

DAVIS BESSE UNIT 1
SAFETY EVALUATION REPORT SUPPLEMENT
DOCKET NUMBER 50-346

7.1 General

In the Safety Evaluation Report (SER) we stated that the electrical drawings of the reactor protection system, the engineered safety features system and the Class 1E support systems that were submitted in the FSAR were incomplete in part or were not presented in sufficient detail to verify that the design has been implemented adequately. We required the applicant to submit a final design package for all safety related equipment in sufficient detail to facilitate our review. Revised final design drawing packages were submitted with sufficient detail to conduct an independent review. We conclude that the drawings presently docketed in the FSAR are adequate for an operating license review and are acceptable.

7.2 Reactor Protection System

In the Safety Evaluation Report (SER) we requested the applicant to document the modification of the power interrupt scheme for the control rod drive trip circuit. The revised schematics which implement the design as described in the SER were submitted and it is therefore acceptable. During our drawing review and subsequent site visit we determined that the applicant's separation criteria did not include separation requirements between Class 1E and non-Class 1E wiring inside the Class 1E logic cabinets and in various control panels (identified in Section 7.9,3 of the SER). As a result, the applicant was requested to verify that faults (i.e., grounding,

7.2 shorting, application of high voltage, or electromagnetic interference [noise]) on non-Class 1E circuits would not propagate through to the safety grade circuits and degrade them below an acceptable level. The applicant agreed to submit test procedures and test results which would demonstrate that such faults would not degrade the safety systems below an acceptable level. We will review this information when submitted and report resolution of this item in the supplement to this report.

7.3.2 Engineered Safety Features Actuation/Basic Logic

In the Safety Evaluation Report (SER) the applicant identified an automatic testing system which will continuously validate operation of all trip logic combinations for all parameters every 34 seconds and annunciate a detected system fault. Subsequently, the applicant identified problem areas (i.e., noise problems and calibration problems) in the automatic testing system and requested to remove the automatic test system from the design. Since this automatic test system is not required for safety and manual testing requirements specified in the technical specifications can be performed with the present design, the staff has accepted removal of this test feature from the ESFAS design. The applicant has been informed that the documentation in the FSAR and in the final design schematics requires revisions which reflect this change. In the event the applicant wishes to reinstate this testing feature into the ESFAS design at some later date, we will require that this design feature be re-evaluated prior to reinstatement into the

7.3.2 ESFAS system. We therefore conclude that this modification enhances safety and is therefore acceptable subject only to the satisfactory documentation of this change in the FSAR. We will review the change when submitted, and report the results of the evaluation in a supplement to this report.

7.3.4 Decay Heat Removal Low Pressure to High Pressure Isolation Valves

In the Safety Evaluation Report the applicant was requested to (a) verify that the consequences of inadvertant valve closure of valves DH11 and DH12 during the decay heat removal mode of operation would not degrade the core cooling system below an acceptable level or modify the design to preclude inadvertant valve closure. The applicant proposed a procedure to remove power to these valves during this mode of operation. Power will be removed administratively before the decay heat pumps are allowed to start. In addition the applicant has provided a pressure relief valve in the decay heat line to accommodate pressure transients imposed on the system during this mode of operation. The adequacy of this design is under review. We will report resolution of this item in a supplement to this report.

7.3.5 Core Flooding Tank Isolation Valves

In the Safety Evaluation Report we stated that the design was acceptable conditioned only on the satisfactory verification of the implementation of the design during the site visit. We have completed the site visit and found no apparent inconsistencies with what was stated in the Safety Evaluation Report. We therefore conclude that the implementation of this design is acceptable.

7.4.1 Steam and Feedwater Line Rupture Control System (SFRCS)

In the Safety Evaluation Report various areas where the design did not conform to the requirements established for systems required for safety were identified and as such the design was unacceptable at that time.

Subsequently the applicant modified the design and responded to the concerns expressed by the staff. The following sections identify the concerns expressed by the staff and the resolution.

1. Item 1 in Section 7.4.1 of the Safety Evaluation Report required that the design of the anticipatory trip inputs to the SFRCS (e.g., inputs from the integrated control system, i. e., main feedwater pump trip status and loss of all four reactor coolant pumps signal) be modified to satisfy the requirements of IEEE Std 279-1971 if they are to remain as inputs to the SFRCS or remove them if they are not required for safety. The applicant elected to delete these trip functions from the SFRCS design. We conclude that since credit is not taken for these trips in the accident analysis and they are not required for safety, this modified design is acceptable. The applicant submitted final design drawings that implement this change in the FSAR. We have reviewed various final design schematics and the information documented in the FSAR. We conclude that the design satisfies the Commission's requirements stated in Section 7.1 of the SER and is acceptable.

