

GROUP 10 SEQUENCE OF EVENTS REVIEW

3:24:21 6/ 9/85

1:35:0:355	Q613	MFPT 1	TRIP
1:35:29: 95	P864	RPS CH 2 RC HI PRESS	TRIP
1:35:29:100	Q818	RPS CH 2 CH TRIP	TRIP
1:35:29:990	P868	RPS CH 3 RC HI PRESS	TRIP
1:35:29:995	Q826	RPS CH 3 CH TRIP	TRIP
1:35:30: 60	Q181	CRD CH B/D ANY TRIP DEVICE	TRIP
1:35:30: 60	X038	T-G MASTER TURB TRIP	TRIP
1:35:30: 65	Q180	CRD CH A/C ANY TRIP DEVICE	TRIP
1:35:30: 95	X030	T-G MASTER TRIP SOLENOIDS	TRIP
1:35:30:145	Q266	CRD TRIP CONFIRM	TRIP
1:35:30:190	P858	RPS CH 1 RC HI PRESS	TRIP
1:35:30:195	Q810	RPS CH 1 CH TRIP	TRIP
1:35:30:285	X033	T-G MECH TRIP SOLENOID TURB TRIP	TRIP
1:35:30:310	X032	T-G MECH TRIP VLV	TRIP
1:35:30:370	P873	RPS CH 4 RC HI PRESS	TRIP
1:35:30:370	Q834	RPS CH 4 CH TRIP	TRIP
1:35:30:540	A850	RPS CH 1 FLUX-DFLUX-FLW BSTBL	TRIP
1:35:30:545	A869	RPS CH 4 FLUX-DFLUX-FLW BSTBL	TRIP
1:35:30:550	A856	RPS CH 2 FLUX-DFLUX-FLW BSTBL	TRIP
1:35:30:550	A862	RPS CH 3 FLUX-DFLUX-FLW BSTBL	TRIP
1:35:30:935	Q963	SFRCS FULL TRIP	TRIP
1:35:34: 70	Q963	SFRCS FULL TRIP	NORM
1:35:41:675	P869	RPS CH 3 RC LO PRESS BSTBL	TRIP
1:35:41:710	P859	RPS CH 1 RC LO PRESS BSTBL	TRIP
1:35:41:745	P874	RPS CH 4 RC LO PRESS BSTBL	TRIP
1:35:42:230	P863	RPS CH 2 RC LO PRESS BSTBL	TRIP
1:35:54:930	J428	GEN REVERSE PWR	TRIP
1:35:54:950	X026	SWYD ACB 34561	OPEN
1:35:54:950	X025	SWYD ACB 34560	OPEN
1:35:54:955	I425	GEN GROUND CURRENT	HIGH
1:35:55: 50	I425	GEN GROUND CURRENT	NORM
1:35:55:330	J428	GEN REVERSE PWR	NORM
1:41: 4:345	Q963	SFRCS FULL TRIP	TRIP
1:43:23:255	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	INHIB
1:43:58:160	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	NORM
1:48:51:420	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	INHIB
1:48:51:745	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	NORM
1:50:10:320	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	INHIB
1:50:10:650	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	NORM
1:51:20:535	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	INHIB
1:51:21: 45	Q841	RPS SU RATE RWD WTHDRWL INHIBIT	NORM
1:51:21: 85	P701	SFRCS OP HALF/FULL TRIP ,SG 1	TRIP
1:51:21:910	P702	SFRCS OP HALF/FULL TRIP ,SG 2	TRIP
1:51:38:895	P702	SFRCS OP HALF/FULL TRIP ,SG 2	NORM
1:51:40:265	P701	SFRCS OP HALF/FULL TRIP ,SG 1	NORM
2: 2:46:990	Q634	MFPT 2	TRIP

Post Trip Review

The following review must be completed for each reactor trip (except normal tripping of CRD during heatups and cooldowns) even if a unit restart is not in progress.

1.1 Plant Pre-Trip Conditions (to be completed by the Shift Technical Advisor and Operations personnel after the plant stabilization is complete).

(A) Reactor power prior to the trip: 90 %

Note any runback that occurred: Following the MFP #1 trip,
an ICS limited by FW runback was initiated after the
loss of MFP #2 runback

(B) List any ICS stations in manual prior to the trip: _____

MFP 1-2 (HIS 36A) was in manual

(C) List any testing in progress prior to the trip: _____

none

(D) List any safety systems inoperable prior to the trip: _____

none

(E) List any other abnormal plant conditions contributing to the plant trip (inoperable main feedwater pump, high condenser vacuum, etc.).

none

Completed By Ted Yang

Date 6-9-85

1.2 Plant Post Trip Conditions (to be completed by the Shift Technical Advisor and Shift Supervisor after the plant stabilization is complete).

- (A) Did any of the following occur? (Use Control Room recorders, computer information, or operator observations.)

Did the PORV actuate?	<u>No</u>
Did the pressurizer code safety valves actuate?	<u>X</u>
Did either steam generator level exceed 82.5%?	<u>X</u>
Did SG level go below 18"?	<u>X</u>
Was SFAS actuated?	<u>X</u>
Did pressurizer level decrease below 8 inches?	<u>X</u>
Did pressurizer level exceed 300 inches?	<u>2)</u>
Was the Emergency Plan activated?	<u>3)</u>
Did the SFRCS actuate?	<u>4)</u>

If any of the above did occur, determine the cause and describe below:

- 1) Porv lifted and controlled at 2300 psig RCS pressure
 - 2) Pressurizer level increased to 310" following LOFW
(during RC heatup)
 - 3) At the time of the LOFW, a Site Area Emergency would
have been called. However, before the plan was entered, AFW
was restored. At the Shift Supervisor's discretion, an Unusual
event was declared
 - 4) See attached page
- (B) Write a short description of the cause of the trip, the reactor trip sequence of events which resulted in the trip, and any actions taken to prevent recurrence. (Review the Post Trip Review, Alarm Printout, and Sequence of Events Printouts, if available.)

The reactor tripped on high pressure since it couldn't
run back fast enough following the MFP trip. See
SFRCS initiation on attached page. For an unknown
cause, it appears that ICS increased FW demand
prior to the trip. Only MFP 1-1 could respond and it
couldn't handle the demand.

Shift Technical Advisor Ted Gary Date 6-9-85

Shift Supervisor T. Seckman Date 6/9/85

4) SFRCS actuation:

Sequence of events shows an SFRCS trip at 0135 along with the reactor trip. MSIVs went closed at the same time, however, there does not appear to be further substantiation of ^{automatic} SFRCS initiation. For example, ARTS initiation does not show in the sequence of events ^(also no annunciators). No plant parameters were in a state to trip SFRCS except the single tripped MFP.

During the event, after the MSIVs closed, the manual SFRCS pushbuttons were used. However, rather than initiating SFRCS on low level, SFRCS pushbuttons for both OTSG low pressure trips were pushed. SFRCS was quickly reset and tripped on low level as desired. Both AFPs initially ran, but tripped via the trip throttle valves. AF 599 and AF 608 stuck closed until manually opened off their seats.

Further data analysis and interviews are necessary to get a complete resolution.

Ted Yang 6-9-85
To Selman 6/9/85

1.3 Safety Review of Transient (to be completed by Shift Technical Advisor and Shift Supervisor).

- (A) Verify no safety concerns* have been identified in the review of the trip.

*A safety concern is defined as a safety related system not performing the design function for which it was intended.

Shift Supervisor _____ Date _____

Shift Technical Advisor _____ Date _____

- (B) Verify no safety limits exceed during the transient (see Technical Specification 2.1). If any safety limits has been exceeded, operation shall not be resumed until authorized by the Commission as per 10CFR50.36 Section C.

Shift Supervisor T. Sullivan Date 6/1/85

Shift Technical Advisor Ted Jones Date 6-9-85

If the cause of the unit trip cannot be determined, or the Sequence of Events for the reactor trip cannot be determined, or any safety concern identified, a unit restart cannot proceed until a Station Review Board review of the transient has been completed.

After this form is completed, it should be routed to the Operations Engineer for his review.

* Operations Engineer W.D. Olan Date 6-10-85

After the Operations Engineer review, his attachment should be routed to the Technical Section to be included in the trip files.

* Safety concerns were noted in that APW did not function properly. Water was added to S/G from startup pump with S/G possibly dry. MSIV's closed without full trip. AF 599+608 appeared to stick closed. PORV seemed to remain open too long on last cycle. TBV on line 2 was damaged. SW was momentarily injected to SG. MFP 1-1 tripped on overspeed

POST TRIP REVIEW

6/9/85

NOT TO USE :

THE SCAN FREQUENCY AND SCALE OF DAM

(SOME PERS ARE WORSE OR A LOW FREQUENCY)

(AS MAKE SOME PERS HAVE COSTLY DAM,

THIS DAM IS NOT THE BEST REPRESENTATION OF THE
PLANT DAM. IT IS CURRENTLY ONLY USED AS

A SUPPLEMENT TO THE DAM EQUIPMENT AND

PLANT SYSTEM CONTROL.

[illegible]

096*5-1	500*5-1	802*5-1	115*5-1	1*16-1	5*26-1	9*16-1	9*16-1	61:05:11
518*5-1	500*5-1	802*5-1	802*5-1	5*16-1	1*16-1	9*16-1	1*16-1	6:105:11
518*5-1	855*5-1	501*5-1	021*5-1	5*16-1	1*16-1	1*16-1	1*16-1	60:62:11
928*5-1	512*5-1	501*5-1	021*5-1	1*16-1	1*16-1	1*16-1	1*16-1	85:162:11
851*5-1	512*5-1	501*5-1	820*5-1	2*16-1	5*16-1	1*16-1	1*16-1	61:62:11
851*5-1	212*5-1	190*5-1	820*5-1	2*16-1	1*16-1	2*16-1	2*16-1	6:162:11
226*5-1	212*5-1	190*5-1	820*5-1	0*16-1	0*16-1	2*16-1	2*16-1	88:82:11
261*5-1	528*5-1	821*5-1	821*5-1	8*16-1	0*26-1	6*06-1	2*16-1	85:82:11
261*5-1	052*5-1	191*5-1	250*5-1	6*16-1	5*26-1	9*16-1	6*16-1	61:82:11
698*5-1	052*5-1	191*5-1	250*5-1	8*16-1	5*26-1	8*16-1	1*16-1	6:182:11
698*5-1	115*5-1	060*5-1	250*5-1	8*16-1	5*26-1	6*16-1	6*16-1	55:122:11
259*5-1	021*5-1	516*5-1	918*5-1	5*16-1	5*16-1	2*16-1	8*16-1	08:122:11
259*5-1	021*5-1	516*5-1	156*5-1	5*16-1	1*16-1	5*16-1	8*16-1	02:122:11
259*5-1	021*5-1	516*5-1	156*5-1	5*16-1	8*16-1	2*16-1	5*16-1	5:122:11
259*5-1	021*5-1	516*5-1	156*5-1	5*16-1	0*26-1	2*16-1	2*16-1	68:92:11
259*5-1	021*5-1	516*5-1	918*5-1	5*16-1	9*16-1	5*16-1	5*16-1	85:192:11
259*5-1	021*5-1	516*5-1	918*5-1	5*16-1	9*16-1	5*16-1	5*16-1	61:92:11
259*5-1	650*5-1	516*5-1	918*5-1	5*16-1	1*16-1	2*16-1	1*16-1	6:192:11
259*5-1	650*5-1	516*5-1	918*5-1	2*16-1	1*16-1	2*16-1	2*16-1	68:52:11
259*5-1	650*5-1	516*5-1	918*5-1	2*16-1	9*16-1	5*16-1	2*16-1	85:152:11
259*5-1	650*5-1	516*5-1	918*5-1	2*16-1	1*16-1	2*16-1	1*16-1	61:52:11
259*5-1	650*5-1	516*5-1	918*5-1	5*16-1	1*16-1	2*16-1	1*16-1	6:152:11
259*5-1	650*5-1	516*5-1	918*5-1	5*16-1	1*16-1	2*16-1	1*16-1	68:162:11
259*5-1	650*5-1	516*5-1	918*5-1	5*16-1	8*16-1	2*16-1	5*16-1	85:162:11
259*5-1	650*5-1	516*5-1	918*5-1	5*16-1	8*16-1	2*16-1	2*16-1	61:62:11
115*5-1	650*5-1	816*5-1	918*5-1	2*16-1	8*16-1	5*16-1	1*16-1	6:162:11
115*5-1	650*5-1	516*5-1	918*5-1	2*16-1	9*16-1	2*16-1	1*16-1	68:52:11
115*5-1	650*5-1	888*5-1	918*5-1	5*16-1	9*16-1	5*16-1	5*16-1	85:52:11
299*5-1	650*5-1	586*5-1	918*5-1	5*16-1	9*16-1	5*16-1	2*16-1	61:52:11
115*5-1	650*5-1	586*5-1	918*5-1	2*16-1	1*16-1	2*16-1	2*16-1	6:152:11
115*5-1	650*5-1	888*5-1	918*5-1	2*16-1	9*16-1	5*16-1	5*16-1	88:22:11
115*5-1	650*5-1	888*5-1	918*5-1	8*16-1	1*16-1	5*16-1	2*16-1	85:22:11
115*5-1	650*5-1	888*5-1	918*5-1	2*16-1	1*16-1	8*16-1	2*16-1	61:22:11
115*5-1	650*5-1	888*5-1	918*5-1	2*16-1	1*16-1	5*16-1	5*16-1	6:122:11
115*5-1	650*5-1	888*5-1	918*5-1	2*16-1	1*16-1	8*16-1	2*16-1	55:122:11
115*5-1	650*5-1	888*5-1	918*5-1	2*16-1	1*16-1	2*16-1	2*16-1	28:122:11
115*5-1	586*5-1	888*5-1	918*5-1	2*16-1	8*16-1	5*16-1	2*16-1	02:122:11
115*5-1	586*5-1	888*5-1	918*5-1	5*16-1	8*16-1	5*16-1	1*16-1	6:122:11
115*5-1	650*5-1	888*5-1	918*5-1	5*16-1	1*16-1	5*16-1	1*16-1	88:162:11
115*5-1	650*5-1	586*5-1	888*5-1	2*16-1	1*16-1	2*16-1	2*16-1	85:162:11

