

EXTENSION OF EXEMPTION
FROM PROVISIONS OF
10 CFR 50 APPENDIX H

for

Duke Power Company
Oconee Nuclear Station - 1, 2, 3

by

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INTRODUCTION

In early 1977, Duke Power Company (DPCo) requested by Reference 1 an exemption from the requirements of 10 CFR 50 Appendix H. This exemption was granted by Reference 2 and allowed continued operation of the Oconee Nuclear Station (ONS) while irradiating reactor vessel surveillance capsules at Florida Power Corporation's Crystal River Unit 3.

This exemption was granted for a period of five years with a provision for extending the exemption based on successful operating experience. This report is a summary of the experience DPCo has had with the Integrated Reactor Vessel Surveillance Program (IRVSP) and the future plans for the program. An adequate justification for the extension of the exemption from the requirements of Appendix H to 10 CFR 50 is provided.

DISCUSSION

Operating Experience

Surveillance Specimen Holder Tubes

The key factor leading to DPCo participation in the IRVSP and Reactor Vessel Material Owners Group was the loss of integrity of the Surveillance Specimen Holder Tubes (SSHT's) and their subsequent removal from the Oconee units. It was concluded that, although the installation of re-designed SSHT's was feasible on an operating plant, the benefits did not justify the costs associated with the development of remote tooling, extended plant downtime, and significant radiation exposure to personnel. The Owners

of the affected operating plants entered into agreements with Utilities that were scheduled to bring new plants on line in the near future, to continue the Reactor Vessel Surveillance capsule irradiation at these new "host" plants. The Oconee reactor vessel materials surveillance capsules were installed in SSHT's at Crystal River 3. The SSHT's at Crystal River 3, including the supports and bolts that attach them to the Thermal Shield, have been examined via remote video inspection during refueling outages. No loss of structural integrity has been observed. In addition, there have been no signals provided by the loose parts monitoring system which would indicate the loss of integrity of the SSHT's or their mounting at CR-3. There are no plans to modify the SSHT's or the Core Support Assembly on any operating B&W plant which would change the geometric similarity of the reactors or preclude the continued irradiation of surveillance capsules in the host plants. Thus, adequate surveillance information will continue to be obtained for the Oconee Units.

Surveillance Capsules Evaluated

B&W has evaluated 12 surveillance capsules that have been removed from operating B&W plants, they are:

<u>Plant Name</u>	<u>Capsule I.D.</u>	<u>Report Number/Date</u>
Oconee 1	OCI-F	BAW-1421, August 1975
Oconee 1	OCI-E	BAW-1436, September 1977
Oconee 2	OCII-C	BAW-1437, May 1977
Oconee 2	OCII-A	BAW-1699, November 1981
Oconee 3	OCIII-A	BAW-1438, July 1977
Oconee 3	OCIII-B	BAW-1697, October 1981
Three Mile Island 1	TMI-1E	BAW-1439, January 1977
Arkansas Nuclear One-1	ANI-E	BAW-1440, April 1977

<u>Plant Name</u>	<u>Capsule I.D.</u>	<u>Report Number/Date</u>
ANO-1	ANI-B	BAW-1698, November 1981
Crystal River 3	CR3-B	BAW-1679, June 1981
Rancho Seco	RSI-B	BAW-1702, January 1982
Davis Besse	TEI-F	BAW-1701, January 1982

The surveillance capsules other than those owned by DPCo are significant because of participation in the B&W IRVSP by many Utilities. The information shared among Utilities with reactors constructed of similar materials, supplemented with future capsule evaluations, testing of special research capsules, and data obtained from NRC sponsored test reactor programs will provide a data base which permits a continuing evaluation of the behavior of these materials in a reactor vessel environment. Based on the surveillance capsule data obtained from all the B&W - 177 FA plants to date, it has been demonstrated that the prediction techniques used in the establishment of vessel operation limitations (i.e., Reg. Guide 1.99, Rev. 1) are conservative.

The Crystal River, Rancho Seco and Davis Besse capsules contain weld metal compact fracture specimens that will be tested using a single specimen J-Integral technique in early 1982.

Reactor Vessel Fluence Evaluation

A concern which developed as a result of the removal of the SSHT's was the inability to monitor the fluence received by the reactor vessel wall. However, due to the geometric similarity of plants, the fluence accumulated by the R.V. in plants without SSHT's can be calculated based on their power histories and dosimetry measurements from plants with SSHT's. Continued refinement of these analytical techniques is being accomplished through B&W

participation in the NRC sponsored "LWR Pressure Vessel Irradiation - Surveillance Dosimetry Program". A high degree of analytical accuracy by B&W has been demonstrated in the NRC program to date, and continued participation is expected to improve the fluence evaluation capability.

