Enclosure

The following changes shall be made to the Davis Besse Unit 1 EICSB Safety Evaluation Report dated June 23, 1975.

Section 7.1 Page 1

Replace Paragraph 4 with the following:

The drawings of the RPS, ESF and Class 1E support systems that are provided in the FSAR are incomplete in part or are not presented in sufficient detail to verify that the design has been adequately implemented. The applicant was requested to submit a final design package for all safety related equipment after an audit is performed assuring that the information presented (a) represents the as built design. (b) contains the necessary cross references and (c) will permit a point by point identification from an initiating device through to the actuated devices and equipment.

We will review these drawings when submitted and report the results. in a supplement to this report.

Section 7.1 Page 1

Replace Paragraph 5 with the following: A site review for the purpose of evaluating the physical arrangements and installations of electrical equipment was conducted in October 1975. Because of construction restraints and incomplete status of equipment installation it was not possible to complete our review. The applicant was informed that an additional site visit would be necessary and should be scheduled as soon as this installation is 80% complete. The results of the site visit will be included in a supplement to this report.

7.3.3 Decay Heat Removal (DHR) Low Pressure to High Pressure Isolation Valves

Replace last paragraph in Section 7.3.3 with the following:

The original design of the DHR low pressure to high pressure isolation valve control system was found unacceptable. The applicant modified the design to conform with the above requirements. The modified design utilizes independent and diverse interlocks, one for each valve, which automatically actuate valve closure and prevent the valves from opening whenever the reactor coolant pressure exceeds 280 psig. In addition, during our review the applicant was requested to (a) verify that the consequences of inadvertant closure of these valves during DHR mode of operation would not degrade the core cooling system below an acceptable level or (b) modify the design to make the consequences of such a failure acceptable (Section 5.5.7 contains additional information regarding the evaluationof this design).

Our review of the DHR low pressure to high pressure isolation system included review of the logic diagrams and selected schematics presently included in the FSAR. We conclude that the design meets the Commissions requirements stated in Section 7.1 of this report and the requirements stated above and is therefore acceptable, conditioned only to the satisfactory resolution of the items discussed in Section 7.1 and resolution of the staffs concern regarding inadvertant valve closure identified above.

7.3.4 Core Flooding Tank Isolation Valves (CFTIV)

Replace Section 7.3.4 on page 4 with the following:

Each of the two Core Flooding Tanks are provided with a motor operated isolation valve. The control circuits for these valves are designed to automatically open and prevent closing these valves whenever the reactor coolant pressure is above 800 psig. The interlock functions are derived from two independent and redundant instrument channels located in separate engineered safety features cabinates. Each channel operates one of the two isolation valves. Valve position indication, electrically independent of the valve power supply, is provided in the control room to monitor the status of these valves at all times. Also, two independent computer alarms, one for each valve, derived from contacts on the motor operator indicate when the valve is not fully open and when the wide range reactor coolant pressure sensers (on a 2 out of 4 basis) sense a pressure in excess of 725 psig. A third valve position indication system is provided using stem mounted valve position contacts and redundants and independent reactor pressure switches to indicate when the valve is not fully open when pressure is greater than 725 psig. In addition the applicant has documented that the Technical Specifications will require that the isolation valve motor control circuit breakers will be locked open and padlocked to assure that the valves will remain open during reactor operation. The circuit breaker status is indicated in the control room.

Our review of the design of the core flooding tank isolation valves included review of the logic diagrams and selected schematic diagrams presnetly included in the FSAR. We have concluded that the design meets the Commission's requirements as stated in Section 7.1 of this report and is acceptable conditioned only to the satisfactory resolution of the items discussed in Section 7.1 of this report.

Delete Sections 7.4.2 and 7.4.3

These sections are now covered under Section 7.4.1 because of the applicant's modified design.

7.4.1 Steam and Feedwater Line Rupture Control System (SFRCS)

Replace Section 7.4.1 with the following:

The function of the SFRCS is to 1) automatically start the auxiliary feedwater system in the event of a main feedwater line rupture or a main steam line rupture and, 2) automatically isolate the main steam and feedwater system in the event of a rupture and autoamtically align the auxiliary feedwater system with the uneffected steam generator.

The SFRCS is comprised of two redundant and independent subsystems. Each subsystem consists of an AC powered logic channel and a DC powered logic channel. The loss of power to the logic channel will trip the affected channel.