1100

[illegible]

3125: 0 6/ 9/1985

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REACTION PROTECTION SYSTEM (RPS)

TIME	CH1 PR	CH2 PR	CH3 PR	CH4 PR	CH1 PR	CH2 PR	CH3 PR	CH4 PR
	N16 FLUX	N15 FLUX	N18 FLUX	N17 FLUX	N16 FLUX	N15 FLUX	N18 FLUX	N17 FLUX
	R795	RB00	RB10	RB20	R790	RB03	RB13	RB19
1140:45	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1140:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1141: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1141:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1141:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1141:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1142: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1142:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1142:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1142:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1143: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1143:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1143:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1143:50	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1144: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1144:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1144:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1144:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1145: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1145:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1145:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1145:57	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1146: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1146:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1146:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1146:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1147: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1147:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1147:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1147:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1148: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1148:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1148:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1148:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1149: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1149:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1149:34	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1149:49	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1150: 4	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513
1150:19	0.0	0.0	0.0	0.0	-0.038	-0.145	-0.282	-0.513

07 9/1985

CANDIDATE		NAME		ADDRESS		CITY		STATE		ZIP		COUNTRY		TELEPHONE		FAX		E-MAIL		WEBSITE		BIOGRAPHY		EDUCATION		EMPLOYMENT		MILITARY		AWARDS		HONORS		REFERENCES		NOTES	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
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WATER ALLOCATION CONTROL AND SYSTEM

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REACTION COOLANT SYSTEM

TIME	LOOP 1 HL6 ON TEMP	LOOP 1 HL6 TEMP	LOOP 2 HL6 TEMP	REP 1-1 DISCH TEMP	REP 2-1 DISCH TEMP	AVG P/21	LOOP 1 HL6 NRT PRESS (PSIG)	LOOP 2 HL6 NRT PRESS (PSIG)	AVG HL6 TEMP	AVG HL6 TEMP	PR-3M AVG LVL (IN)
140:05	555.2	554.5	555.7	553.5	553.5	554.4	2029.	2035.	147.0	147.0	67.2
140:49	555.2	554.5	555.7	553.5	553.5	554.4	2029.	2035.	147.0	147.0	67.2
141:0	554.9	554.6	555.0	553.0	553.0	554.4	2067.	2035.	147.0	147.0	70.5
141:19	554.5	554.6	552.7	554.0	554.0	554.1	2067.	2070.	147.0	147.0	70.5
141:34	554.2	554.8	553.2	554.0	554.0	554.1	2112.	2070.	147.0	147.0	70.5
141:49	554.1	554.1	553.6	554.1	554.1	554.1	2112.	2114.	147.0	147.0	90.0
142:0	554.2	554.7	554.6	554.6	554.6	554.1	2112.	2114.	147.0	147.0	90.0
142:19	554.5	554.4	554.6	554.6	554.6	554.8	2170.	2176.	147.0	147.0	90.0
142:34	555.1	556.6	556.3	556.3	556.3	554.8	2170.	2176.	147.0	147.0	106.4
142:49	555.6	557.4	557.0	557.0	557.0	555.9	2176.	2167.	147.0	147.0	106.4
143:0	556.2	557.8	557.6	557.6	557.6	555.9	2176.	2167.	147.0	147.0	106.4
143:19	556.8	558.1	558.2	558.2	558.2	557.1	2187.	2183.	147.0	147.0	106.4
143:34	557.4	558.6	558.6	558.6	558.6	557.1	2187.	2183.	147.0	147.0	136.8
143:50	557.9	559.2	559.2	559.2	559.2	558.1	2201.	2197.	147.0	147.0	136.8
144:0	558.4	559.8	559.9	559.9	559.9	558.1	2201.	2197.	147.0	147.0	136.8
144:19	559.0	560.7	560.5	560.5	560.5	559.2	2221.	2219.	147.0	147.0	136.8
144:34	559.5	561.5	561.2	561.2	561.2	559.2	2221.	2219.	147.0	147.0	136.8
144:49	560.2	562.1	562.0	562.0	562.0	560.7	2252.	2252.	147.0	147.0	164.7
145:0	560.8	562.7	562.7	562.7	562.7	560.7	2252.	2252.	147.0	147.0	164.7
145:19	561.5	563.5	563.5	563.5	563.5	561.9	2276.	2273.	147.0	147.0	164.7
145:34	562.1	564.3	564.3	564.3	564.3	561.9	2276.	2273.	147.0	147.0	164.7
145:57	562.7	565.1	565.4	565.4	565.4	563.4	2306.	2303.	147.0	147.0	164.7
146:0	563.4	566.0	566.0	566.0	566.0	563.4	2306.	2303.	147.0	147.0	164.7
146:19	564.1	566.8	566.8	566.8	566.8	564.9	2340.	2335.	147.0	147.0	196.0
146:34	564.9	567.6	567.6	567.6	567.6	564.9	2340.	2335.	147.0	147.0	228.5
146:49	565.7	568.8	568.8	568.8	568.8	566.5	2368.	2363.	147.0	147.0	228.5
147:0	566.5	569.9	569.9	569.9	569.9	566.5	2368.	2363.	147.0	147.0	228.5
147:19	567.4	570.9	570.9	570.9	570.9	568.4	2387.	2379.	147.0	147.0	228.5
147:34	568.3	571.9	571.9	571.9	571.9	568.4	2387.	2379.	147.0	147.0	228.5
147:49	569.2	572.9	572.9	572.9	572.9	570.4	2390.	2381.	147.0	147.0	228.5
148:0	570.2	574.0	574.0	574.0	574.0	570.4	2390.	2381.	147.0	147.0	228.5
148:19	571.2	575.0	575.0	575.0	575.0	572.4	2392.	2383.	147.0	147.0	228.5
148:34	572.2	576.2	576.2	576.2	576.2	572.4	2392.	2383.	147.0	147.0	228.5
148:49	573.2	577.5	577.5	577.5	577.5	574.6	2402.	2394.	147.0	147.0	228.5
149:0	574.0	578.2	578.2	578.2	578.2	574.6	2402.	2394.	147.0	147.0	228.5
149:19	575.4	579.4	579.4	579.4	579.4	576.7	2414.	2394.	147.0	147.0	228.5
149:34	576.5	580.8	580.8	580.8	580.8	576.7	2414.	2394.	147.0	147.0	228.5
149:49	577.5	581.4	581.4	581.4	581.4	578.8	2484.	2377.	147.0	147.0	228.5
150:0	578.6	582.0	582.0	582.0	582.0	578.8	2484.	2377.	147.0	147.0	228.5
150:19	579.6	583.4	583.4	583.4	583.4	581.0	2403.	2397.	147.0	147.0	228.5

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RESEARCH COUNCIL ON DRUGS

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GROUP 3 PWSHIP REVIEW
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REACTION COOLANT SYSTEM

PRZM	MU TANK	MU FLOW	LE TOWER	RCP SEAL
PHES PSIG	LVL (IN)	(GPM)	(GPM)	FLOW (GPM)
P769	L761	F740	A7B5	F765
1:30:34	80.53	31.06	872.0	5.49
1:30:49	80.53	31.49	872.0	5.49
1:31:0	80.50	28.15	872.0	5.49
1:31:19	80.50	28.09	872.0	5.49
1:31:34	80.61	17.56	872.0	5.49
1:31:49	80.76	17.54	872.0	5.49
1:32:4	80.91	17.34	872.0	5.49
1:32:19	81.06	17.41	872.0	5.49
1:32:34	81.15	27.21	872.0	5.49
1:32:49	81.15	29.87	872.0	5.49
1:33:5	81.11	29.91	872.0	5.49
1:33:20	81.09	29.91	872.0	5.49
1:33:40	81.06	29.91	872.0	5.49
1:33:55	81.06	35.24	872.0	5.49
1:34:4	80.98	35.24	872.0	5.49
1:34:19	80.91	35.18	872.0	5.49
1:34:34	80.84	35.15	872.0	5.49
1:34:49	80.76	35.19	872.0	5.49
1:35:4	80.41	91.58	872.0	5.49
1:35:19	79.58	134.05	872.0	5.48
1:35:34	78.70	137.01	872.0	5.48
1:35:51	78.50	61.55	872.0	5.48
1:36:6	78.46	17.29	872.0	5.48
1:36:21	76.92	159.99	872.0	5.48
1:36:35	74.27	159.99	872.0	5.48
1:36:50	71.46	159.99	872.0	5.48
1:37:6	68.60	159.99	872.0	5.48
1:37:20	65.74	159.99	872.0	5.48
1:37:34	62.89	159.99	872.0	5.48
1:37:49	60.04	159.99	872.0	5.48
1:38:4	57.21	159.99	872.0	5.48
1:38:19	54.29	159.99	872.0	5.50
1:38:34	51.53	159.99	872.0	5.50
1:38:49	48.85	159.99	872.0	5.56
1:39:6	46.23	159.99	872.0	5.56
1:39:19	43.53	159.99	872.0	5.56
1:39:34	41.27	159.99	872.0	5.56
1:39:49	39.13	159.99	872.0	5.56
1:40:25	34.97	159.99	872.0	5.56
1:40:25	34.97	159.99	872.0	5.56

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THE UNIVERSITY OF CHICAGO

PHZK PHZS P/69	MLT LAMP LVL (LM)	NU FLOW F/40	LR FLOW R/40	MLP SEAL F/65
140145	50.91	1159.99	072.0	5.16
140149	50.91	1159.99	072.0	5.16
140154	28.94	1159.99	072.0	5.20
140159	27.01	1159.99	072.0	5.20
140159	25.15	1159.99	072.0	5.20
140159	25.45	1159.99	072.0	5.37
140159	21.90	1159.99	072.0	5.37
140219	20.58	1159.99	072.0	5.37
140224	18.94	1159.99	072.0	5.50
140249	17.44	1159.99	072.0	5.50
140314	16.00	1159.99	072.0	5.50
140314	14.49	1159.99	072.0	5.54
140319	13.11	1159.99	072.0	5.54
140324	11.08	1159.99	072.0	5.54
140329	10.21	1159.99	072.0	5.54
140419	9.25	1159.99	072.0	5.54
140424	11.17	1159.99	072.0	5.58
140429	12.37	1159.99	072.0	5.58
140514	13.62	1159.99	072.0	5.58
140519	14.39	1159.99	072.0	5.58
140524	15.02	1159.99	072.0	5.58
140529	15.61	1159.99	072.0	5.58
140614	16.21	1159.99	072.0	5.58
140619	16.81	1159.99	072.0	5.74
140624	17.40	1159.99	072.0	5.74
140629	18.05	1159.99	072.0	5.74
140714	18.64	1159.99	072.0	5.74
140719	19.27	1159.99	072.0	5.74
140724	19.89	1159.99	072.0	5.84
140729	20.50	1159.99	072.0	5.84
140814	21.60	1159.99	072.0	5.84
140819	22.39	1159.99	072.0	6.07
140824	23.18	1159.99	072.0	6.07
140829	23.97	1159.99	072.0	6.07
140914	24.74	1159.99	072.0	6.07
140919	25.53	1159.99	072.0	6.06
140924	26.31	1159.99	072.0	6.06
140929	27.11	1159.99	072.0	6.06
141014	27.87	1159.99	072.0	6.06
141019	28.68	1159.99	072.0	5.92

