to 7000 KW (100%) the ability to swap from one fuel oil strainer to the other was successfully tested. By using the diverter valve it is possible to change to the other fuel oil strainer without a drop or loss of fuel oil pressure.
11.) To verify the fuel oil storage capacity of seven days at full load by measuring the Diesel Generator's fuel consumption rate at full load.	On 3/23/84 With the Diesel Generator 1B loaded to 7000 KW (100%) the fuel oil consumption rate was measured to be 470 gal/hr. This does meet initial acceptance criteria of < 488.5 gal/hr but Design Engineering is evaluating the results to determine acceptability. This requirement has been reworded to agree with our current Technical Specifications.
12.) To demonstrate the functional capability of the Diesel Generator, at full-load temperature, to operate properly. By simulating a Black Out concurrent with a LOCA signal, verify that the Diesel Generator can start, in the required time and sequence loads automatically while maintaining voltage and frequency within required limits.	This test has not been completed as of yet.
13.) To demonstrate the capability of the Diesel Generator, to start and accept $\geq$ 50% rated load $\geq$ 1 hour, 35 consecutive times.	The Diesel Generator 1B was successfully tested to show the 35 consecutive starts as follows:

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
1	11-17-83/11:43	3.43 Sec	7000 KW	40 Min	Invalid/Success	Terminated run intentionally due to spurious actuation of CO_2 alarm
2	11-29-83/14:25	3.71 Sec	7000 KW	65 Min	Valid/Success	
3	11-30-83/10:25	3.2 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
4	11-30-83/10:30	3.36 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
5	11-30-83/10:35	3.5 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
6	11-30-83/10:37	3.65 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
7	11-30-83/10:42	3.8 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
8	11-30-83/10:53	3.6 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
9	11-30-83/11:10	3.52 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
10	11-30-83/12:45	3.14 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
11	11-30-83/12:55	3.26 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
12	11-30-83/13:00	3.48 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
13	11-30-83/13:15	6.49 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
14	11-30-83/14:19	3.9 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
15	11-30-83/14:30	2.69 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
16	11-30-83/14:40	5.07 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
17	11-30-83/14:44	4.96 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
18	11-30-83/14:51	4.92 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing trips
19	12-1-83/08:57	3.14 Sec	7000 KW	60 Min	Valid/Success	
20	12-1-83/11:00	3.2 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, testing controls
21	12-1-83/12:55	3.19 Sec	4000 KW	60 Min	Valid/Success	
22	12-2-83/08:37	3.15 Sec	4000 KW	60 Min	Valid/Success	
23	12-2-83/11:05	3.19 Sec	5000 KW	60 Min	Valid/Success	
24	12-2-83/13:35	3.22 Sec	4000 KW	21.45 Min	Invalid/Success	Trip of a device (overcurrent relay) which is bypassed in emergency
25	12-3-83/08:45	3.18 Sec	5000 KW	75 Min	Valid/Success	
26	12-3-83/11:55	3.29 Sec	7000 KW	60 Min	Valid/Success	
27	12-4-83/11:57	3.17 Sec	4000 KW	60 Min	Valid/Success	
28	12-4-83/14:03	3.4 Sec	5000 KW	60 Min	Valid/Success	

