

PRECURSOR DESCRIPTION AND ANALYSIS

LER No.: 325/85-059
Event Description: Reactor Isolation and Scram Plus RCIC and DG Trips
Date of Event: November 2, 1985
Plant: Brunswick 1

EVENT DESCRIPTION

Sequence

At 2326 h Unit 1 primary containment groups 1, 3, and 6 isolations occurred (including MSIV closure) because of a reactor low-level No. 2 signal. The HPCI system and the RCIC system autostarted, and RCIC tripped. The core spray subsystems (A and B) autostarted on a momentary low-level reactor No. 3 signal. The LOOP recirculation pumps tripped off. The reactor building ventilation system autoisolated, and the standby gas treatment system autostarted. The RHR system LPCI mode did not automatically initiate because the low-level No. 3 signal did not seal in. Manual initiation capability remained available. Emergency ac DGs 1 through 4 autostarted, and DG 4 tripped. DG 4 was restarted 20 min later. At 2332 h the unit autoscrammed because of high reactor pressure before the operators were able to reopen the MSIVs to control pressure. A scram recovery was carried out. Reactor safety relief valve A was manually opened to control reactor pressure. The RCIC and condensate feedwater systems were used to control reactor level.

The incurred low-level signals resulted from reactor level instrumentation falsely sensing low reactor levels when a pressure spike occurred on the instruments' common reference leg. The spike occurred because of an operator's opening the instrument drain valve of the reactor pressure instrument C32-PT-N008 during maintenance.

Corrective Action

The involved person was appropriately disciplined. Problems affecting operability of DG 4 and RCIC were resolved, and they were returned to service.

Plant/Event Data

Systems Involved:

LPCI, RCIC, and emergency power

Components and Failure Modes Involved:

RCIC — failed on demand but was recovered

LPCI — failed on demand

One DG — failed on demand

Event Identifier: 325/85-059

Component Unavailability Duration: NA
Plant Operating Mode: 2 (6%, in startup)
Discovery Method: Operational event
Reactor Age: 11.1 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

PCS	1.0	MSIVs had closed
MFW	0.34	MSIVs had closed isolating steam from MFW pumps that are turbine-driven
RCIC	0.12	Recoverable from the control room, but no indication of the initial trip was available from the unit reactor turbine gage board

Plant Models Utilized

BWR plant Class C

Event Identifier: 325/85-059

CONDITIONAL CORE DAMAGE CALCULATIONS

LER Number: 325/85-059
 Event Description: Reactor Isolation and Scram Plus RCIC and DG Trips
 Event Date: 11/2/85
 Plant: Brunswick 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.000E+00
-------	-----------

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	1.035E-06
Total	1.035E-06
CD	
TRANS	5.979E-05
Total	5.979E-05
ATWS	
TRANS	2.034E-05
Total	2.034E-05

DOMINANT SEQUENCES

End State: CV	Conditional Probability: 5.511E-07
---------------	------------------------------------

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

End State: CD	Conditional Probability: 2.177E-05
---------------	------------------------------------

120 TRANS -SCRAM PCS/TRANS -SRV.CHALL/TRANS.-SCRAM -FW/PCS.TRANS RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I
 .AND.V/RHR(SDC).RHR(SPCOOL)

End State: ATWS	Conditional Probability: 2.034E-05
-----------------	------------------------------------