- 7.4.1 2. Item 2 in Section 7.4.1 of the Safety Evaluation Report identified areas where the design of the SFRCS did not conform to the requirements of IEEE Std 279-1971 Sections 4.2 and 4.16. A modified design and revised final design schematics to demonstrate full conformance with Section 4.2 and 4.16 of the reference standard were provided. We have reviewed the final design drawings and conclude that the design meets the Commission's requirements stated in Section 7.1 of the Safety Evaluation Report and is therefore acceptable.
3. Item 3 in Section 7.4.1 of the Safety Evaluation Report identified two normally open valves (i.e., HV599 and HV608) on the discharge side of the auxiliary feed pumps (one in each loop), which if failed closed would preclude adequate system function. A modified design for these valves was provided. The modified design provides automatic closure of these valves only under specific accident conditions (i.e., in the event of a steam line break the valve supplying auxiliary feedwater to the degraded steam generator would automatically close). The circuit design for these valves includes interlocks to assure that a single electrical failure would not cause closure of the valve to the intact steam generator. In addition, redundant and independent position indication for these valves to alert the operator of their status at all times have been included in the design. We have reviewed the mod-

7.4.1 fied final schematics and also verified the implementation of the design of these valves during the site visit. We conclude that the design satisfies the Commission's requirement stated in Section 7.1 of the Safety Evaluation Report and is acceptable.

In addition, during our continuing review of the design concerning the single failure criterion as it relates to electrically-operated active and passive components, four additional valves (i.e., DH1A, DH1B, DH14A, DH14B) were identified which if failed closed during accident conditions would preclude adequate core cooling. The applicant was requested and submitted a modified design for these valves which conforms to the requirements stated in Position EICSB 18 of Appendix A in the Standard Review Plan. We have reviewed the modified final design schematics and also verified the implementation of their design during the site visit. We require that the technical specifications identify the valves which are to remain open with power removed during reactor operations. We have concluded that this design satisfies the Commission's requirements referenced above and is acceptable.

4. Item 4 in Section 7.4.1 of the Safety Evaluation Report identified the staff's requirements regarding testability of safety related "blind sensors." In a recent amendment to the FSAR (39) the applicant identified a proposed modification to his existing design. The modified design will replace the four level switches (i.e., blind sensors) in

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each steam generator inside containment with four level transmitters. These sensors will have continuous indication of the measured variable displayed inside the control room. In addition bistable trip relays will be located inside the SFRCS logic to actuate the trip logic whenever the predetermined setpoints are reached. This modification will be incorporated prior to June 1977, to facilitate the staff's requirements on testing without necessitating plant shutdown. In the interim the applicant has committed to periodically calibrate the blind sensors every three months. Monthly checks will be conducted in accordance with the requirements stated in Section 4.9 of IEEE Std 279-1971. Based on our review of SFRCS design and the applicant's commitment to comply with the staff's requirements, we conclude that the design satisfies the Commission's requirements and is acceptable.

5. Item 5 in Section 7.4.1 of the Safety Evaluation Report identified a commitment by the applicant to remove the override interlocks which would automatically shut and inhibit the steam inlet valves to the auxiliary feed pump turbine (i.e., HV016, HV107, HV106A, and HV107A) from opening whenever containment pressure exceeded a preselected setpoint of 38.5 psia.

Modified final design schematics for these valves were submitted which deleted these interlocks. We have reviewed selected final design drawings and conclude that this modification of the circuit design for these valves satisfies the Commission's requirements identified in Section 7.1 of this report and is acceptable.

- 7.4.1 6. During our review the applicant was requested to address the staff's concerns regarding loss of all AC power to this system. In response to the staff's concern the applicant committed to modify the design and provide a diverse power source (i.e., DC power) to selected motor operated valves (HV 106, HV 306, and HV 3870) in one redundant auxiliary feedwater train to assure that the plant can be safely shut down in the event of loss of all AC power. Final schematics of this design modification were submitted. In addition the applicant stated that this design change will be implemented during the first refueling. (The justification is provided in Section 9 of this report.) We have reviewed these changes and the final schematics which describe how the design will be implemented. We conclude that this modification satisfies the staff requirements and is acceptable.

