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OCONEE 3 SURVEILLANCE HOLDER TUBE REPORT, THIS REPORT CONSISTS OF SUMMARY FOR THE INSPECTION WHICH HAS BEEN PERFORMED.....

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DUKE POWER COMPANY
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WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

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373-4083

April 12, 1976

Mr. Benard C. Rusche
Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Oconee Unit 3
Docket No. 50-287

Dear Mr. Rusche:

My letter of March 22, 1976 requested an exemption to the conditions of Appendix H to 10 CFR 50 to permit operation of Oconee 3 for the duration of the present fuel cycle with the reactor vessel material surveillance capsules removed. A revision to the Oconee Nuclear Station Technical Specifications to support this operation was also requested. Attachment 1 to this letter provides a summary of the inspections which have been performed, corrective action which has been taken and the analyses which demonstrate the acceptability of the Oconee 3 surveillance holder tubes for operation for the duration of this fuel cycle.

Oconee 3 is scheduled to resume operation on April 15, 1976; consequently, it is requested that approval of our March 22, 1976 submittal be completed as soon as possible.

Very truly yours,

W. O. Parker, Jr.

William O. Parker, Jr.

By MST

MST:mmb

Attachment

3787

OCONEE 3 SURVEILLANCE HOLDER TUBE REPORT

INTRODUCTION

The Oconee 3 reactor vessel surveillance capsules and holder trains have been removed, and the surveillance capsule holder tubes have been inspected. Based on the analyses performed on the results of these inspections, Oconee 3 will be operated for the remainder of Cycle 1 with the surveillance capsule holder tubes installed in the reactor vessel, but with the surveillance capsules and holder trains removed. The holder tubes have been secured from motion by spring-loaded retaining devices which have been loaded into the upper end of each holder tube. This report documents the results of inspections performed and demonstrates the acceptability of these actions.

SURVEILLANCE CAPSULE HOLDER TUBE ARRANGEMENT

The design of the Oconee 3 surveillance specimen holder tubes and holddown mechanism are the same as Oconee 1; with the exceptions that the push rod spacers are of a three-piece circular design rather than the single piece cloverleaf shape design, and that there are no thermal aging specimen capsules installed in Oconee 3. This design is described in Reference 1.

SURVEILLANCE CAPSULE HOLDER TUBE INSPECTION

All three surveillance specimen holder tubes were inspected by remote video techniques for evidence of wear on the internal surface. Evidence of wear was noted at each of the push rod spacer axial locations, at the location of the holddown spring, at the surveillance capsule rings, and at a location between the third and fourth spacers. This latter wear was attributed to contact and motion of the push rod. The other wear sites are attributed to contact and motion of the holddown spring, spacer or surveillance capsule at their respective locations. The wear indications are all very shallow with the following exceptions:

During removal of the surveillance specimen capsules, two of the tubes showed complete severance at the axial location of the second push rod spacer from the top. An indication of wall penetration was also noted on the intact tube at the second push rod spacer location.

The wall penetration on this tube is limited to about a 170° angle of the tube circumference.

Evidence of deep wear was also found at the third and fourth spacer locations of one of the tubes severed at the second spacer location. This deep wear is limited to an angle of about 180° of the tube circumference. A small hole exists at the fourth spacer location on this tube.

External inspections were also conducted on all three tubes using the same video technique. The journal bearing area and the upper pintle were examined for evidence of wear. These inspection results confirm the adequacy of the holder tube supports; however, some indications of wear on the journal bearing were found.

CORRECTIVE ACTION

Evaluation based on the inspection results conclude that the Oconee 3 holder tubes retain sufficient integrity to remain in the reactor vessel. B&W has concluded that the cause of the observed tube wear was flow induced relative motion between the surveillance capsule train and the holder tube. To minimize the possibility of further unacceptable wear occurring during the remainder of Cycle 1, the following steps have been taken:

1. The surveillance capsules and push rod assemblies were removed.
2. The holder tubes have been secured from motion by a spring-loaded retaining device which was loaded into the upper end of each holder tube. The two tubes severed at the second push rod spacer location have been cut at the axial location of a tube support, and an extended spring-loaded retaining device has been installed which fits inside the holder tube and provides structural continuity for the tube.
3. The journal bearing area of each holder tube has been expanded by rolling to restore adequate journal bearing support.

