UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION II - SUITE 818
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ATLANTA, GEORGIA 30303

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INSPECTION REPORT

COMPLIANCE REPORT NO.: 50-269/71-7

DUKE POWER COMPANY
OCONEE 1
Seneca, South Carolina
License No.: CPPR-33
Docket No.: 50-269
Category: B1
Type of Licensee: PWR-2452 Mw(t) B&W

Type of Inspection: Routine, Announced

Dates of Inspection: June 28-29, July 29-August 1, and August 4, 1971

Dates of Previous Inspection: May 30-June 1, June 8-11, 1971

Principal Inspector: C E Murphy 10/21/71
C. E. Murphy, Reactor Inspector (Testing and Startup) — Date

Accompanying Inspectors: H. L. Whitener 10/20/71
H. L. Whitener, Reactor Inspector (Operations) — Date

N. C. Moseley for 10/22/71
W. S. Farmer, Acting Chief, Technical Support Branch, CO:HQ — Date

N. C. Moseley for 10/22/71
L. Beratan, Senior Structural Engineer, CO:HQ — Date

Other Accompanying Personnel: R. F. Warnick, Reactor Inspector (Testing and Startup)

D. C. Kirkpatrick, Reactor Inspector (Operations)

Reviewed By: N. C. Moseley 10/22/71
N. C. Moseley, Senior Reactor Inspector (Testing and Startup) — Date

Proprietary Information: None

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SECTION I

ENFORCEMENT ACTION

Noncompliance Items

Criterion VIII of Appendix B to 10 CFR 50 - Traceability of piping and fittings. (See Section II, Paragraph 4)

LICENSEE ACTION ON PREVIOUSLY IDENTIFIED ENFORCEMENT MATTERS

The licensee responded August 6, 1971, to the items of noncompliance and nonconformance discussed in CO Report No. 71-6, dated August 3, 1971, Paragraphs 4 and 7, and Section IV, Paragraph 4. This response was considered to be satisfactory.

UNRESOLVED ITEMS

A. Crane Chapman Valves (See Section II, Paragraph 3)

B. Turbine Building Welding (See Section II, Paragraph 5)

C. Control Rod Drives (See Sections IV, V, & VI)

STATUS OF PREVIOUSLY REPORTED UNRESOLVED ITEMS

The actions taken by the licensee with respect to the decay heat cooler deficiencies and the use of electricians tape on stainless steel pipe will be reviewed during the next inspection. These items were discussed in CO Report No. 71-6, dated August 3, 1971, Paragraphs 5 and 6.

UNUSUAL OCCURRENCES

Control Rod Drives - During checkout and preoperational testing of the Oconee 1 control rod drives, eleven mechanisms were damaged when they were subjected to scrams with insufficient water in the hydraulic buffers to decelerate the mechanisms and absorb the energy. (See Sections IV, V & VI)

PERSONS CONTACTED

Duke Power Company (Duke)

W. O. Parker, Jr. - Assistant Manager of Steam Production
P. H. Barton - Manager, Technical and Nuclear Services
J. E. Smith - Superintendent, Oconee Station
J. C. Rogers - Project Engineer, Oconee and McGuire
D. G. Beam - Assistant Project Engineer, Oconee
G. L. Hunnicutt - Principal Field Engineer
L. C. Dail - Principal Civil Design Engineer
T. F. Wyke - Mechanical Design Engineer
J. W. Hampton - Assistant Superintendent
M. D. McIntosh - Reactor Engineer
J. Goode - Consultant
O. S. Bradham - Instrument and Control Engineer
R. M. Koehler - Technical Support Engineer
E. E. Sibley - Principal Mechanical Engineer

Babcock and Wilcox Company (B&W)

D. W. Berger - Site Manager
R. R. Beach - Manager, Field Engineer
J. T. Williams - Engineer
B. B. Cardwell - Manager, Mechanical Engineering
G. E. Kulynych - Project Engineer
W. Fassee - Construction Engineer

Diamond Power Specialty Company (Diamond Power)

G. J. Echelbarger - Engineer
T. Koksal - Engineer
R. A. Wallin - Engineer
B. D. Ziels - Engineer

MANAGEMENT INTERVIEW

The following subjects were discussed with Smith, Barton, Rogers, Bean, Hunnicutt, and Wyke at the Management Interview on August 4, 1971.