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
29	12-4-83/16:00	3.23 Sec	7000 KW	60 Min	Valid/Success	
30	12-5-83/12:51	3.22 Sec	4000 KW	62 Min	Valid/Success	
31	12-5-83/15:07	3.2 Sec	7000 KW	0 Min	Invalid/Success	Spurious trip of Lo Turbo Oil Press Alarm
32	12-6-83/14:17	3.24 Sec	0 KW	0 Min	Invalid/Success	Troubleshooting Turbo Oil Trip
33	12-7-83/10:50	3.14 Sec	5000 KW	60 Min	Valid/Success	
34	12-11-83/11:23	3.24 Sec	7700 KW	60 Min	Valid/Success	
35	12-13-83/15:30	4.28 Sec	4000 KW	61 Min	Valid/Success	
36	12-14-83/10:02	3.19 Sec	7700 KW	63 Min	Valid/Success	
37	12-14-83/13:16	3.3 Sec	5000 KW	62 Min	Valid/Success	
38	12-14-83/15:45	3.25 Sec	5000 KW	62 Min	Valid/Success	
39	12-16-83/08:42	3.16 Sec	4000 KW	61 Min	Valid/Success	
40	12-16-83/14:11	3.13 Sec	4000 KW	103 Min	Valid/Success	
41	12-16-83/17:00	3.25 Sec	4000 KW	60 Min	Valid/Success	
42	12-16-83/19:50	3.23 Sec	4000 KW	60 Min	Valid/Success	
43	12-17-83/10:35	3.11 Sec	4000 KW	62 Min	Valid/Success	
44	12-17-83/13:00	3.21 Sec	5000 KW	61 Min	Valid/Success	
45	12-17-83/15:20	3.25 Sec	6000 KW	60 Min	Valid/Success	
46	12-17-83/17:36	3.2 Sec	4000 KW	60 Min	Valid/Success	
47	12-17-83/20:07	3.2 Sec	4000 KW	61 Min	Valid/Success	
48	12-18-83/09:02	3.19 Sec	4000 KW	61 Min	Valid/Success	
49	12-18-83/11:25	3.2 Sec	5000 KW	61 Min	Valid/Success	
50	12-18-83/13:50	3.22 Sec	4000 KW	62 Min	Valid/Success	
51	12-18-83/17:31	3.19 Sec	4000 KW	60 Min	Valid/Success	

Start #	Date/Time	Starting Time	Load	Time Loaded	Result	Comments
52	12-18-83/19:21	3.26 Sec	4000 KW	60 Min	Valid/Success	
53	12-19-83/08:12	3.2 Sec	4000 KW	61 Min	Valid/Success	
54	12-19-83/10:38	3.21 Sec	4000 KW	62 Min	Valid/Success	
55	12-19-83/13:05	3.2 Sec	5000 KW	61 Min	Valid/Success	
56	12-19-83/16:05	3.21 Sec	0 KW	0 Min	Invalid/Success	Did not attempt to load, checking governor settings and fuel oil
57	12-21-83/15:28	3.19 Sec	4000 KW	62 Min	Valid/Success	

PURPOSE	RESULTS
14.) To demonstrate that the transient following the complete loss of load should not cause the Diesel Generator to reach 500 RPM.	This test has not been completed as of yet.
15.) To demonstrate that the capability of the Diesel Generator to supply emergency power within the required time is not impaired during testing.	This was successfully demonstrated during the Diesel Generator 1B Load Sequencer Functional Test. This test showed that if the Diesel Generator 1B was 1.) Paralleled to the system grid and 2.) An emergency signal was received, that the Diesel Generator 1B Breaker would open and the Diesel Generator 1B would continue to operate ready to accept loads if necessary.
16.) To demonstrate that 1) the Diesel Generator is capable of starting and accelerating to rated speed, in the required sequence, all of the Black Out Loads, 2) at not time during the loading sequence that the frequency and voltage decrease to less than 95% of nominal and 75% of nominal, respectively, and 3) the frequency is restored to within 2% of nominal, and the voltage is restored to within 10% of nominal within 60% of each load sequence time interval.	This test has not been completed as of yet.
17.) To demonstrate the capability of the Diesel Generator to reject a load of ~ 825 KW and maintain voltage at 4160 ± 416 volts and frequency at 60 ± 1.2 HZ.	This test has not been completed as of yet.
18.) To demonstrate the ability to 1) synchronize the Diesel Generator while connected to the emergency load, with offsite power, 2) transfer the emergency load to the offsite power, 3) isolate the Diesel Generator, and 4) restore the Diesel Generator to standby status.	This test has not been completed as of yet.

