

## PRECURSOR DESCRIPTION AND ANALYSIS

LER No.: 413/85-041  
Event Description: LOFW and Secondary-Side Relief Valve Problems  
Date of Event: June 13, 1985  
Plant: Catawba 1

### EVENT DESCRIPTION

#### Sequence

After declaring an Unusual Event at 2145 h because of unidentified RCS leakage, reactor power was reduced to 15%. MFW pump A was secured. At this power level, the feedwater flow path was switched from the lower feedwater nozzles to the upper AFW nozzles. During the changeover a low-suction flow trip of MFW pump B occurred, causing a turbine trip and an autostart of both AFW motor-driven pumps and MFW isolation. The reactor was subsequently manually tripped from 6% power as required by the loss of SG feedwater abnormal procedure.

The pressurizer PORVs opened and closed on high pressure within 2 s. SG PORV "C" opened for 1.5 min. The PORVs in the other three SGs failed to open on demand. The safety-grade MSRVs were operational.

The MFW pump trip occurred during a flow reduction caused by a normal plant shutdown sequence. The MFW pump B recirculation valve was not capable of modulating quickly enough to provide adequate pump minimum flow, causing its trip. An attempted restart of pump B failed.

#### Corrective Action

SG PORVs were recalibrated to open at proper set points. Procedures were revised to provide guidelines for manual control of the feedwater minimum flow valves during nozzle changeover to ensure minimum pump flow.

#### Plant/Event Data

##### Systems Involved:

Main steam relief (PORVs) and MFW

##### Components and Failure Modes Involved:

MFW pump — failed in operation

Three SG PORVs — failed on demand

Event Identifier: 413/85-041

Component Unavailability Duration: NA  
Plant Operating Mode: 1 (16% power)  
Discovery Method: Operational event  
Reactor Age: 0.5 year  
Plant Type: PWR

Comments

See LER 413/85-043 on June 22, 1985, for a similar event

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient	1.0	Nonrecoverable
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Branches Impacted and Branch Nonrecovery Estimate

MFW	0.34	Restart of pump B failed, so the nonrecovery estimate reflects the difficulty of restarting the system or pump B or restarting pump A during the transient
Secondary-side depressurization	0.34	The three failed SG PORVs were not readily recoverable (recoverable only locally, if at all); turbine bypass valves were still available for depressurization

Plant Models Utilized

PWR plant Class F

Event Identifier: 413/85-041

# CONDITIONAL CORE DAMAGE CALCULATIONS

LER Number: 413/85-041  
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 Plant: Catawba 1

## INITIATING EVENT

### NON-RECOVERABLE INITIATING EVENT PROBABILITIES

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

End State/Initiator	Probability
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#### CV

TRANS	6.871E-06
Total	6.871E-06

#### CD

TRANS	6.698E-06
Total	6.698E-06

#### ATWS

TRANS	3.000E-05
Total	3.000E-05

### DOMINANT SEQUENCES

End State: CV	Conditional Probability:	2.545E-06
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109 TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI

End State: CD	Conditional Probability:	1.289E-06
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127 TRANS -RT AFW MFW HPI(F/B) SS.DEPRESS

End State: ATWS	Conditional Probability:	3.000E-05
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128 TRANS RT

Event Identifier: 413/85-041

# SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Seq. Prob	Non-Recov**
101	TRANS -RT -AFW PORV.OR.SRV.CHALL -PORV.OR.SRV.RESEAT SS.RELE AS.TERM HPI	CV	1.059E-07	1.765E-01
102	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI -SS.DEPRESS -LPR/-HPI.HPR	CV	5.433E-07	1.956E-03
103	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI -SS.DEPRESS LPR/-HPI.HPR	CD	1.103E-06	1.956E-03
104	TRANS -RT -AFW PORV.OR.SRV.CHALL PORV.OR.SRV.RESEAT -HPI HP R/-HPI SS.DEPRESS	CD	8.482E-07	1.008E-03
109	TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI	CV	2.545E-06 *	1.768E-01
119	TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS -COND/MFW	CV	3.750E-07	3.682E-02
120	TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS COND/MFW	CD	1.932E-07	1.897E-02
121	TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN SS.DEPRESS	CD	2.927E-07	2.874E-02
122	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI -SS.DEPRESS -COND/MFW	CV	1.628E-06	2.275E-03
123	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI -SS.DEPRESS COND/MFW	CD	8.389E-07	1.172E-03
124	TRANS -RT AFW MFW -HPI(F/B) HPR/-HPI SS.DEPRESS	CD	1.271E-06	1.776E-03
125	TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS -COND/MFW	CV	1.652E-06	1.826E-03
126	TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS COND/MFW	CD	8.509E-07	9.406E-04
127	TRANS -RT AFW MFW HPI(F/B) SS.DEPRESS	CD	1.289E-06 *	1.425E-03
128	TRANS RT	ATWS	3.000E-05 *	1.200E-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:pwrmtree.cmp

DATA: b:catapro.cmp

No Recovery Limit

## BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.030E-03	1.000E+00	
LOOP	2.280E-05	3.400E-01	
LOCA	4.170E-06	3.400E-01	
RT	2.500E-04	1.200E-01	
RT/LOOP	0.000E+00	1.000E+00	
EMERG.POWER	2.850E-03	5.100E-01	

Event Identifier: 413/85-041

AFW	1.020E-03	2.700E-01	
AFW/EMERG.POWER	5.000E-02	3.400E-01	
MFW	2.000E-01 > 1.000E+00	3.400E-01	
Branch Model: 1.0F.1			
Train 1 Cond Prob:	2.000E-01 > Failed		
PORV.OR.SRV.CHALL	4.000E-02	1.000E+00	
PORV.OR.SRV.RESEAT	3.000E-02	5.000E-02	
PORV.OR.SRV.RESEAT/EMERG.POWER	3.000E-02	5.000E-02	
SS.RELEAS.TERM	1.500E-02	3.400E-01	
SS.RELEAS.TERM/-MFW	1.500E-02	3.400E-01	
HPI	1.000E-03	5.200E-01	
HPI(F/B)	1.000E-03	5.200E-01	4.000E-02
HPR/-HPI	3.000E-03	5.600E-01	4.000E-02
PORV.OPEN	1.000E-02	1.000E+00	
SS.DEPRESS	3.600E-02 > 1.000E+00	1.000E+00 > 3.400E-01	
Branch Model: 1.0F.1			
Train 1 Cond Prob:	3.600E-02 > Failed		
COND/MFW	1.000E+00	3.400E-01	
LPI/HPI	1.000E-03	3.400E-01	
LPR/-HPI.HPR	6.700E-01	1.000E+00	
LPR/HPI	1.000E-03	1.000E+00	

\*\*\* forced

Austin  
08-13-1986  
17:48:33

Event Identifier: 413/85-041