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TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

80 JUL 17 July 16, 1980

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

OFFICE OF INSPECTION AND ENFORCEMENT BULLETIN 80-17 - RII:JPO
50-259, -260, -296 - BROWNS FERRY NUCLEAR PLANT

Enclosed is our response to item 2 (unit 3 only), 4, 5, 6(c), and 7 of the subject bulletin. A response for item 2 for units 1 and 2 will be provided upon completion of the required testing.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Regulation and Safety

Subscribed and sworn to before
me this 16th day of July 1980.

Bryant M. Lowery
Notary Public

My Commission Expires April 4, 1982

Enclosure
cc: Office of Inspection and Enforcement (Enclosure)
U.S. Nuclear Regulatory Commission
Division of Reactor Operations Inspection
Washington, DC 20555

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ENCLOSURE
BROWNS FERRY NUCLEAR PLANT
UNIT 3

Item 2 - Browns Ferry Unit 3

Each specific requirement of action item 2 of the Bulletin will be discussed separately. Results will be discussed and evaluated with respect to anticipated response. The manual scram was initiated via the manual scram buttons. The automatic scram was initiated by intentionally making one APRM inoperable in each trip system. Appendix 1 of this report is a summary of the data collected during and after both the manual and automatic scrams required by the Bulletin. Appendix 2 is a summary of data collected via special tests prior to receipt of the Bulletin. Appendix 3 is a collection of data from scrams that occurred before June 28, 1980, on unit 3.

Item 2a - Obtain all rod insert times and as many individual rod scram times as practical.

The time from scram to all rods in was measured by an observer using a stop watch for each scram. The watch was started upon loss of amber scram solenoid indicating lights and stopped when, after scanning the core display on panel 9-5, the observer was satisfied that all rod motion had stopped. The times are necessarily very conservative due to the observer scan time required. For each scram, the observer verified times were very similar. In each case, the recorded time was faster than the technical specification scram time limit of 7 seconds for 90 percent insertion of any individual rod. Scram timing of the A sequence rods which failed to insert on June 28 identified rod 18-55 as the slowest rod. This rod was observed during the manual scram and was verified to be fully inserted within 4 seconds via stopwatch. For the automatic scram, the slowest B sequence rod, 22-39, was similarly identified and timed. Full insertion was recorded in 3.3 seconds. The scram time data used to select 18-55 and 22-39 as the slowest rods indicated scram times of 2.9 and 2.8 seconds respectively. Based on this data, it is concluded that all technical specification requirements for control rod insertion times were met.

Item 2b - Obtain voltage at the scram solenoid valve buses to verify that these solenoids are deenergized upon receipt of scram signal.

Proper scram solenoid valve bus operation was verified by monitoring each of the eight rod scram group buses independently. Test data showed that the buses all fully deenergized at the time of scram and deenergized upon scram reset.

Item 2c - Verify that scram valve air is relieved through the backup valves and that the backup valves are fully open and remain open during the presence of a scram signal.

Operation of both backup scram valves was verified by using paper flags to observe the release of air from each valve tested at the time of scram.

Item 2d - Measure instrument volume fill time from scram initiation to high level alarm, rod block, and scram points.

The fill times on the SDVT from scram to switch actuation was obtained by two methods. The 3 GPM switch was obtained manually using a stopwatch, the 25 GPM and 50 GPM switches were obtained from the alarm and sequential events recorders respectively.

The difference in fill time, manual versus automatic, is due to the length of time the scram signal was present. The manual scram was reset in 13 seconds and from this point on scram water flow stopped. The SDV volume (header, piping, and tank) equalized and only static head from header to tank caused water flow after drain and vent valve closures at approximately 16 seconds.

On the automatic scram, the scram signal was present for approximately 5 minutes, therefore, more water was forced into the SDV and it is also speculated that the pressure within the SDV was higher. This higher water flow and higher pressure caused the shorter fill times on the SDVT.

Item 2e - Measure vent and drain valve opening and closing times utilizing the valve stem mounted switches. This measurement may be independent of scrams.

Vent and drain valve opening and closing times were determined independent of and just before each scram by measuring the time from hand switch operation to change of valve position indication. The longer manual isolation closing time recorded for all valves is due to the slower response characteristics of the test solenoid valve.

Item 2f - Measure the delay time from scram initiation to closure of the SDV vent and drain valves utilizing stem mounted position switches.

Vent and drain valve closure time was determined by measuring the time from scram initiation to change of valve position indication. The longest closing time recorded was well within the acceptable limit recommended by G.E.

Item 2g - Sample water from the Instrument Volume discharge after each scram for particulates.

The water sample from the Scram Discharge Volume Tank (SDVT) was obtained by means of a connection added to an existing instrument drain line. Following each scram, system pressure was relieved by opening the vent valves, and an auxilliary cooler was used to cool the samples. Approximately 375 ml samples were collected and a portion of each was filtered so that a particulate concentration determination could be made.

The amount of particulates (~7.5ppm) present following the scrams was very small and within expected levels.

Item 2h - Measure the time to drain SDV to a repeatable level.

Data was gathered manually using a stop watch locally at the SDVT. The clock was started upon receipt of the red (open) light on the SDVT drain valve and stopped at switch reset actuation.

Based upon results obtained from previous tests the SDVT switch reset occurs when the west header has drained. The east header continues to drain after the west has emptied and level switches have reset.

The longer time to switch reset on the automatic scram is due to the larger amount of water in the west header, which is due to the longer time to scram reset.

The time for switch reset on the automatic scram is very consistent with results obtained on previous tests (Appendix 2) for times to drain the west header from full to empty.