PURPOSE	RESULTS
19.) To verify that the auto-connected loads to the Diesel Generator do not exceed 7700 KW.	This test has not been completed as of yet.
20.) To demonstrate the Diesel Generator 1) starts from ambient conditions and accelerates to at least 427 RPM in $\leq$ 11 seconds, 2) the generator voltage and frequency shall be 4160 ± 420 volts and 60 ± 1.2 HZ within 11 seconds after the start signal on an ESF Actuation Test Signal.	The wording of the requirement was changed after discussions with the NRC during ESF testing. According to the Technical Specifications and the NRC, only one test signal needed to be verified, based upon the conditions set forth. This test was successfully completed 3/27/84 by simulating a ESF Actuation Signal and verifying the Diesel Generator 1A started in 6.19 seconds as obtained by the D/G 1B start timer. The D/G reached its nominal value for frequency and voltage in less than 7 seconds.
21.) To demonstrate on a simulated loss of offsite power. 1) The de-energization of the emergency buses and, 2) load shedding from the emergency buses.	This test has not been completed as of yet.

TP/1/A/1550/01B - DIESEL GENERATOR 1B FUEL OIL SYSTEM COLD FUNCTIONAL TEST

PURPOSE	RESULTS
1.) To verify proper operation of the following alarms: A. High ΔP Fuel Filter B. High ΔP Fuel Pump Strainer C. High ΔP DC Pump Strainer D. Low Press Fuel Oil E. High Level Main Fuel Tank F. Low Level Main Fuel Tank G. Main FO Tank Tech Spec Warn H. High Level Fuel Day Tank I. Low Level Fuel Day Tank J. Fuel Pump O/S Drive Failure K. Hi Level FO Retaining Wall	On 10/21/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. High ΔP Fuel Filter B. High ΔP Fuel Pump Strainer C. High ΔP DC Pump Strainer D. Low Press Fuel Oil E. High Level Main Fuel Tank F. Low Level Main Fuel Tank G. Hi Level FO Retaining Wall The remainder of the alarms have not been tested as of yet.
2.) To verify the interlock between the Diesel Generator 1B Fuel Oil Day Tank Retaining Wall Drain Valve and the Lube Oil Transfer Pump.	On 3/26/84 the interlock between the Diesel Generator 1B Fuel Oil Day Tank Retaining Wall Drain Valve (1FD83) and the Lube Oil Transfer Pump was successfully tests. This test verified that upon receipt of an increasingly high level in the retaining wall, that 1FD83 would open and the Lube Oil Transfer Pump would automatically start. It also verified that once the high level condition was cleared, that 1FD83 would close and the Lube Oil Transfer Pump would stop automatically.
3.) To establish operating data on the Motor Driven Fuel Oil Booster Pump.	This test has not been completed as of yet.

TP/1/A/1400/07B - DIESEL GENERATOR 1B COOLING WATER SYSTEM COLD FUNCTIONAL TEST

PURPOSE	RESULTS
1.) To verify proper operation of the following alarms. A. Low Temp Jacket Water In B. Low Temp Jacket Water Out C. High Temp Jacket Water In D. High Temp Jacket Water Out E. High Temp Aftercooler Water In F. Low Press Jacket Water G. Low Level Jack Water	On 10/21/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. Low Temp Jacket Water In B. Low Temp Jacket Water Out C. High Temp Jacket Water In D. High Temp Jacket Water Out E. High Temp Aftercooler Water In F. Low Press Jacket Water G. Low Level Jack Water
2.) To verify the interlock between the Jacket Water Keep Warm Pump and the Jacket Water Keep Warm Heater.	On 10/22/83 the interlock between the Diesel Generator 1B Jacket Water Keep Warm Pump and the Diesel Generator 1B Jacket Keep Warm Heater was successfully tested. This test verified when the Jacket Water Keep Warm Pump stops, the Jacket Water Keep Warm Heater de-energizes.
3.) To verify the capability of the KD System to maintain the Diesel in a warm condition during standby operation.	This test has not been completed as of yet. Awaiting final resolution of the KD Heater thermostat problem. This problem involves a 50°F deadband associated with the thermostat, which is unacceptable.

