

## PRECURSOR DESCRIPTION SHEET

LER No.: 416/85-050 Rev 1  
Event Description: LOFW Plus HPCS Failure  
Date of Event: December 31, 1985  
Plant: Grand Gulf 1

### EVENT DESCRIPTION

#### Sequence

The low-level alarm for the intermediate pressure condenser hotwell alarmed. The operators observed a higher than normal water level on the indicators. Because of a recent loss of water column in the hotwell level transmitter that gave a similar higher than normal level reading, the shift supervisor merely told maintenance to check the line and vent and refill the reference leg. The operators also observed a low hotwell level alarm. Makeup flow to the hotwell was not increased. The low-level alarm is 3 in. above the condensate pump low hotwell level trip set point. In addition, the alarm and trip signals are all connected to the same process piping as the level transmitter.

The erroneous high-level indication was due to an in-leakage of air. The hotwell level actually fell to the low-level trip set point because the operators failed to provide additional makeup; they did not believe either indication reading was correct. All condensate, condensate booster, and main feed pumps tripped off, causing an LOFW.

The reactor scrambled on low level. The RCIC and HPCS systems were actuated. The HPCS injection valve failed to open. It was manually opened from the control room 50 s later. Following the trip recovery, the HPCS was removed from service for repairs.

#### Corrective Action

The level transmitter was repaired.

#### Plant/Event Data

##### Systems Involved:

HPCS, condensate, and feedwater

##### Components and Failure Modes Involved:

Level transmitter - failed in operation

Component Unavailability Duration: NA

Plant Operating Mode: 1 (99% power)

Discovery Method: Operational event

Reactor Age: 3.3 years

Plant Type: BWR

Event Identifier: 416/85-050

Comments

None

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	Nonrecovery
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Branches Impacted and Branch Nonrecovery Estimate

MFW	Base case
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HPCS	0.12	Recoverable from control room
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Plant Models Utilized

BWR plant Class C

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# CONDITIONAL CORE DAMAGE CALCULATIONS

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## INITIATING EVENT

### NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	1.000E+00
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### SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	1.541E-06
Total	1.541E-06
CD	
TRANS	1.772E-04
Total	1.772E-04
ATWS	
TRANS	2.034E-05
Total	2.034E-05

### DOMINANT SEQUENCES

End State: CV	Conditional Probability: 6.556E-07
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155 TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS -COND/FW.PCS -RHR (SDC)

End State: CD	Conditional Probability: 1.250E-04
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119 TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA SRV.ADS

End State: ATWS	Conditional Probability: 2.034E-05
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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	3.003E-05	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	1.361E-05	3.459E-02
119	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI RCIC/LOCA SRV.ADS	CD	1.250E-04 *	6.832E-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	3.543E-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	1.813E-07	7.220E-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	6.556E-07 *	2.470E-02
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	3.355E-07	1.267E-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:gulfprob.cmp

No Recovery Limit

#### BRANCH FREQUENCIES/PROBABILITIES

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	

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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	6.600E-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	2.000E-02 > 1.000E+00	3.400E-01 > 1.200E-01	
Branch Model: 1.OF.1			
Train 1 Cond Prob:	2.000E-02 > Failed		
RCIC/TRANS.OR.LOOP	6.700E-02	5.700E-01	
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	2.000E-02	3.400E-01	
LPCI(RHR)/LPCS	6.000E-04	3.400E-01	
RHRSW/LPCS.LPCI.TRANS	1.000E+00	1.000E+00	
RHRSW/LPCS.LPCI.LOOP	1.000E+00	1.000E+00	
RHRSW/LPCS.LPCI.LOCA	1.000E+00	1.000E+00	
RHR(SDC)	2.108E-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

Austin  
08-13-1986  
17:59:11

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