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FACIL:50-270 Oconee Nuclear Station, Unit 2, Duke Power Co. 05000270

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STOLZ,J.F.	Operating Reactors Branch 4

SUBJECT: Discusses cause of binding of two axial power shaping rod assemblies,per 811104 commitment to perform evaluation.Based on evaluation,binding problem in Unit 2 was similar to Unit 1.

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September 8, 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch No. 4

Re: Oconee Nuclear Station
Docket No. 50-270

Dear Sir:

By an October 28, 1981 letter, as supplemented on October 29, 1981, Duke Power Company (Duke) had requested a revision to the Oconee Nuclear Station (ONS) Technical Specifications (TS). This change allowed for full power operation of Unit 2 with the axial power shaping rod (APSR) assemblies (Figure 1) in the fully inserted position. It was agreed, per a November 4, 1981 letter from P. C. Wagner to W. O. Parker, Jr., that Duke would determine the cause of the binding, perform a careful evaluation if the cause is the same as that discovered in Oconee 1, and provide to the NRC the findings of our evaluation.

Pursuant to our commitment, an investigation of the cause of the binding of the two APSR assemblies in Unit 2 was performed. The investigation has indicated the following for both the Unit 1 and Unit 2 incidents:

a) that the APSRs could be inserted normally

b) that the withdrawal of the APSRs was more difficult than insertion

c) that the APSRs were binding at approximately 75% withdrawn.

- This is the point where the void region of the APSR would interact with the guide tube nut in the upper end fitting of the fuel assembly.

d) that the irradiation levels were similar

e) that the times in the reactor were similar

Based on the above information, it is judged that the binding problem in Unit 2 was similar to the Unit 1 incident.

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The principle cause of the binding of the APSR assemblies has been determined to be the collapse of the APSR clad in the void region between the intermediate plug and the silver-indium-cadmium neutron absorbing material. The collapse in the void region between the plug and neutron absorber was verified by a video scan of the Unit 1 APSR assembly on August 14, 1981. The APSR assembly was withdrawn until it hung up in the fuel assembly at the guide tube pilot nut. A load of 800 lbs. was required to free the APSR assembly. One rod showed severe deformation and abrasion in the region between the intermediate plug and the Ag-In-Cd neutron absorber (Figure 2) where there was a collapsed section of cladding approximately 1½ inches long. The collapsed section was flattened and the wide edges of the collapsed area were shiny with abrasion marks showing the effects of the withdrawal force.

The cause of the collapse in this region was judged to be irradiated induced creep leading to pressure collapse. Furthermore, a sensitivity study has quantified the effect of clad wall thickness and initial ovality on time to collapse.

The manufacturing process of the APSR assemblies for Oconee may have led to higher initial tube ovalities in the void region. Specifically, in order to place the intermediate plug, the tube is slightly crimped at the plug location. The plug is then inserted into the tube until it stops at the crimp, where it is welded in place. As-built ovality measurements on a replacement APSR assembly were done to determine the effect that this process has on the clad ovality in the void region. The results indicate that the average ovality in the void region between the intermediate plug and the neutron absorber was 0.7 mil with a standard deviation of 0.4 mil. For the same tube, excluding the void region, the average ovality was 0.16 mil with a standard deviation of 0.14 mil.

A creep collapse study was performed by Babcock and Wilcox (B&W) using the CROV computer code. Parameters used in the study were based upon as-built manufacturing data. A pressure of 2175 psia, a wall thickness of 20 mils and an initial ovality of 1.5 mils were used. The results of the analysis predicted that creep collapse would occur during Cycle 6 of Oconee 1. B&W has advised other B&W plant owners of this problem with the APSR assemblies. In addition, appropriate design changes on future replacement APSR's have been made by B&W to increase wall thickness and to assure low ovality.

The similarities between the Oconee Unit 1 and Unit 2 APSR operating experience, plus the results of the ovality measurements obtained from a replacement APSR, in conjunction with the results of the creep collapse study and sensitivity analysis, indicate with a high degree of confidence that the Unit 2 APSR binding is similar to the Unit 1 cause.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