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SITAM GENERATION

SG 1 FULL RANGE LVL(IN)	SG 2 FULL RANGE LVL(IN)	SG 1 SUI LVL(IN)	SG 2 SUI LVL(IN)	SG 1 WP LVL(2)	SG 2 WP LVL(2)	SG 1 OUT TEMP	SG 2 OUT TEMP
1120134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1120149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1121110	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1121120	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1121142	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1121155	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1122119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1122134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1122149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1123119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1123134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1123149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1124119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1124134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1124149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1125119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1125134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1125149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1126119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1126134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1126149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1127119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1127134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1127149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1128119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1128134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1128149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1129119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1129134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1129149	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1130119	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1130134	248.9	152.9	153.5	58.66	62.5	598.2	595.5
1130149	248.9	152.9	153.5	58.66	62.5	598.2	595.5

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6/9/1985

STEP GENERATION

SG 1 FULL RANGE (LVLIN):	SG 2 FULL RANGE (LVLIN):	SG 1 SGT LVL(10):	SG 2 SGT LVL(10):	SG 1 SGT LVL(4):	SG 2 SGT LVL(4):	SG 1 SGT LVL(4):	SG 2 SGT LVL(4):	SG 1 SGT LVL(4):	SG 2 SGT LVL(4):
1879	1889	1885	1893	1881	1891	1885	1891	1885	1891
1240245	51.5	21.6	29.6	5.79	6.73	566.6	567.0	566.6	567.0
1240149	46.8	21.6	29.6	5.79	6.73	566.6	567.0	566.6	567.0
124114	42.8	24.4	28.2	5.74	6.65	566.6	566.3	566.6	566.3
124119	41.5	22.1	27.2	5.65	6.75	562.1	566.3	562.1	566.3
124134	39.4	20.0	25.5	5.63	6.67	562.1	566.9	562.1	566.9
124149	46.5	19.0	24.7	5.74	6.77	560.0	566.9	560.0	566.9
124214	46.5	18.4	24.2	5.65	6.65	560.0	566.9	560.0	566.9
124219	44.6	17.9	22.8	5.95	6.65	562.8	566.9	562.8	566.9
124234	45.8	17.6	21.9	6.04	6.79	562.8	566.9	562.8	566.9
124249	44.9	17.3	20.6	6.12	6.65	566.6	566.9	566.6	566.9
124314	42.0	16.9	18.9	6.09	6.64	566.6	567.5	566.6	567.5
124319	41.4	16.3	17.5	6.14	6.56	570.6	567.5	570.6	567.5
124334	40.1	15.6	16.2	6.06	6.51	570.6	563.4	570.6	563.4
124349	37.0	15.2	15.0	6.14	6.46	574.8	563.4	574.8	563.4
124414	36.0	14.9	14.5	6.19	6.56	574.8	561.1	574.8	561.1
124419	36.0	14.6	14.2	6.24	6.67	576.9	561.1	576.9	561.1
124434	35.6	14.3	13.6	6.26	6.66	576.9	561.1	576.9	561.1
124449	35.4	13.7	12.2	6.12	6.53	578.4	563.7	578.4	563.7
124514	35.1	13.1	12.0	6.17	6.45	578.4	563.7	578.4	563.7
124519	35.3	13.1	12.2	6.21	6.50	578.4	563.7	578.4	563.7
124534	35.8	13.2	12.4	6.26	6.55	578.4	563.7	578.4	563.7
124549	34.2	12.6	12.5	6.10	6.65	577.0	564.5	577.0	564.5
124614	34.3	12.6	12.0	6.13	6.68	577.0	564.5	577.0	564.5
124619	35.0	12.8	11.9	6.15	6.50	576.6	564.5	576.6	564.5
124634	35.2	12.8	12.0	6.15	6.53	576.6	565.6	576.6	565.6
124649	35.2	12.3	12.0	5.99	6.55	574.8	565.6	574.8	565.6
124714	35.4	11.9	12.1	5.87	6.58	574.8	565.6	574.8	565.6
124719	35.4	11.6	12.1	5.76	6.60	572.0	565.6	572.0	565.6
124734	35.4	11.4	12.1	5.68	6.60	572.0	565.6	572.0	565.6
124749	35.4	11.2	12.0	5.60	6.63	567.4	565.6	567.4	565.6
124814	35.4	10.9	12.0	5.55	6.63	567.4	567.5	567.4	567.5
124819	35.2	10.9	11.9	5.55	6.60	563.9	567.5	563.9	567.5
124834	35.1	10.9	11.8	5.52	6.58	563.9	567.5	563.9	567.5
124849	32.5	10.9	11.5	5.52	6.49	562.5	567.5	562.5	567.5
124914	31.9	10.8	11.2	5.52	6.39	562.5	567.5	562.5	567.5
124919	31.2	10.7	10.9	5.49	6.26	562.5	567.5	562.5	567.5
124934	30.6	10.7	10.5	5.49	6.18	562.5	565.6	562.5	565.6
124949	30.8	10.6	10.5	5.47	6.15	562.5	565.6	562.5	565.6
125014	30.8	10.5	10.5	5.45	6.12	562.5	562.4	562.5	562.4
125019	30.8	10.5	10.5	5.36	6.12	562.5	562.4	562.5	562.4

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Abstract

56 1 001	56 2 001	56 1 1 P 6	56 2 1 P 6
PRE 55 P 510	PRE 55 P 510	PRE 55 P 510	PRE 55 P 510
1951	1956	1950	1955
1:20:30	071.4	902.5	093.4
1:20:49	072.0	902.5	093.4
1:21:14	070.6	902.5	093.4
1:21:20	072.5	902.5	093.4
1:21:42	070.2	902.5	093.4
1:21:55	070.2	902.5	093.4
1:22:14	070.5	902.5	093.4
1:22:21	071.2	902.5	093.4
1:22:31	073.1	902.5	093.4
1:22:50	071.5	902.5	093.4
1:23:49	071.2	902.5	093.4
1:25:19	073.1	902.5	093.4
1:25:34	072.0	902.5	093.4
1:25:49	072.0	902.5	093.4
1:26:19	071.5	902.5	093.4
1:26:34	073.5	902.5	093.4
1:26:49	071.5	902.5	093.4
1:27:15	071.1	902.5	093.4
1:27:20	069.6	902.5	093.4
1:27:40	069.1	902.5	093.4
1:27:55	069.1	902.5	093.4
1:28:14	072.5	902.5	093.4
1:28:34	071.5	902.5	093.4
1:28:49	071.9	902.5	093.4
1:29:19	071.0	902.5	093.4
1:29:34	071.0	902.5	093.4
1:29:49	071.0	902.5	093.4
1:30:14	071.5	902.5	093.4
1:30:19	071.2	902.5	093.4

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SIAM GENERATION

SG 1 WOI	SG 2 WOI	SG 1 FW	SG 2 FW
PHSS PSIG	PHSS PSIG	PHSS PSIG	PHSS PSIG
9331	9356	9330	9355
1150:50	872.8	907.8	892.7
1150:49	871.9	902.8	892.7
1151:0	874.0	905.7	894.5
1151:19	871.5	905.7	894.5
1151:54	872.5	905.7	894.5
1151:49	872.6	905.7	894.5
1152:0	873.2	902.8	894.5
1152:19	871.9	902.8	894.5
1152:54	873.5	902.8	894.5
1152:49	872.1	902.8	894.5
1153:5	872.1	902.8	892.7
1153:20	870.2	901.9	892.7
1153:40	870.8	901.9	892.7
1153:55	871.5	901.9	892.7
1154:0	872.5	901.9	892.7
1154:19	872.5	901.9	892.7
1154:54	869.5	903.3	894.1
1154:49	875.6	903.3	894.1
1155:0	866.1	904.6	895.9
1155:19	901.2	904.6	895.9
***** HLP *****			
1155:54	861.0	921.5	917.9
1155:51	1063.2	1051.6	917.9
1156:0	1015.8	1051.6	1052.5
1156:21	1000.0	1012.9	1052.5
1156:35	1009.9	1012.9	1003.1
1156:50	1010.8	1012.9	1003.1
1157:0	1010.8	1020.4	1001.2
1157:20	1011.1	1020.4	1001.2
1157:54	1010.7	1019.1	990.2
1157:49	1011.9	1019.1	990.2
1158:0	1011.9	1020.0	987.5
1158:19	1011.9	1020.0	987.5
1158:54	1004.9	1018.8	981.1
1158:49	999.5	1018.8	981.1
1159:0	997.9	1010.8	972.4
1159:19	991.5	1010.8	972.4
1159:54	987.5	1005.5	1013.8
1159:49	986.5	1005.5	1013.8
1160:25	977.5	987.5	982.7
1160:25	977.5	987.5	982.7

GROUP 5 POSTOFFICE DIVISION
 512510 6/ 9/1905

6/ 9/1905

SHIPMENT INFORMATION

SHIPMENT NO.	SHIPMENT DATE	SHIPMENT TIME	SHIPMENT TYPE	SHIPMENT STATUS	SHIPMENT LOCATION	SHIPMENT COMMENTS
1140145	944.9	908.5	907.5	907.5	907.5	907.5
1140149	944.9	908.5	907.5	907.5	907.5	907.5
114114	920.2	1008.6	908.5	908.5	908.5	908.5
1141119	944.9	908.5	907.5	907.5	907.5	907.5
1141134	950.6	912.7	930.7	930.7	930.7	930.7
1141149	963.9	995.5	930.7	930.7	930.7	930.7
114214	905.1	1012.0	962.1	962.1	962.1	962.1
1142119	1004.1	995.5	906.5	906.5	906.5	906.5
1142134	1015.2	997.6	1006.5	1006.5	1006.5	1006.5
1142149	1024.4	990.9	1006.5	1006.5	1006.5	1006.5
114314	1030.4	957.2	1029.4	1029.4	1029.4	1029.4
1143119	1025.0	954.0	1029.4	1029.4	1029.4	1029.4
1143134	1025.0	954.0	1025.7	1025.7	1025.7	1025.7
1143150	1022.1	954.9	1025.7	1025.7	1025.7	1025.7
114414	1053.2	981.0	1025.7	1025.7	1025.7	1025.7
1144119	1041.6	1000.8	1025.7	1025.7	1025.7	1025.7
1144134	1041.0	1014.0	1047.0	1047.0	1047.0	1047.0
1144149	1052.0	957.2	1047.0	1047.0	1047.0	1047.0
114514	1025.2	925.0	1056.4	1056.4	1056.4	1056.4
1145119	1057.2	975.2	1056.4	1056.4	1056.4	1056.4
1145134	1045.4	908.8	1041.7	1041.7	1041.7	1041.7
1145157	1052.1	999.2	1056.0	1056.0	1056.0	1056.0
114614	1015.4	1007.4	1056.0	1056.0	1056.0	1056.0
1146119	1030.1	960.4	1056.0	1056.0	1056.0	1056.0
1146134	1038.6	976.7	1034.2	1034.2	1034.2	1034.2
1146149	1012.0	965.9	1034.2	1034.2	1034.2	1034.2
114714	991.6	991.2	1030.7	1030.7	1030.7	1030.7
1147119	971.8	993.5	1030.7	1030.7	1030.7	1030.7
1147134	971.2	994.5	968.4	968.4	968.4	968.4
1147149	962.7	995.0	968.4	968.4	968.4	968.4
114814	952.2	995.0	973.3	973.3	973.3	973.3
1148119	954.0	995.4	973.3	973.3	973.3	973.3
1148134	950.4	990.6	960.2	960.2	960.2	960.2
1148149	950.4	960.5	960.2	960.2	960.2	960.2
114914	950.4	950.9	963.7	963.7	963.7	963.7
1149119	954.5	940.6	963.7	963.7	963.7	963.7
1149134	951.0	920.5	963.7	963.7	963.7	963.7
1149149	946.5	929.5	963.7	963.7	963.7	963.7
115014	944.7	951.0	957.0	957.0	957.0	957.0
1150119	941.0	951.5	957.0	957.0	957.0	957.0

