

PRECURSOR DESCRIPTION SHEET

LER No.: 293/85-027
Event Description: LPCI Made Inoperable for Modifications
Date of Event: September 19, 1985
Plant: Pilgrim 1

EVENT DESCRIPTION

Sequence

The LPCI was out of service for equipment qualification work when the loop "B" injection valve failed to open in a test because of a failed motor. The motor failed from aging and wear.

Corrective Action

The valve was repaired.

Plant/Event Data

Systems Involved:
LPCI

Components and Failure Modes Involved:
Injection valve — failed in test

Component Unavailability Duration: 32.5 h
Plant Operating Mode: 1 (100% power)
Discovery Method: Testing
Reactor Age: 13.3 years
Plant Type: BWR

Comments

The LER indicates the "LPCI system" was inoperable and that only RHR train A and LPCS were available, which implies RHR B train B was inoperable. Therefore, LPCI injection capability and RHR train B were assumed unavailable.

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MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient, LOOP, Base case
small LOCA
(postulated
event)

Branches Impacted and Branch Nonrecovery Estimate

LPCI 1.0 Not recoverable within ~30 min
(assumed)

RHR Base case One train unavailable

Plant Models Utilized

BWR plant Class C

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CONDITIONAL CORE DAMAGE CALCULATIONS

LER Number: 293/85-027
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Event Date: 9/19/85
Plant: Pilgrim

UNAVAILABILITY, DURATION= 32.5

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

| | |
|-------|-----------|
| TRANS | 3.712E-02 |
| LOOP | 1.442E-04 |
| LOCA | 3.591E-05 |

SEQUENCE CONDITIONAL PROBABILITY SUMS

| End State/Initiator | Probability |
|---------------------|---------------|
| CV | |
| TRANS | (2.225E-13) |
| LOOP | (9.805E-14) |
| LOCA | (4.503E-15) |
| Total | (3.250E-13) |

| | |
|-------|-----------|
| CD | |
| TRANS | 1.398E-06 |
| LOOP | 3.260E-08 |
| LOCA | 8.109E-09 |
| Total | 1.439E-06 |

| | |
|-------|-----------|
| ATWS | |
| TRANS | 0.000E+00 |
| LOOP | 0.000E+00 |
| LOCA | 0.000E+00 |
| Total | 0.000E+00 |

DOMINANT SEQUENCES

End State: CV Conditional Probability: 1.046E-11

135 TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS -COND/F

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W.PCS RHR(SDC) -RHR(SPCOOL)/-LPCI.RHR(SDC)

End State: CD Conditional Probability: 1.243E-06

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)

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 | 1.243E-06 * | 1.073E-01 |
| 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 | 1.282E-07 | 3.828E-02 |
| 135 | TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS -COND/FW.PCS RHR(SDC) -RHR(SPCOOL)/-LPCI.RHR(SDC) | CV | 1.046E-11 * | 2.285E-02 |
| 139 | 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) -RHR(SPCOOL)/-LPCI.RHR(SDC) | CV | 5.385E-12 | 1.177E-02 |
| 156 | TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS -COND/FW.PCS RHR(SDC) -RHR(SPCOOL)/-LPCI.RHR(SDC) | CV | 5.055E-13 | 4.008E-02 |
| 227 | LOOP -EMERG.POWER SCRAM -SLC.OR.RODS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS -LPCS RHR(SDC) -RHR(SPCOOL)/-LPCI.RHR(SDC) | CV | 3.782E-12 | 3.461E-02 |

* 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:bwrcrtree.cmp
DATA: b:pilgprob.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 | |

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| | | | |
|--------------------------------|-------------------------|-----------------------|-----------|
| SLC.DR.RODS | 1.000E-02 | 1.000E+00 | 4.000E-02 |
| PCS/TRANS | 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 | 1.320E-02 | 1.000E+00 | |
| EMERG.POWER | 2.850E-03 | 5.100E-01 | |
| FW/PCS.TRANS | 2.900E-01 | 3.400E-01 | |
| FW/PCS.LOCA | 4.000E-02 | 3.400E-01 | |
| HPCI | 1.000E-01 | 5.700E-01 | |
| RCIC/TRANS.DR.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 | 3.000E-03 | 3.400E-01 | |
| LPCI(RHR)/LPCS | 4.000E-04 > 1.000E+00 | 3.400E-01 > 1.000E+00 | |
| Branch Model: 1.OF.2 | | | |
| Train 1 Cond Prob: | 4.000E-03 > Unavailable | | |
| Train 2 Cond Prob: | 1.000E-01 > Unavailable | | |
| 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 > 1.180E-01 | 3.400E-01 | |
| Branch Model: 1.OF.2+ser | | | |
| Train 1 Cond Prob: | 4.000E-03 > Failed | | |
| Train 2 Cond Prob: | 1.000E-01 | | |
| Serial Component Probability: | 2.000E-02 | | |
| 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
08-14-1986
13:28:41

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