PRECURSOR DESCRIPTION SHEET

LER No.:   249/86-013
Event Description: HPCI and one train of the core spray and LPCI
                   systems are inoperable
Date of Event: August 27, 1986
Plant: Dresden 3

EVENT DESCRIPTION

Sequence

    Dresden 3 was in the run mode at 19% power with the HPCI system
declared inoperable for repairs (reason not stated). At 0030 h during
surveillance testing, the train B CSS full-flow-test valve (3-1042-4B)
was discovered to be damaged, so the valve would not close; the B core
spray subsystem was also unpressurized. In addition, the LPCI system
minimum-flow valve (3-1501-13A) showed a double position indication —
the valve was in midposition. The 2/3 DG failed to close manually onto
bus 33-1; however, the generator was able to be synchronized manually to
bus 23-1 without incident. In the event of a LOCA, the DG would have
closed automatically on bus 33-1. A unit shutdown was begun.
    Investigation revealed that valve 3-1042-4B (the "B" pump CSS full-
flow-test valve) had a fractured motor-operator housing. The torque
switch failed and allowed the motor to drive the valve disk into the
valve seat until the motor housing was fractured. The torque switch was
incorrectly installed in the reverse direction.
    Investigation revealed that the handwheel retaining-ring was dis-
engaged and resting atop the handwheel bearing of the Limitorque motor-
operator for the LPCI system minimum-flow valve (3-1501-13A). The valve
was opened manually.
    Investigation revealed that DG 2/3 failed to close onto bus 33-1
because a terminal block screw was loose in junction box 3TB-187. Cold
shutdown was achieved at 2007 h.

Corrective Action

    The torque switch on valve 3-1042-4B (CSS full-flow-test valve) was
installed correctly, and the motor housing was replaced. The handwheel
retaining ring for the LPCI system minimum-flow valve (3-1501-13A) was
correctly installed. The loose terminal block screw in the DG 2/3
junction box 3TB-187 was tightened.

Event Identifier: 249/86-013

Plant/Event Data

Systems Involved:
    LPCI, core spray, emergency power, and HPCI

Components and Failure Modes Involved:
    Pump B CSS full-flow-test valve — failed to close in test
    LPCI system minimum-flow valve — failed in midposition in test
    DG 2/3 — failed to close onto bus 33-1 in manual mode operation in
      test
    HPCI — inoperable (reason not stated)

Component Unavailability Duration: 15 d
Plant Operating Mode: 1 (19% power)
Discovery Method: Testing
Reactor Age: 15.6 years
Plant Type: BWR

Comments

    Dresden station has three DGs. Each unit has one dedicated DG and
the third is a swing DG (2/3) between both. One train of each unit's
ECCS is supported by DG 2/3. Failure of DG 2/3 would prevent emergency
power to one ECCS train. The SDC system is independent of LPCI so it
was not affected.

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Postulated transient   Base case nonrecovery
Postulated LOOP
Postulated LOCA

Branches Impacted and Branch Nonrecovery Estimate

HPCI   1.0   Out of service and assumed unavailable
LPCS   Base case   Assumed one of two trains fails in
                              test
LPCI   Base case   Assumed one of two trains fails in
                              test

Plant Models Utilized

BWR plant Class B

Event Identifier: 249/86-013

CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

Event Identifier: 249/86-013
Event Description: HPCI and One Train of LPCS and LPCI Are Inoperable
Event Date: 8/27/86
Plant: Dresden 3

UNAVAILABILITY, DURATION= 360

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS   3.1E-01
LOOP   2.0E-03
LOCA   5.9E-04

