

August 15, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

'84 AGO 17 A11:48

In the Matter of)
DUKE POWER COMPANY, ET AL.)
(Catawba Nuclear Station,)
Units 1 and 2))

OFFICE OF RECORDS
Docket Nos. 50-413 06
50-414 06

NRC STAFF SUPPLEMENTAL RESPONSES TO
PALMETTO ALLIANCE AND CAROLINA ENVIRONMENTAL
STUDY GROUP'S GENERAL INTERROGATORIES
DIRECTED TO THE STAFF (DATED MARCH 18, 1984)

INTERROGATORY 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.

RESPONSE

The Staff intends to call as witnesses at the hearing on the diesel generator contention: (1) Carl H. Berlinger, Manager of the TDI Project Group, Division of Licensing, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission; (2) J. F. Nesbitt, Pacific Northwest Laboratory (Diesel Engine O/R Project Staff), Richland, Washington, and B. J. Kirkwood, Covenant Engineering, and consultant to PNL Diesel Engine O/R Project.

a. The substance of the facts and opinions of these witnesses is contained in the SER and TER related to the Catawba Unit 1 diesel generators, which have been previously forwarded to the parties.

b. See answer to a.

c. See attached statements of Messrs. Nesbitt and Kirkwood. Mr. Berlinger's statement of professional qualifications has been previously supplied with the Staff's April 4, 1984 responses.

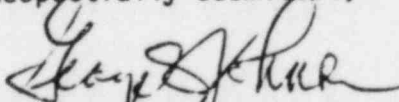
INTERROGATORY 6

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.

RESPONSE

The documents upon which the Staff position is based, principally the Staff SER and the PNL TER, have been supplied previously. Also, additional documents were identified in the TER, and were furnished with the TER, previously made available to Intervenors, or are being supplied herewith.

Respectfully submitted,


George E. Johnson
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 15th day of August, 1984

Professional Qualifications

JOHN F. NESBITT

Senior Research Engineer
Materials & Manufacturing Technology Section
Pacific Northwest Laboratory
Battelle Memorial Institute

Education

B.S., M.E., University of Idaho, 1950
Company Management Courses, 1952-1984

Experience

Presently a member of group organized to review and assess the reliability and operability of emergency diesel generators at specified commercial reactors sites for the NRC. Also project manager for Federal Interim Storage Deployment portion of DOE's Commercial Spent Fuel Management Program.

Since joining PNL in 1975, developed and implemented a department quality assurance program. Responsible for the procurement of special instrument systems, equipment, and vessels installed in hot cells to process nuclear fuels and to vitrify their wastes. Principal author of documentation identifying the ramifications and requirements of various remote processes to solidify high-level nuclear wastes. Conducted studies and developed plans for increasing N-Reactor fuel fabrication and for reducing N-Reactor charge/discharge-time requirements. Contributed to facility studies on monitored retrieval storage for spent fuel and nuclear wastes. Also principal investigator for a NRC program on the QA problems related to nuclear reactor design, construction, and operation.

From 1971 to 1975, was Director of Engineering for the International Snowmobile Industry Association, Washington, D.C., and Minneapolis, Minnesota with responsibilities pertaining to vehicle standards, design, manufacture, operations, and use.

From 1964 through 1970, was with AMF, Inc., York Pennsylvania. Initially was project engineer responsible for equipment to handle and process irradiated fuel. Later worked on the research, development, and testing of snowmobiles and was responsible for the design of the new models.

Mr. Nesbitt was employed by General Electric Company, Richland, Washington for 14 years. He worked on the design of four nuclear reactor plants and was responsible for and directed the design, procurement, and installation of systems for the reactors and their facilities. Also directed operational and startup tests on reactor components and systems. Was shop engineer in Hanford's central maintenance shops and he also worked as maintenance engineer in a fuel reprocessing facility.

Professional Affiliations

Licensed Professional Engineer, Washington, Pennsylvania, Minnesota
Society of Automotive Engineers
American Society of Mechanical Engineers
National Society of Professional Engineers

PROFESSIONAL QUALIFICATIONS

B. J. KIRKWOOD, P.E.

Registered Professional Engineer - CO; MO; KS

Massachusetts Institute of Technology - 1950 - BS/Mechanical Engrg.
- 1950 - MS/Econ. & Engrg.