These actions will provide for continued operation and allow for the engineering of the holder tube design modifications and material procurement prior to the resumption of the surveillance capsule irradiation program.

SAFETY EVALUATION

Reactor Vessel

The previous request for an exemption to the requirements of 10 CFR 50, Appendix H (Reference 2) provides the justification for operation with the reactor vessel surveillance specimens removed. Removal of the specimens from the reactor vessel for the remainder of Cycle 1 will not adversely affect the results of future testing of these specimens or the overall results of the surveillance program.

Surveillance Capsule Holder Tube

The present condition of the Oconee 3 surveillance holder tubes has been evaluated. The loads on the tubes measured during hot functional testing are very low compared to the allowable loads. A comparison of these loads is provided in B&W Topical Report BAW-10039 (Reference 3). A fatigue evaluation has been performed using the as-measured strains and appropriately conservative factors for the reduction in cross-sectional area and notch effects associated with the wear sites. The results of this evaluation demonstrates that the maximum alternating stress levels during continued operation are well below the high-cycle endurance limit for the 304 stainless steel material. Based on the large margins in the design, the corrective action taken as described above, and the results of the evaluation, the tubes are considered acceptable in their present condition for the remainder of Cycle 1 operation with the surveillance capsules and push rod assemblies removed, and the spring-loaded retaining devices installed to provide proper holder tube restraint.

Even though the holder tubes will remain in the reactor for only a portion of a cycle and are considered structurally adequate, failures in the areas of wear as described above have been considered. Complete severance at the wear locations within the shroud tube would have no immediate effect since these portions are contained by the shroud tube. Severance at the 4th spacer location could allow the lower portion of the holder tube to oscillate on the hinged mounting brackets (pintles). This motion would be expected to wear the anti-rotation portion of the mounting bracket at the dowel pin. This wear could allow larger oscillations until eventually the upper portion of the holder tube and spring-loaded retaining device could be free to drop

into the annulus between the thermal shield and the reactor vessel wall. Depending on the motion and condition of the upper portion of the tube, it may be in one or more sections at the wear locations. These sections, depending on their length, would either wedge in the annulus between the thermal shield and the vessel wall, or for shorter pieces, may wedge in the lower reactor vessel head. The spring-loaded retaining device would probably wedge in the lower head. Damage from these loose parts could occur to the reactor vessel clad, incore instrument guide tubes and the lower reactor internals. This damage would not represent an imminent threat to public health and safety, but could require expensive evalution or repair to assure these structures remain serviceable for the life of the plant. The loose parts monitoring system at Oconee has proven able to detect parts much smaller than those from the failure of a holder tube and would allow an orderly shutdown in the unlikely event a failure should occur.

CONCLUSION

It is concluded that operation of Oconee 3 with the surveillance specimen capsules removed and the surveillance specimen capsule holder tubes restrained by the upper tube spring-loaded retaining device is acceptable during the balance of Cycle 1. This change will not be inimical to the health and safety of the public.

REFERENCES

1. Letter, Mr. William O. Parker, Jr., Duke Power Company, to Mr. Benard C. Rusche, NRC, Re: Oconee Unit 1, March 16, 1976.
2. Letter, Mr. William O. Parker, Jr., Duke Power Company, to Mr. Benard C. Rusche, NRC, Re: Oconee Unit 1, March 22, 1976.
3. Prototype Vibration Measurement Results for B&W's 177-Fuel-Assembly, Two-Loop Plant, BAW-10039, Babcock & Wilcox, April 1973.