

## PRECURSOR DESCRIPTION SHEET

LER No.: 277/86-003  
Event Description: DG trip in test causes scram  
Date of Event: January 24, 1986  
Plant: Peach Bottom 2

### EVENT DESCRIPTION

#### Sequence

Before the event, the DG E-2 was in service supplying the E-22 and E-23 emergency buses in preparation for a loss of power test on Unit 3.

At 0612 h, DG E-2 automatically tripped, thereby removing all power to the E-22 and E-23 buses. Loss of bus E-22 caused MSIVs AO-2-2-86B and AO-2-2-86D to close inadvertently (their solenoids deenergized). The redundant dc solenoids were later found failed. Closure of these valves resulted in a high core-flux condition, which was sufficient to initiate a full reactor scram. Immediately following the scram, reactor water level decreased to -32 in. Group II and III isolations occurred properly at the 0-in. water level. The speeds of all three reactor feed pumps automatically increased to recover reactor water level. At +45 in. the reactor feed pumps and the main turbine received trip signals indicating high reactor water level. The feed pumps and main turbine tripped properly. Both reactor recirculation pumps tripped properly during the 13.2-kV bus fast transfer. At 0634 h reactor feed pump C was reset from the high-water-level trip and placed in service to control reactor water level. Both recirculation pumps were returned to service by 0645 h.

Additionally, Group II and III outboard isolations occurred on Unit 3 as a result of this event.

#### Corrective Action

A review of the most recently completed surveillance test indicated that all MSIV ac and dc coils had satisfactory operating currents when tested 2 d before the event. The dc solenoids were replaced on January 25.

#### Plant/Event Data

##### Systems Involved:

Emergency power, main steam isolation, and MFW

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Components and Failure Modes Involved:  
DG — failed in test  
MSIVs — failed closed during operation

Component Unavailability Duration: NA  
Plant Operating Mode: 1 (95% power)  
Discovery Method: Testing  
Reactor Age: 12.3 years  
Plant Type: BWR

Comments

None

MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Transient Nonrecoverable

Branches Impacted and Branch Nonrecovery Estimate

MFW	0.04	Recoverable from control room (tripped off on high head after scram)
Emergency power system	Base case	DG train E-2 is unavailable
RHR/shutdown cooling	Base case	One train unavailable because of loss buses
RHR/SDC	Base case	One train unavailable because of loss buses
RHR service water	Base case	One train unavailable because of loss buses
SLC/rod insert	Base case	One train unavailable because of loss buses
LPCS	Base case	One train unavailable because of loss buses

Plant Models Utilized

BWR plant Class C

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End State: ATWS

Conditional Probability: 1.7E-05

173 TRANS SCRAM SLC.OR.RODS

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	6.4E-05 *	1.1E-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	2.6E-06	4.6E-03
119	TRANS -SCRAM PCS/TRANS SRV.CHALL/TRANS.-SCRAM SRV.CLOSE FW /PCS.LOCA HPCI RCIC/LOCA SRV.ADS	CD	1.1E-05	1.7E-01
134	TRANS SCRAM -SLC.OR.RODS PCS/TRANS -SRV.CLOSE FW/PCS.TRANS HPCI RCIC/TRANS.OR.LOOP -SRV.ADS -COND/FW.PCS -RHR(SDC)	CV	6.8E-09	1.3E-02
138	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)	CV	3.5E-09	6.6E-03
155	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS -COND/FW.PCS -RHR(SDC)	CV	5.2E-08 *	1.6E-01
159	TRANS SCRAM -SLC.OR.RODS PCS/TRANS SRV.CLOSE FW/PCS.LOCA HPCI RCIC/LOCA -SRV.ADS COND/FW.PCS -LPCS -RHR(SDC)	CV	2.7E-08	8.0E-02
173	TRANS SCRAM SLC.OR.RODS	ATWS	1.7E-05 *	1.0E+00

\* dominant sequence for end state

\*\* non-recovery credit for edited case

SEQUENCE MODEL: c:\asp\newmodel\bwrcree.cmp

BRANCH MODEL: c:\asp\newmodel\peach.txt

PROBABILITY FILE: c:\asp\newmodel\bwrc\_c.pro

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

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	1.0E+00	
Branch Model: 1.0F.1			
Train 1 Cond Prob:	1.7E-01 > Unavailable		
PCS/LOCA	1.0E+00	1.0E+00	

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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	3.6E-02	1.0E+00	
EMERG.POWER	2.7E-05	8.0E-01	
FW/PCS.TRANS	4.6E-01 > 1.0E+00	3.4E-01 > 4.0E-02	
Branch Model: 1.0F.1			
Train 1 Cond Prob:	4.6E-01 > Unavailable		
FW/PCS.LOCA	1.0E+00	3.4E-01	
HPCI	2.9E-02	7.0E-01	
RCIC/TRANS.OR.LOOP	6.0E-02	7.0E-01	
RCIC/LOCA	1.0E+00	1.0E+00	
CRD	1.0E-02 > 1.0E+00	1.0E+00	4.0E-02
Branch Model: 1.0F.1+opr			
Train 1 Cond Prob:	1.0E-02 > Unavailable		
SRV.ADS	3.7E-03	7.1E-01	4.0E-02
COND/FW.PCS	1.0E+00	3.4E-01	
LPCS	3.0E-03 > 3.0E-02	3.4E-01	
Branch Model: 1.0F.2			
Train 1 Cond Prob:	3.0E-02		
Train 2 Cond Prob:	1.0E-01 > Unavailable		
LPCI(RHR)/LPCS	1.0E-03 > 1.0E-02	7.1E-01	
Branch Model: 1.0F.2			
Train 1 Cond Prob:	1.0E-02		
Train 2 Cond Prob:	1.0E-01 > Unavailable		
RHR(SW)/LPCS.LPCI.TRANS	5.0E-01	1.0E+00	4.0E-02
RHR(SW)/LPCS.LPCI.LOOP	5.0E-01	1.0E+00	4.0E-02
RHR(SW)/LPCS.LPCI.LOCA	5.0E-01	1.0E+00	4.0E-02
RHR(SDC)	2.1E-02 > 3.0E-02	3.4E-01	
Branch Model: 1.0F.2+ser			
Train 1 Cond Prob:	1.0E-02		
Train 2 Cond Prob:	1.0E-01 > Unavailable		
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	
C.I.AND.V/RHR(SDC).RHR(SPCOOL)	1.0E+00	3.4E-01	

\* branch model file

\*\* forced

Minarick  
02-24-1988  
12:06:26

Event Identifier: 277/86-003