

February 6, 2004

MEMORANDUM TO: John A. Grobe, Chairman
Davis-Besse Oversight Panel
Region III

FROM: Eric J. Leeds, Deputy Director */RA/*
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 - RESPONSE
TO TASK INTERFACE AGREEMENT (TIA) 2003-06
(TAC NO. MC1676)

EXECUTIVE SUMMARY

By memorandum dated December 15, 2003, you requested technical assistance from the Office of Nuclear Reactor Regulation (NRR) regarding procedural allowance permitting reactor coolant (RC) level to go to the top of active fuel (TAF) under certain post-fire safe shutdown scenarios at the Davis-Besse Nuclear Power Station, Unit 1.

The NRR staff has concluded that Davis-Besse Abnormal Procedure DB-OP-02519, "Serious Control Room Fire," continues to provide reasonable assurance that, for anticipated fires in the control room or cable spreading room, the reactor can be safely shut down.

The detailed NRR staff determination is provided below.

BACKGROUND

During a fire protection inspection at Davis-Besse, a Region III inspector identified an issue associated with the licensee's procedures addressing post-fire safe shutdown that apparently would allow the response to the spurious opening of the pressurizer power-operated relief valve (PORV) to take up to 45 minutes. This time frame, if utilized, would result in the drain down of the RC level to the TAF. Davis-Besse Abnormal Procedure DB-OP-02519 sets a maximum time restraint on PORV closure at 45 minutes. This 45-minute time limit is based on the results of a thermal-hydraulic analysis. Based upon discussions with the licensee and the review of the licensee's thermal-hydraulic calculations, this 45-minute time limit corresponds to the time that the inventory of the reactor reaches the TAF.

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ENCLOSURE 2

RISK SIGNIFICANCE

Region III has not had the opportunity to perform a risk-significance evaluation of the licensee's operator actions when following Abnormal Procedure DB-OP-02519.

REQUESTED ACTION

NRR is requested to evaluate the safety significance of allowing minimal defense-in-depth for apparent post-fire safe shutdown, including the RC system inventory reaching the TAF. Additionally, the evaluation of safety significance should consider the safety implications of allowing a maximum of 45 minutes to close a pressurizer PORV during this postulated fire scenario.

DAVIS-BESSE FIRE PROTECTION LICENSING BASIS

Following the Browns Ferry fire in 1975, the Nuclear Regulatory Commission (NRC) developed technical guidance and issued it as Branch Technical Position Auxiliary Power Conversion Systems Branch 9.5-1 (BTP APCS 9.51), "Guidelines for Fire Protection for Nuclear Plants." This guidance did not apply to plants operating at the time of the Browns Ferry fire. Guidance to the operating plants was provided later in Appendix A to BTP APCS 9.5-1. Davis-Besse was operating prior to the issuance of the BTP and the licensee was required to compare the Davis-Besse Fire Protection Program to the guidelines contained in Appendix A to the BTP. The NRC staff issued safety evaluation reports (SERs) describing the Davis-Besse Fire Protection Program and approved alternatives found acceptable to the staff, as well as unresolved issues.

The NRC issued the fire protection rule (Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.48, and Appendix R to 10 CFR Part 50) in February 1981. The rule requires licensees to submit (1) plans and schedules for meeting the requirements of Appendix R, (2) a design description of proposed alternative shutdown capability pursuant to paragraph III.G.3 of Appendix R, and (3) exemption requests from Appendix R, as applicable. The licensee originally requested two exemptions from Appendix R for Davis-Besse. The NRC staff reviewed and approved the exemptions.

In 1983, the NRC conducted a fire protection inspection at Davis-Besse to verify compliance with Appendix R. The inspection identified numerous violations of Appendix R and significant deficiencies in the overall Fire Protection Program. As a result of the inspection, the NRC issued escalated enforcement without a civil penalty (EA 83-124). The license committed to implement interim compensatory measures to assure safe shutdown capability following a fire and to perform modifications to Davis-Besse to bring the plant into compliance with NRC fire protection regulations. In 1986, the licensee requested new exemptions from the requirements of Appendix R. In addition, the licensee submitted (1) a new comparison of the Davis-Besse Fire Protection Program to the guidelines contained in Appendix A to BTP APCS 9.5-1, and (2) documentation on how the Fire Protection Program was in compliance with the requirements of Appendix R. During the NRR technical staff review of the Fire Protection Program, meetings were held with the licensee to provide clarification of concerns raised with the Fire Protection Program. In 1987 and 1988, the licensee responded to numerous requests for additional information.