Member: American Society of Mechanical Engineers
Associate - Diesel and Gas Engine Power Division
Secretary (1967-73) Performance Test Code Com. #17,
Reciprocating Internal Combustion Engines
Accreditation Board for Engineering and Technology (ME)
American Solar Energy Society
National Society of Professional Engineers
Colorado Engineering Society (ex-MoSPE and DsES)
Pi Tau Sigma (national honorary ME fraternity)

- 1984 - - Covenant Engineering - Self-employed consulting engineer (semi-retired)
Services include studies and consultation on:
power supply planning; utility rates and economics; diesel engine applications; project administration and financing; utility coordination; etc.
- 1982-1984 - B. J. Kirkwood, PE, Consulting Engineer (4308 W. 79th Prairie Village, KS 66208 - Self-employed consulting engineer (semi-retired)
Services were the same as for Covenant Engineering.
- 1954 - 1982 - A. C. Kirkwood & Assocs. (8080 Ward Pkwy, Kansas City, MO 64114)
Retired 1/1/82 as one of three senior partners. Responsible for quality assurance and procedure for all specifications, studies and reports; directed all and performed many economic and rate studies; project sponsor for majority of engine-generator project designs; director of long-range planning and business analyses for Firm.

NB: ACKSA was responsible (1947-1982) for engine generator installation design embracing 13 basic models of seven engine manufacturers, ranging in size from 600 to 7000 kW, and speeds of 200 to 900 rpm. BJK was responsible for 15 diesel projects for 10 different clients involving 19 engines of 5 different makes. Also directed study of present and future engine utilization for the Electric Power Research Institute.

Publications, etc. - Several articles for Diesel and Gas Turbine Progress magazine; papers and presentations for Energy Technology Conference, Diesel Engine Manufacturers Association, Kansas Municipal Utilities, and Iowa Association of Municipal Utilities



Battelle

Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99352
Telephone (509) 375-2780
Telex 15-2874

May 7, 1984

Mr. Carl Berlinger
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Berlinger:

SUBJECT: CATAWBA NUCLEAR POWER STATION - TDI DIESEL ENGINE 1-A
DISSASSEMBLY AND INSPECTION

Summarized in this letter are the comments and suggestions that were discussed with you by the following PNL staff and diesel engine consultants during a telephone conversation on May 3, 1984:

PNL Staff

PNL Diesel Engine Consultants

W. W. Laity
J. F. Nesbitt

A. J. Henriksen
P. J. Louzecky

Pistons

During a visit to Catawba on April 25-27, PNL representatives observed four pistons that had been disassembled for inspection by Catawba staff. The machined surfaces of these pistons did not show any apparent signs of distress. However, we recommend that all 16 pistons be disassembled and inspected, with dye-penetrant examination of critical surfaces, for the following reasons:

- o The adequacy of the design of the AN piston skirt (the type used at Catawba) is unknown at this time. An Owners' Group analysis of this type of skirt is pending.
- o Bosses on the AN skirt (for the bolts used to attach the piston crowns to the skirts) are lighter than those on the AE- or AF-type skirts. Cracks in AF skirts appeared in the boss area.
- o In other engines where piston skirts (type AF) were found to be cracked, generally only a few of the pistons exhibited the defects. This further suggests that all pistons in an engine should be inspected.



Wrist Pins and Bushings

In the light of the cracked wrist pin bushings found at Shoreham, all of the wrist pins and bushings removed during disassembly of the pistons at Catawba should also be examined using dye-penetrant inspection. These components are critical for engine operation.

Main Bearings

We understand that several bearings toward the middle of the engine (e.g., bearing numbers 4, 6, & 8) will be inspected. We recommend that bearing number 1 and bearings 9 and 10 also be examined. These end bearings experience loads not seen by the other bearings. Number 1 is near the engine gears; numbers 9 and 10 share flywheel and generator loads. If any of these bearings show abnormal wear and/or failure, the other main bearings should also be removed and examined. We recommend radiography of the bearings in accordance with acceptance criteria established by the Owners' Group. Any defective bearings should be replaced.

Connecting Rod Bearings

These bearings had been sent to radiography at the time of the visit, but photographs of them were available. Our consultants concluded from the photographs that at least one bearing exhibited a fatigue pattern and most showed signs of cavitation in the babbitt overlay. At least two are questionable for reinstallation. The others should be inspected again within 500 hours if they are reinstalled.

Our consultants may be able to provide additional comments and recommendations if the results of the radiographic inspections and photographs of the bearings identified by bearing number are sent to them.

Turbocharger

The turbocharger was not available in the examination area during the visit of our consultants to Catawba. Unless appropriate changes are made in the installation of the turbocharger, however, our consultants anticipate a continuation of problems such as those experienced during the recent test run. We recommend that

the diesel engine manufacturer's latest recommendations on turbocharger installation be considered in evaluating appropriate corrective action. We also note the need for provisions to adequately prelubricate the turbocharger bearings before engine startup, and to lubricate the bearings during turbocharger coastdown after the engine is secured.

Cylinder Liners

One of the liners showed signs of scuffing. If this can't be removed by honing, the liner should be replaced. All of the liners should be deglazed to facilitate reseating of the piston rings.