PFG:dyh

cc: Mr. James P. O'Reilly, Regional Administrator
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Mr. J. C. Bryant
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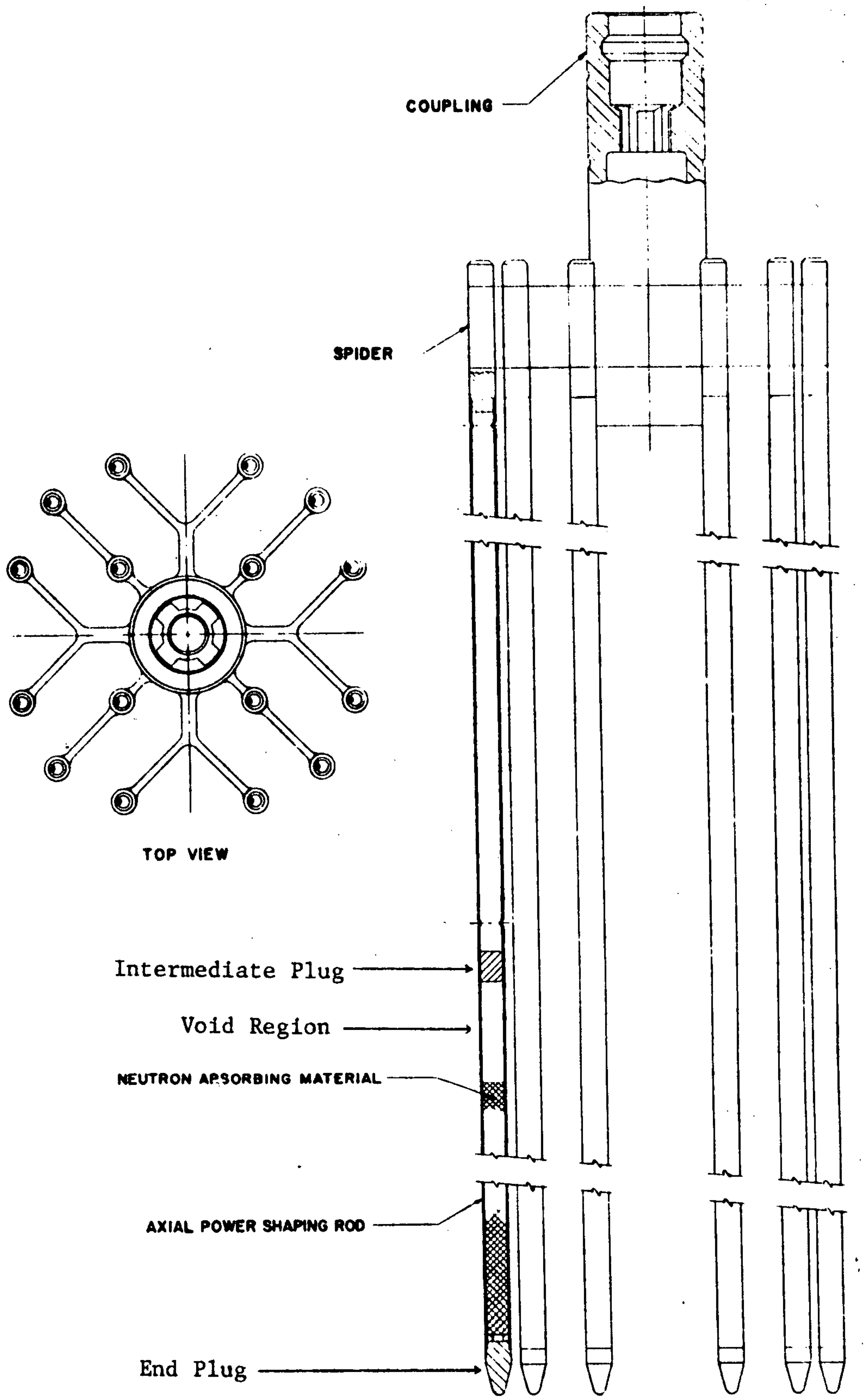
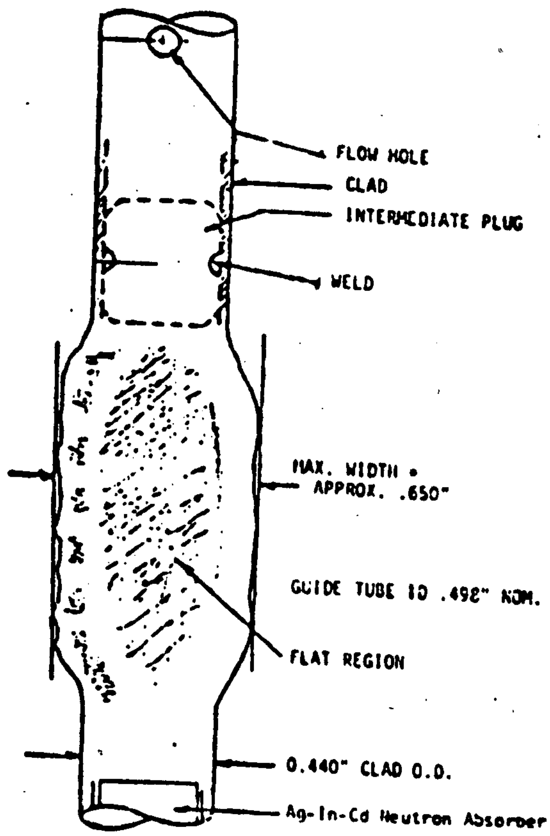


AXIAL POWER SHAPING
ROD ASSEMBLY
OCONEE NUCLEAR STATION
Figure 1



Collapsed Section of APSR

Figure 2