TP/1/A/1700/01B - DIESEL GENERATOR 1B LUBE OIL SYSTEM COLD FUNCTIONAL TEST

1.) To verify proper operation of the following alarms: A. Low Temp Lube Oil Inlet B. Low Temp Lube Oil Outlet C. High Temp Lube Oil Inlet D. High Temp Lube Oil Outlet E. High ΔP Lube Filter F. High ΔP Lube Strainer G. Low Press Lube Oil H. Low Press Trubo Oil Right Front I. Low Press Turbo Oil Left Front J. Low Lube Tank Level	On 10/21/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. Low Temp Lube Oil Inlet B. Low Temp Lube Oil Outlet C. High Temp Lube Oil Inlet D. High Temp Lube Oil Outlet E. High ΔP Lube Filter F. High ΔP Lube Strainer G. Low Press Lube Oil H. Low Press Turbo Oil Right Front I. Low Press Turbo Oil Left Front J. Low Lube Tank Level

PURPOSE	RESULTS
2.) To verify the interlock between the Pre-Lube Oil Pump and the Lube Oil Sump Tank Heaters.	On 10/21/83 the interlock between the Diesel Generator 1B Pre-Lube Oil Pump and the Diesel Generator 1B Lube oil Sump Tank Heaters were successfully tested. This test verified when the Pre-Lube Oil Pump stops, the Lube Oil Sump Tank Heaters de-energize.
3.) To verify the capability for the LD System to maintain the Diesel in a warm condition during standby operation.	This test has not been completed as of yet. Awaiting final resolution of the LD Heater thermostat problem. This problem involves a 50°F deadband associated with the thermostats, which is unacceptable.

TP/1/A/1450/08B - DIESEL GENERATOR 1B ENGINE STARTING AIR SYSTEM COLD FUNCTIONAL TEST

1.) To verify proper operation of the following alarms: A. Low Press Starting Air B. Low Press Control Air	On 10/21/83 the following alarms were verified to operate properly on a simulated abnormal condition: A. Low Press Starting Air B. Low Press Control Air
2.) To verify that Starting Air Compressor 1B1 operates automatically to maintain adequate starting Air Tank 1B1 pressure.	On 10/21/83 the Diesel Generator 1B Engine Starting Air System 1B1 was verified to maintain the starting Air Tank 1B1 pressure at 250 ± 15 psig. The automatic function of the starting Air Compressor 1B1 was demonstrated 3 times to maintain the starting Air Tank 1B1 pressure between 240 psig and 252 psig.
3.) To verify that Starting Air Compressor 1B2 operates automatically to maintain adequate Starting Air Tank 1B2 pressure.	On 10/21/83 the Diesel Generator 1B Engine Starting Air System 1B2 was verified to maintain the starting Air Tank 1B2 pressure at 250 ± 15 psig. The automatic function of the starting Air Compressor 1B2 was demonstrated 3 times to maintain the starting Air Tank 1B2 pressure between 240 psig and 255 psig.

ATTACHMENT 4
RESPONSE TO PALMETTO ALLIANCE/
CESG INTERROGATORY 49A

Response to Question 49A

The following is a listing of significant events during the Diesel Generator 1A Extended Run:

1200 hrs 1/25/84 - **Diesel Generator 1A started and loaded to 7000 KW.**

2300 hrs 1/26/84 - **While loaded to 7000 KW, the Right Front Turbocharger**
Accumulated Hours - **Lube Oil Drip Line failed at the ferrule. The engine**
232.5 hours **manually shutdown to prevent oil spray. This line is**
Time for Repair - **1/4" S.S. tubing which supplies lube oil to the Right**
8 hours **Front Turbocharger bearings during standby. The failure appeared to be the result of over tightening the tubing nut and vibration. The tubing was replaced under WR80640PS. The suggestions for long term action are:**

1) **Use thicker wall S.S. tubing.**

2) **Observe proper station procedures for tubing.**

3) **Design a better support for this tubing, or add a vibration dampener.**

The final resolution will be documented on a NCI.

