

TOLEDO EDISON COMPANY
DAVIS-BESSE UNIT ONE NUCLEAR POWER STATION
SUPPLEMENTAL INFORMATION FOR LER NP-32-77-8

DATE OF EVENT: July 17, 1977

FACILITY: Davis-Besse Unit 1

IDENTIFICATION OF OCCURRENCE: Failure of Decay Heat Stop Check Valve DH77 to prevent reverse flow.

Conditions Prior to Occurrence: Just prior to the occurrence, the plant was being heated up in Mode 3, with Load (MWE) = 0 and Power (MWT) = 0. Reactor Coolant System (RCS) pressure was approximately 784 PSIG and RCS cold leg temperature was 351°F.

Description of Occurrence: At 0620 hours on July 17, 1977, Operations personnel were performing Surveillance Test ST 5050.03, "Core Flood System Valve Interlock Test, Phase II". This Surveillance Test verifies the automatic opening of the Core Flood Tank Isolation Valves, CF1B and CF1A, at 800 + 30 PSIG Reactor Coolant System (RCS) pressure. At 784 PSIG, Core Flood Isolation Valve CF1B stroked open as intended. As the valve stroked open, the alarms "Core Flood Tank 1 Pressure Low" and "Core Flood Tank Level Low" were received. At the same time, the operators also found that the Decay Heat Pump 1-2 Minimum Cool-down Flow Indicator FI4908 was indicating a flow and that the Containment Normal Sump and Reactor Coolant Drain Tank levels were increasing. The operators then determined that DH77, Decay Heat Train 1 Stop Check Valve was leaking by and allowing a reverse flow.

To rectify the situation, an attempt was made to close the Core Flood Tank 1 Isolation Valve, CF1B. As intended, the interlock against closing this valve prevented closing it. Reactor Coolant System pressure was then reduced by pressurizer spray and CF1B was closed at 0627 hours.

Before the incident, Core Flood Tank 1-1 level was 13.1 feet. After CF1B was closed Core Flood Tank 1-1 was at a level of 10.8 feet and 415 PSIG. This indicates a total of 1150 gallons of water was discharged to the Decay Heat System. As the Core Flood Tank discharged to the Decay Heat System, the Decay Heat System Relief Valves PSV 4849, PSV 1529, PSV 1550, PSV 1508 and PSV 1509 lifted and provided overpressure protection as designed to the Decay Heat System. PSV 4849, the Decay Heat System Suction Line from the RCS, relieved to the Containment normal sump. The PSV 4849 setpoint is 320 PSIG. As per the Normal Sump Flow Indicator, 166 gallons of water were pumped from the Containment normal sump. The remainder of the water was discharged to the Reactor Coolant Drain Tank by PSV 1529, "Decay Heat Pump 1-1 Discharge to the RCS"; PSV 1550, "Decay Heat Pump 1-2 Discharge to the RCS"; PSV 1508, "Decay Heat Pump 1-1 Emergency Sump Suction Relief Valve" and PSV 1509, "Decay Heat Pump 1-2 Emergency Sump Suction Relief Valve". On the Reactor Coolant Drain Tank, the Reactor Coolant Drain Tank Vent Line Drain Valve, RC 160, was being used as a vent path. The Reactor Coolant

Drain Tank level before the incident was 43 inches. One Reactor Coolant Drain Tank Pump was in service. Of the approximately 984 gallons that were discharged to the Reactor Coolant Drain Tank, approximately 110 gallons overflowed the tank. The bulk of the water was pumped to the Clean Waste Receiver Tanks.

At 0700 hours, the Operations Engineer was notified. Reactor Coolant System pressure was being maintained at 700 PSIG and RCS temperature was 350°F.

At 0930 hours, Decay Heat Isolation Valve DH1B was closed to perform a leak check on DH77. A Deviation Report was written with respect to entry into an Action Statement of Technical Specification 3.5.2 which requires two independent ECCS subsystems to be operable in Mode 3. After it was verified that DH77 was leaking through, DH77 and DH1B were opened to return the Decay Heat System to operable status. The plant was then out of the Action Statement 3.5.2.a of Technical Specifications at 1126 hours on July 17.

Similarly, at 1145 hours, DH1A, Decay Heat Isolation Valve for Decay Heat Loop 2 was closed to check DH76 for leakage. DH76 did not leak. Again, a Deviation Report was written for entry into an Action Statement of Technical Specification 3.5.2. At 1310 hours, DH76 and DH1A were opened and Decay Heat Loop 2 was declared operable.

As a result of the incident, two relief valves, PSV 1529 and PSV 1550 were damaged. In an attempt to isolate the leakage from the two relief valves, which have a common discharge isolation valve, RC 89, the isolation valve RC 89 was closed. It also leaked by.