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TABLE 2

: MP COND

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1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 26

2004-1

6,961: 6 79

6/ 9/1985

ENDS PMP	YEAR 1	YEAR 2	STG	STG
FLOW MPPH	IN LVL	OUT LVL	IN LVL	OUT LVL
F172	F152	F156	F156	F156
1:20:34	7077	8,426	8,241	
1:20:49	7117	8,426	8,153	
1:21:14	7117	8,414	8,011	
1:21:20	7119	8,414	8,001	
1:21:42	7119	8,377	8,204	
1:21:55	7119	8,377	8,204	
1:22:14	7124	8,377	8,350	
1:22:19	7119	8,367	8,275	
1:22:34	7119	8,350	7,947	
1:22:49	7102	8,375	8,046	
1:23:11	7126	8,375	8,070	
1:23:34	7126	8,358	8,157	
1:23:49	7115	8,372	8,348	
1:24:11	7115	8,362	8,309	
1:24:19	7027	8,363	7,948	
1:24:49	7071	8,389	8,016	
1:25:11	7071	8,404	8,077	
1:25:34	7115	8,404	8,162	
1:25:49	7115	8,372	8,351	
1:26:11	7115	8,343	7,943	
1:26:34	7066	8,328	8,172	
1:26:49	7194	8,314	7,950	
1:27:11	7194	8,350	8,079	
1:27:20	7207	8,339	8,233	
1:27:40	7207	8,411	8,302	
1:27:55	7207	8,411	7,938	
1:28:11	7235	8,421	8,143	
1:28:24	7214	8,450	7,969	
1:28:49	7219	8,477	7,982	
1:29:11	7245	8,490	8,067	
1:29:24	7245	8,521	8,162	
1:29:49	7188	8,543	8,319	
1:29:54	7188	8,492	8,255	
1:29:59	7200	8,470	7,950	
1:30:11	7200	8,460	8,040	
1:30:34	7150	8,460	7,928	

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TABLE 1. Data for the 1993-1994 season.

0551 : 2551 : 2114

750°C	1	955°C	1	1050°C
	1		1	

AD1*0	:	965*0	:	*1617
15*0	:	100*0	:	100*0

115 * 2	1	0 / 5 * 0	1	* 1 0 1 /
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206 * I	:	105 * P	:	* 010 /
012 * P	:	056 * P	:	* 010 /

601 * 0 1 1 666 * 0 1 1 * 5 6 0 1

1951-5	1	006-0	1	*1501
196-1	1	006-0	1	*5501

522*0	1	150*0	1	* / 50 /
522*0	1	150*0	1	* / 50 /

1100 ^a 1	1	1100 ^a 1	1	1169
1100 ^a 1	1	1100 ^a 1	1	1169

500 * 4	2	505 * 8	1	* 9 6 0 0
1 0 0 * 2	1	6 0 5 * 0	1	* 1 1 1 0

1900 * 2 1905 * 2 1910 * 2

201-0	:	842-0	:	* 6517
890*0	:	605*0	:	* 6517

912*H	1	005*H	1	*1521
913*H	1	006*H	1	*1522

602*0	1	105	0	1	0021
602*0	2	105	0	2	1521

625 °H	:	591 °P	:	° 6021
665 °H	:	165 °P	:	° 6021

8.505 : 1.606 : 1.775

610*Q : Q55*Q : *2751

806	1	205	1	0651
819*9	1	505*6	1	*0651

$h h h^* h$	2	$h G L^2 h$	2	$^* 0 h G I$
$h h h^* G$	2	$2 h G^2 h$	2	$^* 0 h G I$

966 ^a 6	1	516 ^a 6	1	*065/L
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9A0-6	1	51A-6	1	*0651
290*6	1	520*6	1	*0651

6/4 ⁺ 6	1	6/4 ⁺ 6	2	*065/
6/4 ⁺ 6	2	6/4 ⁺ 6	3	6/4 ⁺ 6

$61M^*6$:	666^*6	:	$*065I$
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CHQ ^a A	:	h/h ^a A	:	*5711
hCU ^a A	:	h/A ^a A	:	*6211

250*6 2 1000*6 2 *5211

180°A	!	256°A	!	*0511
514°A	!	896°A	!	*5211

100% A	1	00% A	1	*0511
00% A	1	00% A	1	00% A

991 ^a h	1	526 ^a h	1	*05,11
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997 * A	1	569 * A	1	* 05 11
997 * A	1	116 * A	1	* 05 11

991*6 1 569*6 2 *0511

9/1985

CHDS P4P	DEAR	SIG	DEAR 2	SIG
FLWR APPH	TR LVL	(F1)	TR LVL	(F1)
F172	F172	F172	F172	F172
100:45	1150.	9.881	9.828	9.828
100:49	1150.	9.881	9.828	9.828
101:4	1217.	9.867	9.867	9.867
101:19	1217.	9.867	9.867	9.867
101:34	1217.	9.867	9.867	9.867
101:49	1249.	9.867	9.867	9.867
102:4	1249.	9.867	9.867	9.867
102:19	1249.	9.867	9.867	9.867
102:34	1249.	9.867	9.867	9.867
103:4	1274.	9.896	9.896	9.896
103:19	1274.	9.896	9.896	9.896
103:34	1274.	9.896	9.896	9.896
103:49	1274.	9.896	9.896	9.896
104:4	1275.	9.925	9.925	9.925
104:19	1275.	9.925	9.925	9.925
104:34	1275.	9.925	9.925	9.925
104:49	1275.	9.925	9.925	9.925
105:4	1299.	9.949	9.949	9.949
105:19	1299.	9.949	9.949	9.949
105:34	1299.	9.949	9.949	9.949
105:49	1299.	9.949	9.949	9.949
106:4	1299.	10.013	10.013	10.013
106:19	1299.	10.013	10.013	10.013
106:34	1299.	10.013	10.013	10.013
106:49	1299.	10.013	10.013	10.013
107:4	1318.	10.025	10.025	10.025
107:19	1318.	10.025	10.025	10.025
107:34	1318.	10.025	10.025	10.025
107:49	1318.	10.025	10.025	10.025
108:4	1298.	10.050	10.050	10.050
108:19	1298.	10.050	10.050	10.050
108:34	1318.	10.069	10.069	10.069
108:49	1318.	10.069	10.069	10.069
109:4	1298.	10.077	10.077	10.077
109:19	1298.	10.077	10.077	10.077
109:34	1298.	10.077	10.077	10.077
109:49	1298.	10.077	10.077	10.077
110:4	1298.	10.101	10.101	10.101
110:19	1298.	10.101	10.101	10.101
110:34	1298.	10.101	10.101	10.101
110:49	1298.	10.101	10.101	10.101
111:4	1318.	10.116	10.116	10.116
111:19	1318.	10.116	10.116	10.116
111:34	1318.	10.116	10.116	10.116
111:49	1318.	10.116	10.116	10.116
112:4	1318.	10.152	10.152	10.152
112:19	1318.	10.152	10.152	10.152
112:34	1318.	10.152	10.152	10.152
112:49	1318.	10.152	10.152	10.152
113:4	1318.	10.162	10.162	10.162
113:19	1318.	10.162	10.162	10.162
113:34	1318.	10.162	10.162	10.162
113:49	1318.	10.162	10.162	10.162

1. 6660

AFWS sequence of events

PDR

1 30 30.9	2963	SFRCS FULL TRIP		
1 35 31	L896	LOW LVL TRIP CH 2		
1 35 32	L896	" NORM "		
1 35 34.7	Q963	SFRCS FULL TRIP (LEAK)		
1 35 36	Z686	MSIU 2 CLOSED	5 SEC	
1 35 37	Z683	MSIU 1 CLOSED	6 SEC	
1 41 03	L896	LOW LVL TRIP CH 1		
41 04.2	Q963	SFRCS FULL TRIP		
41 04	Z961	#1 ATMO CLOSE		
41 06	Z675	#1 SHUT VAL CLOSED	2 SEC	FROM LO LVL
41 06	Z003	MS 106 1-1 NC		
41 06	Z680	#2 SHUT VAL CLOSED	2 SEC	FROM LO LVL
41 08	P680	MS LOW PRESS CH 2		
41 08	P681	" " " CH 1		
41 10	Z162	AF608 → 1 NO		
41 10	Z970	AF599 → 2 NO		
41 15	L896	LOW LVL TRIP CH 2		
41 17	Z674	MAIN FEED STOP FW 612 CLOSED	12 SEC	FROM LO LVL
41 21	Z679	" " " FW 601 CLOSED	13 SEC	FROM LO LVL
41 22	Z13	MS 106 1-1 CLOSED		
41 27	Z688	AF 370 1-1 OPEN	23 SEC	FROM LO LVL
41 27	Z008	" " " NO		
41 31	S007	AFP 1 OVERSPEED TRIP		
41 34	Z009	AF 3769 1-2 OPEN	26 SEC	FROM LO FEED
41 35	Z011	AF 3771 2-1 OPEN	27 SEC	FROM LO FEED
41 44	S017	AFP 2 OVERSPEED TRIP		
42 00	P680	MS LOW PRESS NORM CH 2		
42 01	P681	" " " " CH 1		
42 01	Z003, Z006	MS 06 SHUT VAL, #107 SHUT VAL		
42 04	Z008	AF 3771 1-1 OPEN	24 SEC	FROM LO FEED
42 27	Z13	AF 3771 2-2 OPEN	27 SEC	FROM LO FEED

1 47 49 E970 AF599 #2 ISO OPEN

5 DIA 48 SEC FROM 12 HRS

1 49 29 E962 AF609 #1 ISO OPEN

7 DIA 48 SEC FROM 13 HRS

1 SI 21.8 P701 DP TRIP SG 1

1 SI 21.9 P702 DP TRIP SG 2

SI 22 P671 DP TRIP CH 1

SI 22 P672 DP TRIP CH 2

SI 38.9 P702 DP TRIP SG 2 NORM

SI 40.2 P701 " " SG 1 NORM

SI 40 P671 DP TRIP CH 1 NORM

SI 40 P672 " " CH 2 NORM

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1 30 30.4	Z8963	SFRCS FULL TRIP	
1 35 31	Z896	LOW LVL TRIP CH 2	
1 35 33	Z896	" " NORM "	
1 35 34.7	Z8963	SFRCS FULL TRIP (LEAK)	
1 35 36	Z686	MCIN 2 CLOSED	5 SEC
1 35 37	Z683	MCIN 1 CLOSED	6 SEC
1 41 03	Z896	LOW LVL TRIP CH 1	
41 04.5	Z8963	SFRCS FULL TRIP	
41 04	Z961	#1 ATMO CLOSED	
41 06	Z675	#1 SH CTR VLV CLOSED	2 SEC FROM LO LVL
41 06	Z003	MID 106 1→1 NC	
41 06	Z680	#2 SH CTR VLV CLOSED	2 SEC FROM LO LVL
41 08	P680	MC LOW PRES CH 2	
41 08	P681	" " " CH 1	
41 10	Z162	AF608 →1 NO	
41 10	Z970	AF599 →2 NO	
41 12	Z896	LOW LVL TRIP CH 2	
41 17	Z679	MAIN FEED STOP FW612 CLOSED	12 SEC FROM LO LVL
41 21	Z679	" " " FW601 CLOSED	13 SEC FROM LO PRES
41 22	Z893	MID 106 1→1 CLOSED	
41 27	Z898	PF3876 1→1 CH EN	20 SEC FROM LO LVL
41 28	Z008	" " " NO	
41 31	S007	AFF 1 OVERSPEED TRIP	
41 34	Z009	AF 3867 1→2 OPEN	26 SEC FROM LO PRES
41 35	Z011	AF 3871 2→1 OPEN	27 SEC FROM LO PRES
41 44	S017	AFF 2 OVERSPEED TRIP	
42 30	P680	MC LOW PRES NORM CH 2	
42 31	P681	" " " " CH 1	
42 31	Z003, Z006	MS 06 OPENING, F 1107 OPENING	
42 34	Z002	AF 3871 1→1 OPEN	24 SEC FROM LO PRES NORM
42 37	Z011	AF 3871 2→2 OPEN	27 SEC FROM LO PRES NORM

• 1 47 48 E970 AF599 #2 ISC OPEN

5 MIN 48 SEC FROM 12:15:00

• 1 49 28 E962 AF 609 #1 ISC OPEN

7 MIN 28 SEC FROM 12:15:00

1 51 21.8 P701 DP TRIP SG 1

1 51 21.9 P702 DP TRIP SG 2

51 22 P671 DP TRIP CH 1

51 22 P672 DP TRIP CH 2

51 38.9 P702 DP TRIP SG 2 NORM

51 40.2 P701 " " SG 1 NORM

51 40 P671 DP TRIP CH 1 NORM

51 40 P672 " " CH 2 NORM

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54

PDR

SEQUENCE OF EVENTS JUNE 9, 1985 TRIP

Updated 1200 Hours June 18, 1985

The following is a summary of the Sequence of Events that occurred at Davis-Besse on June 9, 1985. The plant was originally at approximately 90% of full power. No surveillance testing related to the event was in progress. The plant was in full automatic control except for the #2 Main Feedpump which was in manual.