0700 hrs 1/27/84 - **Diesel Generator 1A restarted and loaded to 7000 KW.**

0800 hrs 1/29/84 - **While loaded to 7000 KW, the delivery valve holder on**
Accumulated Hours - **the 1L Fuel Oil Injection Pump cracked. The engine**
281.5 hours **was manually shutdown to prevent a fire hazard. The**
Time for Repair - **delivery valve holder is a casting which houses the**
14 hours **delivery valve of the Fuel Oil Injection Pump. This housing is subjected to cyclic hydraulic pressures of 3000 psig. The entire Fuel Oil Injection Pump was replaced under WR80950PS. The defective delivery valve holder was sent to B & W Labs in Ohio for analysis. Results are pending and the problem will be resolved through NCI CN-065.**

2200 hrs 1/29/84 - **Diesel Generator 1A restarted and loaded to 7000 KW.**

1700 hrs 2/4/84 - **While loaded to 7000 KW, a temporary modification to**
Accumulated Hours - **the Left Front Turbocharger Lube Oil Drain failed**
419.5 hours **resulting in an oil spill. The engine was manually**
Time for Repair - **shutdown to prevent a fire hazard. It was decided to**
267 hours **repair several problems at this time.**

The Turbo Lube Oil Pressure had been decreasing since 2/1/84. Upon investigations performed by Duke, Delaval and Elliot representatives, it was determined that both the Right Front and Left Front Turbochargers had experienced thrust bearing failures. The problem was as a result of insufficient lube oil being supplied to the thrust bearing faces during startup. The oil flow was measured at .0211 gph per turbocharger. After discussions with Delaval, the oil flow was increased to .1427 gph per turbocharger. Further analysis is being performed by Delaval to determine a solution to thrust bearing failure. The turbochargers were replaced under WR1429PRF and WR1445PRF.

The 3L Cylinder Head started leaking jacket water on 2/3/84. This indicated a possible cracked cylinder head. Upon removing the suspect head and pressuring with water, it was verified that a hairline crack had developed. The crack was located in the area where the Fuel Oil Injector goes through the head. The cylinder head was replaced under WR1430PRF. The cause of the failure presently appears to be a casting imperfection. Final resolution will be through NCI CN-067.

While the cylinder head was being replaced, the push rods were examined for cracks. Since 2 of 3 push rods on 3L were cracked, all other push rods were removed. Upon examination numerous push rods showed linear indications in the weld areas. A new version of push rod is being manufactured by TDI which utilizes friction welding. This new type push rod was placed into the engine. NPR-CR-2169A was written to document this change.

While replacing the push rods, it was noticed that the 1R Rocker Box Assembly was damaged. The Rocker Box Assembly holds the Rocker Arms in place for engine operation. The damage was next to the Intermediate Exhaust Rocker Arm. The entire Rocker Box Assembly was replaced under WR1446PRF. The cause of the failure appears to be as a result of a misalignment of the Intermediate Exhaust Rocker Arm dowel pin. This misalignment probably occurred during the Spring 1983 rebuild of this engine. This problem has been documented on NCI CN-066.

The following items were performed during this shutdown:

1) The Turbocharger Lube Oil Drip Line orifices were drilled to .070" under WR1455PRF. This size orifice delivers .1427 gph of lube oil to each turbocharger.

2) Right Bank Turbocharger Exhaust Manifolds bolts had failed (4 total failures). These are 1/2" diameter bolts of a non-ferrous material. The bolts were replaced by other bolts manufactured by TDI. This problem will be documented on a NCI.

3) A 3/8" S.S. tubing line had been misaligned due to an impact causing the line to rub against the engine. Vibration caused this line to wear through resulting in an air leak. This line is part of the Control Air System and is identified as line E-53 (60 psi Supply). The tubing was replaced under WR1439PRF.

2030 hrs 2/15/84 - Diesel Generator 1A restarted and loaded to 7000 KW.

0130 hrs 2/19/84 - Diesel Generator 1A was manually shutdown to investigate possible water loss from the Jacket Water System and reason for excessive Outlet temperatures on Jacket Water and Lube Oil. No apparent reason for discrepancies. This was subsequently resolved (see 05:30 hrs - 2/23/84 entry).
Accumulated Hours - 296.5 hours
Time Down - 40.5 hrs

1800 hrs 2/20/84 - Diesel Generator 1A restarted and loaded to 7000 KW.

1640 hrs 2/21/84 - Diesel Generator 1A was manually shutdown again in an attempt to determine why Outlet temperatures on Jacket Water and Lube Oil are high. No apparent reason for discrepancies. This was subsequently resolved (see 05:30 hrs 2/23/84 entry).
Accumulated Hours - 517 hours
Time Down - 11 hours

0545 hrs 2/22/84 - Diesel Generator 1A restarted and loaded to 7000 KW.

