

## PRECURSOR DESCRIPTION SHEET

LER No.: 254/84-014  
Event Description: Two LPCI Injection Valves Fail to Open  
Date of Event: August 8, 1984  
Plant: Quad-Cities 1

### EVENT DESCRIPTION

#### Sequence

During the cycle 7 refueling outage at 1625 h, while the operator was in the process of starting the SDC mode of the RHR system, both LPCI injection valves would not open. RHR could be accomplished using the RWCS and the RHR system with the LPCI "B" valve 25% open.

The cause of the failure was a personnel error in 1980 during modifications: a wiring design error. It went undetected.

#### Corrective Action

The valve stems were removed and replaced. The wiring correction was made, and the wiring diagram was corrected to reflect the change.

#### Plant/Event Data

Systems Involved:  
LPCI

Components and Failure Modes Involved:  
LPCI valves — failed to open on demand

Component Unavailability Duration: 4 years (720 h assumed for analysis;  
assumed failed during last surveillance test  
Plant Operating Mode: 2 (0% power)  
Discovery Method: In operation  
Reactor Age: 12.9 years  
Plant Type: BWR

#### Comments

The valve in the "B" LPCI train was 25% open. That percentage has been assumed to be insufficient to supply adequate flow for decay DHR.

Event Identifier: 254/84-014

## MODELING CONSIDERATIONS AND DECISIONS

### Initiators Modeled and Initiator Nonrecovery Estimate

Postulated transient, LOOP, and small-break LOCA Base

### Branches Impacted and Branch Nonrecovery Estimate

LPCI	1.0	No recovery assumed possible based on event description
RHR (SDC)	1.0	No recovery assumed possible based on event description
RHR SW	Base case	No recovery assumed possible based on event description

### Plant Models Utilized

BWR plant Class C

Event Identifier: 254/84-014

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 254/84-014  
 Event Description: Two LPCI Injection Valves Fail to Open  
 Event Date: 8/8/84  
 Plant: Quad Cities 1

UNAVAILABILITY, DURATION= 720

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	8.2E-01
LOOP	3.2E-03
LOCA	8.0E-04

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	( 5.6E-11 )
LOOP	( 2.0E-11 )
LOCA	( 1.6E-12 )
Total	( 7.8E-11 )
CD	
TRANS	6.4E-04
LOOP	2.1E-05
LOCA	5.4E-06
Total	6.7E-04
ATWS	
TRANS	0.0E+00
LOOP	0.0E+00
LOCA	0.0E+00
Total	0.0E+00

DOMINANT SEQUENCES

End State: CV                      Conditional Probability: 4.8E-09

Event Identifier: 254/84-014

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)

End State: CD Conditional Probability: 5.7E-04

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	Prob	N Rec**
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	5.7E-04 *	3.2E-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	5.9E-05	1.1E-01
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	4.8E-09 *	7.3E-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	2.5E-09	3.8E-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(SPCOO L)/-LPCI.RHR(SDC)	CV	2.9E-10	1.3E-01
160	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS COND/FW.PCS -LPCS RHR(SDC) -RHR (SPCOOL)/-LPCI.RHR(SDC)	CV	1.5E-10	6.6E-02
201	LOOP -EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM -SRV.CLOSE -HP CI RHR(SDC) RHR(SPCOOL)/-LPCI.RHR(SDC) C.I.AND.V/RHR(SD C).RHR(SPCOOL)	CD	2.0E-05	1.1E-01
227	LOOP -EMERG.POWER SCRAM -SLC.OR.RODS HPCI RCIC/TRANS.OR.LOO P -SRV.ADS -LPCS RHR(SDC) -RHR(SPCOOL)/-LPCI.RHR(SDC)	CV	2.5E-09	1.1E-01
315	LOCA SCRAM -SLC.OR.RODS PCS/LOCA FW/PCS.LOCA HPCI -SRV.ADS -COND/FW.PCS RHR(SDC) -RHR(SPCOOL)/-LPCI.RHR(SDC)	CV	1.5E-10	4.3E-02

\* dominant sequence for end state

\*\* non-recovery credit for edited case

Note: For unavailabilities, conditional probability values are differential values which reflect the added risk due to failures associated with an event. Parenthetical values indicate a reduction in risk compared to a similar period without the existing failures.