Connecting Rods

All connecting rods should be dye checked in the critical areas. After the connecting rods are replaced in the engine, the bolts that hold the articulated rod assemblies together should be checked and retorqued after every 25 engine starts, 50 hours of operation, or six months (whichever occurs first). If the 50 hours of operation is reached while the engine is running, the check may be deferred until the engine is shut down.

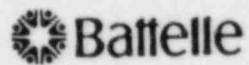
Rocker Arm Boxes

Cracks in supports for rocker arm shafts have been found in three of these boxes. We understand that the problem is under investigation, and that one of the three boxes may be replaced. Our consultants believe that the other two boxes may be run temporarily, but that the cracks in them will eventually propagate. If so, they will need to be replaced later if they are not replaced now.

Lubricating Oil System

Pentane insolubles (or "sludge") will build up with time in the oil. The proportion of these insolubles in the oil should be monitored via chemical tests of oil samples, and the oil changed before the buildup exceeds 3%. Smaller micron filters (e.g., 10 microns or less) could be used to extend the life of the oil.

May 7, 1984
Mr. Carl Berlinger
Page 4



Gears

Our consultants would like to review the results of the engine torsionograph measurements and the torsional analysis. From this information and/or on the basis of an inspection of the gears, the owner should verify that gear design is adequate.

We will be pleased to respond to any questions that you may have on this letter.

Sincerely,

A handwritten signature in cursive script that reads "J. F. Nesbitt".

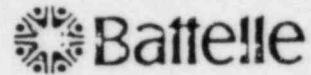
J. F. Nesbitt
Diesel Engine Project

WWL:JFN:rl

cc: M. Plahuta, DOE-RL
A. Henriksen
P. Louzecky
M. Carrington, NRC (2)

Concurrence:

A handwritten signature in cursive script that reads "W. W. Laity".
W. W. Laity
PNL Project Manager



Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99152
Telephone (509) 375-2332
Telex 15-2874

May 11, 1984

Mr. Carl Berlinger
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Berlinger:

SUBJECT: Catawba Nuclear Power Station - TDI Diesel
Engine 1-A Disassembly and Inspection
REFERENCE: Letter JF Nesbitt to Carl Berlinger, same
subject, dated 5-7-84

AJ Henriksen, JE Horner, PJ Louzecky, JF Nesbitt and JC Spanner visited the Catawba Nuclear Power Station on April 26-27, 1984. On both days, discussions were held with representatives of Duke Power Co., their consultants and NRC personnel; as well as observing the tear-down inspections and activities being performed on components of TDI diesel engine #1A.

The people present at some time during the two-day session are shown on the attached list.

Basically the 1A engine has been operated for a total of 810 hours and has performed the startup tests as required by the regulatory guides with only a few problems. The last 168 hours of operation were continuous. The inspection program is to look at the engine parts whose failure could stop the diesel or degrade its performance. The engine has been disassembled down to the blocks and the crankshaft. The inspection program will be ongoing for several more weeks. Duke Co. personnel indicated no major problems have been found to date.

Considerable time was spent on the diesel-generator (D-G) room looking at the installation, the D-G itself, as well as the various parts and components that have been removed or were being examined.

The items of wear or change from use that were seen included:

- Fretting or wearing in the serrated joints of the articulated connecting rods.
- Scoring and damage on three slave rod bushings and pins.

Mr. Carl Berlinger
Page 2
May 11, 1984

- Scoring or scuffing in one cylinder liner.
- Peeling of chrome on valve stems.
- Cracks in boss on cylinder head covers or rocker-arm boxes.

Items such as the connecting-rod bearings, turbochargers and pushrods were not available for viewing. However photos of the connecting-rod bearings were made available on Friday. Some of these showed wear spots and areas that could be babbitt cavitation.

Some data on the Catawba engine, such as fuel oil piping schematic, lube oil piping schematic, operating temperatures and pressures, clearances, torques, and timing, were obtained. Duke personnel promised to provide more data on the engines and the inspection as it becomes available or can be located. These include:

- Pictures of connecting-rod bearings.
- Data on front-end gearing and their inspection.
- Crankshaft torsiongraph tests and analysis.
- Cylinder-block vintage or model.
- Turbocharger data.

J. Horner and J. Spanner reviewed inspection procedures. The acceptance standards for the liquid penetrant (PT) examinations appear to have been extracted from Section VIII of the ASME Boiler and Pressure Vessel Code. Their application may not be appropriate to items such as bearing surfaces, valve seats, large castings, bolts and studs. They probably are too restrictive for castings and rough surfaces; but may not be sufficiently restrictive for bearing surfaces, valve seats, etc.

