



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30303

Report Nos.: 50-259/84-39, 50-260/84-39 and 50-296/84-39

Licensee: Tennessee Valley Authority  
500A Chestnut Street  
Chattanooga, TN 37401

Docket Nos.: 50-259, 50-260 and 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry Nuclear Plant

Inspector: R. C. Butcher 10/1/84  
R. C. Butcher Date Signed

Approved: F. S. Cantrell 10/1/84  
F. S. Cantrell Date Signed

SUMMARY

An enforcement conference was held in Region II on September 26, 1984, at 1:00 p.m. to review the violations relating to the overpressurization of loop 1 of the Unit 1 core spray system (see Inspection Report 50-259/260/296/84-34 for details). With Unit 1 at 100 percent power, a personnel error during the performance of surveillance test 2.B.39-A, Core Spray Logic Test, allowed the outboard isolation valve, FCV 75-25, to open. Previous maintenance to the solenoid of the inboard isolation valve, FCV 75-26 (a testable check valve), caused the actuator to hold the check valve in the open position. This combination of errors then allowed primary coolant to backflow through the inboard and outboard isolation valves resulting in the overpressurization of loop 1 of the core spray system. A one inch relief valve on the core spray piping relieved which helped minimize the effect on the piping and once the operators realized what had occurred, the outboard isolation valve was shut, terminating the event. The licensee's investigation showed no damage had occurred to the core spray system. Inspection of similar valves on Units 1, 2, and 3 showed no similar problems.

## REPORT DETAILS

### 1. Attendance

#### a. NRC

J. P. O'Reilly, Regional Administrator  
R. C. Lewis, Director Division of Reactor Projects (DRP)  
J. P. Stohr, Director Division of Radiation Safety and Safeguards (DRSS)  
D. M. Verrelli, Branch Chief, DRP  
K. P. Barr, Branch Chief, DRSS  
A. G. Gibson, Branch Chief, DRS  
A. R. Herdt, Branch Chief, Division of Reactor Safety (DRS)  
W. M. Hill, Technical Assistant, DRS  
P. R. Bemis, Section Chief, DRP  
G. L. Paulk, Senior Resident Inspector, BFNP  
R. C. Butcher, Project Engineer, DRP  
G. M. Nejjfelt, Enforcement Specialist  
C. A. Patterson, Resident Inspector, BFNP

#### b. TVA

J. P. Darling, Manager, Nuclear Power  
J. A. Coffey, Site Director, BFNP  
G. T. Jones, Plant Manager, BFNP  
L. M. Mills, Manager, Nuclear Licensing  
R. E. Jackson, Chief, Physical Security, BFNP  
R. W. Miller, Security Project Engineer, EFNP  
K. W. Whitt, Assistant Director, Nuclear Safety Review Staff  
D. C. Mims, Engineering Group Supervisor, BFNP  
J. C. Howell, Supervisor, Nuclear Security Program  
J. E. Swindell, Superintendent, Operations and Engineering, BFNP  
B. C. Morris, Compliance Supervisor, BFNP  
J. H. Fox, Supervisor, Metallurgy and Welding  
J. Hollins, Valve Coordinator, BFNP  
P. Ebersole, Mechanical Engineer, BFNP  
F. S. Poppell, Reactor Engineer, BFNP  
R. A. Cook, Civil Engineer, Office of Engineering  
J. D. Carlson, QA Supervisor, BFNP

### 2. Event Discussion

The licensee presented the results of their investigation into the over-pressurization of loop 1 of the Unit 1 Core Spray System (CSS). On August 14, 1984, with Unit 1 at 100 percent power and while performing Surveillance Instruction (SI) 4.2.B.39-A, Core Spray Logic Test, at 9:39 a.m. an operator error due to not following procedures, allowed the outboard isolation valve (FCV 75-25) to open. The inboard isolation valve FCV 75-26 (a testable check valve), due to a maintenance error, was held in

the open position by its actuator. This allowed primary coolant to backflow from the reactor vessel into the CSS. The CSS piping is low pressure piping (500 psig) with a one inch relief valve. The relief valve opened to relieve the pressure and water flowed thru the relief discharge piping and is believed to have been discharged from the 'A' core spray pump seal leakoff which connects to the same discharge piping as the relief valve. At 9:45 a.m., a roving fire watch noticed smoke near the CSS piping and phoned in a fire alarm. The fire brigade entered the reactor building and assessed that reactor water was leaking back into the core spray system. The operator closed FCV 75-25 at 9:52 a.m. terminating the event. Core spray loop 1 was isolated and tagged, placing Unit 1 in a seven day Limiting Condition for Operation (LCO).

TVA Engineering Design analyzed the system piping and supports and concluded the CSS piping was not damaged. The CSS 'A' pump seal was removed and no damage was observed. Also, there was no evidence that hot water entered the pump area piping which indicates the pump discharge check valves were holding. The extent of the pipe heating was determined by examination of paint damage on the piping. The maximum temperature experienced was estimated to be 400F. Paint damage extended from the isolation valves back to the system relief valve.

Unit 1 was shutdown on August 21, 1984, and inspection of FCV 75-26 revealed the check valve was held open because of an improper insert in the actuator solenoid. This error was masked by the improper wiring of the valve position indicating lights. TVA could not determine from maintenance records when the errors were made. Similar installations were examined on Units 1 and 3 and found not to have similar problems. Accessible wiring on Unit 2 was examined to provide confidence for continued operation. Subsequently, Unit 2 was shut down for a scheduled outage and examination showed Unit 2 did not have an actuator problem.

Corrective actions include revised procedures to be more descriptive for valve and actuator maintenance and return to service checks. Also, the solenoid valves are now being purchased as a unit and will not be overhauled at the site. Operator training was conducted on this event with attention to valve breaker manipulation. The surveillance instruction has been revised to make the wording more specific since the SI stated to open the FCV 75-25 circuit breaker and the wording on the circuit breaker specified "OFF" or "ON". The licensee also made engineering calculations that indicated the check valve actuator pin would shear allowing the check valve to close on backflow through the valve of greater than twelve feet per second velocity. A break equivalent to approximately a three inch diameter hole would be required to produce that amount of backflow.

TVA stated that their regulatory improvement plan should help prevent events like this from occurring in the future.