

PRECURSOR DESCRIPTION SHEET

LER No.: 440/87-012
Event Description: LOFW, trip, and RCIC fails
Date of Event: 3/2/87
Plant: Perry 1

EVENT DESCRIPTION

Sequence

A reactor scram occurred due to low reactor vessel water level caused when operations personnel inadvertently caused a loss of feedwater to the reactor vessel while investigating a condensate system hot surge tank low-level alarm. Following the loss of feedwater, the motor-driven feed pump started, but its control valves locked at minimum flow due to control system problems. The reactor core isolation cooling (RCIC) system failed to initiate because the inboard containment isolation steam supply valve failed to open. The high-pressure core spray (HPCS) initiated and supplied water to the reactor vessel. The reactor coolant system cooled down at a rate of 180°F/h for 1 h after the reactor trip. This was 80 degrees above the Technical Specification limit of 100°F/h.

Corrective Action

Reactor feed pump trip logic was to be revised to require a low-low level trip in conjunction with a hot surge tank low-level trip. Investigation of the feed pump control problem was continuing at the time of the report.

Plant/Event DataSystems Involved:

Reactor core isolation cooling system

Components and Failure Modes Involved:

RCIC failed on demand

Component Unavailability Duration: N/A

Plant Operating Mode: 1 (28% power)

Discovery Method: Operational event

Reactor Age: 0.7 y

Plant Type: BWR

Comments

None.

Event Identifier: 440/87-012

MODELING CONSIDERATION AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	No recovery
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Branches Impacted and Branch Nonrecovery Estimate

PCS	1.0	No recovery
FW	1.0	No recovery
RCIC	1.0	No recovery

Plant Models Utilized

BWR plant Class C

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

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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	6.6E-06
Total	6.6E-06
CV	
TRANS	1.7E-05
Total	1.7E-05
ATWS	
TRANS	7.0E-06
Total	7.0E-06

SEQUENCE CONDITIONAL PROBABILITIES (PROBABILITY ORDER)

Sequence	End State	Prob	N Rec**
105 trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS -hpci rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v rhrsw(c.i.and.v)	CD	2.8E-06	1.2E-01
145 trans -scram PCS/TRANS srv.chall/trans.-scram srv.close fw/p cs.loca hpci srv.ads	CD	1.8E-06	8.2E-02
125 trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS hpci RCIC crd srv.ads	CD	1.6E-06	2.4E-01
106 trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS -hpci rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) c.i.and.v	CD	1.8E-07	3.4E-01
127 trans -scram PCS/TRANS srv.chall/trans.-scram srv.close -fw/p cs.loca rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v rhrsw(c.i.and.v)	CD	1.2E-07	7.6E-02
104 trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS -hpci rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw(c.i.and.v)	CV	1.3E-05	2.9E-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	1.4E-06	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	7.2E-07	1.1E-01
126 trans -scram PCS/TRANS srv.chall/trans.-scram srv.close -fw/p cs.loca rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw(c.i.and.v)	CV	6.0E-07	1.9E-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**
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Event Identifier: 440/87-012

104	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS -hpci rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw(c.i.and.v)	CV	1.3E-05	2.9E-01
105	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS -hpci rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v rhrsw(c.i.and.v)	CD	2.8E-06	1.2E-01
106	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS -hpci rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) c.i.and.v	CD	1.8E-07	3.4E-01
125	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS hpci RCIC crd srv.ads	CD	1.6E-06	2.4E-01
126	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close -fw/p cs.loca rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw(c.i.and.v)	CV	6.0E-07	1.9E-01
127	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close -fw/p cs.loca rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v rhrsw(c.i.and.v)	CD	1.2E-07	7.6E-02
145	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close fw/p cs.loca hpci srv.ads	CD	1.8E-06	8.2E-02
913	trans scram -slc.or.rods PCS/TRANS -srv.close FW/PCS.TRANS h pci RCIC -srv.ads -cond/fw.pcs -rhr(sdc)	CV	1.4E-06	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	7.2E-07	1.1E-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\perry.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:			
srv.chall/trans.-scram	1.0E+00	1.0E+00	
srv.chall/loop.-scram	1.0E+00	1.0E+00	
srv.close	6.3E-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 > 1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:			
fw/pcs.loca	4.6E-01 > Failed	3.4E-01	
hpci	1.0E+00	3.4E-01	
RCIC	2.0E-02	3.4E-01	
	6.0E-02 > 1.0E+00	7.0E-01 > 1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:			
crd	6.0E-02 > Failed	1.0E+00	1.0E-02
srv.ads	1.0E-02	7.1E-01	1.0E-02
cond/fw.pcs	3.7E-03	3.4E-01	1.0E-03
lpcs	1.0E+00	3.4E-01	
lpci(thr)/lpcs	2.0E-02	7.1E-01	
rhr(sdc)	6.0E-04	3.4E-01	1.0E-03
rhr(sdc)/-lpci	2.3E-02	3.4E-01	1.0E-03
rhr(sdc)/lpci	2.0E-02	1.0E+00	1.0E-03
rhr(spcool)/-lpci.rhr(sdc)	1.0E+00	1.0E+00	
rhr(spcool)/lpci.rhr(sdc)	2.0E-03	1.0E+00	
c.i.and.v	5.2E-01	1.0E+00	1.0E-02
rhrsw	1.0E-03	3.4E-01	2.0E-03
rhrsw(c.i.and.v)	2.0E-02	3.4E-01	
	5.0E-01	3.4E-01	

* branch model file
** forced

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