0653 hrs 2/22/84 - While loaded to 7000 KW, the Left Front Turbocharger Lube oil Drip Line failed at the ferrule. The engine was manually shutdown to prevent oil spray. This line is 1/4" S.S. tubing which supplies Lube Oil to the Left Front Turbocharger bearings during standby. The failure appears to be the result of over-tightening the tubing nut and vibration. The tubing was replaced under WR82890PS. Actions implemented are:
Accumulated Hours - 518 hours
Time for Repair - 22.5 hours

1) Use of thicker wall S.S. tubing.

2) Added vibration dampeners for this tubing.

0530 hrs 2/23/84 - Diesel Generator 1A restarted and loaded to 7000 KW. Subsequent to this start, the solution to the Jacket Water loss and high Outlet temperatures was discovered. The thermocouples which read the Outlet temperatures were found to be defective. These were replaced under WR1497PRF. The water loss was attributed to misinterpretation of system instrumentation.

1030 hrs 2/25/84 - Diesel Generator 1A manually shutdown to repair crack
Accumulated Hours - in the Right Front Turbocharger Aftercooler. The
571 hours crack developed in the aftercooler casing at the
Time for Repair - Inlet flange. The aftercooler casing was replaced
35.5 hours under WR708MNT. The crack appears to be the result of an incorrect alignment of the Turbocharger flange and the Aftercooler flange. The suggestion for long term action is to ensure proper flange alignment before torquing any of the Turbocharger bolts.

2200 hrs 2/26/84 Diesel Generator 1A restarted and loaded to 7000 KW.

0840 hrs 2/29/84 Diesel Generator 1A manually shutdown to prevent fire
Accumulated Hours - hazard. The tubing ferrule on the 7L Fuel Oil
629.5 hours Injector had an indentation. This resulted in a
Time for Repair - fine mist of Fuel Oil being sprayed onto the head.
32 hours The entire tubing assembly was replaced under WR8318OPS. This problem will be documented by an NCI.

