

## PRECURSOR DESCRIPTION SHEET

LER No.: 389/84-004  
Event Description: LOFW, Failure of One AFW Train, and One MSRV Sticks Open  
Date of Event: February 9, 1984  
Plant: St. Lucie 2

### EVENT DESCRIPTION

#### Sequence

While the reactor was at 100% power, the MFWPs tripped due to low suction pressure. The reactor subsequently tripped on low SG level. Following the trip, the 2C AFW pump started and then tripped on over-speed. A main steam SRV on the "A" SG also stuck partially open following the trip. Approximately 40 min was required to reseal the safety valve. Cooldown from the open safety valve was successfully controlled.

#### Corrective Action

The cause of the low suction pressure to the MFWPs was not positively determined. Condensate pump vent-line design probably contributed. The design is being changed to allow proper venting during strainer cleaning.

The 2C AFW pump tripped because of transients on a power supply during AFW actuation. The cause was not immediately known. However, repeated testing over a period of 6 d revealed the problem. A modification has been completed to eliminate this problem.

The SRV stuck open because a cotter pin was missing from a spindle nut. When the safety valve opened (as expected), the nut vibrated down and held the valve partially open. The nut pin was replaced, and all safeties were checked.

#### Plant/Event Data

##### Systems Involved:

AFW and SG steam relief

##### Components and Failure Modes Involved:

AFW pump — failed on demand  
MSRV — failed open in operation  
MFW — tripped during operation

Event Identifier: 389/84-004

Component Unavailability Duration: NA  
Plant Operating Mode: 1 (100% power)  
Discovery Method: Operational event  
Reactor Age: 0.7 year  
Plant Type: PWR

Comments

None

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

|           |     |                |
|-----------|-----|----------------|
| Transient | 1.0 | Nonrecoverable |
|-----------|-----|----------------|

Branches Impacted and Branch Nonrecovery Estimate

|     |      |                                       |
|-----|------|---------------------------------------|
| MFW | 0.34 | Recovery assumed locally at equipment |
|-----|------|---------------------------------------|

|     |           |                            |
|-----|-----------|----------------------------|
| AFW | Base case | Degraded; one train failed |
|-----|-----------|----------------------------|

|                                      |     |                     |
|--------------------------------------|-----|---------------------|
| Secondary-side<br>release terminated | 1.0 | No recovery assumed |
|--------------------------------------|-----|---------------------|

|   |     |                     |
|---|-----|---------------------|
| Secondary-side<br>release terminated<br>given MFW success | 1.0 | No recovery assumed |
|---|-----|---------------------|

Plant Models Utilized

PWR plant Class G

Event Identifier: 389/84-004

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 389/84-004  
 Event Description: LOFW With Failure of One AFW Train and Stuck-Open MSRV  
 Event Date: 2/9/84  
 Plant: St Lucie 2

INITIATING EVENT

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS 1.0E+00

SEQUENCE CONDITIONAL PROBABILITY SUMS

| End State/Initiator | Probability |
|---------------------|-------------|
| CV                  |             |
| TRANS               | 5.0E-04     |
| Total               | 5.0E-04     |
| CD                  |             |
| TRANS               | 2.0E-04     |
| Total               | 2.0E-04     |
| ATWS                |             |
| TRANS               | 3.0E-05     |
| Total               | 3.0E-05     |

DOMINANT SEQUENCES

End State: CV Conditional Probability: 3.3E-04  
 112 TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS -COND/MFW  
 End State: CD Conditional Probability: 1.7E-04  
 113 TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS COND/MFW  
 End State: ATWS Conditional Probability: 3.0E-05