7.5 Safety-Related Display Instrumentation

During the site visit the staff indicated that manual initiation of system level inoperable status or bypass indication did not fully meet the objective of Regulatory Guide 1.47, Section C.4 and the design was not acceptable. Specifically, manual initiation of systems level inoperable status or bypass indication for containment isolation was not provided. The applicant was requested and agreed to provide manual initiation of inoperable status indication for this subsystem and to review his design to assure that manual initiation of inoperable status or bypass indication is provided for all safety related systems.

7.5 The applicant modified the design and provided two additional manual initiation of inoperable status or bypass indication for the following subsystems: (1) Containment Isolation and (2) Steam Generator Isolation.

The applicant revised the information in the FSAR to reflect this change. The present design includes bypass status indication for the following subsystems.

- A. Auxiliary Feedwater System,
- B. Component Cooling System,
- C. Service Water System,
- D. High Pressure Injection System,
- E. Low Pressure Injection System,
- F. Containment Spray System,
- G. Core Flooding System,
- H. Emergency Ventilation System,
- I. Borated Water Storage System,
- J. Containment Air System,
- K. Containment Radiation System,
- L. Control Room System,
- M. Containment Isolation System, and
- N. Steam Generator Isolation System.

We have reviewed the modified design and conclude that the design satisfies the Commission's requirements stated in Section 7.1 of the Safety Evaluation Report and is acceptable.

7.7 Environmental Qualification

In a recent amendment to the FSAR the applicant identified additional safety related instrumentation inside containment (i.e., steam generator level transmitters) and outside containment (i.e., containment pressure transmitters). Qualification test procedures and results for this equipment have not been submitted for review. The applicant was requested and agreed to supplement the information in the FSAR and describe the qualification tests performed for these instruments, submit the test results and procedures used to qualify this equipment, and demonstrate that the equipment is qualified for its intended function.

We conclude that the environmental qualification of the safety related equipment is acceptable, conditioned only on the satisfactory resolution of the items identified above and the staff's concerns identified in Section 6.2.1 of the Safety Evaluation Report regarding qualification of safety related equipment in a postulated main steam line accident environment. The staff's resolution will be included in a supplement to this report.

7.9.2 Separation Criteria Between Redundant Class 1E Circuits in Wireways

During our review of the applicant's separation criteria it was determined that wireways (i.e., metal troughs with covers) were used in the cable spreading areas. Several meetings were conducted with the applicant to determine the adequacy and implementation of this design. In a recent amendment to the FSAR, the applicant documented the separation criteria for the wireways. These designs are currently under review.

7.9.2 We will report the results of the evaluation in a supplement to this report.

7.9.3 Separation Criteria Between Redundant Class 1E and Non-Class 1E Circuits Within Enclosures

In the Safety Evaluation Report we identified concerns regarding the applicant's criteria between redundant Class 1E and non-Class 1E circuits within enclosures. We have reviewed the final test results regarding the flame tests conducted by the applicant and conducted a site visit to review the as-installed designs. Based on the staff's evaluation during the site visit, we could not support the adequacy of the design as implemented and requested the applicant to provide additional barriers in these installations to assure that Class 1E circuits are adequately separated.

Subsequently, additional criteria for this installation was documented. The modified criteria for these enclosures provides additional fire stops and barriers on the top of the cabinets and at inter-cabinet junction points. In addition the cables on the bottom of the cabinets will be coated with silicon rubber. Also, smoke detectors are installed in specified panels to detect fires.

Based on review of the modified criteria, and the demonstrated degree of flame retardancy of the cable used in this installation, we conclude that the design satisfies the Commission's requirements and is acceptable subject only to verification to assure that the implementation of this modified criteria is complete. The staff will verify the implementation before the license is issued.

7.9.3 The adequacy of the fire barriers will be discussed in a supplement to the SSER (Section 9.5.1).

7.10 Electrical Penetrations

In our Safety Evaluation Report we stated that the applicant was requested to supplement the information in the FSAR and provide their justification and basis to assure that the design of the electrical penetrations satisfies the requirements stated in General Design Criterion 50, i.e., "Containment Design Basis."

In response, the applicant documented short circuit test results which were conducted on their medium and low voltage penetrations that demonstrate that these penetration assemblies can withstand, without loss of mechanical integrity, the maximum possible fault current versus time conditions. In addition, the applicant submitted analysis which demonstrate that the primary and back-up protective relaying used in these circuits are designed to interrupt power in sufficient time to preclude electrical penetration damage in the event of faults in these circuits.

Based on our review of the test results, analysis and various final design schematics, we conclude that the design of the electrical penetration protection provides an equivalent or improved design as compared to the designs recently licensed and is therefore acceptable.