

U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-346/80-34

Docket No. 50-346

License No. NF-3

Licensee: Toledo Edison Company  
Edison Plaza  
300 Madison Avenue  
Toledo, Ohio 43652

Facility Name: Davis-Besse Nuclear Power Station

Inspection At: Davis-Besse Site, Oak Harbor, OH

Inspection Conducted: December 5, 6, 8-12, 15-19, 22, 23, 1980

*RFW for*  
Inspectors: W. G. Rogers

Feb 6, 1981

*J. D. Smith*  
J. D. Smith

Feb. 7, 1981

*RF Warnick*  
Approved By: R. F. Warnick, Chief  
Reactor Projects Section 3

Feb 6, 1981

Inspection Summary

Inspection on December 5, 6, 8-12, 15-19, 22, 23, 1980 Report No. 50-346/80-34  
Areas Inspected: Routine resident inspection of Operational Safety Verification, Monthly Surveillance Observation, Followup on Inadvertant Safety Features Actuation, and Independent Inspection Effort. The inspection involved 85 inspector-hours onsite by two NRC inspectors including ten inspector-hours onsite during off-shifts.

Results: No items of compliance were identified.

## DETAILS

### 1. Persons Contacted

T. Murray, Station Superintendent  
B. Beyer, Assistant Station Superintendent  
P. Carr, Maintenance Engineer  
R. Flood, Shift Supervisor  
T. Isley, Maintenance Specialist  
D. Matheny, Senior Technical Assistant

The inspectors also interviewed other licensee employees, including members of the technical, operations, maintenance, I & C, and health physics staff.

### 2. Operational Safety Verification

The inspector observed control room operations, reviewed applicable logs and conducted discussions with control room operators during the period of December 5 through December 23, 1980. The inspector verified the operability of selected emergency systems, reviewed tagout records and verified proper return to service of affected components. Tours of the auxiliary building and turbine building were conducted to observe plant equipment conditions, including potential fire hazards, fluid leaks, and excessive vibrations and to verify that maintenance requests had been initiated for equipment in need of maintenance. The inspector by observation verified that the physical security plan was being implemented in accordance with the station security plan.

The inspector observed plant housekeeping/cleanliness conditions and verified implementation of radiation protection controls. During the period of December 5 through December 23, 1980, the inspector walked down the accessible portions of the Diesel Generator systems to verify operability.

These reviews and observations were conducted to verify that facility operations were in conformance with the requirements established under technical specifications, 10 CFR, and administrative procedures.

No items of noncompliance or deviations were identified.

### 3. Monthly Surveillance Observation

The inspector observed technical specifications required surveillance testing (other than calibrations and checks) on the Reactor Protection System Channel 3 (ST 5030.02) and verified that testing was performed in accordance with technically adequate procedures, that results were in conformance with technical specifications and procedure requirements and were reviewed by personnel other than the individual directing the

test, and that any deficiencies identified during testing were properly reviewed and resolved by appropriate management personnel.

No items of noncompliance or deviations were identified.

#### 4. Plant Trip and Safety System Challenge

On December 3, 1980, Davis-Besse 1 experienced a reactor trip from 100% power. Cause of the trip was due to a D.C. electrical fault.

Specifically, the fault occurred in one of the electrical penetrations and produced a false signal of reduced seal injection and component cooling water flow to reactor coolant pump 2-2. When this signal stayed below the setpoint for 90 seconds the reactor coolant pump 2-2 automatically tripped. The integrated control system started a runback to 75% power. However, as the reactor coolant flow decreased to three pump operation so did the  $\phi/\Delta\phi$  flow reactor protection envelope. This envelope reacted faster than the runback and the reactor tripped on  $\phi/\Delta\phi$  flow.

After the reactor plant systems stabilized following the reactor trip, Safety Actuation Monitoring (SAM) lights in both Safety Features Actuation System (SFAS) trains were discovered to be blinking. This was the initial indication of an electrical abnormality in the SFAS.

Investigation into the blinking lights revealed a 120 VAC signal superimposed on the usual 15 VDC signal in SFAS channels 1 and 3. To further isolate the fault at 10:50 p.m. on December 5, 1980, channel 3 was de-energized to determine if the 120 VAC signal would be eliminated. Channel 3 was reenergized at 11:00 p.m. and 16 seconds. When power was returned, the bistables to the Borated Water Storage Tank (BWST) low level,  $\phi$  containment pressure Hi, did not reset (i.e., were in a tripped state).

At the same time a status light to one of the D.C. power supplies (PS07) was discovered to be out in channel 3. A spare light to that SFAS channel was to be used to replace the burned-out light. However, when the spare light was removed from the chassis an arc occurred that produced a loss of power in one of channel 1's D.C. power supplies. This failed power supply had been providing power to the containment pressure Hi-Hi, BWST Lo-Level, and containment pressure Hi bistables. With loss of power, these bistables went to the tripped condition. Thus at 11:00 p.m. and 59 seconds the two of four coincidence was achieved on both containment pressure Hi and BWST Lo-Level. As designed, level 1 (containment isolation), level 2 (high pressure injection), level 3 (low pressure injection), and level 5 (long term recirculation) were actuated in both trains of SFAS. Levels 1, 2, and 3 receive input from containment pressure Hi and level 5 receives input from BWST Lo-Level. Level 4 receives input from containment pressure Hi-Hi.

Since the reactor was in mode 3, hot standby, and at normal operating pressure, actual injection of water into the reactor did not occur. However, with actuation of long term recirculation the suction for the running HPI and LPI pumps was changed from the BWST to the emergency sump. The operators determined that an actual LOCA condition did not exist and proceeded to turn off the HPI and LPI pumps and return the valving from long term recirculation to normal before pump damage could take place. Subsequent corrective action included venting the ECCS piping of air (air was found in suction and discharge piping) and performing the monthly surveillance tests on the HPI pumps. During the SFAS actuation (levels 1, 2, 3, and 5) approximately 15,000 gallons of borated water were drained into containment from the borated water storage tank. Subsequently, the spilled water was pumped into the miscellaneous clean waste receiving tanks.

The SFAS system was returned to service after replacement of the faulted power supply and performance of the SFAS surveillance test. The D.C. fault that initiated the reactor trip was found to be a ground in an electrical penetration. The seal injection signal was transferred to a spare electrical cable in the faulted penetration. The unit returned to power operation (Mode 1) on December 7, 1980. As a result of this investigation into the inadvertent SFAS initiation two major items of concern surfaced.

First, that there is a physical connection of channels 1/3 and of channels 2/4 via a common floating ground. This may not be in conformance with the physical separation requirements of Section 4.6 of IEEE-279, 1971. This item has been discussed with IE:HQ and turned over to NRR for disposition.

Secondly, that without modification or deletion of level 5 SFAS (long term recirculation), during an inadvertent actuation of levels 2, 3, 4, 5 or levels 1, 2, 3, 4, 5 of SFAS, there exists the potential for disabling all active ECCS systems (HPI, LPI and CS). This is due to the transfer of suction of the ECCS pumps from the BWST to the emergency sump and subsequent actions. With the actuation of level 4 the containment spray pumps will drain the sump and cavitation of the running ECCS pumps will begin. This item has been discussed with IE:HQ and turned over to NRR for disposition.

A license amendment has been submitted by the licensee to modify the SFAS level 5 in order to prevent inadvertent actuations that could degrade the ECCS. Facility Change 80-278 has been prepared and will be implemented prior to the unit startup from the current outage. The inspectors will followup the above listed actions to verify completion of the corrective actions. (50-346/80-34-01)