SEQUENCE CONDITIONAL PROBABILITY SUMS

      End State/Initiator   Probability

CV

      TRANS   1.4E-06
      LOOP   6.1E-07
      LOCA   2.5E-09

      Total   2.0E-06

CD

      TRANS   6.8E-07
      LOOP   1.7E-06
      LOCA   3.4E-07

      Total   2.7E-06

ATWS

      TRANS   0.0E+00
      LOOP   0.0E+00
      LOCA   0.0E+00

      Total   0.0E+00

DOMINANT SEQUENCES

End State: CV   Conditional Probability: 9.2E-07

Event Identifier: 249/86-013

130 TRANS SCRAM -SLC.OR.RODS PCS/TRANS FW/PCS.TRANS HPCI -SRV.ADS -COND/FW.PCS -SDC

End State: CD   Conditional Probability: 1.3E-06

213 LOOP -EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM SRV.CLOSE HPCI SRV.ADS

SEQUENCE CONDITIONAL PROBABILITIES

	Sequence	End State	Prob	N Rec**
109	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM -SRV.CLOSE IS OL.COND FW/PCS.TRANS HPCI CRD SRV.ADS	CD	1.8E-07	2.4E-01
117	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI SRV.ADS	CD	4.2E-07	2.4E-01
130	TRANS SCRAM -SLC.OR.RODS PCS/TRANS FW/PCS.TRANS HPCI -SRV. ADS -COND/FW.PCS -SDC	CV	9.2E-07 *	2.2E-01
134	TRANS SCRAM -SLC.OR.RODS PCS/TRANS FW/PCS.TRANS HPCI -SRV. ADS COND/FW.PCS -LPCS -SDC	CV	4.6E-07	1.1E-01
147	TRANS SCRAM -SLC.OR.RODS PCS/TRANS FW/PCS.TRANS HPCI SRV. ADS	CD	6.2E-0E	2.4E-01
207	LOOP -EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM -SRV.CLOSE IS OL.COND HPCI CRD SRV.ADS	CD	7.9E-08	2.3E-01
212	LOOP -EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM SRV.CLOSE HP CI -SRV.ADS LPCS LPCI FIREWTR.OR.OTHER/LPCS.LPCI/LOOP	CD	7.4E-08	7.7E-02
213	LOOP -EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM SRV.CLOSE HP CI SRV.ADS	CD	1.3E-06 *	2.3E-01
222	LOOP -EMERG.POWER SCRAM -SLC.OR.RODS HPCI -SRV.ADS -LPCS -SD C	CV	5.9E-07	3.1E-01
238	LOOP EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM -SRV.CLOSE IS OL.COND HPCI	CD	8.6E-08	2.6E-01
240	LOOP EMERG.POWER -SCRAM SRV.CHALL/LOOP.-SCRAM SRV.CLOSE HP CI	CD	7.2E-08	2.6E-01
309	LOCA -SCRAM PCS/LOCA FW/PCS.LOCA HPCI SRV.ADS	CD	3.4E-07	1.2E-01

* 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.

SEQUENCE MODEL: c:\asp\newmodel\bwrbtree.cmp
BRANCH MODEL: c:\asp\newmodel\dresden.txt
PROBABILITY FILE: c:\asp\newmodel\bwr_c.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Event Identifier: 249/86-013

Branch	System	Non-Recov	Opr Fail
TRANS	8.6E-04	1.0E+00	
LOOP	1.7E-05	3.2E-01	
LOCA	3.3E-06	5.0E-01	
SCRAM	3.5E-04	1.0E+00	
SLC.OR.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	8.0E-01	
FW/PCS.TRANS	2.9E-01	3.4E-01	
FW/PCS.LOCA	4.0E-02	3.4E-01	
HPCI	2.9E-02 > 1.0E+00	7.0E-01 > 1.0E+00	
Branch Model: 1.0F.1			
Train 1 Cond Prob:	2.9E-02 > Unavailable		
ISOL.COND	2.0E-02	1.0E+00	
CRD	1.0E-02	1.0E+00	4.0E-02
SRV.ADS	3.7E-03	7.1E-01	4.0E-02
COND/FW.PCS	1.0E+00	3.4E-01	
LPCS	2.0E-03 > 1.0E-01	3.4E-01	
Branch Model: 1.0F.2			
Train 1 Cond Prob:	2.0E-02 > Failed		
Train 2 Cond Prob:	1.0E-01		
LPCI	1.0E-03 > 1.0E-01	7.1E-01	
Branch Model: 1.0F.2			
Train 1 Cond Prob:	1.0E-02 > Failed		
Train 2 Cond Prob:	1.0E-01		
FIREWTR.OR.OTHER/LPCS.LPCI/TRA	1.0E+00	1.0E+00	
FIREWTR.OR.OTHER/LPCS.LPCI/LOO	1.0E+00	1.0E+00	
FIREWTR.OR.OTHER/LPCS.LPCI/LOC	1.0E+00	1.0E+00	
SDC	2.9E-03	3.4E-01	
LPCI(CC)	1.0E-03	3.4E-01	
LPCI(CC)/LPCI	1.0E+00	1.0E+00	
C.I.AND.V/LPCI	1.0E+00	3.4E-01	

* branch model file
** forced

Minarick
02-24-1988
12:02:05

Event Identifier: 249/86-013