Each logic channel receives the following inputs:

a. Main steam line pressure

b. Main feedwater/steam generator differential pressure

c. Steam generator level

d. Reactor coolant pump status

e. Main feedwater pump trip status and loss of all four reactor coolant pumps. (Input from the non-safety control system)

Each logic channel actuates on a one out of two basis. Operation of each subsystem requires actuation of both the AC and the DC logic channel in the subsystem to initiate a safety action.

During our review the applicant was requested to address concerns regarding loss of all AC power to this system. The details of this review and the resolution of the staffs concerns are addressed in Section 9.2.7 of this SER.

Based on the review of the logic drawings and selected final design schematics various design features of this system have been identified as areas of nonconformance with the requirements established for safety systems and therefore, unacceptable to the staff. The applicant was requested to modify the design to conform fully with the Commissions requirements and the requirements of IEEE Std. 279-1971 and amend the FSAR accordingly.

Our review concludes that the design of the SFRCS can be made acceptable subject only to the satisfactory resolution of the items identified below.

1. Anticipatory trip inputs to the reactor protection system are derived from systems that are not Class 1E (e.g., inputs from the Integrated Control System) and as such do not satisfy the requirements of IEEE Std. 279-1971 Section 4.7.1. The applicant was requested to design these inputs to the requirements of IEEE Std. 279-1971 if they are to remain as SFRCS inputs, or remove them if they are not required for safety. The applicant agreed to these requirements and committed to submit a modified design. We will review the modified design when submitted and will report resolution of this item in the supplement to this report.

2. The SFRCS portion of the design that is used to isolate the main feedwater and steam flow in the event of an accodent in not designed in full conformance with the requirements of Sections 4.2 and 4.16 of IEEE Std. 279-1971 and is, therefore, unacceptable. Our review identified areas in the main and startup feedwater valve control system and in the main steam isolation valve control system where a single failure could negate the required isolation of the intact steam generator. In addition, we identified areas in the circuitry associated with solenoid actuated valves where the protection system once initiated could be automatically reset and prevent protective

action to go to completion. The applicant agreed to modify the design and revise the schematic drawings to demonstrate full conformance with Section 4.2 and 4.16 of the reference standard.

We will review the modified design when submitted and report resolution of these items in the supplement to this report.

3. The applicant's response to our position concerning the single failure criterion as it relates to electrically-operated active and passive components identified two normally open valves on the discharge side of the auxiliary feed pumps (one in each loop) which if failed closed would preclude adequate system function. These valves are required to remain open to assure a heat sink to the steam generators during the course of an accident.

The applicant submitted a design that provides adequate assurance that the valves will remain open when required. Two independent relays isolate the control power to the valves which prevents valve movement and satisfies the single failure criterion during normal operation. Restoration of the control power to these valves requires actuation of two separate and independent pushbuttons located in the control room. Our review of the circuitry associated with these valves indicated that although the design satisfied the staffs requirements regarding removal of power to the valves, the position indication of these valves were inadequate and, therefore, unacceptable. The applicant was requested and agreed to modify the design and provide redundant position indication in the main control room to monitor the status of these valves at all times, and that the design of the position indication itself satisfy the single failure criterion.

We will review the modified design when submitted and report the resolution in the supplement to this report.

4. Testability of SFRCS was reviewed. Provisions in the system allow periodic on-line testing of the system logic channels. The system design incorporates "blind sensor" inputs. These sensors are located both inside and outside containment. The applicant verified that for all sensors located outside containment provisions will be available to periodically verify sensor operability. However, no apparent provisions were available to periodically verify sensor operability of those sensors located inside containment. The applicant was requested to include provisions that would allow periodic verification of all sensors required for safety and satisfy the requirements of IEEE Std. 279-1971, Section 4.9.

The applicant has been informed that the staff requires the Technical Specification to include periodic testing of systems required for safety to verify their functional operability. (This includes the systems as a whole, i.e., sensors, logics and actuated devices.) The channel testing period defined, is not to exceed once a month. For "blind sensor" channels this monthly test will include actuation of the output device of the sensor itself. In addition, the Technical Specification will require periodic calibration of these "blind sensors" once every three months. We will review the method used to verify operability of the sensors required for safety during our site visit and provide the results in a supplement to this report.

5. Our review of the SFRCS actuated equipment identified valves HV106, HV106A, HV107, and HV107A (steam inlet valve to the auxiliary feedwater pump turbines) which incorporate on override interlock to shut these valves or inhibit the valves from opening whenever the containment pressure exceeds preselected setpoint of 38.5 psia. It is the staff's concern that this interlock can inhibit the operation of the auxiliary feedwater, both automatically and manually, and negate this system during accident conditions.