Event Identifier: 325/85-059

173 TRANS SCRAM SLC.OR.RODS

SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Seq. Prob	Non-Recov**
101	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE -FW /PCS.TRANS RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I.AND. V/RHR(SDC).RHR(SPCOOL)	CD	9.079E-06	7.630E-02
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	4.411E-06	3.828E-02
110	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW /PCS.TRANS HPCI RCIC/TRANS.OR.LOOP CRD SRV.ADS	CD	1.563E-06	8.492E-04
119	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI RCIC/LOCA SRV.ADS	CD	7.286E-06	3.245E-02
120	TRANS -SCRAM PCS/TRANS -SRV.CHALL/TRANS.-SCRAM -FW/PCS.TRANS RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I.AND.V/RHR(SDC).R HR(SPCOOL)	CD	2.177E-05 *	7.630E-02
121	TRANS -SCRAM PCS/TRANS -SRV.CHALL/TRANS.-SCRAM FW/PCS.TRANS -HPCI RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I.AND.V/RHR (SDC).RHR(SPCOOL)	CD	1.058E-05	3.828E-02
129	TRANS -SCRAM PCS/TRANS -SRV.CHALL/TRANS.-SCRAM FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP CRD SRV.ADS	CD	3.748E-06	8.492E-04
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	5.511E-07 *	1.408E-02
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	2.836E-07	7.254E-03
155	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS -COND/FW.PCS -RHR(SDC)	CV	1.274E-07	1.173E-01
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	6.558E-08	6.045E-02
173	TRANS SCRAM SLC.OR.RODS	ATWS	2.034E-05 *	2.181E-01

* dominant sequence for end state

** non-recovery credit for edited case

Note:

Conditional probability values are differential values which reflect the added risk due to observed failures. Parenthetical values indicate a reduction in risk compared to a similar period without the existing failures.

MODEL: b:bwrtree.cmp

DATA: b:brunprob.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Event Identifier: 325/B5-059

Branch	System	Non-Recov	Opr Fail
TRANS	1.142E-03	1.000E+00	
LOOP	1.305E-05	3.400E-01	
LOCA	3.250E-06	3.400E-01	
SCRAM	4.100E-04	1.000E+00	
SLC.OR.RODS	1.000E-02	1.000E+00	4.000E-02
PCS/TRANS	1.700E-01 > 1.000E+00	1.000E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	1.700E-01 > 1.000E+00		
PCS/LOCA	1.000E+00	1.000E+00	
SRV.CHALL/TRANS.-SCRAM	3.000E-01	1.000E+00	
SRV.CHALL/TRANS.SCRAM	1.000E+00	1.000E+00	
SRV.CHALL/LOOP.-SCRAM	3.000E-01	1.000E+00	
SRV.CHALL/LOOP.SCRAM	1.000E+00	1.000E+00	
SRV.CLOSE	2.700E-02	1.000E+00	
EMERG.POWER	2.850E-03	5.100E-01	
FW/PCS.TRANS	4.600E-01 > 1.000E+00	3.400E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	4.600E-01 > 1.000E+00		
FW/PCS.LOCA	1.000E+00	3.400E-01	
HPCI	1.000E-01	5.700E-01	
RCIC/TRANS.OR.LOOP	6.700E-02 > 1.000E+00	5.700E-01 > 1.200E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	6.700E-02 > 1.000E+00		
RCIC/LOCA	1.000E+00	1.000E+00	
CRD	1.000E-02	1.000E+00	4.000E-02
SRV.ADS	6.700E-03	1.000E+00	4.000E-02
COND/FW.PCS	1.000E+00	3.400E-01	
LPCS	3.000E-03	3.400E-01	
LPCI (RHR) /LPCS	4.000E-04	3.400E-01	
RHR SW/LPCS.LPCI.TRANS	5.000E-01	1.000E+00	4.000E-02
RHR SW/LPCS.LPCI.LOOP	5.000E-01	1.000E+00	4.000E-02
RHR SW/LPCS.LPCI.LOCA	5.000E-01	1.000E+00	4.000E-02
RHR (SDC)	2.039E-02	3.400E-01	
RHR (SDC) /-LPCI	2.000E-02	3.400E-01	
RHR (SDC) /LPCI	1.000E+00	1.000E+00	
RHR (SPCOOL) /-LPCI.RHR (SDC)	2.000E-02	1.000E+00	
RHR (SPCOOL) /LPCI.RHR (SDC)	5.200E-01	1.000E+00	
C.I.AND.V/RHR (SDC).RHR (SPCOOL)	1.000E+00	3.400E-01	

*** forced

Minarick
08-13-1986
04:50:34

Event Identifier: 325/85-059