<u>Time</u>	<u>Event</u>
01:35:00	The #1 Main Feedwater Pump (MFP) tripped on overspeed due to a control failure. An automatic plant runback was automatically initiated. Due to the reduced feedwater flow available, Reactor Coolant System (RCS) temperature and pressure began increasing. The plant ran back to approximately 80% of full power prior to the reactor trip.
01:35:29	The reactor tripped on high RCS pressure (2300 psig). The turbine tripped from reactor trip.
01:35:31	The Steam & Feedwater Rupture Control System (SFRCS), Channel 2, spuriously half tripped on low SG level and cleared four seconds later. A sequence of events monitor SFRCS full trip alarm was also received and cleared.
01:35:36	Main Steam Isolation Valve (MSIV) #2 closed.
01:35:37	MSIV #1 closed.
01:35 to 01:40	Normal post trip equipment operation, such as the auto transfer of housepower to the startup transformers, etc. The #2 MFP continued to supply normal feedwater until approximately 0140 hours, when there was not adequate steam to operate the MFP turbine due to the closure of the MSIV's.
01:41:04	Steam generator water levels decreased to the SFRCS low level trip setpoint. A full trip on low level occurred on SFRCS actuation Channel 1. Actuation of SFRCS actuation Channel 1 related components was initiated including alignment of Auxiliary Feed Pump (AFP) 1 to feed Steam Generator (SG) 1.

01:41:08

The control room operator attempted to manually initiated SFRCS to start auxiliary feedpumps, however, he incorrectly actuated the SFRCS on low steam pressure instead of the desired low steam generator level. He performed the manual actuation by depressing the top switch in both strings of manual actuation switches for the respective SFRCS actuation channels. This generated a low pressure trip on SG 1 in SFRCS actuation Channel 1 and a low pressure trip in SG 2 on SFRCS actuation Channel 2. Therefore, each SFRCS actuation channel sensed that its respective steam generator was inoperable while the opposite steam generator was still intact. SFRCS actuation Channel 1 then attempted to align AFP 1 to feed steam generator 2 and SFRCS actuation channel 2 attempted to align AFP 2 to feed SG 1. Both actuation channels, however, closed their respective steam generator isolation valves (AF599, AF608) which prevented any auxiliary feed flow from reaching the steam generators.

Per the SFRCS design, some valves positioned by the low level trip on SFRCS Channel 1 were repositioned by the low pressure trip. The AFP 1 steam supply valve from SG 1, MS 106, started open in response to the SFRCS actuation Channel 1 low level trip. Following the manual initiation of the low pressure trip, the valve should have continued opening to its full open position before it cycled closed. The entire open/close stroke time should have been about 50-60 seconds. The valve returned to its closed position in about 18 seconds, however. This indicates that the open command to the valve did not seal in as designed.

01:41:13

SFRCS actuation Channel 2 tripped on low steam generator level. Since the low pressure trip already present had priority, no change in component actuation occurred.

01:41:31 AFP 1 tripped on overspeed.

01:41:44 AFP 2 tripped on overspeed.

01:42:00 The Operator's error was corrected by clearing the manual SFRCS actuation on low steam pressure. Since both SFRCS actuation channels were already tripped on low steam generator level, the SFRCS attempted to realign valves in the normal configuration with AFP 1 feeding SG 1 and AFP 2 feeding SG 2. The SFRCS attempted to open steam generator isolation valves AF599 and AF608, but the valves did not open. With these valves closed and the AFPs tripped, no feedwater was being supplied to the steam generators.

01:45 Both Steam Generators had steamed down to approximately 12-13 inches of indicated level.

 RCS Tave at this time was approximately 562°F.

01:45 - 01:51 RCS Tave was increasing due to the lack of primary to secondary heat transfer. RCS pressure was increasing due to the decreasing density of the RCS water and increasing pressurizer level. RCS pressure increased to the Power Operated Relief Valve (PORV) setpoint (2425 psig). The PORV cycled a total of three (3) times, relieving pressurizer pressure to the Quench Tank. Following the third opening, the PORV failed to reclose properly. The control room operator observed primary conditions and closed the block valve on the PORV. RCS pressure fell to 2075 psig before the block valve closed or the PORV reseated.

 During this time period, operators were attempting to restart the auxiliary feedwater pumps locally. Some problems were encountered with local control of the AFP turbines. The turbine trip throttle valves at the turbine inlet were difficult to reset and the effort was complicated by communications problems with the control room.

 During the same time period, an operator locally assisted the opening of both steam generator isolation valves AF599 and AF608. After he partially opened the valves, the motor operator stroked the valves open.

- 01:51 Operators placed the Startup Feedpump (SUFP) in operation to supply the steam generators. SG 1 pressure had reached a minimum of approximately 750 psig. SG 1 repressurized to approximately 900 psig from the startup feedpump. The #2 SG has reached a minimum of 920 psig.
- ~01:52 AFP 2 was returned to operation by operators to supply SG 2 and SG level began increasing. Maximum RCS temperature had reached approximately 592°F. When AFP 2 was returned to service, the control room operator controlled the pump in manual rather than returning it to the Auto Essential mode of operation.
- ~01:55 AFP 1 was returned to operation by operators to supply the SG 1 and the SG level began increasing. Operation of AFP 1 turbine could not be regained by the control room operator in either the Auto Essential or the manual mode of operation. Control of the turbine was maintained locally by an operator at the turbine steam inlet valve.
- ~01:58 Tave restored to normal post trip temperature. The cooldown lowered RCS pressure. Operators manually started the HPI pump #1 in the piggyback mode (D.H. pump 1 supplying the suction to the HPI pump 1). A slight amount of water (≤ 50 gallons) was injected.

Additional Notes:

Adequate subcooled margin was available throughout the transient. The Reactor Coolant Pumps remained in operation. The Quench Tank contained the discharges from the PORV. Makeup/High Pressure Injection cooling of the RCS was available as a method of core cooling at all times.

This data is preliminary and additional clarifications or corrections may be necessary after a detailed analysis of the event.

JRL:SNB:bec

SEQUENCE OF EVENTS JUNE 9, 1985 TRIP

Updated 1200 Hours June 18, 1985

The following is a summary of the Sequence of Events that occurred at Davis-Besse on June 9, 1985. The plant was originally at approximately 90% of full power. No surveillance testing related to the event was in progress. The plant was in full automatic control except for the #2 Main Feedpump which was in manual.

<u>Time</u>	<u>Event</u>
01:35:00	The #1 Main Feedwater Pump (MFP) tripped on overspeed due to a control failure. An automatic plant runback was automatically initiated. Due to the reduced feedwater flow available, Reactor Coolant System (RCS) temperature and pressure began increasing. The plant ran back to approximately 80% of full power prior to the reactor trip.
01:35:29	The reactor tripped on high RCS pressure (2300 psig). The turbine tripped from reactor trip.
01:35:31	The Steam & Feedwater Rupture Control System (SFRCS), Channel 2, spuriously half tripped on low SG level and cleared four seconds later. A sequence of events monitor SFRCS full trip alarm was also received and cleared.
01:35:36	Main Steam Isolation Valve (MSIV) #2 closed.
01:35:37	MSIV #1 closed.
01:35 to 01:40	Normal post trip equipment operation, such as the auto transfer of housepower to the startup transformers, etc. The #2 MFP continued to supply normal feedwater until approximately 0140 hours, when there was not adequate steam to operate the MFP turbine due to the closure of the MSIV's.
01:41:04	Steam generator water levels decreased to the SFRCS low level trip setpoint. A full trip on low level occurred on SFRCS actuation Channel 1. Actuation of SFRCS actuation Channel 1 related components was initiated including alignment of Auxiliary Feed Pump (AFP) 1 to feed Steam Generator (SG) 1.

01:41:08

The control room operator attempted to manually initiated SFRCS to start auxiliary feedpumps, however, he incorrectly actuated the SFRCS on low steam pressure instead of the desired low steam generator level. He performed the manual actuation by depressing the top switch in both strings of manual actuation switches for the respective SFRCS actuation channels. This generated a low pressure trip on SG 1 in SFRCS actuation Channel 1 and a low pressure trip in SG 2 on SFRCS actuation Channel 2. Therefore, each SFRCS actuation channel sensed that its respective steam generator was inoperable while the opposite steam generator was still intact. SFRCS actuation Channel 1 then attempted to align AFP 1 to feed steam generator 2 and SFRCS actuation channel 2 attempted to align AFP 2 to feed SG 1. Both actuation channels, however, closed their respective steam generator isolation valves (AF599, AF608) which prevented any auxiliary feed flow from reaching the steam generators.

Per the SFRCS design, some valves positioned by the low level trip on SFRCS Channel 1 were repositioned by the low pressure trip. The AFP 1 steam supply valve from SG 1, MS 106, started open in response to the SFRCS actuation Channel 1 low level trip. Following the manual initiation of the low pressure trip, the valve should have continued opening to its full open position before it cycled closed. The entire open/close stroke time should have been about 50-60 seconds. The valve returned to its closed position in about 18 seconds, however. This indicates that the open command to the valve did not seal in as designed.

01:41:13

SFRCS actuation Channel 2 tripped on low steam generator level. Since the low pressure trip already present had priority, no change in component actuation occurred.

01:41:31 AFP 1 tripped on overspeed.

01:41:44 AFP 2 tripped on overspeed.

01:42:00 The Operator's error was corrected by clearing the manual SFRCS actuation on low steam pressure. Since both SFRCS actuation channels were already tripped on low steam generator level, the SFRCS attempted to realign valves in the normal configuration with AFP 1 feeding SG 1 and AFP 2 feeding SG 2. The SFRCS attempted to open steam generator isolation valves AF599 and AF608, but the valves did not open. With these valves closed and the AFPs tripped, no feedwater was being supplied to the steam generators.

01:45 Both Steam Generators had steamed down to approximately 12-13 inches of indicated level.

 RCS Tave at this time was approximately 562°F.

01:45 - 01:51 RCS Tave was increasing due to the lack of primary to secondary heat transfer. RCS pressure was increasing due to the decreasing density of the RCS water and increasing pressurizer level. RCS pressure increased to the Power Operated Relief Valve (PORV) setpoint (2425 psig). The PORV cycled a total of three (3) times, relieving pressurizer pressure to the Quench Tank. Following the third opening, the PORV failed to reclose properly. The control room operator observed primary conditions and closed the block valve on the PORV. RCS pressure fell to 2075 psig before the block valve closed or the PORV reseated.

 During this time period, operators were attempting to restart the auxiliary feedwater pumps locally. Some problems were encountered with local control of the AFP turbines. The turbine trip throttle valves at the turbine inlet were difficult to reset and the effort was complicated by communications problems with the control room.

 During the same time period, an operator locally assisted the opening of both steam generator isolation valves AF599 and AF608. After he partially opened the valves, the motor operator stroked the valves open.