The applicant was requested to demonstrate that when conditions inside containment reach 38.5 psia the operation of the auxiliary feedwater system would not be required to mitigate the consequences of an accident and that adequate margin is provided in these set points that allows proper operation of this system when required, or modify the design to satisfactorily resolve the staff's concern. In a recent meeting, the applicant agreed to delete these interlocks and submit a modified design. We will review the modified design when submitted and report resolution of this item in the supplement to this report.

Section 7.4.4 for the Auxiliary Shutdown System should now be identified as Section 7.4.2.

7.5.1 Accident and Post-Accident Monitoring

Replace Section 7.5.1 with the following:

The staff's requirements with regard to accident and post-accident monitoring instrumentation is that the instrumentation should be:

1. Qualified for the accident environment (post-accident instruments only),
2. Redundant with at least one channel recorded (the recording system, recorders and associated circuitry and components, are required to be seismically qualified to demonstrate operability following, not necessarily during a seismic event, and
3. Energized from the onsite power supplies and designed in accordance with the requirements of IEEE Std 279-1971.

During our review we found the design to be unacceptable. The applicant modified the design to conform with the above position and identified in Table 7.9 of the FSAR the parameters that are used for accident and post-accident monitoring.

We have reviewed the criteria and the design for the accident and post-accident monitoring system and conclude that the design meets the above requirements and is acceptable conditioned only on the satisfactory resolution of the items discussed in Section 7.1 of this report.

The adequacy of the parameters deemed essential for accident and and post accident monitoring is discussed in Section 6 of the SER.

Replace Section 7.9 with the following:

7.9 Cable Separation and Identification Criteria

We have reviewed the applicant's criteria and procedures for maintaining the integrity, physical independence, and identification of safety-related equipment and circuits. During our review we have identified areas where adequate separation was not provided or the information was too general to complete our evaluation. The applicant has amended the information in the FSAR describing his criteria for separation of redundant Class IE circuits, documented his criteria for fire stops and seals and has submitted preliminary test results demonstrating the degree of flame retardancy of his cable.

The following sections identify the staff's concerns and the resolutions:

We conclude that conditioned on the satisfactory resolutions discussed in Section 7.1, Section 7.9.2, and Section 7.9.3, the separation criteria for the Davis Besse Unit 1 design provide equivalent or improved degree of separation as compared to designs of recently licensed plants and are acceptable.

7.9.1 <u>Separation Between Redundant Class IE and Non-Class IE Raceways in Cable Spreading Rooms and General Plant Areas</u>

The applicant's criteria for non-class IE raceways defines three distinct groups (i.e., A, B, and C). Each group is routed in its own designated raceways (i.e., A, B, and C). Intermixing of non-class IE cables is precluded by administrative procedures, but each non-class IE group may be run in close proximity to another non-class IE group with no minimum separation requirements. The criteria for electrical separation between redundant class IE raceways are defined as 4 feet vertical, 18" horizontal. When these distances are not maintained barriers will be provided to assure that fire propagation would not degrade redundant trains.

In addition, the applicant's criteria for power cables (i.e., above 150V) require that these cables be routed in rigid steel conduits or be embedded in duct banks.

During our review the staff identified areas where non-class IE raceways were interposed between redundant class IE raceways in such close proximity that a fire in a non-class IE tray could propagate, via other non-class IE trays stacked one above the other, to redundant class IE trays and degrade safety. Although the applicant criteria permit specific non-class IE groups to be run in close proximity to specific class IE groups with no minimum separation requirements (i.e., non-class IE group A run in close proximity with Class IE channel 1, and non-class IE group B run in close proximity with class IE channel 2), the applicant was requested and agreed to modify his design to provide barriers so that fire propagation via non-class IE raceways would not degrade both redundant class IE raceways. The applicant amended his design criteria to [illegible] 18 inches minimum separation requirements between Class IE raceways of one channel and non-class IE raceways associated with redund nt class IE raceway of another channel and provide barriers if this minimum separation could not be maintained.

To support the adequacy of their separation criteria the applicant has conducted flame test simulating the as built design condition. The tests simulated various tray configurations, using the actual cable types, tray fill, and cable raceways installed at the plant site. The tests exceeded or equaled the recom ndations described in Section 2.5 of IEEE Std. 383-1974 (IEEE Standard for type tests of Class IE Electrical Cables, Field Species and Connection for Nuclear Power Generating Stations).