1. The possibility that some of the Crane-Chapman (CC) valves might not meet minimum wall thickness requirements for their service and that the valve operators might not function satisfactorily under design operating conditions was discussed. Wyke stated that in his opinion the licensee was taking appropriate steps to preclude having these problems at Oconee.

In addition to the assurances that the licensee has received from CC and the Pittsburgh Testing Laboratory (PTL), Wyke stated that the licensee will make measurements of the valves for Units 2 and 3. (See Section II, Paragraph 3)

2. The inspector stated that the licensee appeared to be in noncompliance with Criterion VIII of Appendix B to 10 CFR 50 in that the traceability of piping and pipe fittings had not been maintained. (See Section II, Paragraph 4)

3. The licensee agreed to UT the top welds in the turbine building steel and to repair all welds found to be unacceptable. (See Section II, Paragraph 5)

4. The inspector briefly reviewed the discussions that had been held with Duke, B&W and Diamond Power relative to the control rod drive problems. Parker was advised that a report on the problem would be required and that, in particular, more information was needed in the following areas:

a. Forces and stresses associated with dry scram and mechanism failure. Include comparisons of calculated values with those actually experienced.

b. Detailed revised venting procedures.

c. Justification for the belief that gas accumulation in the control rod drive housing will not occur and procedures he proposes to preclude its occurrence.

d. Evaluation of consequences of failures in terms of possible fuel damage and fission product release, etc., and safety significance.

Parker agreed to provide a report on the control rod drive mechanism failure, if it were requested by DRL. (See Sections IV, V and VI)

SECTION II

Prepared By: C. E. Murphy
Reactor Inspector
(Testing and Startup)

ADDITIONAL SUBJECTS INSPECTED, NOT IDENTIFIED IN SECTION I, WHERE NO DEFICIENCIES OR UNRESOLVED ITEMS WERE FOUND

1. The inspector witnessed the reactor building structural integrity test. No deficiencies were noted in the implementation of the test procedure. The actual response of the structure to the test has not been determined since the licensee has not completed his evaluation of the test data. No obvious deficiencies were noted in the structure by the inspector.

2. Pressurizer and Steam Generator Relief Valves installation.

DETAILS OF SUBJECTS DISCUSSED IN SECTION I

3. Crane-Chapman Valves

During a previous inspection, the licensee had agreed to provide the inspector with information that would assure that the valves manufactured by CC had been dimensionally checked to verify wall thickness. In addition, the licensee was to provide information that would assure that the valves with motor operators would perform satisfactorily in service.[1/] During the inspection, the inspector discussed this item with Wyke. During this discussion and a subsequent telephone call, Wyke advised the inspector as follows:

a. CC has assured Duke that the valves will meet the minimum wall thickness requirements although they cannot provide documentation of dimensional checks.

b. PTL has certified that the valve walls meet the minimum wall thickness requirements although PTL cannot document that dimensional checks were made.

c. Duke has never experienced any difficulties of this nature with CC valves.

d. Duke will make measurements of random samples of valves purchased for Units 2 and 3.

e. Duke will functionally test the CC valves and operators under design operating conditions.

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Data obtained from Unit 2 and measurements and tests for all three units will be made available to the inspector during a future inspection. These items were discussed during the Management Interview.

