



SACRAMENTO MUNICIPAL UTILITY DISTRICT □ 6201 S Street, Box 15830, Sacramento, California 95813; (916) 452-3211

August 2, 1982

DIRECTOR OF NUCLEAR REACTOR REGULATION
ATTENTION JOHN F STOLZ CHIEF
OPERATING REACTORS BRANCH 4
U S NUCLEAR REGULATORY COMMISSION
WASHINGTON D C 20666

DOCKET 50-312
RANCHO SECO NUCLEAR GENERATING STATION
UNIT 1
REQUEST FOR EXEMPTION, 10CFR50 APPENDIX H
REACTOR VESSEL MATERIAL - SURVEILLANCE PROGRAM REQUIREMENTS

By letter dated October 20, 1977, the Commission granted the Sacramento Municipal Utility District an exemption to Appendix H to 10CFR50 which permitted future operation of Rancho Seco Nuclear Generating Station while irradiating the reactor vessel surveillance specimens at Davis-Besse Unit No. 1. Irradiation of the Rancho Seco surveillance specimens in the Davis-Besse reactor vessel causes the specimen irradiation program to be out of conformance with the provision of Appendix H which requires the irradiation program to be performed within the Rancho Seco vessel.

The exemption to Appendix H was granted for a period of five years with a provision for extending the exemption based on successful operating experience. The enclosed report should provide adequate justification for the extension of the exemption.

SMUD requests that the Commission review the request for extension of the exemption, noting that the current exemption expires on October 20, 1982. We consider this to be a Class III request and accordingly a check for \$4,000 is enclosed.

Wm. C. Walbridge
General Manager

*Pool
w/checks
\$4000.00*

Enclosures

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EXTENSION OF EXEMPTION FROM PROVISIONS OF 10 CFR 50 APPENDIX HINTRODUCTION

In late 1976, Sacramento Municipal Utility District (SMUD) requested an exemption from the requirements of 10 CFR 50 Appendix H. This exemption was granted by the Commission on October 20, 1977 and allowed continued operation of the Rancho Seco Unit 1 while irradiating reactor vessel surveillance capsules at Toledo Edison Company's Davis-Besse Unit 1.

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 SMUD 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.

DISCUSSIONOperating ExperienceSurveillance Specimen Holder Tubes

The key factor leading to SMUD 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 Rancho Seco. It was concluded that, although the installation of redesigned 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 Rancho Seco reactor vessel materials surveillance capsules were installed in SSHT's at Davis Besse 1. The SSHT's at Davis Besse 1, 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 DB-1. 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 Rancho Seco 1.

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> |
|------------------------|---------------------|---------------------------|
| Arkansas Nuclear One-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 SMUD 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 during 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 Davis-Besse 1 and Rancho Seco 1; the neutron fluence received by the Rancho Seco surveillance capsules being irradiated in Davis-Besse 1 leads the neutron fluence experienced by the Rancho Seco vessel by a significant margin.

Calculations show that the Rancho Seco reactor vessel has achieved an accumulated neutron fluence at the 1/4 thickness location (as of December 31, 1981): of 1.2×10^{18} n/cm² ($E > 1$ MEV) which is equivalent to approximately 3.7 full power years.

The Rancho Seco surveillance capsule most recently removed from Davis Besse 1 (RSI-B) achieved a neutron fluence from irradiation at both Rancho Seco and Davis Besse 1 of 4.0×10^{18} n/cm² ($E > 1$ MEV) which is approximately 13 effective full power years.

The capacity factor of Davis Besse 1 since November 21, 1977, its commercial operation date, through December 31, 1981 is 0.40 and for comparison, the capacity factor of the Rancho Seco 1 is 0.54.

With lead factors in the range of 7 to 10, the surveillance capsules are expected to continue to lead 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 Rancho Seco reactor vessel at the end of service life. Data from these test reactor programs are becoming available and will be evaluated for applicability to the Rancho Seco reactor vessel in the future.

Future Plans

Of particular interest to Rancho Seco 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 the Rancho Seco reactor vessel as follows:

| <u>Capsule</u> | <u>Reactor</u> | <u>Estimated Capsule Fluence n/cm² (E 1 MEV)</u> | <u>Equivalent EFPY</u> |
|----------------|----------------|---|----------------------------|
| CR3-LI | CR3 | 6.6×10^{18} | 22 |
| DB-LI | DB-1 | 5.4×10^{18} | 18 |

The testing of these research capsules, which are supplemental to the plant specific capsules, will yield valuable power reactor irradiation information on some of the materials actually found in the reactor vessel.

In addition, a large number of specimens made from WF-70, an important weld in the 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. 15 to Facility Operating License No. DPR-54. The IRVSP continues to provide material data that leads the reactor vessel and has demonstrated that the material behavior prediction techniques are conservative. There are 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 SMUD 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 Rancho Seco Surveillance specimens at Toledo Edison Company Davis Besse Unit 1.