In addition, the applicant provided a cable tray design which has solid metal bottoms and cross bars spaced 18" apart inside the trays above the metal bottoms which provide free air space (i.e., thermal barrier) between the cable tray bottom and the cable itself.

Also, in the cable spreading room and in general plant areas the applicant has provided fire detection systems which will automatically initiate alarms in the main control room. The fire detection and protection systems are discussed in Section 9.5.1 of the SER.

Based on the review of the modified criteria, selected drawings that implement these criteria, the review of the construction of the raceways, the use of solid metal conduits for power cables and the flame tests demonstrating the flame retardancy of the cable used, we conclude that the design is acceptable.

7.9.2 <u>Separation Criteria Between Redundant Class IE Circuits in Metal Conduits</u>

The applicant utilizes metal conduits for various Class IE essential circuits routings. During our review the staff identified areas where redundant channel wiring routed in separate and independent metal conduits, were routed in close proximity (i.e. 1 1/2 inch apart) to each other without provisions for barriers other than the conduit itself. Although the staff recognizes that the metal conduits may be a valid barrier for certain types of events, the staff does not consider that conduits alone are adequate barriers for all types of events. The applicant was requested to review their installation, and where events such as heat or missiles may effect the redundant circuits in these conduits, the applicant was requested to provide barriers to assure the integrity of these circuits, or justify their design on some other defined basis. Incidents such as a fire in an open tray crossing under redundant conduits was cited as an example that may effect the cables inside the conduit and degrade the system circuits below an acceptable level. The applicant committed to evaluate their design and will advise the staff as to the resolution of this concern. We will review the applicants response when submitted and report our evaluation in the supplement to this report.

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

During the review, the staff identified areas in enclosures (i.e., control boards and instrument cabinets) where non-Class 1E cables are bundled together with essential cables (i.e., non class 1E train A cables routed together with Class 1E channel 1 and non class 1E train B cables are routed together with Class 1E channel 2 cables).

Although minimum separation of 12" is provided between essential redundant cables in these enclosures, the two non class 1E groups identified above enter the enclosures via a common routing path and are then diverted toward their designated locations in a wye (Y) configuration and bundled together with the associated class 1E cables. The applicant was advised that this design violates the independence of redundant essential trains and is unacceptable unless it can be demonstrated by test simulating the actual as built conditions that a fire inside these enclosures could not propagate to both redundant Class 1E channels and degrade them below an acceptable level. The applicant committed to provide these tests and demonstrate the adequacy of their design. Preliminary test results have been submitted to the staff for review. Discrepencies identified by our review were discussed with the applicant. The applicant agreed to resolve these discrepancies and submit the final test results as part of the FSAR docket.

We will review the final test results when submitted and report resolution of this item in the supplement to this report.

7.10 Electrical Penetrations

Replace the 2nd paragraph of section 7.10 with the following:

Since these tests are predicted on the satisfactory operation of the interrupt devices provided i.e., breakers, fuses, etc. the applicant was requested to describe in detail the degree of protection provided by these devices to assure functional integrity of the penetration, for both safety and non safety circuits associated with the electrical penetrations. Where back-up protection is used the applicant was requested to describe the type of devices used and justify their design accordingly, thereby demonstrating their conformance to NRC General Design Criteria 50, "Containment Design Bases."

The applicant was requested to document these tests and their results in the FSAR.

Section 8.3.1 Page 12

Replace Paragraph 7 Page 13 with the following:

Onsite fuel oil storage is contained in one 6,000 gallon tank for each unit. This is sufficient for more than 30 hours of operation of each diesel at fuel load. The offsite fuel storage capacity is sufficient for 7 day operation for each diesel generator unit. The review of the fuel oil system concludes that the design meets the requirements of IEEE Std. 308-1971 with regard to seismic qualification and emergency storage capacity and is acceptable. Refer to Section 9.5.4 of the Safety Evaluation Report for the detailed system description.

Section 8.3.1 Page 13

Replace last paragraph with the following:

We have reviewed selected detailed schematics and elementary schematics and conclude that the design of the emergency a-c power system meets the requirements of GDC 17 and 18 and Regulatory Guide 1.6 and is acceptable conditioned only on the satisfactory resolution of the items identified in Sectior 7.1 of this report.