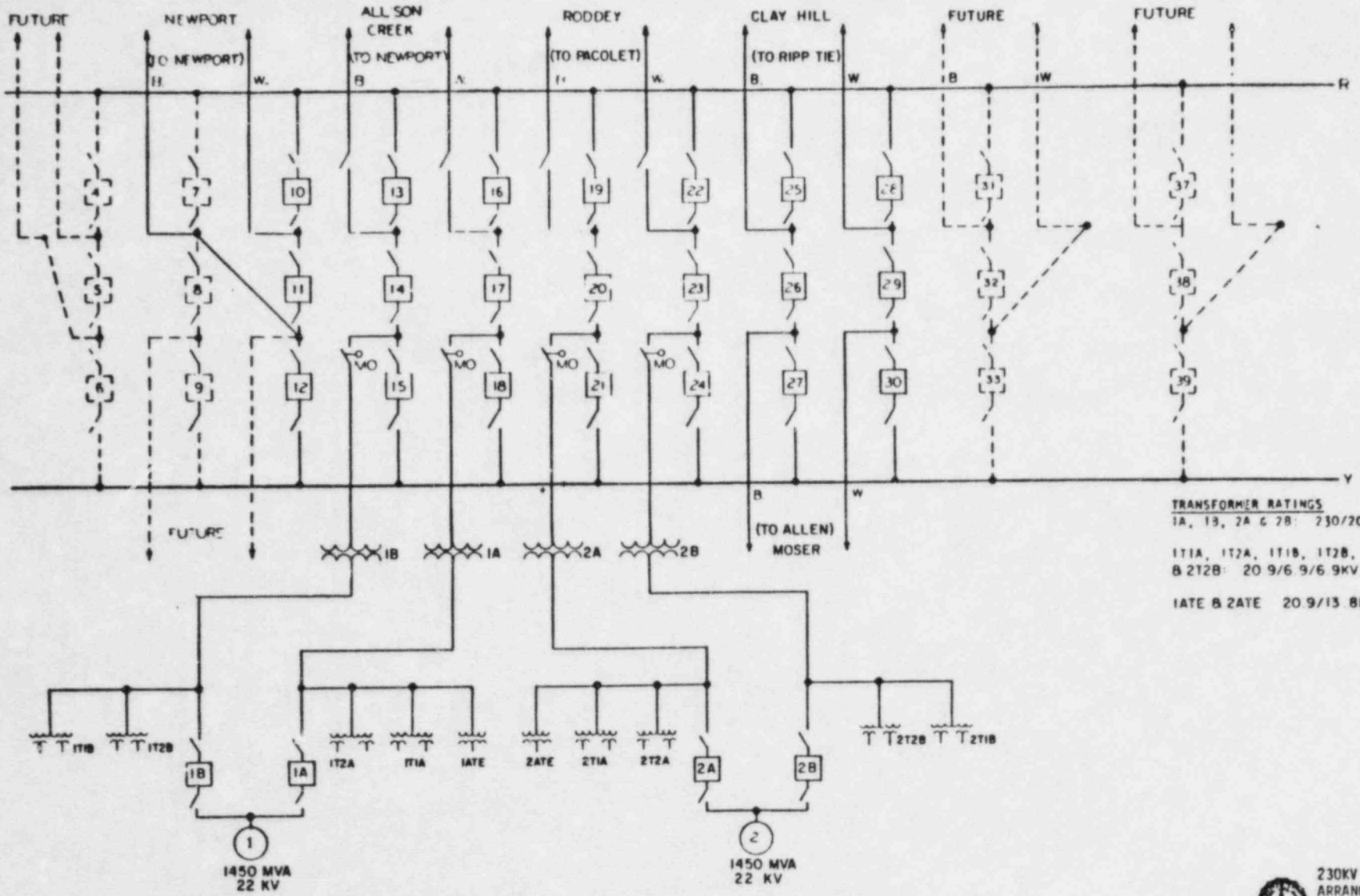
While the engine was shutdown, it was noticed that a 1/2" capscrew on the 1R side door cover was missing its head. Upon replacing that bolt and retorquing the cover, another capscrew head sheared off at less than 15 ft-lb. The bolts were replaced under WR1515PRF. Further failure analysis is needed and will be documented by a NCI.

1700 hrs 3/1/84 - Diesel Generator 1A restarted and loaded to 7000 KW.

1730 hrs 3/8/84 - Diesel Generator 1A manually shutdown to allow for
Accumulated Hours - prerequisite testing needed to start the Engineered
798 hours Safeguard Features Actuation Functional Test.
Time Down - 7 hours

0020 hrs 3/9/84 - Diesel Generator 1A restarted and loaded to 7000 KW.

As of 1200 hrs 3/9/84, the Diesel Generator 1A has 810 hours of documented run. Of this time, ≈ 75% has been at 7000 KW (100%).



