

TOLEDO EDISON COMPANY
DAVIS-BESSE NUCLEAR POWER STATION UNIT ONE
SUPPLEMENTAL INFORMATION FOR LER NP-32-80-11

DATE OF OCCURRENCE: July 9, 1980

FACILITY: Davis-Besse Unit 1

IDENTIFICATION OF OCCURRENCE: Design deficiency in the Safety Features Actuation System (SFAS) Sequencer

Conditions Prior to Occurrence: The unit was in Mode 6, with Power (MWT) = 0 and Load (Gross MWE) = 0.

Description of Occurrence: On July 9, 1980, a meeting was held to review the results of the Integrated SFAS Test, ST 5031.07. Those present were the SFAS vendor, the architect/engineer, and Toledo Edison. It was determined that during the conduct of a portion of the test, involving an SFAS trip coincident with a loss of offsite power that some of the logic modules on sequence steps 2, 3, 4, and 5 tripped before being blocked by the sequencer. This would have allowed some valves to operate to their safety position before their corresponding sequence step. It was the premature valve actuations that alerted I&C personnel to the potential malfunction in this logic. This similarly observed actuation in some original system testing was erroneously explained at that time as due to automatic valve control. It could have also allowed an undesired instantaneous loading of the diesel generator. It is important that during this unusual set of circumstances the sequencer block the output module trips initially so that all of the possible safety loads do not try to start at the same time and overload the emergency diesel generator (EDG) (with high starting torques). The sequencer then removes the blocks one at a time and allows the loads to start in their turn which allows the EDG to handle the full load.

This finding is being reported per Technical Specification 6.9.1.8.i as the discovery of conditions not considered in the safety analysis report that require corrective measures to prevent the existence of an unsafe condition. Luis Reyes, NRC Resident Inspector, was informed at 1500 hours on July 9, 1980. The confirming teletype to the Region III Office was sent at 0820 hours on July 10, 1980.

Designation of Apparent Cause of Occurrence: The cause of the occurrence is a design deficiency. This unlikely combination of events had not been accounted for in the logic design. On a loss of offsite power, the EDG breaker closes on the bus in approximately 10 seconds. Forty seconds later, component cooling water (unless it was running) and service water pumps are started on the bus. In the event of a loss of offsite power with SFAS actuation, the major safety equipment is loaded by the sequencer onto the EDG in addition to component cooling water and service water pump; high pressure injection pump (600 HP), decay heat pump (400 HP), containment spray pump (200 HP), and containment air cooler (half speed - 40 HP). It can be postulated that during a loss of offsite power with a subsequent trip of SFAS incident level 2 (since the logic modules on sequence step 2 would trip before it could be blocked by the sequencer) that the high pressure injection pump, containment air cooler, component cooling water pump, and service water pump would start simultaneously resulting in an instantaneous loading of 1640 HP on the EDG. Similarly, in the case of an incident levels 1, 2, and 3 trip, the EDG could experience an instantaneous loading of 2040 HP. In the even more unlikely

event that all SFAS incident levels trip simultaneously with an untimely sequencer blocking, the EDG could be instantaneously loaded with 2240 HP. The above loads are the running loads. The starting loads would be as much as two to three times the running loads. Since the EDG is rated at 3600 HP, it would be overloaded if it had to start these loads simultaneously.

When the SFAS incident level conditions are sensed, the same signal that trips the actuation output modules also starts the sequencer. The sequencer then has to in turn block the output modules so that it can load the EDG in a designed orderly manner and prevent a potentially unsafe condition. However, during this approximately 30 millisecond turnaround, these output modules would already be tripped before they could be blocked which would result in the undesired instantaneous loading.

Analysis of Occurrence: There was no danger to the health and safety of the public or to station personnel. This logic design deficiency does not affect normal plant operation. It would only be of consequence during the most unusual set of circumstances. It should be emphasized that in real life situations, it is highly improbable to experience an incident level 3 trip without prior receipt of an incident level 2 trip. Similarly it is highly unlikely to trip all incident levels simultaneously. Therefore, severe loading of the EDG as identified above is unlikely.

Corrective Action: A Facility Change Request (FCR 80-181) has been implemented which added a 45 to 82 millisecond time delay to ensure SFAS output logic modules on sequence steps 2, 3, 4 and 5 are properly blocked by the sequencer and do not trip simultaneously during a loss of offsite power. The sequencer will then unblock the trip logic modules and allow the equipment to be loaded on the EDG in the designed order and not create a potentially unsafe overload.

Failure Data: There have been no previous reports of this type of sequencer design deficiency.

LER #80-053