01:51

Operators placed the Startup Feedpump (SUFP) in operation to supply the steam generators. SG 1 pressure had reached a minimum of approximately 750 psig. SG 1 repressurized to approximately 900 psig from the startup feedpump. The #2 SG has reached a minimum of 920 psig.

~01:52

AFP 2 was returned to operation by operators to supply SG 2 and SG level began increasing. Maximum RCS temperature had reached approximately 592°F. When AFP 2 was returned to service, the control room operator controlled the pump in manual rather than returning it to the Auto Essential mode of operation.

~01:55

AFP 1 was returned to operation by operators to supply the SG 1 and the SG level began increasing. Operation of AFP 1 turbine could not be regained by the control room operator in either the Auto Essential or the manual mode of operation. Control of the turbine was maintained locally by an operator at the turbine steam inlet valve.

~01:58

Tave restored to normal post trip temperature. The cooldown lowered RCS pressure. Operators manually started the HPI pump #1 in the piggyback mode (D.H. pump 1 supplying the suction to the HPI pump 1). A slight amount of water (≤ 50 gallons) was injected.

Additional Notes:

Adequate subcooled margin was available throughout the transient. The Reactor Coolant Pumps remained in operation. The Quench Tank contained the discharges from the PORV. Makeup/High Pressure Injection cooling of the RCS was available as a method of core cooling at all times.

This data is preliminary and additional clarifications or corrections may be necessary after a detailed analysis of the event.

JRL:SNB:bec

60
83

PDR 6/19

SEQUENCE OF EVENTS

Davis-Besse
Complete Loss of Feedwater Event
June 9, 1985

NRC Fact Finding Team 8:30 AM JUNE 19, 1985

Status: Preliminary (Rev. ¹Q) ~~3:00 PM~~
~~11:00 AM~~ June 18, 1985

*Unexpected or off-normal response

C. E. Rossi

Initial Conditions

- Unit operating at 90%
- Number One Main Feedpump (MFP) in automatic control
- Number Two Main Feedpump in manual
- One Source Range Nuclear Instrumentation Channel inoperable
- Safety Parameter Display System (SPDS) inoperable

Transient Initiator

- *01:35:00 #1 MFP Trips
MFP flow increases; MFP turbine trips on overspeed.

Systems Response/Operator Actions to Partial Loss of Main Feedwater

01:35:01 Unit runback toward 55% at 50%/min initiated.

01:35:21 Operator increases the speed of #2 MFP turbine. Pressurizer spray valve manually opened to 100%.

01:35:30 Reactor Trip + Turbine Trip - RCS High Pressure (2300 psig) from 80% power.

COMPUTER RECORDED
*01:35:31 Steam & Feedwater Rupture Control System (SFRCS), trip on S/G low level, actuation Channel 2. Both MSIVs start to close.

*01:35:31

01:35:34 SFRCS actuation signal clears.

*01:35:36 Main Steam Isolation Valve (MSIV) #2 has closed.

*01:35:37 MSIV #1 has closed.
With both MSIVs closed, the source of steam for #2 MFP turbine is isolated. Steam from main steam piping and moisture separator reheaters continued to drive #2 MFP for a while.

01:35:45 Pressurizer spray valve closed.

SEQUENCE OF EVENTS

⁵⁶
01:35:36 Once Through Steam Generator (OTSG) levels at normal post-trip level (35 inches).

*01:40:00 OTSG levels begin to fall from the normal post-trip level.

System Response/Operator Actions to Complete Loss of Main Feedwater

01:41:04 SFRCS low OTSG level (26.5 in.) Actuation Channel 1 actuates; this actuation causes Auxiliary Feedwater Pump (AFP) #1 to be aligned to feed OTSG #1.

*01:41:08 The control room operator attempted to manually initiate SFRCS; however, he incorrectly actuated the SFRCS on low steam pressure instead of the desired low steam generator level. He performed the manual actuation by depressing the top switch in both strings of manual actuation switches for the respective SFRCS actuation channels. Therefore, each SFRCS actuation channel sensed that its respective steam generator was inoperable. SFRCS actuation Channel 1 then attempted to align AFP 1 to feed steam generator 2 and SFRCS actuation Channel 2 attempted to align AFP 2 to feed SG 1; both actuation channels, however, closed their respective steam generator containment isolation valves (AF-599, AF-608), which prevented any auxiliary feed flow from reaching the steam generators.

Per the SFRCS design, valves positioned by the low level trip on SFRCS Channel 1 were repositioned by the higher priority pressure trip. The AFP 1 steam supply valve from SG 1, MS 106 had started open in response to the SFRCS actuation Channel 1 low level trip. Following the manual initiation of the low pressure trip, the valve should have continued opening to its full open position before it cycled closed. The entire open/close stroke time should have been about 50-60 seconds. *The valve however returned to its closed position in about 18 seconds. This indicates that the open command to the valve did not seal in as designed.

01:41:13 SFRCS actuation Channel 2 tripped on low steam generator level. Since the low pressure trip already present had priority, no change in component actuation occurred.

*01:41:31 AFP 1 tripped on overspeed.

*01:41:44 AFP 2 tripped on overspeed.

SEQUENCE OF EVENTS

Acc

System Response/Operator Actions to Complete Loss of Feedwater

01:42:00 Manual reset of SFRCS low OTSG pressure actuation.

*AF-599, AF-608 should re-open automatically, but did not.

*An attempt was made to re-open AF-599 and AF-608 from the main control panel, but the valves did not respond.

01:43:55 Assistant Shift Supervisor went to SFRCS cabinets (behind the control room area), opened the doors, and operated the SFRCS "Initial Reset and Bypass" function in an attempt to reset any automatic safety signals to AF-599 and AF-608.

*The valves remained closed.

*01:44 - 01:52 The Shift Supervisor dispatched Equipment Operators into the plant to operate the following equipment:

- (1) Two Equipment Operators were sent to the Auxiliary Feedwater Pump turbines to manually restore the AFW pumps to service. No. 2 AFW turbine overspeed trip was reset at 01:45:50. Manual control of the turbine trip throttle valve was required to bring the turbine up to speed. No. 1 AFW turbine was reset and speed was controlled locally throughout the recovery.
- (2) The Assistant Shift Supervisor left the control room to place the startup feed pump in service. This evolution required opening the pump suction valve, the pump discharge valve, and two cooling water valves. In addition, the control fuses for the pump circuit breaker were required to be installed. The startup feed pump was started at 01:51:23.
- (3) Two equipment operators were sent to open OTSG Auxiliary Feed Isolation Valves AF-599 and AF-608. These valves are the containment isolations for the AFW system. The operators moved the valves from the closed position, and the motor operators opened the valves. Computer printouts indicate that the #2 OTSG Valve AF-599 was open at 01:47:48, and the #1 OTSG Valve AF-608 was open at 01:49:28.

01:47:33 OTSG #1 below 960 psig and decreasing.

01:48:49 Pzr. PORV opens first time at 2433 psig (2425 setpoint).

*01:48:51 OTSG #2 below 960 psig and decreasing.

SEQUENCE OF EVENTS

01:48:52 Pzr. PORV has closed at 2377 psig (2375 setpoint).
01:50:09 Pzr. PORV opens second time at 2434 psig.
01:50:12 Pzr. PORV has closed at 2369 psig.
01:51:17 OTSG SG #1 level falls below eight inches.
*01:51:18 Pzr. PORV opens third time at 2435 psig; did not close.
01:51:23 Startup feed pump motor on.
01:51:42 Pzⁿ_r. PORV block valve ^{was started} closed by operator at 2140 psig.
01:51:42 RCS Loop #1 reaches a minimum pressure of 2081 psig.
Loop #1 T-hot = 588.6°F; Tave = 587.5°F.
01:51:49 Accoustic monitor indicates no flow thru PORV/block valve.
01:53:00 RCS loop #1 T-hot reaches peak value of 593.5°F.
01:53:22 AFW #2 has significant flow, with control locally via the trip throttle valve.
To
ABOUT 02:01 — { When AFW 2 was returned to service, the control room operator controlled the pump in manual rather than returning it to ~~the~~ Automatic. Pump would not control from control room.
01:53:25 RCS Tave reaches peak value of 592.3°F.
01:53:35 SG #2 returns to above 960 psig.
01:53:56 PORV Block Valve reopened by operator.
01:54:45 SG #1 return to above 960 psig.
01:54:46 AFW #1 has significant flow, with control locally via the trip throttle valve.
~~Operation of AFW 1 turbine could not be regained by the control room operator in either the Automatic or the manual mode of operations. Control of the turbine was maintained locally by an operator via the turbine steam trip valve.~~
01:56:58 SG #2 below 960 psig and decreasing due to return of feedwater.
01:57:05 SG #1 below 960 psig and decreasing.

SEQUENCE OF EVENTS

01:58 Tave restored to normal post-trip temperature. The cooldown had lowered RCS pressure to about 1720 psig. Operators manually started the HPI pump #1 in the piggy-back mode (LPI pump 1 supplying the suction to the HPI pump 1). A slight amount of water (about 50 gallons) was injected.

01:58:08 RCS loop #1 reaches a minimum pressure of 1716 psig. Loop #1 T-hot = 546.6°F; Tave = 546.2°F.

01:58:33 AFW #1 flow reduced to control OTSG level.

02:01:13 AFW #2 flow reduced.

02:02:27 SG #1 returns to above 960 psig.

02:02:30 SG #2 returns to above 960 psig.

02:04 Plant conditions essentially stable.

Additional Complications

*When the only operable source range nuclear instrumentation channel was energized, it failed to an offscale low value. This left no... nuclear instrumentation on scale. All control rods were re-verified to be fully inserted. The operator initiated emergency boration.

*AFP #1 suction automatically transferred from the condensate storage tank (CST) to the service water system. The operator realigned ~~to~~ to CST.

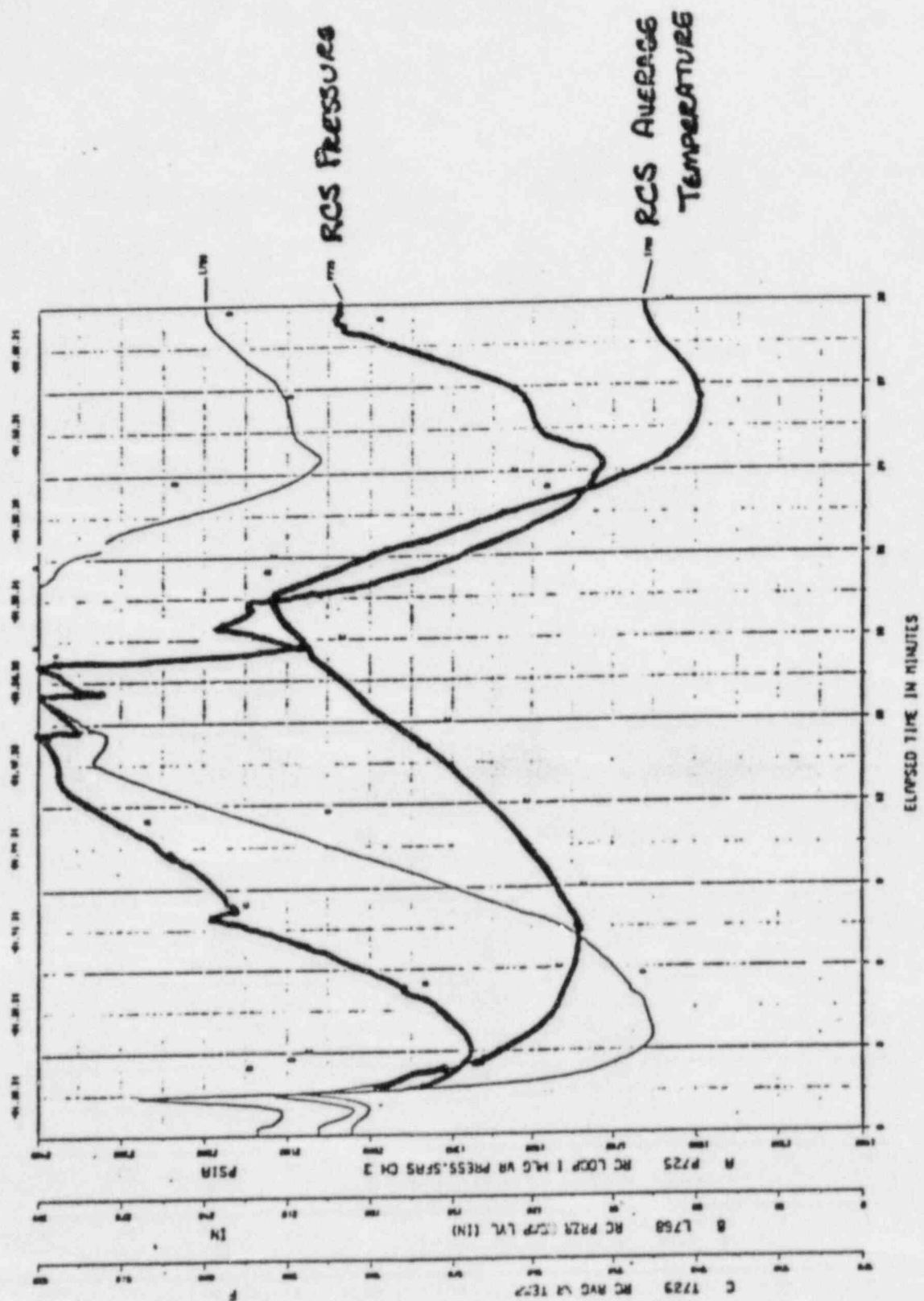
*The desuperheating spray ~~regulator~~ for the auxiliary steam system ~~had been bypassed prior to the transient. This~~ allowed water into the main steam piping. When vacuum was restored and the MSIVs opened, the water slug damaged one of the main turbine bypass valves.