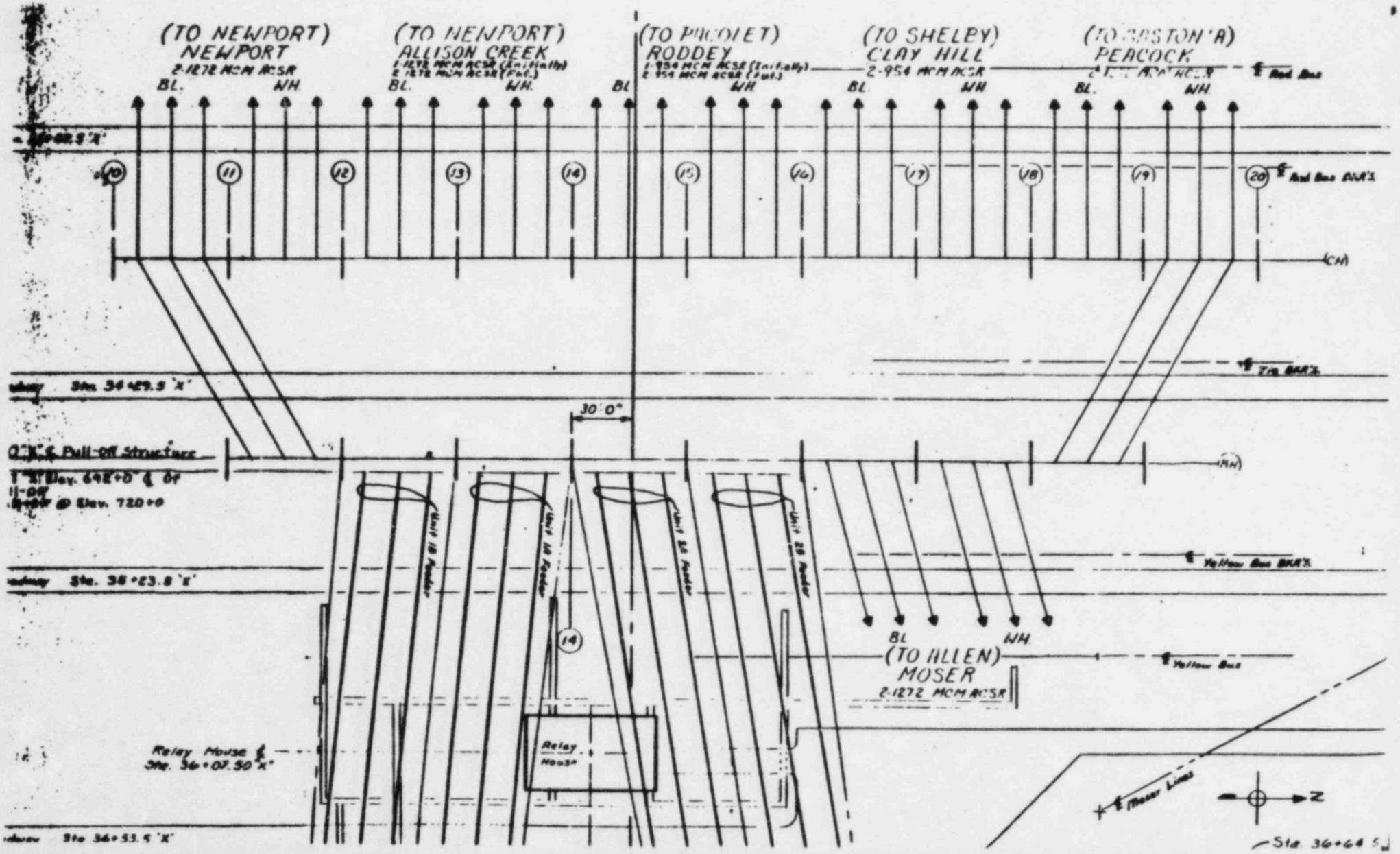
TRANSFORMER RATINGS

1A, 1B, 2A & 2B: 230/20.9KV, 750MVA, 3Ø.

1T1A, 1T2A, 1T1B, 1T2B, 2T1A, 2T2A, 2T1B & 2T2B: 20.9/6.9/6.9KV, 42/56/70MVA, 3Ø.

1ATE & 2ATE: 20.9/13.8KV, 24/32/40MVA, 3Ø.

230KV SWITCHYARD GENERAL ARRANGEMENT
CATAWBA NUCLEAR STATION
Figure 8.2.1-5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NEWPORT
2-1272 MCM ACSR
BL.
WH.
(TO NEWPORT)
ALLISON CREEK
BL.
WH.
BL
(TO PICOLET)
RODDEY
WH
(TO SHELBY)
CLAY HILL
2-954 MCM ACSR
BL.
WH.
(TO BOSTON 'A')
PEACOCK
BL.
WH.
Red Bus
Red Bus BKR'S
CM
Tie BKR'S
Sta. 34+29.5 'X'
30'-0"
Q'X'S Pull-Off Structure
Elev. 642'-0" & 01
Elev. 720'-0
Unit 18 Feeder
Unit 19 Feeder
Unit 24 Feeder
Unit 25 Feeder
Yellow Bus BKR'S
Sta. 38+23.8 'X'
BL
WH
(TO ALLEN)
MOSER
2-1272 MCM ACSR
Yellow Bus
Relay House &
Sta. 36+07.50 'X'
Relay House
Moser Lines
N
Sta. 36+53.5 'X'
Sta. 36+64.5