The NRR technical staff culminated its evaluation of the Davis-Besse Fire Protection Program when it issued its safety evaluation dated January 24, 1990 (ADAMS Accession No. 9002020182, Microform Addresses 70132:300-351). The safety evaluation contained the following four open issues:

1. Circuit supervision and alarms associated with the fire detection and alarm system.
2. Fire protection program Technical Specifications.
3. Post-fire means for reactor coolant pump seal injection and cooling.
4. Voluntary disablement of offsite power supplies for post-fire safe shutdown.

In 1990, the licensee provided documentation to resolve the open issues. In April and May 1990, Region III, with the help of contractors from Brookhaven National Laboratory (Rudy Hodor, Keith Parkinson, and Kenneth Sullivan) and the NRR Project Manager, performed a detailed inspection of the Fire Protection Program at Davis-Besse. A final inspection report (Report No. 50-346/90-07 (DRS), ADAMS Accession No. 9009040177, Microform Address 55079: 245-302) was issued on August 22, 1990. By letter dated May 30, 1991, the NRC staff issued its final safety evaluation of the Fire Protection Program at Davis-Besse.

To provide adequate protection for anticipated fires in the control room or cable spreading room, the licensee chose to use the alternative shutdown option in paragraph III.G.3 of Appendix R. Part of the licensee's alternative shutdown capability was to develop a procedure, "Serious Control Room Fire," which contains a series of operator actions such as tripping breakers and operating components manually or by local controllers. The licensee recognized that following a control room or cable spreading room fire, for a short time, the performance goals contained in paragraph III.L. of Appendix R may not be met (e.g., reactor coolant makeup function within the level indication in the pressurizer), and requested NRC approval of these exceptions. The control room or cable spreading room fire may induce a transient of a short duration where the parameters in paragraph III.L. of Appendix R may not be met until operator actions are taken, allowing the III.L. parameters to be reestablished. The licensee established that this transient would be acceptable as long as no unrecoverable plant condition would occur. The licensee defined an unrecoverable situation as the loss of a shutdown function for such a duration as to ultimately cause the reactor coolant level to fall below the TAF.

NRR's technical staff reviewed the Davis-Besse Fire Protection Program specifically with respect to the opening of the PORV and the PORV block valve due to a spurious actuation as a result of a fire in the control room or cable spreading room. The NRR technical staff reviewed the licensee's procedure and time line to cope with the spurious actuation. As documented in the January 24, 1990, safety evaluation, the NRR technical staff found that the operator actions would be timely, resulting in no unrecoverable plant condition. The NRR technical staff's acceptance of the spurious opening of the PORV and block valve was based on the licensee's ability to demonstrate that the reactor coolant would not reach the TAF as long as auxiliary feedwater and reactor coolant makeup flows are reestablished within 25 minutes, and the PORV closed within 30 minutes. The licensee affirmed that, based on plant walkdowns of the Abnormal Procedure DB-OP-02519, these actions could be accomplished within 15 and 20 minutes, respectively. The NRR technical staff further concluded that, subject to confirmation by inspection, there is a time-related margin of safety to accomplish these operator actions. As

documented in NRC Inspection Report No. 50-346/90-07(DRS), the NRC inspection of Abnormal Procedure DB-OP-02519 did not identify any unacceptable conditions.

The NRC staff's May 30, 1991, safety evaluation was the final documentation of the NRC's evaluation of the Fire Protection Program at Davis Besse. The NRC staff accepted the spurious opening of the PORV and PORV block valve following a control room or cable spreading room fire based on the margin of safety provided by the licensee's ability to take prompt operator action, allowing sufficient time prior to the plant reaching an unrecoverable situation.

NRR STAFF EVALUATION

The NRR staff reviewed the licensee's current fire protection licensing basis, including Revisions 7 and 8 of Abnormal Procedure DB-OP-02519, as well as the calculations which support the procedure and the previous SERs issued by the NRC concerning the Davis-Besse Fire Protection Program. The NRR staff found that the licensee continues to maintain the same level of protection that was approved and documented in the May 30, 1991, safety evaluation.