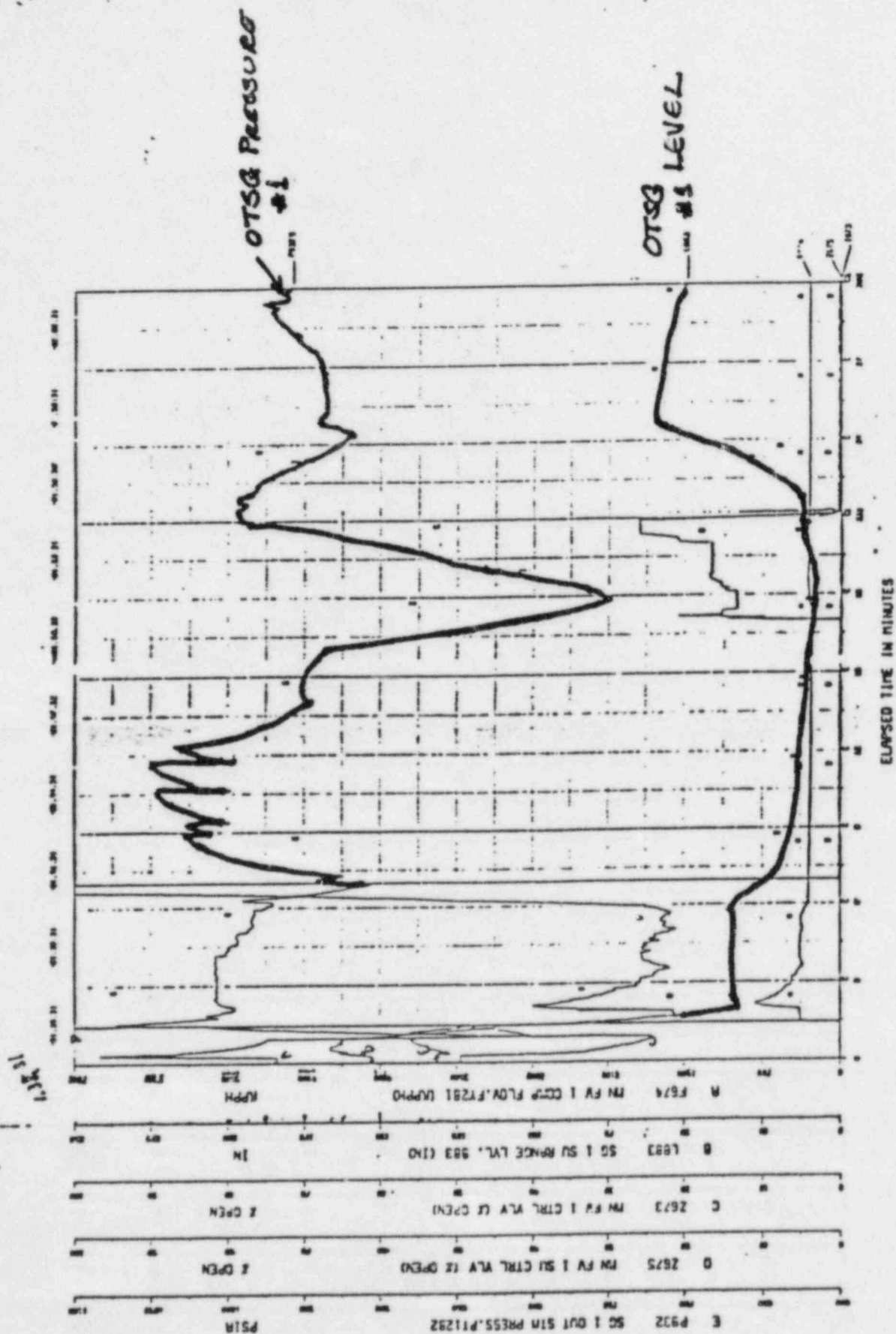
Notes

1. Adequate subcooled margin was available throughout the transient. The Reactor Coolant Pumps remained in operation. The Quench Tank contained the discharges from the PORV. ~~Makeup/High Pressure Injection cooling of the RCS was available as a method of core cooling at all times.~~
2. THERE IS A QUESTION ON THE OPERABILITY OF S/U CONTROL VALVE SP-7A, WHICH WOULD BE USED TO PROVIDE S/U FEED PUMP FLOW TO OTSG #2.

SEQUENCE OF EVENTS

3. The above sequence of events is based upon combining information obtained from plant computer printouts and operator interviews. Due to time responses of instruments providing input to plant computer systems and the inability to obtain the precise time of events from the operator interviews, there is some potential ambiguity in the exact times; however, such ambiguity is not considered to be significant in understanding the event.





SEQUENCE OF EVENTS JUNE 9, 1985 TRIP

Updated 1400 Hrs. June 14, 1985

The following is a summary of the Sequence of Events that occurred at Davis-Besse on June 9, 1985. The plant was originally at approximately 90% of full power. No surveillance testing related to the event was in progress. The plant was in full automatic control except for the #2 Main Feedpump which was in manual.

<u>Time</u>	<u>Event</u>
01:35:00	The #1 Main Feedwater Pump (MFP) tripped on overspeed due to a control failure. An automatic plant runback was automatically initiated. Due to the reduced feedwater flow available, Reactor Coolant System (RCS) temperature and pressure began increasing. The plant ran back to approximately 80% of full power prior to the reactor trip.
01:35:29	The reactor tripped on high RCS pressure (2300 psig). The turbine tripped from reactor trip.
01:35	The Steam & Feedwater Rupture Control System (SFRCS), Channel 2, spuriously half tripped on low SG level and cleared four seconds later. A sequence of events monitor SFRCS full trip alarm was also received and cleared.
01:35:36	Main Steam Isolation Valve (MSIV) #1 closed.
01:35:37	MSIV #2 closed.
01:35 to 01:40	Normal post trip equipment operation, such as the auto transfer of housepower to the startup transformers, etc. The #2 MFP continued to supply normal feedwater until approximately 0140 hours, when there was not adequate steam to operate the MFP turbine due to the closure of the MSIV's.
01:41:04	Steam generator water levels decreased to the SFRCS low level trip setpoint. A full trip on low level occurred on SFRCS actuation Channel 1. Actuation of SFRCS actuation Channel 1 related components was initiated including alignment of Auxiliary Feed Pump (AFP) 1 to feed Steam Generator (SG) 1.

01:41:08

The control room operator attempted to manually initiated SFRCS to start auxiliary feedpumps, however, he incorrectly actuated the SFRCS on low steam pressure instead of the desired low steam generator level. He performed the manual actuation by depressing the top switch in both strings of manual actuation switches for the respective SFRCS actuation channels. This generated a low pressure trip on SG 1 in SFRCS actuation Channel 1 and a low pressure trip in SG 2 on SFRCS actuation Channel 2. Therefore, each SFRCS actuation channel sensed that its respective steam generator was inoperable while the opposite steam generator was still intact. SFRCS actuation Channel 1 then attempted to align AFP 1 to feed steam generator 2 and SFRCS actuation channel 2 attempted to align AFP 2 to feed SG 1. Both actuation channels, however, closed their respective steam generator isolation valves (AF599, AF608) which prevented any auxiliary feed flow from reaching the steam generators.

Per the SFRCS design, some valves positioned by the low level trip on SFRCS Channel 1 were repositioned by the low pressure trip. The AFP 1 steam supply valve from SG 1, MS 106, started open in response to the SFRCS actuation Channel 1 low level trip. Following the manual initiation of the low pressure trip, the valve should have continued opening to its full open position before it cycled closed. The entire open/close stroke time should have been about 50-60 seconds. The valve returned to its closed position in about 18 seconds, however. This indicates that the open command to the valve did not seal in as designed.

01:41:13

SFRCS actuation Channel 2 tripped on low steam generator level. Since the low pressure trip already present had priority, no change in component actuation occurred.

01:41:31 AFP 1 tripped on overspeed.

01:41:44 AFP 2 tripped on overspeed.

01:42:00 The Operator's error was corrected by clearing the manual SFRCS actuation on low steam pressure. Since both SFRCS actuation channels were already tripped on low steam generator level, the SFRCS attempted to realign valves in the normal configuration with AFP 1 feeding SG 1 and AFP 2 feeding SG 2. The SFRCS attempted to open steam generator isolation valves AF599 and AF608, but the valves did not open. With these valves closed and the AFPs tripped, no feedwater was being supplied to the steam generators.

01:45 Both Steam Generators had steamed down to approximately 12-13 inches of indicated level.

RCS Tave at this time was approximately 562°F.

01:45 - 01:51 RCS Tave was increasing due to the lack of primary to secondary heat transfer. RCS pressure was increasing due to the decreasing density of the RCS water and increasing pressurizer level. RCS pressure increased to the Power Operated Relief Valve (PORV) setpoint (2425 psig). The PORV cycled a total of three (3) times, relieving pressurizer pressure to the Quench Tank. Following the third opening, the PORV failed to reclose properly. The control room operator observed primary conditions and closed the block valve on the PORV. RCS pressure fell to 2075 psig before the block valve closed or the PORV reseated.

During this time period, operators were attempting to restart the auxiliary feedwater pumps locally. Some problems were encountered with local control of the AFP turbines. The turbine trip throttle valves at the turbine inlet were difficult to reset and the effort was complicated by communications problems with the control room.

During the same time period, an operator locally assisted the opening of both steam generator isolation valves AF599 and AF608. After he partially opened the valves, the motor operator stroked the valves open.

- 01:51 Operators placed the Startup Feedpump (SUFP) in operation to supply the steam generators. SG 1 pressure had reached a minimum of approximately 750 psig. SG 1 repressurized to approximately 900 psig from the startup feedpump. The #2 SG has reached a minimum of 920 psig.
- ~01:52 AFP 2 was returned to operation by operators to supply SG 2 and SG level began increasing. Maximum RCS temperature had reached approximately 592°F. When AFP 2 was returned to service, the control room operator controlled the pump in manual rather than returning it to the Auto Essential mode of operation.
- ~01:55 AFP 1 was returned to operation by operators to supply the SG 1 and the SG level began increasing. Operation of AFP 1 turbine could not be regained by the control room operator in either the Auto Essential or the manual mode of operation. Control of the turbine was maintained locally by an operator at the turbine steam inlet valve.
- ~01:58 Tave restored to normal post trip temperature. The cooldown lowered RCS pressure. Operators manually started the HPI pump #1 in the piggyback mode (D.H. pump 1 supplying the suction to the HPI pump 1). A slight amount of water (≤ 50 gallons) was injected.

Additional Notes:

Adequate subcooled margin was available throughout the transient. The Reactor Coolant Pumps remained in operation. The Quench Tank contained the discharges from the PORV. Makeup/High Pressure Injection cooling of the RCS was available as a method of core cooling at all times.