4. Traceability of Piping

The inspector briefly reviewed the licensee's records relating to the traceability of the high pressure injection system piping and fittings. The licensee's procedures provide that the heat numbers be etched on each piece of pipe and each fitting with an electric pencil at the time the pipe is erected. The QC inspector records these heat numbers on an isometric drawing of that section of the system. The heat numbers are cross referenced on the isometric to the individual data packages which contain the chemical, physical and other quality control information relating to that heat. The inspector's review was limited to two of the isometrics pertaining to the high pressure injection system. Data on Sheet 1 of Isometric 51A indicated that the heat numbers could not be identified for six items of pipe and fittings, and, in addition, six of the heat numbers etched on the pipe and fittings could not be identified with a data package. Sheet 7 of this isometric indicates that two of the heat numbers cannot be correlated to data packages and the heat numbers of numerous spool pieces and fittings cannot be determined.

The deficiencies noted by the inspector were discussed in detail with Hunnicutt and also in the Management Interview. In response to the inspector's questions, Hunnicutt stated that the deficiencies noted in the brief review of the high pressure injection system documentation were typical of those for all of the safety feature and safety-related systems. He advised the inspector that although some of the missing documentation might be available from Duke engineering or from vendors, he did not feel that the construction unit would be able to make a significant number of additions to the documentation. He stated that in all probability many of the deficiencies could be attributed to errors made in etching heat numbers on the piping and fittings. In other cases, he stated that it was probable that Duke had not received documentation from the vendors and had no way of identifying the supplier at this point. The inspector advised Rogers, Barton, and Hunnicutt during the management interview that it appeared that the licensee was in noncompliance with the requirements of Criterion VIII of Appendix B to 10 CFR 50, in that the identity of materials had not been maintained. Rogers stated that the licensee was continuing his efforts to identify the material.

5. Turbine Building Welds

During a previous inspection, the inspector had determined that the licensee had experienced problems in the welding of structural steel members.[1/] At that time, the licensee had stated that all accessible welds in the affected area of the turbine building would be retested using revised UT procedures to determine if unacceptable defects were present. During this inspection, the inspector inquired about the progress of these tests. Rogers stated that because of other work very little had been accomplished in the testing. Rogers and Dail agreed during the Management Interview to have the testing completed expeditiously and repair all unacceptable defects that were found.

1/ CO Report No. 50-269/70-10

SECTION III

Prepared By: L. L. Beretan
Senior Structural Engineer
CO:HQ

ADDITIONAL SUBJECTS INSPECTED, NOT IDENTIFIED IN SECTIONS I WHERE NO DEFICIENCIES OR UNRESOLVED ITEMS WERE FOUND

Structural Integrity Test

1. General

After some difficulty with the pumps, full overpressure (68 psig) of the containment was achieved at 2:56 p.m. on August 1, 1971. An inspection of the equipment and personnel hatch areas revealed no cracked or fissured concrete. Some minor cracks were observed at the base of the ring girder. The width of the largest was estimated to be 2 mils.

2. Pressurization of the Containment

With both air pumps working, the containment was pressurized at the rate of 2 psig per hour. Difficulty with one of the pumps resulted in its being taken out of service for several hours on August 1, 1971, but both pumps were in operation when the containment reached its full overpressure.

3. Structural Deformations

Taut wires were used to measure the movement of the dome and walls of the containment. Measurements indicate that the crown of the dome moved vertically approximately 0.2 inch, the predicted movement was 0.25 inch. The walls moved outward 0.04 inch at elevation 879. The movement of the buttress at 0° and elevation 825 was 0.045 inch.

4. Strain Gages

Twenty-six Carlson strain gages were mounted on the containment and forty-six other strain gages in various portions of the containment were operable. The data examined by the inspector indicated that most of the gages were functioning. A few appeared to be erratic and would be disregarded.

5. Tendon Lift Off Tests

Lift-off tests were being conducted on selected tendons but this data was not being reduced at the time of the testing. It was not possible to determine the validity of this testing at this time. The data from the lift-off testing will be included in the applicant's final report of the testing.

