PRECURSOR DESCRIPTION SHEET

LER No.: 387/84-010
Event Description: SRV Failure to Close Following Scram
Date of Event: February 25, 1984
Plant: Susquehanna 1

EVENT DESCRIPTION

Sequence

On February 25, 1984, at 1848 h, Unit 1 was in mode 1 at 54% power when it was manually scrammed during preplanned testing of the ADS Susquehanna 1 utilizes 16 SRVs; 6 of these valves also function as ADS valves. A preplanned test requirement was in progress to verify operability of the ADS valves wherein each ADS valve was to be manually and sequentially cycled. During the test sequence, the "M" SRV failed to close; in accordance with the test procedure, a manual scram was initiated because attempts to close the SRV were unsuccessful.

Each of the ADS SRVs has three independent solenoid-operated control valves. During testing of the "B" solenoid on the "M" SRV, the solenoid valve stuck open, and the instrument gas pressure kept the SRV open. After 2 min of attempting to close the SRV by a procedure especially written for this activity, the reactor was manually scrammed. At 1 min and 20 s after scram, the inboard MSIVs were closed to reduce vessel depressurization. Vessel pressure dropped from 946 to 682 psig during the transient. Several minutes later, the "M" SRV closed due to internal spring energy when the instrument gas header isolated for the test dropped to 60 psig.

Corrective Action

The "B" solenoid and air valve on the "M" SRV were replaced, and the new solenoid was tested successfully. Investigation has found this to be a nonrecurring event. The vendor will inspect the valves to determine the cause of the failure. The test was continued, and the other SRVs and solenoid valves operated properly.

Plant/Event Data

Systems Involved:
Steam relief

Event Identifier: 387/84-010

Components and Failure Modes Involved:
SRV — failed open in operation

Component Unavailability Duration: NA
Plant Operating Mode: 1 (54% power)
Discovery Method: Testing
Reactor Age: 1.4 years
Plant Type: BWR

Comments

None

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	Nonrecoverable

Branches Impacted and Branch Nonrecovery Estimate

SRV	0.1	Assumed recoverable because of isolated gas header
PCS	1.0	Unavailable because of MSIV closure
MFW	1.0	Unavailable because of MSIV closure

Plant Models Utilized

BWR plant Class C

Event Identifier: 387/84-010

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

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Event Description: SRV Failure to Close Following Scram
Event Date: 2/25/84
Plant: Susquehanna 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.0E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	1.4E-06
Total	1.4E-06
CD	
TRANS	1.4E-04
Total	1.4E-04
ATWS	
TRANS	2.0E-05
Total	2.0E-05

DOMINANT SEQUENCES

End State: CV Conditional Probability: 4.8E-07

134 TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS -COND/FW.PCS -RHR(SDC)

End State: CD Conditional Probability: 9.0E-05

119 TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA SRV.ADS

End State: ATWS Conditional Probability: 2.0E-05

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173 TRANS SCRAM SLC.OR.RODS

SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Prob	N Rec**
102	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW /PCS.TRANS -HPCI RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C. I.AND.V/RHR(SDC).RHR(SPCOOL)	CD	4.0E-05	1.0E-01
110	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW /PCS.TRANS HPCI RCIC/TRANS.OR.LOOP CRD SRV.ADS	CD	4.5E-06	2.9E-01
111	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE -FW /PCS.LOCA RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I.AND.V /RHR(SDC).RHR(SPCOOL)	CD	3.1E-06	7.6E-03
119	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI RCIC/LOCA SRV.ADS	CD	9.0E-05 *	1.9E-02
134	TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS -COND/FW.PCS -RHR(SDC)	CV	4.8E-07 *	1.9E-01
138	TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS COND/FW.PCS -LPCS -RHR(SDC)	CV	2.5E-07	9.9E-02
155	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS -COND/FW.PCS -RHR(SDC)	CV	4.7E-07	1.3E-02
159	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS COND/FW.PCS -LPCS -RHR(SDC)	CV	2.4E-07	6.6E-03
173	TRANS SCRAM SLC.OR.RODS	ATWS	2.0E-05 *	1.0E+00

* dominant sequence for end state
** non-recovery credit for edited case

MODEL: b:\bwrctree.cmp
DATA: b:\susqprob.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.1E-03	1.0E+00	
LOOP	1.3E-05	3.4E-01	
LOCA	3.3E-06	3.4E-01	
SCRAM	4.1E-04	1.0E+00	
SLC.OR.RODS	1.0E-02	1.0E+00	4.0E-02
PCS/TRANS	1.7E-01 > 1.0E+00	1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	1.7E-01 > Unavailable		
PCS/LOCA	1.0E+00	1.0E+00	

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SRV.CHALL/TRANS.-SCRAM	1.0E+00	1.0E+00	
SRV.CHALL/TRANS.SCRAM	1.0E+00	1.0E+00	
SRV.CHALL/LOOP.-SCRAM	1.0E+00	1.0E+00	
SRV.CHALL/LOOP.SCRAM	1.0E+00	1.0E+00	
SRV.CLOSE	5.3E-02 > 1.0E+00	1.0E+00 > 1.0E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	5.3E-02 > Failed		
EMERG.POWER	5.4E-04	5.1E-01	
FW/PCS.TRANS	4.6E-01 > 1.0E+00	3.4E-01 > 1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	4.6E-01 > Unavailable		
FW/PCS.LOCA	1.0E+00	3.4E-01	
HPCI	1.0E-01	5.7E-01	
RCIC/TRANS.OR.LOOP	6.7E-02	5.7E-01	
RCIC/LOCA	1.0E+00	1.0E+00	
CRD	1.0E-02	1.0E+00	4.0E-02
SRV.ADS	6.7E-03	1.0E+00	4.0E-02
COND/FW.PCS	1.0E+00	3.4E-01	
LPCS	3.0E-03	3.4E-01	
LPCI(RHR)/LPCS	4.0E-04	3.4E-01	
RHRSW/LPCS.LPCI.TRANS	5.0E-01	1.0E+00	4.0E-02
RHRSW/LPCS.LPCI.LOOP	5.0E-01	1.0E+00	4.0E-02
RHRSW/LPCS.LPCI.LOCA	5.0E-01	1.0E+00	4.0E-02
RHR(SDC)	2.0E-02	3.4E-01	
RHR(SDC)/-LPCI	2.0E-02	3.4E-01	
RHR(SDC)/LPCI	1.0E+00	1.0E+00	
RHR(SPCOOL)/-LPCI.RHR(SDC)	2.0E-02	1.0E+00	
RHR(SPCOOL)/LPCI.RHR(SDC)	5.2E-01	1.0E+00	
C.I.AND.V/RHR(SDC).RHR(SPCOOL)	1.0E+00	3.4E-01	

*** *forced*

Minarick
04-12-1987
12:14:04

Event Identifier: 387/84-010