PRECURSOR DESCRIPTION SHEET

LER No.: 324/87-001 R2
Event Description: Reactor trip with HPCI and RCIC unavailable
Date of Event: 1/5/87
Plant: Brunswick 2

EVENT DESCRIPTION

Sequence

While at 100% power, problems with holding main generator voltage caused a grid voltage fluctuation and a reactor scram. A low RCS level signal initiated RCIC and HPCI; however, the systems did not inject because the signal duration was too brief to permit seal-in of each system's injection valve opening logic (per design). RCS pressure peaked at 1189 psig, and MSRVs opened to relieve steam. Operators opened additional valves to lower RCS pressure. Several SRVs lost valve position indication, but the loss of indication did not affect relief function. Operators monitored tailpipe temperature to confirm operability. Operators attempted to use RCIC to restore vessel inventory, but this was ineffective because of a 50% open full-flow test valve. When operators tried to use HPCI again, its injection valve would not open due to its valve motor having failed. A control rod drive pump and RCIC (degraded) were employed to maintain vessel level.

Corrective Action

Repairs were made.

Plant/Event Data

Systems Involved:

HPCI

Components and Failure Modes Involved:

HPCI isolation valve motor fails on demand, RCIC valve stem anti-rotation device failed.

Component Unavailability Duration: N/A
Plant Operating Mode: 1 (100%)
Discovery Method: Operational event
Reactor Age: 11.8 y
Plant Type: BWR

Comments

The event has been modeled assuming RCIC inoperability and the use of the CRD pumps for injection.

MODELING CONSIDERATION AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate	
Transient	No recovery

Branches Impacted and Branch Nonrecovery Estimate		
HPCI	1.0	No recovery
RCIC	1.0	No recovery (CRD pumps utilized)
PCS	1.0	No recovery

Plant Models Utilized
BWR plant Class C

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 324/87-001R2
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INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.0E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CD	
TRANS	2.4E-04
Total	2.4E-04
CV	
TRANS	1.3E-04
Total	1.3E-04
ATWS	
TRANS	7.0E-06
Total	7.0E-06

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

	Sequence	End State	Prob	N Rec**
145	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close fw/pcs.loca HPCI srv.ads	CD	1.6E-04	2.4E-01
125	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/PCS.TRANS HPCI RCIC crd srv.ads	CD	8.2E-05	2.4E-01
913	trans scram -slc.or.rods PCS/TRANS -srv.close FW/PCS.TRANS HPCI RCIC -srv.ads -cond/fw.pcs -rhr(sdc)	CV	7.3E-05	2.2E-01
917	trans scram -slc.or.rods PCS/TRANS -srv.close FW/PCS.TRANS HPCI RCIC -srv.ads cond/fw.pcs -lpcs -rhr(sdc)	CV	3.7E-05	1.1E-01
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 -rhrsw (c.i.and.v)	CV	8.4E-06	1.9E-01
110	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/PCS.TRANS HPCI RCIC -crd rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v	CV	5.1E-06	1.2E-01
941	trans scram -slc.or.rods PCS/TRANS srv.close fw/pcs.loca HPCI -srv.ads -cond/fw.pcs -rhr(sdc)	CV	2.7E-06	2.2E-01
963	trans scram slc.or.rods	ATWS	7.0E-06	1.0E+00

** non-recovery credit for edited case

SEQUENCE CONDITIONAL PROBABILITIES (SEQUENCE ORDER)

	Sequence	End State	Prob	N Rec**
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 -rhrsw (c.i.and.v)	CV	8.4E-06	1.9E-01
110	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/PCS.TRANS HPCI RCIC -crd rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v	CV	5.1E-06	1.2E-01

125	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS HPCI RCIC crd srv.ads	CD	8.2E-05	2.4E-01
145	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close fw/p cs.loca HPCI srv.ads	CD	1.6E-04	2.4E-01
913	trans scram -slc.or.rods PCS/TRANS -srv.close FW/PCS.TRANS H PCI RCIC -srv.ads -cond/fw.pcs -rhr(sdc)	CV	7.3E-05	2.2E-01
917	trans scram -slc.or.rods PCS/TRANS -srv.close FW/PCS.TRANS H PCI RCIC -srv.ads cond/fw.pcs -lpcs -rhr(sdc)	CV	3.7E-05	1.1E-01
941	trans scram -slc.or.rods PCS/TRANS srv.close fw/pcs.loca HP CI -srv.ads -cond/fw.pcs -rhr(sdc)	CV	2.7E-06	2.2E-01
963	trans scram slc.or.rods	ATWS	7.0E-06	1.0E+00

** non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\newmodel\bwr_cnew.cmp
BRANCH MODEL: c:\asp\newmodel\brunswck.new
PROBABILITY FILE: c:\asp\newmodel\bwr_cnew.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
trans	8.6E-04	1.0E+00	
loop	1.7E-05	3.2E-01	
loca	3.3E-06	5.0E-01	
scram	3.5E-04	1.0E+00	
slc.or.rods	1.0E-02	1.0E+00	1.0E-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		
srv.chall/trans.-scram	1.0E+00	1.0E+00	
srv.chall/loop.-scram	1.0E+00	1.0E+00	
srv.close	3.6E-02	1.0E+00	
emerg.power	2.9E-03	8.0E-01	
ep.rec	1.0E+00	1.7E-01	
FW/PCS.TRANS	4.6E-01 > 1.0E+00	3.4E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	4.6E-01 > Unavailable		
fw/pcs.loca	1.0E+00	3.4E-01	
HPCI	2.9E-02 > 1.0E+00	7.0E-01 > 1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	2.9E-02 > Failed		
RCIC	6.0E-02 > 1.0E+00	7.0E-01 > 1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	6.0E-02 > Failed		
crd	1.0E-02	1.0E+00	1.0E-02
srv.ads	3.7E-03	7.1E-01	1.0E-02
cond/fw.pcs	1.0E+00	3.4E-01	1.0E-03
lpcs	3.0E-03	3.4E-01	
lpci(rhr)/lpcs	1.0E-03	7.1E-01	
rhr(sdc)	2.1E-02	3.4E-01	1.0E-03
rhr(sdc)/-lpci	2.0E-02	3.4E-01	1.0E-03
rhr(sdc)/lpci	1.0E+00	1.0E+00	1.0E-03
rhr(spcool)/-lpci.rhr(sdc)	2.0E-03	1.0E+00	
rhr(spcool)/lpci.rhr(sdc)	5.2E-01	1.0E+00	
c.i.and.v	1.0E-03	1.0E+00	1.0E-02
rhrsw	2.0E-02	3.4E-01	2.0E-03
rhrsw(c.i.and.v)	5.0E-01	3.4E-01	

* branch model file
** forced

Minarick
05-16-1989
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Event Identifier: 324/87-001R2