Capsule Fluence vs. Reactor Vessel Fluence

Because of the relatively large lead factors [fast flux ($E > 1$ MEV) at capsule centerline divided by the fast flux at 1/4 thickness of reactor vessel] associated with the location of the SSHT's at the Host Reactors, the similarity of plant capacity factors, and the similarity of fuel management at both Crystal River-3 and the Oconee Units; the neutron fluence received by the Oconee surveillance capsules being irradiated in Crystal River-3 leads the neutron fluence experienced by the Oconee vessels.

Calculations show that the Oconee reactor vessels have achieved an accumulated neutron fluence at the 1/4t location (as of December 31, 1981) calculated at:

<u>Plant</u>	<u>n/cm² (E > 1 MEV)</u>	<u>Equivalent EFPY</u>
Oconee 1	1.4 x 10 ¹⁸	5.1
Oconee 2	1.2 x 10 ¹⁸	4.8
Oconee 3	1.3 x 10 ¹⁸	4.9

The Oconee surveillance capsules most recently removed from Crystal River-3 achieved a neutron fluence from irradiation at both Oconee and Crystal River-3 of:

<u>Capsule</u>	<u>n/cm² (E > 1 MEV)</u>	<u>Equivalent EFPY</u>
OC-IIA	3.4 x 10 ¹⁸	14.8
OC-IIIB	3.1 x 10 ¹⁸	12.8

The capacity factor of Crystal River-3 since January 14, 1977, its commercial operation date, through December 31, 1981 is 0.52 and for comparison, the capacity factors of the Oconee units are:

	Commercial	
	<u>Date</u>	<u>Capacity Factor</u>
Oconee 1	4/19/73	0.58
Oconee 2	11/11/73	0.59
Oconee 3	9/5/74	0.67

With load factors in the range of 7 to 10, the surveillance capsules are expected to continue to load the respective reactor vessel's accumulated peak fluence.

Additionally, specimens made of related weld metals were donated to NRC sponsored research programs and have been irradiated in test reactors to fluence levels beyond that expected to be achieved by the Oconee reactor vessels at the end of service life. Data from these test reactor programs are becoming available and will be evaluated for applicability to the Oconee reactor vessels.

Future Plans

Of particular interest to Oconee is that, in addition to plant specific capsules scheduled for withdrawal over the next several years, two research capsules which are a part of the IRVMSP are to be withdrawn from operating reactors in 1983. These capsules contain Charpy V-notch and compact fracture specimens made from weld metals which have a direct relationship to weld metal in two of the Oconee reactor vessels as follows:

<u>Weld No.</u>	<u>Estimated Capsule Fluence n/cm² (E > 1 MEV)</u>	<u>Equivalent EFPY</u>	<u>Significance</u>
SA-1585	7.27 x 10 ¹⁸	30	Center Circumferential Weld in Oconee 1
WF-70 & WF-67	8.78 x 10 ¹⁸	32	Center Circumferential Weld in Oconee 3

The testing of these research capsules, which are supplemental to the plant specific capsules, will yield valuable power reactor irradiation information on two of the materials actually found in the Oconee 1 and 3 reactor vessels.

In addition, a large number of specimens made from WF-25, an important weld in the Oconee 2 reactor vessel, have been irradiated in test reactors and tested. This data is scheduled for evaluation in 1982.

CONCLUSION

The objective and technical description of the IRVSP has not changed from that described in the Safety Evaluation by the Office of Nuclear Reactor Regulation supporting Amendment No. 44, 44 and 41 to Facility licenses DPR - 38, 47 and 55 respectively. The IRVSP continues to provide material data that leads the reactor vessel and has demonstrated that the material behavior prediction techniques are conservative. There is not anticipated to be any operational or fuel management modifications that will adversely affect the IRVSP.

Based on the successful experience of the IRVSP to date, it is requested that DPCo be granted a continued extension of their exemption from the provisions of Appendix H to 10 CFR 50, by continuing the irradiation of the remaining Oconee Surveillance specimens at Florida Power Corporation Crystal River Unit 3.

Reference 1 - Duke Power Company's William O. Parker to NRC's Bernard C. Rusche dated March 10, 1977.

Reference 2 - NRC's Victor Stello to Duke Power Company's William O. Parker, Jr. July 14, 1977 (Docket Nos. 50-269/270 and 50-287).