6. Physical Examination of the Containment

a. The examination of the containment was restricted to those areas above ground level. The electrical penetration area was restricted because of safety considerations and the inspectors were not permitted into this area. The surface area of the containment above grade level and especially around the equipment and personnel hatches was inspected. No cracking was noted. Those cracks above the equipment hatch that seeped grease and were repaired with epoxy grout did not exhibit cracking or other undesirable structural characteristics.

b. A team inspected the ring girder and reported that cracks approximately 2 mils wide were found at its base. The surface of the dome was painted with a plastic coating; therefore, a detailed examination was not conducted.

c. Accompanying Smith, Plant Superintendent, the inspectors went down to the lowest level of the auxiliary building. It was observed that water was seeping down the containment wall and the cross walls of the auxiliary building. This seepage of water presents a potential hazard to the electrical and instrumentation systems mounted on these walls. It was stated by Smith that measures to correct this situation would be undertaken.

SECTION IV

Prepared By: W. S. Farmer, Acting Chief
Technical Support Branch
CO:HQ

DETAILS OF SUBJECTS DISCUSSED IN SECTION I (Assist Inspection on June 28-29, 1971)

1. Control Rod Drive Problem - In a meeting with Smith, Hampton, Goode and Bradham the inspector was given the following information relating to the failure of the control rod drives:

A. During the performance of the functional electrical preoperational test TP 1A 340 11 1 in the period 6/1 to 6/10/71 and the control rod drive integrated system test TP 1A 330 1 between 6/9/71 and 6/11/71, it was found that a number of control rod mechanisms had failed. The functional test called for cycling the drive in and out, three scrams at 10% and one scram at 35% withdrawal. The system test called for cycling in and out and a scram from 100% withdrawal.

B. Seven mechanisms were believed to have definitely been damaged and five more were suspect. Of those examined up to June 29, there were five found with their tangs completely sheared off. The two tangs (or ears) support the torque tube from the top closure head of the control rod housing. The buffer and spring which absorb the energy of the falling lead screw control rod combination at the end of the scram stroke are fastened to the bottom of the torque tube. See Exhibit A which shows a vertical section of the control rod drive.

C. The broken tangs did not shatter, but stayed in one piece. The tangs were broken out of the side of the top of the torque tube by shear along their edges and tension across the bottom edge. Based on dimensions provided by the licensee, the fracture surface of the two tangs together represents approximately 0.30 square inches. See Exhibit B for details of the tang support.

D. The damaged control rod mechanisms were located on the apex region of the dome of the vessel. Following the failure, the individual drive housings were vented through a flow meter, and the volume of gas present was recorded. The drives that failed had reported gas volumes present in the amount of 5 cu. ft. as measured at 60 psig. Based on approximate control rod drive dimensions, the inspector estimated that 0.70 cu. ft. of volume is present in the drive housing between the buffer seal and the top closure. Thus, at 60 psig the measurement of approximately 3 cu. ft. or more of gas would indicate the absence of water in the buffer dashpot, and hence, it would not decelerate the control rod on scram. Under these circumstances, the total deceleration energy from scram would have to be absorbed by the spring, and impact or bottoming of the buffer piston on the end of the torque tube.

E. During the preoperational tests mentioned in Section A, a dummy control rod assembly weighing only 10 lbs. was fastened to the 102 lbs. lead screw on all but ten of the drives. Ten drives had a normal 130 lb. control rod attached. None of the ten drives with a normal control rod attached were scrammed. Based on the 112 lbs. total weight above, the inspector estimated a free fall velocity of 27 ft/sec, and scram time from 100% withdrawal to full insertion of 0.85 seconds. The licensee in the latter phases of the preoperational testing employed a high speed recorder to time the scram. Full travel for a 100% withdrawal scram was recorded as 0.89 seconds on several drives that failed, and 1.98 seconds on other drives exhibiting anticipated normal behavior with water in the buffer. Based on the free fall velocity and 112 lbs. weight above, the inspector estimated an impact force of 11,500 lbs. was being applied to the end of the torque tube when a 100% withdrawal scram occurred with a gas bound buffer. This would give a stress across the 0.30 sq. in. tang shear area of 38,500 psi which is close to the 40,000 psi shear stress of the 304 stainless steel tang material.