J. Horner and A. Henriksen reviewed process procedures, records and logs. Suggestions on some of these were made to Duke personnel.

J. Spanner observed and took pictures of interest on the nondestructive testing/nondestructive examination (NDT/NDE) of components. Photos of components and parts were also taken by J. Horner and P. Louzecky.

Mr. Carl Berlinger
Page 3
May 11, 1984



The operational procedures and test plans developed for the 1A engine are impressive and in general all-inclusive. Partial sampling in place of 100% inspection on some components was an item that was discussed.

Other items of concern and pertinent comments were those discussed with you during a telephone conversation on May 3, 1984 and transmitted to you in the referenced letter.

One additional area that needs to be addressed by the Owners' Group is whether or not to require the replacement of apparently good components with similar items of a more recent design per the Owners' Group program plan; for example, Duke personnel indicated there were no plans to change out cylinder head studs, air-start cap screws, or rocker-arm cap screws, as these items have not presented any problems at Catawba.

In general, Duke's approach to the inspection and testing of their TDI engines appears to be well organized.

Sincerely,

A handwritten signature in cursive script that reads "J. F. Nesbitt".

J. F. Nesbitt
Diesel Engine Project

Concur: 
W. W. Laity
PIL Project Manager

JFN:amd

Attachment

cc: MJ Plahuta - DOE-RL
AJ Henriksen
JE Horner
PJ Louzecky
WD Richmond
JC Spanner
M Carrington - NRC (2)
RL Gill - Duke Power Co.

bcc JM Alzheimer
M Clement
SD Dahlgren
DA Dingee
RE Dodge
WW Laity (2)
WD Richmond
Catawba File - B62351
JFN/I.B

Duke Power Company

Neil Rutherford	- Licensing
Robert L. Gill	- "
Robert O. Sharpe	- Production-Licensing
Russell P. Muschick	- Maintenance Engineer
C.W. Hendrix	- " "
W.R. McCullum	- Schedule Engineer

Duke Consultants

S.R. Ward	- Dominion Engineering, Inc.
Robert E. Gustafson	- Gustafson Associates
L.A. Swanger	- Failure Analysis Associates

NRC

Carl Berlinger	- Division of Licensing
Kahten N. Jabhour	- " " "
P.H. Skinner	- Site Representative

PNL

John F. Nesbitt

PNL Consultants

Adam Henriksen	- Diesel Consultant
Jack Horner	- " "
Paul Louzecky	- " "
Jack Spanner	- NDE Consultant

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

'84 AGO 17 A11:48

In the Matter of
DUKE POWER COMPANY, ET AL.
(Catawba Nuclear Station,
Units 1 and 2)

OFFICE OF SECRETARY
DOCKETING & SERVICE
Docket Nos. 50-413 0 C
50-414 0 C

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF SUPPLEMENTAL RESPONSES TO PALMETTO ALLIANCE AND CAROLINA ENVIRONMENTAL STUDY GROUP'S GENERAL INTERROGATORIES DIRECTED TO THE STAFF (DATED MARCH 18, 1984)" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk, by deposit in the Nuclear Regulatory Commission's internal mail system, this 15th day of August, 1984:

*James L. Kelley, Chairman
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dr. Paul W. Purdom
Administrative Judge
235 Columbia Drive
Decatur, GA 30030

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

Richard P. Wilson, Esq.
Assistant Attorney General
P. O. Box 11549
Columbia, South Carolina 29211

J. Michael McGarry, III, Esq.
Mark S. Calvert
Bishop, Liberman, Cook,
Purcell & Reynolds
1200 Seventeenth Street, N.W.
Washington, DC 20036

Robert Guild, Esq.
Attorney for the Palmetto Alliance
P. O. Box 12097
Charleston, South Carolina 29412

Palmetto Alliance
2135 1/2 Devine Street
Columbia, South Carolina 29205

Jesse L. Riley
Carolina Environmental Study Group
854 Henley Place
Charlotte, North Carolina 28207

William L. Porter, Esq.
Albert V. Carr, Esq.
Ellen T. Ruff, Esq.
Duke Power Company
P. O. Box 33189
Charlotte, NC 28242

John Clewett, Esq.
236 Tenth Street, S.E.
Washington, DC 20003

Mr. Donald R. Willard
Department of Environmental Health
1200 Blythe Boulevard
Charlotte, NC 28203


*Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

*Atomic Safety and Licensing Appeal
Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

*Docketing & Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Karen E. Long
Assistant Attorney General
N.C. Department of Justice
Post Office Box 629
Raleigh, NC 27602

Spence Perry, Esquire
Associate General Counsel
Federal Emergency Management Agency
Room 840
500 C Street, S.W.
Washington, D.C. 20472



George E. Johnson
Counsel for NRC Staff