MODEL: b:\bwrctree.cmp

DATA: b:\qcprob.cmp

No Recovery Limit

Event Identifier: 254/84-014

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.1E-03	1.0E+00	
LOOP	1.3E-05	3.4E-01	
LOCA	3.3E-06	3.4E-01	
SCRAM	4.1E-04	1.0E+00	
SLC.DR.RODS	1.0E-02	1.0E+00	4.0E-02
PCS/TRANS	1.7E-01	1.0E+00	
PCS/LOCA	1.0E+00	1.0E+00	
SRV.CHALL/TRANS.-SCRAM	1.0E+00	1.0E+00	
SRV.CHALL/TRANS.SCRAM	1.0E+00	1.0E+00	
SRV.CHALL/LOOP.-SCRAM	1.0E+00	1.0E+00	
SRV.CHALL/LOOP.SCRAM	1.0E+00	1.0E+00	
SRV.CLOSE	1.6E-02	1.0E+00	
EMERG.POWER	2.9E-03	5.1E-01	
FW/PCS.TRANS	2.9E-01	3.4E-01	
FW/PCS.LOCA	4.0E-02	3.4E-01	
HPCI	1.0E-01	5.7E-01	
RCIC/TRANS.DR.LOOP	6.7E-02	5.7E-01	
RCIC/LOCA	1.0E+00	1.0E+00	
CRD	1.0E-02	1.0E+00	4.0E-02
SRV.ADS	6.7E-03	1.0E+00	4.0E-02
COND/FW.PCS	1.0E+00	3.4E-01	
LPCS	3.0E-03	3.4E-01	
LPCI(RHR)/LPCS	4.0E-04 > 1.0E+00	3.4E-01 > 1.0E+00	
Branch Model: 1.OF.2			
Train 1 Cond Prob:	4.0E-03 > Failed		
Train 2 Cond Prob:	1.0E-01 > Failed		
RHRSW/LPCS.LPCI.TRANS	5.0E-01 > 1.0E+00	1.0E+00	4.0E-02
Branch Model: 1.OF.1+opr			
Train 1 Cond Prob:	5.0E-01 > Failed		
RHRSW/LPCS.LPCI.LOOP	5.0E-01 > 1.0E+00	1.0E+00	4.0E-02
Branch Model: 1.OF.1+opr			
Train 1 Cond Prob:	5.0E-01 > Failed		
RHRSW/LPCS.LPCI.LOCA	5.0E-01 > 1.0E+00	1.0E+00	4.0E-02
Branch Model: 1.OF.1+opr			
Train 1 Cond Prob:	5.0E-01 > Failed		
RHR(SDC)	2.0E-02 > 1.0E+00	3.4E-01 > 1.0E+00	
Branch Model: 1.OF.2+ser			
Train 1 Cond Prob:	4.0E-03 > Failed		
Train 2 Cond Prob:	1.0E-01 > Failed		
Serial Component Prob:	2.0E-02		
RHR(SDC)/-LPCI	2.0E-02	3.4E-01	
RHR(SDC)/LPCI	1.0E+00	1.0E+00	
RHR(SPCOOL)/-LPCI.RHR(SDC)	2.0E-02	1.0E+00	
RHR(SPCOOL)/LPCI.RHR(SDC)	5.2E-01	1.0E+00	

Event Identifier: 254/84-014

C.I.AND.V/RHR(SDC).RHR(SPCOOL) 1.0E+00

3.4E-01

\*\*\* forced

Minarick  
04-11-1987  
13:47:04

Event Identifier: 254/84-014