Event Identifier: 389/84-004

121 TRANS RT

SEQUENCE CONDITIONAL PROBABILITIES

|     | Sequence   | End State | Prob      | N Rec** |
|-----|--|-----------|-----------|---------|
| 104 | TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI                     | CV        | 1.5E-04   | 5.2E-01 |
| 112 | TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS<br>-COND/MFW | CV        | 3.3E-04 * | 6.1E-02 |
| 113 | TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN -SS.DEPRESS<br>COND/MFW  | CD        | 1.7E-04 * | 3.1E-02 |
| 114 | TRANS -RT AFW MFW -HPI(F/B) -HPR/-HPI PORV.OPEN SS.DEPRESS               | CD        | 1.9E-05   | 9.2E-02 |
| 118 | TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS -COND/MFW                         | CV        | 1.4E-05   | 3.2E-02 |
| 119 | TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS COND/MFW                          | CD        | 7.1E-06   | 1.6E-02 |
| 121 | TRANS RT   | ATWS      | 3.0E-05 * | 1.2E-01 |

\* dominant sequence for end state  
 \*\* non-recovery credit for edited case

MODEL: b:\pwrgrtree.cmp  
 DATA: b:\luciepro.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

| Branch                         | System            | Non-Recov         | Opr Fail |
|--------------------------------|-------------------|-------------------|----------|
| TRANS                          | 1.0E-03           | 1.0E+00           |          |
| LOOP                           | 2.3E-05           | 3.4E-01           |          |
| LOCA                           | 2.6E-02           | 3.4E-01           |          |
| RT                             | 2.5E-04           | 1.2E-01           |          |
| RT/LOOP                        | 0.0E+00           | 1.0E+00           |          |
| EMERG.POWER                    | 2.9E-03           | 5.1E-01           |          |
| AFW                            | 1.0E-03 > 5.9E-03 | 2.7E-01           |          |
| Branch Model: 1.0F.3+ser       |                   |                   |          |
| Train 1 Cond Prob:             | 2.0E-02 > Failed  |                   |          |
| Train 2 Cond Prob:             | 1.0E-01           |                   |          |
| Train 3 Cond Prob:             | 5.0E-02           |                   |          |
| Serial Component Prob:         | 9.2E-04           |                   |          |
| AFW/EMERG.POWER                | 5.0E-02           | 3.4E-01           |          |
| MFW                            | 1.9E-01 > 1.0E+00 | 3.4E-01           |          |
| Branch Model: 1.0F.1           |                   |                   |          |
| Train 1 Cond Prob:             | 1.9E-01 > Failed  |                   |          |
| PORV.OR.SRV.CHALL              | 2.0E-02           | 1.0E+00           |          |
| PORV.OR.SRV.RESEAT             | 1.0E-02           | 1.2E-01           |          |
| PORV.OR.SRV.RESEAT/EMERG.POWER | 1.0E-02           | 1.2E-01           |          |
| SS.RELEAS.TERM                 | 1.5E-02 > 1.0E+00 | 3.4E-01 > 1.0E+00 |          |
| Branch Model: 1.0F.1           |                   |                   |          |

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|                      |                   |                   |         |
|----------------------|-------------------|-------------------|---------|
| Train 1 Cond Prob:   | 1.5E-02 > Failed  |                   |         |
| SS.RELEAS.TERM/-MFW  | 1.5E-02 > 1.0E+00 | 3.4E-01 > 1.0E+00 |         |
| Branch Model: 1.OF.1 |                   |                   |         |
| Train 1 Cond Prob:   | 1.5E-02 > Failed  |                   |         |
| SS.DEPRESS           | 3.6E-02           | 1.0E+00           |         |
| COND/MFW             | 1.0E+00           | 3.4E-01           |         |
| HPI                  | 3.0E-04           | 5.2E-01           |         |
| HPI(F/B)             | 3.0E-04           | 5.2E-01           | 4.0E-02 |
| PORV.OPEN            | 1.0E+00           | 1.0E+00           |         |
| HPR/-HPI             | 1.0E-03           | 1.0E+00           |         |
| CSR                  | 2.0E-03           | 3.4E-01           |         |

\*\*\* forced

Minarick  
04-12-1987  
12:36:57

Event Identifier: 389/84-004