Drain times from scram reset seen in previous scrams (Appendix 3) are significantly shorter but initial conditions were different.

Item 2i - Monitor the SDV and associated piping for residual water.

Upon draining the system after each scram both headers were examined with ultrasonic devices to determine if water was still present. The test point was the low end of the 6 inch piping where the 2 inch drain connection comes off. Both headers were verified empty after both scrams.

Item 2j - Verify the 10 second delay on scram reset is functioning properly.

Immediately following each scram signal the unit operator initiated continuous attempts to reset the scram. The manual scram reset 13 seconds after scram initiation. The inoperable APRM signals were left for approximately 5 minutes after the scram was initiated and therefore the automatic scram could not be reset until they were cleared. Subsequent to each scram, a surveillance test was performed which measured scram reset time. In both cases, it was measured at 12 seconds.

Conclusions

Each requirement of Bulletin 80-17, action item 2, has been addressed and the associated data compared between scrams. In addition, this data has been compared to information received from other sources (see Appendices 2 and 3). In all cases, the data was found to be normal and anticipated or explainable due to test conditions. It is therefore concluded that the system is functionally normal.

APPENDIX I

RESULTS
UNIT 3

Bulletin Item	Event		Manual Scram	Automatic Scram
2a	all rod insert time		7 sec	~5 sec
	individual scram time		~4 sec	3.3 sec
2b	scram solenoid valve buses de-energize with scram		yes	yes
2c	scram valve air relieved through backup valves		yes	yes
2d	full time of instrument volume to			
	- high level alarm		24 sec	24 sec
	- high level rod block		59 sec	35 sec
	- high level scram A		282 sec	49 sec
	- high level scram B		281 sec	49 sc
	- high level scram C		285 sec	50 sec
	- high level scram D		282 sec	50 sec
2e	vent and drain valve operation time independent of scram			
	drain 85-37 A	open	5 sec	7 sec
		close	117 sec	110 sec
	vent 85-37 B	open	3 sec	2.5 sec
		close	121 sec	114 sec
	vent 85-37 C	open	2 sec	1.5 sec
		close	99 sec	92 sec
2f	vent and drain valve closure time at scram			
	drain 85-37 A		16 sec	16 sec
	vent 85-37 B		15 sec	15 sec
	vent 85-37 C		9 sec	9 sec
2g	instrument volume sample after scram-particulates		7.5 ppm	7.5 ppm
2h	time to drain to repeatable level			
	- high level scram		N/A	525 sec
	- high level rod block		281 sec	567 sec
	- high level alarm		340 sec	630 sec
2i	monitor SDV for water after draining		none	none
2j	verify 10 second delay to reset		11 sec	10 sec

APPENDIX 2

Drain time tests of the SDV system were performed with the following initial conditions:

a) System filled and verified by U.T.
b) Vent valves open.
c) Drain valve closed.

Representative results from two of these drain tests are listed below.

Event	Test A Time	Test B Time
Open drain valve	0	0
"C" high level scram reset	9 min 22 sec	9 min 35 sec
"D" high level scram reset	9 min 35 sec	9 min 35 sec
West header empty by U.T.	9 min 28 sec	N/A
High level rod block reset	10 min 14 sec	10 min 16 sec
High level alarm reset	N/A	11 min 20 sec
East header empty by U.T.	N/A	25 min 22 sec

APPENDIX 3

DATA FROM SCRAMS PRIOR TO

JUNE 28, 1980

Event	Time
Scram No. 81	1-18-80
Time from scram to receipt of high level scram switch (avg. of 4)	53 sec
Time from scram reset (opening of drain valve) to loss of high level scram switch (avg. of 2)	23 sec
Scram No. 82	5-15-80
Time from scram to high level switch actuation (scram)	51 sec
Time from reset to loss of high level switch (scram)	24 sec
Scram No. 84	6-7-80
Time from scram to high level switch actuation (scram)	46 sec
Time from reset to loss of high level switch (scram)	23 sec

Item 4

Action item 4 has been completed through part d. The preliminary training required by 4.e. has been completed and the full training will be performed within 30 days of the Bulletin date.

Item 5

Action item 5 has been fully implemented with the scram discharge valve being monitored on a per shift basis for residual water.

Item 6(c)

We have performed a review of the standby liquid control system (SLC) to determine if 2-pump operation is feasible. The results of this analysis have shown that the present system design is unable to support 2-pump flow. Listed below are the problems identified in this analysis.

1. The system NPSH is designed upon the premise that a single pump is operating. Parallel pump operation would increase the required head to prevent cavitation. This additional head is not available, and the result could be pump cavitation with potential destructive results if operation continues.

2. The discharge piping is designed for single pump operation. Parallel pump operation would result in lifting the safety valves on the discharge of each pump. Should the safety valve fail to reseat, flow to the vessel would be greatly reduced. Raising the relief valve setpoint is unacceptable because the design pressure would possibly be exceeded. Also, operation at high pressure may overload the pump motors. Overloading could result in loss of both pumps.

3. The FSAR, Section 3.8, states that the SLC system flow rate is designed to preclude the possibility of surging the reactor with boron slugs which could cause the reactor power to rise and fall cyclically. The use of both pumps to introduce greater quantities of boron in a shorter time may result in just such an effect. To ensure sufficient mixing of the boron, the system is equipped with interlocking contacts which only allow one pump to operate at a time.

Item 7

Item 8 of the bulletin also required a report in writing within 10 days regarding the analysis of Item 7. Browns Ferry Nuclear Plant is equipped with ATWS related RPT; therefore, we do not plan at this time to submit an analysis pertaining to potential deratings.