To make repairs to DH77 and the other components damaged, depressurization and cooldown of the Reactor Coolant System to 250 PSIG and approximately 205°F was commenced. At 1550 hours on July 17, 1977, the plant re-entered Mode 4. To further facilitate repair of the two relief valves, PSV 1529 and PSV 1550, the RCS was cooled down further. The plant entered Mode 5 at 0600 hours on July 20.

The maximum Reactor Coolant System Pressure during the incident was 790 PSIG. Since 800 PSIG was not exceeded, the Core Flood Tanks were not yet "required" to be operable as per Technical Specification 3.5.1. However, Core Flood Tank 1-2 was not affected by the incident and was in an operable status. The Decay Heat System also remained available for Low Pressure Injection.

Designation of Apparent Cause of Occurrence: Failure of the valve DH77 was strictly a component failure. The valve failed to perform its design function of preventing the Core Flood Tank from discharging to the Decay Heat/Low Pressure Injection System.

Failure of the two relief valves to reseal after lifting was due to seat damage. The disc retaining ring was also found to be broken on one valve and missing on the other valve.

As a result of the incident, the calibration of Flow Transmitter FT 4908, FT 4909 and FT DH2B was checked. Flow Transmitters FT 4909 and FT DH2B were found to have distorted bellows which were replaced and the transmitters recalibrated. Flow Transmitter FT 4908 was not damaged but was slightly out of calibration and was recalibrated and returned to service. The damaged bellows were possibly the result of the reverse direction flow past the two transmitters during the incident.

The leaking valve RC 89 that failed to isolate the two leaking relief valves, PSV 1529 and PSV 1550, was probably due to improper assembly of the valve. No apparent damage was found to RC 89.

Analysis of Occurrence: During the incident, a reverse direction flow existed in the Decay Heat Pump 1-1 discharge piping to the RCS. A reverse flow also existed in the suction piping of Decay Heat Pump 1-1. The setpoints of the five relief valves that lifted are as follows:

PSV 4849	320 PSIG
PSV 1529	450 PSIG
PSV 1550	450 PSIG
PSV 1508	75 PSIG
PSV 1509	75 PSIG

All GCB class piping on the discharge side of the Decay Heat Pumps was hydrostatically tested at 645 PSIG. All GCB class piping on the suction side of the Decay Heat Pumps was hydrostatically tested at 430 PSIG. The HCB class piping on the suction of the Decay Heat Pumps was hydrostatically tested at 106 PSIG. The relief valves listed above did lift to provide overpressure protection to the Decay Heat System and no physical damage to the system other than listed above was sustained. Therefore, no danger to the health and safety of the public or station personnel did occur.

Corrective Action: Initially, the Reactor Coolant System was depressurized and cooled down to 235 PSIG and 205°F so that repairs could be made to the DH77 valve. This was completed at 0850 hours on July 18, 1977. The RCS was cooled down further so that repairs could be made to PSV 1529 and PSV 1550. Mode 5 was entered at 0600 hours on July 20, 1977.

The two relief valves were relapped and the disk retaining rings were replaced. The valves were bench tested and returned to service at 0500 hours on July 21, 1977. PSV 1529 was returned to service at 1500 hours on July 21, 1977.

The valve RC 89 was disassembled. Although no damage was noted, the diaphragm was replaced and the valve was reassembled.

The flow transmitter FTDH2B was repaired by replacing the diaphragm and recalibrating the transmitter. FTDH2B was declared operable at 2230 hours on July 20, 1977. Flow transmitter FT 4909 was repaired by replacing the capsule assembly and force motor assembly and then recalibrating. FT 4909 was returned to service at approximately 1400 hours on July 20, 1977.

Repairs were made to DH77 under the direction of a representative of Velan Engineering Company. DH77 is a 10" stop check valve whose disc has an upper and lower guiding surface and also the body guide surfaces. Repairs included smoothing these guiding surfaces, removing 0.002" from O.D. of the lower guide surface and relapping the valve. Another repair involved relieving or increasing the internal diameter or stem bore of the disc in the area where the stem of the valve meets the disc when the valve is being used as a stop valve. Repair of DH77 was completed at approximately 0600 hours on July 23, 1977. On July 23, 1977, from 1510 to 1832 hours Decay Heat Valve DH77 was leak checked. Decay Heat Valve DH77 passed the leak test and the plant heatup was continued.

To prevent further recurrence of this incident, steps have been added to PP 1802.02, Station Startup Procedure, to perform a leak check on both DH76 and DH77 prior to performing ST 5050.03 while the plant is being heated up. This change was made by Temporary Modification T-2034.

Failure Data: No previous similar events have occurred.