F. It was noted that the tangs had sheared on the mechanism on nozzle #3, and the tangs were bent on the mechanism on nozzle #4. These mechanisms had never been scrammed from more than 35% withdrawal. Thus, with a normal 130 lbs. control rod weight failure of the tangs might be anticipated for scram from withdrawal of as little as 20% with the present mechanism design if the buffer is gas bound.

G. The broken tangs had been recovered from all but two of the mechanisms which fractured. The licensee stated that these two were being shipped to Diamond Power for disassembly, and the remaining broken parts would be recovered there. Examination of the clearances within the drive mechanism indicated the only path for particles into the reactor vessel would be along the lead screw threads through the guide bushing. This passage is 0.125 in. by 0.1875 in. in cross section. To reach this point, the tang particles would have to work their way through a long tortuous path from the top mechanism closure.

H. The gas venting procedures for the control rod mechanisms were reviewed by the inspectors. The B&W procedure prohibits venting at reactor coolant temperature over 200 degrees Fahrenheit and a pressure over 200 psi. The pressure must be over 400 psi, when the reactor coolant pumps are in operation. Hence, all venting took place right after initial fill and prior to pressurization, and reactor coolant circulation. The reactor coolant pressure prior to the conduct of the preoperational tests on the drive mechanism had been raised to greater than 2000 psi to conduct a hydrostatic and leak rate test. The 100% withdrawal scram tests were conducted when the reactor coolant was at about 350 psi.

1. At the time of the June 29 inspection, the licensee's investigation was in progress. He had reconstructed a list of significant events and had them displayed on a figure as shown in Exhibit C. The status of the twelve mechanisms which had been established as damaged or believed to have possibly been damaged are shown in the tabulation in Exhibit D.

2. The inspectors offerred the following comments concerning the incident:

A. A report should be submitted to DRL on the damage to the control rod mechanisms, cause of failure and their evaluation.

B. CO would wish to review the findings from the licensee's suppliers investigation of the failure.

C. Resolution of the venting problem appeared desirable before further control rod testing took place.

D. If the licensee intends to continue his preoperational test program without disassembly and detailed inspection of the mechanism, criteria and plans should be developed to preclude the presence of damaged mechanisms.

3. The inspectors discussed the problem in the management interview held on August 4, 1971.

SECTION V

Prepared By: W. S. Farmer, Acting Chief
Technical Support Branch
CO:HQ

DETAILS OF SUBJECTS DISCUSSED IN SECTION I (Assist Inspection on August 4, 1971)

1. Control Rod Drive Problem - In discussions with Duke, B&W and Diamond Power the inspectors received the following information:

A. The licensee stated that fifteen control rod drive mechanisms had been returned to Diamond Power for inspection. The areas inspected included the closure insert, tangs, support ring and motor tube (See Exhibit B).

B. Tests were run by Diamond Power progressively lowering the water level in the drive mechanism housing. The distance from the closure to the bottom of the damper spring is 163 inches. It was found that the water level could be dropped 120 in. without any indication of impending damage. At a level of 132 to 144 in., they found that the support ring under the tangs started brinelling or indenting. The same brinelling was observed on the support ring when the autoclave control rod scram test was repeated three times. The tests were run at both 400 psi and ambient temperature typical of the Duke preoperational test conditions, and also at 520°F and 2200 psi typical of operating conditions. They did not carry the tests to a dry buffer or mechanism total failure.

C. Based on the tests above, the licensee proposed to inspect all the mechanisms which had been scrammed in the June Oconee 1 preoperational testing in the region of the closure head. If no brinelling was found on the support ring and the drive performed normally, they would be considered undamaged and useable as is. Any drives not passing this criteria would be disassembled, inspected and be repaired or replaced by Oconee 2 drive mechanisms.

D. Duke confirmed the vertical dimensional clearances on mechanism failure given in the June 29 inspection. On failure of the tangs, the torque tube can drop three inches. This in turn will drop the control rod three inches. There is a nominal two-inch clearance between the control rod spider, and the top of its associated fuel element. Hence, one inch of possible fuel element crushing can occur.