The licensee has performed a new calculation to support the Serious Control Fire procedure. The new calculation supports a new time of 45 minutes to close the PORV prior to the RC reaching the TAF. This is an increase of 15 minutes from the licensee's calculation in 1990. In addition, the licensee's training records indicate that operators can successfully close the PORV in less than 10 minutes. This is an improvement of 10 minutes over the time to close the PORV that is documented in the May 30, 1991, safety evaluation.

The NRR technical staff's acceptance of the licensee's alternative shutdown capability for the control room and cable spreading room was predicated on the difference between the amount of time it took operators to perform manual actions to restore the parameters of Section III.I of Appendix R, and the amount of time it took for the RC level to reach the TAF. Reaching the TAF assures that no fuel clad damage will occur, which is a parameter of paragraph III.L of Appendix R. The licensee's calculations indicated that the RC level at the TAF is a collapsed level.

The documentation in the May 30, 1991, SER indicates that the NRR technical staff did not accept the RC draining down to the TAF, but rather accepted procedures that mitigated the effects of a control room or cable spreading room fire which provides a margin of time prior to the RC draining down to the TAF. Review of the licensee's new calculations to support the Serious Control Fire procedure and recent operator training records indicate that the difference in time to close the PORV and time the RCS level will reach the TAF is 35 minutes. This is an increase in margin of 25 minutes above that previously accepted by the NRC staff and documented in the May 30, 1991, safety evaluation. The NRR staff would not accept alternative safe shutdown procedures that would require completion times close to the time it would take the RC to drain down to the TAF.

Operators are trained on Abnormal Procedure DB-OP-02519. Errors resulting in the inability of the operators to carry out the steps in Abnormal Procedure DB-OP-02519 would be unexpected. If human errors were to occur while the operators are performing Abnormal Procedure DB-OP-02519, the 35 minutes provide adequate time for the operators to recover and safely shut down the plant. In the unlikely event that operators required 45 minutes to

close the PORV, the licensee's calculations show that the RC collapsed level would remain above the TAF. This condition assures that there is adequate RC surrounding the fuel to prevent cladding damage in accordance with paragraph III.L. of Appendix R.

In the TIA, a concern was expressed that since the reactor inventory would be below pressurizer level indication during this worst-case scenario, the operators could be operating the plant with no indication of reactor inventory for a protracted period of time. Abnormal Procedure DB-OP-02519 contains Caution 3.0.k, which warns operators that pressurizer level indication may not be accurate and to take appropriate actions to establish makeup flow. Operators are trained on how to establish makeup flow without level indication in the pressurizer. The NRR staff finds this caution statement in the procedure, along with the operator training, provides reasonable assurance that operators will take appropriate actions to safely shutdown Davis-Besse following a fire which causes the loss of level indication in the pressurizer.

During the NRR staff's review of Revision 7 of Abnormal Procedure DB-OP-02519, the NRR staff raised concerns with the licensee about Note 3.0.j. This note contained values associated with the maximum time constraints to ensure a safe shutdown. The NRR staff was concerned that the note may provide a false sense of security to the operators. In the case of the PORV, the operators may feel that the steps in the procedure to close the PORV may be delayed up to 45 minutes. This would eliminate the margin of safety that was the basis for the NRR technical staff's approval of the alternate shutdown capability for a fire in the control room or cable spreading room. On November 26, 2003, the licensee issued Revision 8 to Abnormal Procedure DB-OP-02519. Revision 8 to the procedure removed the note from the operator required action section of the procedure, and placed it in an attachment to the procedure with a warning that the maximum analytical times were for information only.

NRR STAFF CONCLUSION

The NRR staff has concluded that based upon the calculations and timeline studies for operator actions, Abnormal Procedure DB-OP-02519 continues to provide reasonable assurance that for anticipated fires in the control room or cable spreading room, the reactor can be safely shut down. This conclusion is based on the margin of safety provided by the difference in time it takes operators to perform the required actions in the procedure and the time required for the reactor to reach a potentially unrecoverable situation following a control room or cable spreading room fire. In the highly unlikely event that a spuriously opened PORV required 45 minutes to close, the collapsed RC level would be above the TAF. This configuration assures that there is adequate RC surrounding the fuel to prevent cladding damage, in accordance with III.L. of Appendix R. The NRR staff recommends that Region III verify operators are fully trained on Revision 8 to Abnormal Procedure DB-OP-02519.

Docket No. 50-346

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