

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
WASHINGTON, D.C. 20555

December 16, 1980

IE INFORMATION NOTICE NO. 80-44: ACTUATION OF ECCS IN THE RECIRCULATION  
MODE WHILE IN HOT SHUTDOWN

PURPOSE:

The intent of this Information Notice is to alert PWR licensees and holders of construction permits of a potentially generic problem involving inadvertent actuation of the emergency core cooling system (ECCS) in the "Recirculation Mode". Such an event occurred at the Davis-Besse Nuclear Power Station (Docket No. 50-346) on December 5, 1980. The plant was in a hot shutdown mode of operation at the time of the event and was undergoing certain maintenance activities as described below.

DISCUSSION:

Just prior to the inadvertent actuation of the ECCS, the licensee was attempting to isolate electrical shorts and/or grounds in the Safety Features Actuation System (SFAS). Towards this end, A-C power had been removed from Channel 3 of the SFAS. Upon reenergizing Channel 3 it was noted that an indicating lamp was out; therefore, an attempt was made to replace the failed lamp with a spare unit. While removing a lamp from a spare output slot in a Channel 3 chassis, an arc was drawn between the lamp and the module chassis. This arcing was apparently due to a combination of shorts or grounds in the SFAS, which coupled with the "common" connection between Channel 1 and 3 resulted in the loss of a power supply in Channel 1. Since all the bistable trips in Channel 3 had not been completely reset, and since a power supply to Channel 1 was lost, SFAS Levels 1, 2, 3 and 5 were actuated by the two-out-of-four actuation logic. Since SFAS Level 5 indicates that the Borated Water Storage Tank (BWST) is at a low level, the ECCS was placed in a recirculation mode (i.e., the ECCS suction was aligned to the emergency containment sump.)

In order to place the ECCS system in the recirculation mode, the supply valves leading to the Decay Heat Removal (DHR) pumps from the BWST start closing after those in the ECCS line and from the containment emergency sump fully open. Thus, during this valve transition period, a flow path existed to the reactor coolant system (RCS) via the BWST and the ECCS pumping system (i.e., the DHR pumps); however, since the RCS pressure was higher than that of the pumping system (2100 vs. 1600 psig) no BWST water was pumped into the RCS. Rather, during the valve transition time of about 1-1/2 minutes, approximately 15,000 gallons of borated water was drained from the BWST to the containment emergency sump.

The Davis-Besse Nuclear Power Station has experienced several events during the past three and one-half years which have either degraded the DHR system or caused a temporary interruption of DHR operation. Of these, the one most closely paralleling the event described above occurred on April 19, 1980. (See IE Information Notice 80-20, "Loss of Decay Heat Removal Operability at Davis Besse Unit 1 While in A Refueling Mode" dated May 8, 1980 and IE Bulletin No. 80-12, "Decay Heat Removal System Operability" dated May 9, 1980.) During the December 5, 1980 event, the plant was in a hot shutdown mode with RCS pressure at approximately 2100 psig; therefore, the operator was able to promptly trip the DHR pumps, thereby precluding air entrapment in the system or pump damage. In contrast, the April 19, 1980 event occurred while the plant was in a quasi refueling mode (i.e., the reactor head was in place but detensioned, RCS water level was below the steam generator's bottom plate, the RCS was vented to the atmosphere by an open manhole at the top of the steam generator, and decay heat was being removed by one DHR system). Since the DHR pump was being used to remove decay heat during the April 19 event, it was left running for approximately two minutes after the pump had been aligned to the recirculation mode of operation, and tripped when water was discharged from a temporary tygon line. Since the DHR system was the only system available for decay heat removal, the DHR pump was restarted approximately forty minutes later; however, it was tripped shortly thereafter when it was determined that there was air in the suction line of the system. In all, the April 19, 1980 event required approximately two and one-half hours to vent the DHR system and reestablish DHR flow. As a consequence of the relatively long recovery time, the temperature limit specified in the Technical Specification for the refueling mode of operation was exceeded during the April 19, 1980 event.

The above events illustrate means whereby the integrity of a major ECCS system can be jeopardized by inadvertently or prematurely aligning the ECCS to the recirculation mode of operation. The major concern in such cases is that the DHR pumps could become air bound if their suction lines are aligned to a dry sump. At best, with the pumps air bound, the pump motor would trip automatically or could be tripped manually before any damage occurred, in which case flow could be established after the system is vented; at worst, the pumps could be damaged and become inoperable, in which case the active portion of the ECCS would not be available, if needed at that time.

This Information Notice is provided as an early notification of a possibly significant matter that is still under review by the NRC staff. Recipients should review the information for possible applicability to their facilities. No specific action or response is requested at this time; however, if NRC evaluations so indicate, further licensee actions may be requested or required.

If you have any question regarding this matter, please contact the director of the appropriate NRC Regional Office.

RECENTLY ISSUED  
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| 80-44                  | Actuation of ECCS in the Recirculation Mode While in Hot Shutdown   | 12/16/80      | All PWR facilities with an OL or CP                |
| 80-43                  | Failures of the Continuous Water Level Monitor for the Scram Discharge Volume at Dresden Unit No. 2         | 12/5/80       | All power reactor facilities with OL or CP         |
| 80-42                  | Effect of Radiation on Hydraulic Snubber Fluid  | 11/24/80      | All power reactor facilities with OL or CP         |
| 80-41                  | Failure of Swing Check Valve in the Decay Heat Removal System at Davis-Besse Unit No. 1                     | 11/10/80      | All power reactor facilities with an OL or CP      |
| 80-40                  | Excessive Nitrogen Supply Pressure Actuates Safety-Relief Valve Operation to Cause Reactor Depressurization | 11/10/80      | All power reactor facilities with OL or CP         |
| 80-39                  | Malfunctions of Solenoid Valves Manufactured By Valcor Engineering Corporation                              | 10/31/80      | All light water reactor facilities with OLs or CPs |
| 80-38                  | Cracking in Charging Pump Casing Cladding   | 10/30/80      | All PWR facilities with an OL or CP                |
| 80-37                  | Containment Cooler Leaks and Reactor Cavity Flooding at Indian Point Unit 2                                 | 10/24/80      | All power reactor facilities with OLs or CPs       |
| 80-36                  | Failure of Steam Generator Support Bolting  | 10/10/80      | All power reactor facilities with OLs or CPs       |
| 80-35                  | Leaking and Dislodged Iodine-124 Implant Seeds  | 10/10/80      | All categories G and G1 medical licensees          |
| 80-34                  | Boron Dilution of Reactor Coolant During Steam Generator Decontamination                                    | 9/26/80       | All PWR facilities with OLs                        |

OL = Operating Licenses  
CP = Construction Permits