PRECURSOR DESCRIPTION SHEET

LER No.: 321/85-010
Event Description: Loss of HPCI/RCIC During Recovery from a Trip
Date of Event: January 6, 1985
Plant: Hatch 1

EVENT DESCRIPTION

Sequence

At 0955 h while at 65% power and while running off the alternate vital ac power supply, the power supply tripped off because of spurious actuation of relay (ETR 1A). The primary power supply was out of service at the time, and the alternate was in place. This action caused an MFW pump runback. It also caused Bus 1C (600 V) to fail, which deenergized reactor building component cooling water pump 1A, the 1A air compressor, and the main turbine suction and oil pumps. The "E" 4160-V bus also failed, which affected a fire pump.

Vessel water level decreased to the low-level trip set point, and a reactor scram occurred. A group 2 isolation also occurred. The turbine was manually tripped. HPCI/RCIC auto started to recover the water level. MFW pump A was then restarted, and HPCI/RCIC were secured. Vessel pressure was stable at 980 psig. The MSIVs remained open.

During the scram recovery, water temperature became too low for restart of the loop recirculation pumps, and the vessel was depressurized. During this action at 1102 h, water level rose too high, and MFW tripped off. High-level trip signals were also received by HPCI and RCIC. Level dropped, and the RPS actuated for the second time (all rods were already in). A second group 2 isolation also occurred. MFW was restarted.

During the first trip recovery at 1030 h, RCIC failed after being secured because its trip/throttle valve would not engage the reset circuitry. The valve failed closed when operators tried to restart RCIC. A spring had failed in the mechanism.

Following the second RPS actuation at 1320 h, HPCI developed a problem when its turbine stop valve failed to move because of binding. The valve failed in midposition.

Corrective Action

Repairs were made.

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Plant/Event Data

Systems Involved:
HPCI and RCIC

Components and Failure Modes Involved:
HPCI turbine stop valve - failed in operation
RCIC trip/throttle valve - failed in operation

Component Unavailability Duration: NA
Plant Operating Mode: 3 (0% power)
Discovery Method: Operational event
Reactor Age: 9.3 years
Plant Type: BWR

Comments

HPCI valve failure is assumed to prevent sufficient pump pressure for high-pressure injection.

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	0.5	Nonrecovery based on assumed likelihood of failures occurring during initial event

Branches Impacted and Branch Nonrecovery Estimate

MFW	Base case	
RCIC	1.0	No recovery considered possible
HPCI	0.34	Degraded control but operable locally at the valve

Plant Models Utilized

BWR plant Class C

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CONDITIONAL CORE DAMAGE CALCULATIONS

LER Number: 321/85-010
Event Description: Loss of HPCI/RCIC During Recovery from a Trip
Event Date: 1/6/85
Plant: Hatch 1

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	5.000E-01

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	2.148E-05
Total	2.148E-05
CD	
TRANS	2.265E-04
Total	2.265E-04
ATWS	
TRANS	1.017E-05
Total	1.017E-05

DOMINANT SEQUENCES

End State: CV Conditional Probability: 1.370E-05

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: 1.295E-04

110 TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP CRD SRV.ADS

End State: ATWS Conditional Probability: 1.017E-05

Event Identifier: 321/85-010

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	1.513E-05	3.815E-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	5.145E-06	1.297E-02
110	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE FW /PCS.TRANS HPCI RCIC/TRANS.OR.LOOP CRD SRV.ADS	CD	1.295E-04 *	2.110E-03
119	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI RCIC/LOCA SRV.ADS	CD	7.243E-05	9.678E-03
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	1.370E-05 *	3.500E-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	7.049E-06	1.803E-02
173	TRANS SCRAM SLC.OR.RODS	ATWS	1.017E-05 *	1.090E-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:bwrctree.cmp
DATA: b:hatchpro.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.142E-03 > 1.142E-03	1.000E+00 > 5.000E-01	
Branch Model: INITOR			
Initiator Freq:	1.142E-03		
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			

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Train 1 Cond Prob:	1.700E-01 > 1.000E+00		
PCS/LOCA	1.000E+00	1.000E+00	
SRV.CHALL/TRANS.-SCRAM	1.000E+00	1.000E+00	
SRV.CHALL/TRANS.SCRAM	1.000E+00	1.000E+00	
SRV.CHALL/LOOP.-SCRAM	1.000E+00	1.000E+00	
SRV.CHALL/LOOP.SCRAM	1.000E+00	1.000E+00	
SRV.CLOSE	2.700E-02	1.000E+00	
EMERG.POWER	5.415E-04	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 > 1.000E+00	5.700E-01 > 3.400E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	1.000E-01 > 1.000E+00		
RCIC/TRANS.OR.LOOP	6.700E-02 > 1.000E+00	5.700E-01 > 1.000E+00	
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	
RHRSW/LPCS.LPCI.TRANS	5.000E-01	1.000E+00	4.000E-02
RHRSW/LPCS.LPCI.LOOP	5.000E-01	1.000E+00	4.000E-02
RHRSW/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
04:23:35

Event Identifier: 321/85-010