E. It was reported that all broken tangs parts from all mechanisms had been recovered and accounted for.

F. The final assessment of damage revealed that the tangs had sheared off on five drive mechanisms, had been bent on four drive mechanisms and brinelling of the support ring had occurred on two drive mechanisms. Thus, eleven mechanisms had been damaged during preoperational testing.

G. A dummy plate had been fastened below each control rod drive guide tube during the preoperational testing since fuel was not in the reactor. All the plates and supporting bolts were examined to see if they were loose indicating possible impact on drive mechanism failure. Every plate found loose was the basis of examining its associated drive mechanism. The control rod drive mechanism on nozzle #59 was shipped to Diamond Power for examination for this reason. It was found that it was not damaged and was later used for the testing described in B above.

H. Analysis of the gas found in the drive housing indicated it was 99% nitrogen. Nitrogen had been used in the pressurizer at the time of preoperational testing since the heaters were not available.

I. The licensee stated that 0.64 cu. ft. of volume is present in the mechanism housing between the closure head, and the 144 in. threshold of serious damage.

J. Pull tests had been conducted on the torque tube to measure the load required for tang failure. It was found that 12,000 lbs. would yield the tangs and 15,000 lbs. would break them.

K. The licensee's supplier stated there were no plans to increase the strength of the tangs to provide for a dry buffer scram without failure. B&W concurred with the observation that failure had occurred on a scram from 35% withdrawal with a dry buffer with a 10 lbs. dummy control rod.

L. The licensee stated that he was planning to provide a reactor coolant sample point in the letdown line to the low pressure storage tank. A new procedure was presented in which samples would be taken of primary coolant and the gas solubility would be determined. If gas exceeded the solubility limits, the licensee proposed venting the control rod mechanism housing. A new venting tool was to be provided which would permit venting at up to 2000 psi. However, the 200°F limitation still held true. The technical specifications were stated to limit vessel pressurization to primary coolant temperatures over 275°F. The licensee had no immediate solution for how venting would be accomplished in practice but planned to examine the situation further. A detailed venting procedure tied to primary coolant gas solubility measurements is to be developed and be incorporated in the operating procedures. The licensee had at the time no plans to incorporate these in summary form into the technical specifications.

M. The licensee's supplier (B&W) did not believe that free radiolytic gas or gas in the makeup water would result in exceeding the solubility limits of the primary coolant; however, no specific analysis or experience was provided supporting this position.

N. The licensee concurred with the inspector's statement that Westinghouse drives had their buffers in the reactor vessel, and hence, would be expected to be immune from gas accumulation. Therefore, the Westinghouse successful control rod mechanism operation did not resolve the question of gas accumulation. No specific instances of successful operating experience involving the use of a top-mounted drive mechanism with the buffer in the mechanism housing in essentially stagnant coolant were provided by the licensee.

2. At the conclusion of the presentation, the inspectors offered the following comments:

A. The licensee was again requested to submit a report to DRL on the failure, and indicated an intent to do so.

B. Duke was requested to include the detailed venting procedures they proposed at the meeting in their operating procedures.

3. The inspectors also discussed the control rod drive problem in the management interview held on August 4, 1971.

SECTION VI

Prepared By: H. L. Whitener
Reactor Inspector (Operations)

ADDITIONAL SUBJECTS INSPECTED, NOT IDENTIFIED IN SECTION I, WHERE NO DEFICIENCIES OR UNRESOLVED ITEMS WERE FOUND

1. GENERAL

The inspector specifically directed his inspection toward obtaining information on the control rod drive problem (Section I) and did not discuss general status of construction and operation schedule, or test program with the licensee at this time.

2. LOGS AND RECORDS

a. Shift Supervisors Log of 2/17/71 to 6/9/71 - reviewed 6/6/71 to 6/9/71.

b. Shift Supervisors Log of 6/9/71 - to date - reviewed 6/9/71 to 6/13/71.

