

PRECURSOR DESCRIPTION SHEET

LER No.: 321/87-011
Event Description: Loss of feedwater and RCIC trip
Date of Event: 7/23/87
Plant: Hatch 1

EVENT DESCRIPTION

Sequence

While the plant was at 100% power, vital AC electrical power was lost due to failure of the vital AC inverter (believed caused by high internal temperature compounded by dust in the inverter). The electrical failure caused reactor feedwater pump runback on loss of control power and isolation of the reactor water cleanup system. Subsequent reactor water level reduction occurred as the feedwater flow attenuated. A reactor scram automatically initiated when the reactor protection system setpoint was reached on vessel low water level. As the vessel water level continued to decrease, automatic initiation occurred for the primary containment isolation, the standby gas treatment system, the high-pressure coolant injection system, and the reactor core isolation cooling system. Through RCIC initiated, it tripped on overspeed due to failed diodes in the power supply for the electric governor magnetic pickup module, caused by a bent internal pin, which resulted in a higher than normal current in the diodes.

Reactor water level was temporarily stabilized by HPCI. Three minutes after the AC inverter failed, operations personnel transferred the vital AC to an alternate electrical source. Operators then restarted a feedwater pump and initiated and began reactor water level recovery. Six minutes after vital AC power failure, both HPCI and the feedwater pump tripped on high reactor water level. At this point, the control rod drive pump was used to maintain the reactor level. During the event, reactor pressure was controlled by the main turbine bypass valves, and by the steam flow to HPCI and the feedwater pump turbines.

Corrective Action

Immediate corrective action was to reset the PCIS valve group isolations and reset the scram signal. Long-term corrective action was taken to repair or replace the failed inverter, provide cooling to the inverter, and replace the failed RCIC module.

Plant/Event Data

Systems Involved:

Vital AC power
RCIC
Main feedwater

Event Identifier: 321/87-011

Components and Failure Modes Involved:

AC inverter - failed due to high ambient temperature
 RCIC - tripped due to component failures

Component Unavailability Duration: N/A

Plant Operating Mode: 1 (100% power)

Discovery Method: Operational event

Reactor Age: 12.9 y

Plant Type: BWR

Comments

None.

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	No recovery assumed possible
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Branches Impacted and Branch Nonrecovery Estimate

PCS	1.0	Unavailable
MFW		Base case nonrecovery
RCIC	1.0	No recovery assumed possible

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	7.7E-06
Total	7.7E-06
CV	
TRANS	1.6E-05
Total	1.6E-05
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/p cs.locs hpci srv.ads	CD	3.2E-06	1.7E-01
102	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close -FW/P CS.TRANS rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v rhrsw (c.i.and.v)	CD	1.7E-06	7.6E-02
125	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS hpci RCIC crd srv.ads	CD	1.7E-06	1.7E-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	8.7E-07	3.9E-02
103	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close -FW/P CS.TRANS rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) c.i.and.v	CD	1.1E-07	2.2E-01
101	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close -FW/P CS.TRANS rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw (c.i.and.v)	CV	8.4E-06	1.9E-01
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	4.3E-06	9.9E-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	1.5E-06	1.6E-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	7.6E-07	8.0E-02
126	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close -fw/p cs.locs rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw (c.i.and.v)	CV	3.2E-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)

Event Identifier: 321/87-011

	Sequence	End State	Prob	N Rec**
101	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close -FW/P CS.TRANS rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v -rhrsw (c.i.and.v)	CV	8.4E-06	1.9E-01
102	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close -FW/P CS.TRANS rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) -c.i.and.v rhrsw (c.i.and.v)	CD	1.7E-06	7.6E-02
103	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close -FW/P CS.TRANS rhr(sdc) rhr(spcool)/-lpci.rhr(sdc) c.i.and.v	CD	1.1E-07	2.2E-01
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	4.3E-06	9.9E-02
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	8.7E-07	3.9E-02
125	trans -scram PCS/TRANS srv.chall/trans.-scram -srv.close FW/P CS.TRANS hpci RCIC crd srv.ads	CD	1.7E-06	1.7E-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	3.2E-07	1.9E-01
145	trans -scram PCS/TRANS srv.chall/trans.-scram srv.close fw/p cs.loca hpci srv.ads	CD	3.2E-06	1.7E-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	1.5E-06	1.6E-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	7.6E-07	8.0E-02
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\hatch.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	3.6E-02	1.0E+00	
emerg.power	5.4E-04	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:			
fw/pcs.loca	1.0E+00	3.4E-01	
hpci	2.9E-02	7.0E-01	
RCIC	6.0E-02 > 1.0E+00	7.0E-01 > 1.0E+00	
Branch Model: 1.OF.1			
Train 1 Cond Prob:			
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	

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c.i.and.v	1.0E-03	1.0E+00	1.0E-02
rhrrw	2.0E-02	3.4E-01	2.0E-03
rhrrw(c.i.and.v)	5.0E-01	3.4E-01	

* branch model file
** forced

Minarick
05-16-1989
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