50-346

MEMORANDUM FOR: D.F. Ross, Jr., Assistant Director for Reactor Safety, DSS

FROM: K. Kniel, Chief, Core Performance Branch, DSS

SUBJECT: PROPOSED USE OF BURNABLE POISON ROD ASSEMBLY RETAINERS TO HOLDDOWN MODIFIED ORIFICE ROD ASSEMBLIES IN DAVIS BESSE 1

The Reactor Fuels Section of the Core Performance Branch has reviewed the information submitted in support of a proposal to use a BPRA retainer device (design described in B&W report, "BPRA Retainer Design Report," BAW-1496, May 1978) for holddown of modified orifice rod assemblies (MORA). The test results and analyses of the hydraulic and structural adequacy of the retainers provide reasonable assurance that the retainers will provide adequate positive holddown force on the MORAs and that the proposed use of the retainers poses no safety problem. The bases for this conclusion are provided in more detail in the attached.

K. Kniel, Chief
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Attachment:
As stated

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CENTRAL FILES
NRR RDG FILE
CPB RDG FILE

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ENCLOSURE

EVALUATION OF PROPOSAL TO HOLDDOWN TWO MODIFIED ORAs IN DB1 WITH BPRA RETAINER DEVICE

A modified orifice rod assembly (MORA) is a standard ORA modified for use with a primary neutron source. During the initial core operation of Davis Besse, Unit 1 (DB1), two primary neutron sources are located in individual guide tubes of two fuel assemblies. Each source is held in a shroud tube which rests on the bottom of a guide tube. A solid stainless steel rod is placed on top of the source to hold it down against hydraulic lift. To provide further assurance that the source will not come out of the guide tube during postulated accidents, an ORA is latched to the top of the fuel assembly. The rods of the ORA plug the top of each guide tube including the guide tube containing the source.

To prevent the MORA from causing wear of the fuel assembly end fitting and coming loose, Toledo Edison and B&W propose to modify the primary source capturing arrangement. Firstly, twelve of the rods in each of the two ORAs remaining in the core are being removed, leaving only the rod above the source and the three symmetrically located rods. Secondly, a retainer is to be placed over the hub of the modified ORA and held down by the reactor internals.

The design and testing of this retainer device are described in reference 1. From a mechanical design standpoint, the basic concern is whether the retainer provides enough holddown force to preclude loosening of the MORAs. From analyses of the static and dynamic stresses on the retainer spring load arm and housing, results of prototype testing in a flow-test facility, and in-air mechanical tests, criteria for use of the BPRA retainer device with modified ORAs have been established. The primary criterion is that the margin to component lift with the retainer, taking into account the hydraulic forces acting on the MORA, the MORA weight, and the retainer holddown force, should be greater than 30 pounds. This criterion is met with acceptable margin by the fact that, when the retainer device is used with the modified ORA, the holddown force is greater than 35 pounds with all four reactor coolant pumps operating. A second criterion, which is related to fuel assembly growth, is based on a fuel assembly burnup design value that is used as a basis for the retainer design. Since the maximum burnup used in one cycle of operation will be less than the burnup used as a design basis, the fuel assembly growth criterion is met (note that the retainer will be used for only one cycle of operation).

The potential consequences of a retainer failure have also been addressed (Ref.2), although failure is considered unlikely. The neutronic and thermal-hydraulic consequences are considered small. Interference with control rod motion, for example, would not, according to analyses of stuck-out control rod transients for B&W 177-FA plants, prevent safe shut down of the plant.

The major concern associated with retainer failure is plant damage and potential outages for repair. This damage should be precluded by the Loose Parts Monitoring System (LPMS). The LPMS is designed to detect a failed retainer in either the reactor vessel or steam generator. Even though the BPRA retainer is designed for only one cycle of operation, B&W has stated (Ref. 2) that it will recommend that surveillance inspections be made following retainer use. This should provide additional confirmation of acceptable operation. B&W has also stated that definite plans regarding surveillance will be provided to NRC as they are formulated.

In summation, based on (1) analyses and test results on the BPRA retainer device, (2) establishment and meeting of criteria for use of the device with ORAs modified for use with primary neutron sources in DB1, (3) analyses which indicate that failure of the retainers, however unlikely, would not prevent shutdown and (4) failure detection capability of the Loose Parts Monitoring System, we conclude that there is reasonable assurance that the retainers will provide adequate holddown force on the MORAs, and that the proposed use of the BPRA retainer with two MORAs in DB1 will pose no significant safety concern.

References

1. "BPRA Retainer Design Report," Babcock and Wilcox Report, BAW-1496, May 1978.

2. Telex Communication, James H. Taylor (B&W) to Steven A Varga (NRC, June 7, 1978.