DETAILS OF SUBJECTS DISCUSSED IN SECTION I

3. CONTROL ROD DRIVE DRY SCRAM INCIDENT

a. Control Rod Drive Damage

During testing, June 9, 1971, through June 11, 1971, the Oconee 1 control rod drive mechanisms were severely damaged when the rods were scrammed on dry shock absorbers. The control rod drives, a B&W roller-nut design, have hydraulic (water snubbing) shock absorbers which provide the control rod decelerating force. Gas, trapped in the drive housings, voided the hydraulic shock region.

Without the water snubbing deceleration action, full impact of the scrammed control rods was taken by the torque tube assembly. The impact caused brinelling, distortion, yielding and breakage to parts of eleven drive units.

The trapped gas was 99% nitrogen. Apparently, nitrogen from the pressurizer had dissolved in the reactor coolant water under high system pressure. The gas evolved from the coolant and collected in the drive housings when the system pressure was reduced.

b. Analysis of Control Rod Drive Damage

Inspection revealed that damage to the control rod drive mechanisms was confined to the torque tube assembly support tangs and associated support hardware. This was characterized by one or more of the following visible indications:

1. Broken or bent tangs which support the torque tube assembly.

2. Brinelled and distorted support ring which rests on the motor tube and supports the tangs vertically.

3. Brinelled closure insert which caps the top of the motor tube and extends downward to provide radial support for the tangs.

4. Brinelled motor tube surface which supports the tang support ring.

Tests on an Oconee 1 drive line in the Diamond Power drive test facility demonstrated that visible damage occurs to the tangs and associated hardware prior to damage of other parts of the drive mechanisms. Damage to the mechanisms is first visible as brinelling of the tang support ring followed by damage to the support tangs and closure insert.

Based on these test results, the tangs and torque tube assembly support hardware of all Oconee 1 control rod drives were visually inspected for brinelled surfaces and checked for support ring distortion (out-of-round). All damaged drive units will be replaced with identical Oconee 2 control rod drives.

c. Licensee Action to Prevent Recurrence of Control Rod Drive Damage.

To prevent the voided shock absorber condition in the future, the licensee will modify the present venting procedures and limit the amount of gas dissolved in the reactor coolant.

The venting tool has been redesigned to remove the restriction of 200 psi system pressure on control rod drive venting. In the future the drive housings will be vented both before and after reactor coolant pump operation.

Limits will be established on the amount of gas dissolved in the reactor coolant. Coolant water will be periodically sampled and analyzed. If the limits are exceeded the system will be vented.

The licensee will report the plan to prevent recurrence of dry scrams in his report on the control rod drive incident to DRL.

d. Operational Events, June 9, 1971 - June 11, 1971.

An indication of possible damage to a control rod drive mechanism first occurred during Minimum Run - Latch - Unlatch Current Test June 9, 1971. A position indication was not obtained while attempting to raise the control rod drive in core position G 9 after a scram from 35% withdrawal. At this time, the problem appeared to be in the absolute position indicator circuit. No further attempt was made to withdraw this drive unit.

On June 11, the licensee began the Control Rod Drive System Integrated Tests. This procedure involved the transfer of the drive motors from temporary to normal power supply. After each rod group was transferred, the group was tripped from 100% (139 inches) withdrawn. Control rod groups 1 and 2 were tested without incident. However, after the 100% drop of rod group 3 (12 drive units), the indicator lights did not show rod insert for three drive units. Analogue rod drop traces were recorded for six of the drive units during a second trip of group 3 rods from 100% withdrawn. Four traces showed similar rod drop time curves. One trace indicated a fast rod drop and another trace did not deflect. Testing on rod group 3 was terminated and the five control rod drives of group 4 were transferred to normal power supplies.

Analogue rod drop traces were recorded on the first trip of rod group 4 from 100% withdrawn. This time the traces were indexed for time measurements. Full stroke drop time for four of the rods was a nominal 1.98 seconds. The fifth rod dropped in 0.89 seconds. At this point, the operation was terminated for inspection of the drives.

Attachments:
Exhibits A thru D