This data is preliminary and additional clarifications or corrections may be necessary after a detailed analysis of the event.

JRL:SNB:bec

SEQUENCE OF EVENTS SUMMARY

June 9, 1985

The following is a summary of the Sequence of Events that occurred at Davis-Besse on June 9, 1985. The plant was originally at approximately 90% of full power. No surveillance testing was in progress. The plant was in full automatic control except for the #2 Main Feedpump which was in manual.

<u>Time</u>	<u>Event</u>
01:35:00	The #1 Main Feedwater Pump (MFP) tripped on overspeed due to a control failure. Automatic plant runback initiated. Due to the reduced feedwater flow available, Reactor Coolant System (RCS) temperature and pressure increasing. Plant ran back to approximately 80% of full power.
01:35:29	Reactor tripped on high RCS pressure (2300 psig). Turbine trip from reactor trip.
01:35:31	The Steam & Feedwater Rupture Control System (SFRCS), Channel 2, spuriously half tripped.
01:35:36	Main Steam Isolation Valve (MSIV) #1 closed.
01:35:37	MSIV #2 closed.
01:35 to 01:40	Normal post trip equipment operation, such as the auto transfer of housepower to the startup transformers, etc. The #2 MFP continued to supply normal feedwater until approximately 0140 hours, when there was not adequate steam to operate the MFP turbine due to the closure of the MSIV's.
Approx. 01:41	Steam Generator water levels decreased to the SFRCS low level trip setpoint. The SFRCS actuated. The Control Room Operator at this time also actuated the SFRCS manually, however, he incorrectly actuated the SFRCS on low steam pressure instead of the desired low steam generator level.

01:41:31 The #1 Auxiliary Feedpump (AFP) tripped on
overspeed.

01:41:44 The #2 AFP tripped on overspeed.

01:42 The Operator corrected his error by clearing the
manual SFRCS actuation on low steam pressure.
However, since the AFP's were tripped, no feed-
water was supplied by the AFP's.

01:45 Both Steam Generators had steamed down to
approximately 12-13 inches of indicated level.

RCS Tave approximately 562°F.

01:45 - 01:51 RCS Tave increasing due to lack of primary to
secondary heat transfer. RCS pressure increasing
due to decreasing density in RCS water and in-
creasing pressurizer level. RCS pressure in-
creased to the Power Operated Relief Valve
(PORV) setpoint (2425 psig). PORV cycled a total
of three (3) times, relieving pressurizer pres-
sure to the Quench Tank. *Block valve closed.*

01:51 Operators placed the Startup Feedpump (SUFP) in
operation to supply the #1 Steam Generator. The
#1 Steam Generator pressure had reached a minimum
of approximately 750 psig. The #1 Steam Generator
repressurized to approximately 900 psig from the
startup feedpump.

01:52 *SMA* #2 AFP returned to operation by operators to
supply the #2 Steam Generator. Maximum RCS
temperature had reached approximately 592°F.
Steam Generator #2 level restored. The #2
Steam Generator had reached a minimum of 920
psig.

01:55 #1 AFP returned to operation by operators to
supply the #1 Steam Generator. Steam Generator
#1 level restored.

01:58 Tave restored to normal post trip temperature.

Additional Notes:

Adequate subcooled margin was available throughout the transient. The Reactor Coolant Pumps remained in operation. The Quench Tank contained the discharges from the PORV. Makeup/High Pressure Injection cooling of the RCS was available as a method of core cooling at all times.

This data is preliminary and additional clarifications or corrections may be necessary after a detailed analysis of the event.

SNB:nlf
6/10/85

SEQUENCE OF EVENTS JUNE 9, 1985 TRIP

Updated 10:00 AM June 13, 1985

The following is a summary of the Sequence of Events that occurred at Davis-Besse on June 9, 1985. The plant was originally at approximately 90% of full power. No surveillance testing was in progress. The plant was in full automatic control except for the #2 Main Feedpump which was in manual.

<u>Time</u>	<u>Event</u>
01:35:00	The #1 Main Feedwater Pump (MFP) tripped on overspeed due to a control failure. An automatic plant runback was automatically initiated. Due to the reduced feedwater flow available, Reactor Coolant System (RCS) temperature and pressure began increasing. The plant ran back to approximately 80% of full power prior to the reactor trip.
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01:35:36	Main Steam Isolation Valve (MSIV) #1 closed.
01:35:37	MSIV #2 closed.
01:35 to 01:40	Normal post trip equipment operation, such as the auto transfer of housepower to the startup transformers, etc. The #2 MFP continued to supply normal feedwater until approximately 0140 hours, when there was not adequate steam to operate the MFP turbine due to the closure of the MSIV's.

01:41:04 Steam generator water levels decreased to the SFRCS low level trip setpoint. A full trip on low level occurred on SFRCS actuation Channel 1. Actuation of SFRCS actuation Channel 1 related components was initiated including alignment of Auxiliary Feed Pump (AFP) 1 to feed Steam Generator (SG) 1.

01:41:08 The control room operator attempted to manually initiate SFRCS, however, he incorrectly actuated the SFRCS on low steam pressure instead of the desired low steam generator level. He performed the manual actuation by depressing the top switch in both strings of manual actuation switches for the respective SFRCS actuation channels. This generated a low pressure trip on SG 1 in SFRCS actuation Channel 1 and a low pressure trip in SG 2 on SFRCS actuation Channel 2. Therefore, each SFRCS actuation channel sensed that its respective steam generator was inoperable while the opposite steam generator was still intact. SFRCS actuation Channel 1 then attempted to align AFP 1 to feed steam generator 2 and SFRCS actuation channel 2 attempted to align AFP 2 to feed SG 1. Both actuation channels, however, closed their respective steam generator isolation valves (AF599, AF608) which prevented any auxiliary feed flow from reaching the steam generators. Per the SFRCS design, some valves positioned by the low level trip on SFRCS Channel 1 were repositioned by the low pressure trip.

01:41:13 SFRCS actuation Channel 2 tripped on low steam generator level. Since the low pressure trip already present had priority, no change in component actuation occurred.

01:41:31 AFP 1 tripped on overspeed.

01:41:44 AFP 2 tripped on overspeed.

01:42:00

The Operator corrected his error by clearing the manual SFRCS actuation on low steam pressure. Since both SFRCS actuation channels were already tripped on low steam generator level, the SFRCS attempted to realign valves in the normal configuration with AFP 1 feeding SG 1 and AFP 2 feeding SG 2. The SFRCS attempted to open steam generator isolation valves AF599 and AF608, but the valves did not open. With these valves closed and the AFPs tripped, no feedwater was being supplied to the steam generators.

01:45

Both Steam Generators had steamed down to approximately 12-13 inches of indicated level.

RCS Tave at this time was approximately 562°F.

01:45 - 01:51

RCS Tave was increasing due to the lack of primary to secondary heat transfer. RCS pressure was increasing due to the decreasing density of the RCS water and increasing pressurizer level. RCS pressure increased to the Power Operated Relief Valve (PORV) setpoint (2425 psig). The PORV cycled a total of three (3) times, relieving pressurizer pressure to the Quench Tank. Following the third opening, the PORV failed to reclose properly. The control room operator observed primary conditions and closed the block valve on the PORV. RCS pressure fell to 2075 psig before the block valve closed or the PORV reseated.

During this time period, operators were attempting to restart the auxiliary feedwater pumps locally. Some problems were encountered with local control of the AFP turbines.

During the same time period, an operator locally assisted the opening of both steam generator isolation valves AF599 and AF608. After he partially opened the valves, the motor operator stroked the valves open.

01:51

Operators placed the Startup Feedpump (SUFP) in operation to supply the steam generators. SG 1 pressure had reached a minimum of approximately 750 psig. SG 1 repressurized to approximately 900 psig from the startup feedpump. The #2 SG has reached a minimum of 920 psig.

- ~01:52 AFP 2 was returned to operation by operators to supply SG 2 and SG level began increasing. Maximum RCS temperature had reached approximately 592°F. When AFP 2 was returned to service, the control room operator controlled the pump in manual rather than returning it to the Auto Essential mode of operation.
- ~01:55 AFP 1 was returned to operation by operators to supply the SG 1 and the SG level began increasing. Operation of AFP 1 turbine could not be regained by the control room operator in either the Auto Essential or the manual mode of operation. Control of the turbine was maintained locally by an operator at the turbine steam inlet valve.
- ~01:58 Tave restored to normal post trip temperature. The cooldown lowered RCS pressure. Operators manually started the HPI pump #1 in the piggyback mode (D.H. pump 1 supplying the suction to the HPI pump 1). A slight amount of water (\leq 50 gallons) was injected.

Additional Notes:

Adequate subcooled margin was available throughout the transient. The Reactor Coolant Pumps remained in operation. The Quench Tank contained the discharges from the PORV. Makeup/High Pressure Injection cooling of the RCS was available as a method of core cooling at all times.

This data is preliminary and additional clarifications or corrections may be necessary after a detailed analysis of the event.

JRL:SNB:bec

SEQUENCE OF EVENTS SUMMARY

June 2, 1985

The following is a summary of the Sequence of Events that occurred at Davis-Besse on June 2, 1985. The plant was originally at approximately 85% of full power. The main turbine governor valve testing was in progress. The No. 4 high pressure turbine governor valve was successfully tested.

This report may require clarification or corrections after the detailed analysis and Tap report is prepared.

<u>Time</u>	<u>Event</u>
06:03:35	High pressure turbine governor valve #3 was closed as part of the governor valve testing.
06:03:40	High pressure governor valve #3 began to open as part of the governor valve testing.
06:03:41	The main turbine tripped on a high vibration. With the turbine tripped, the ARTS system tripped the reactor.
06:03:42	Main feed pump 1 tripped.
06:03:43	Steam and Feedwater Rupture Control System channel 2 spuriously half tripped.
06:03:44	Main Feed Pump #2 tripped.
06:03 - 06:05	Normal post trip equipment operation such as the auto transfer of house power to the startup transformers, etc. Steam generator water levels decreased due to the loss of the main feed pumps.
06:05	Steam generator levels decreased down to the SFRCS low steam generator level trip set point. Both auxiliary feed pumps actuated correctly and supplied their respective steam generator with proper auxiliary feedwater. Steam generator levels were adequately maintained by the auxiliary feedpumps.
07:00 - 09:10	Startup feedpump was started and used to supply the steam generator feedwater. As the decay heat load decreased, the startup feedpump was used as the main source of feedwater to the steam generators.

Sequence of Events Summary - 6/2/85
Page 2

<u>Time</u>	<u>Event</u>
0900	The #1 auxiliary feedpump was experiencing some speed control problems while being removed from service. This did not affect the plant transient. Operators continued with the normal trip recovery actions.

The transient was initiated by high Main Turbine vibration during governor valve testing. The loss of the main feed pumps resulted in an SFRCS actuation on low S.G. level. The Auxiliary Feed pumps operated to properly supply auxiliary feedwater for the transient.

CHRONOLOGICAL SUMMARY OF EVENTS

TIME	EVENT
1:34:21	MAIN FEEDWATER (FW) FLOW INCREASES
1:34:28	REACTOR POWER BEGINS TO INCREASE DUE TO COOLING OF REACTOR COOLANT SYSTEM (RCS) DUE TO INCREASED FW FLOW
1:35:00:355	MAIN FEEDWATER PUMP (MFP) TURBINE #1 TRIP
1:35:01	UNIT BEGINS PUMPBACK TO SECURE REACTOR
1:35:02	LOW FEEDWATER (FW) FLOW ALARM TRIP
1:35:05:445	RPS CH 2 REACTOR COOLANT SYSTEM HIGH PRESSURE TRIP
1:35:30:145	REACTOR TRIP CONFIRMED
1:35:30:310	MAIN TURBINE TRIP
1:35:31	STEAM AND FEEDWATER RUPTURE CONTROL SYSTEM (SFRCS) STEAM GENERATOR (SG) LOW LEVEL HALF TRIP (SOE RECORDER SHOWS THIS AS A FULL TRIP AT 1:35:30:935)
1:35:33	SFRCS SG LOW LEVEL HALF TRIP CLEARS (SOE SHOWS THIS AS AN SFRCS FULL TRIP CLEARING AT 1:35:34:70)
1:35:36	MAIN STEAM ISOLATION VALVE (MSIV) #2 CLOSING
1:35:37	MSIV #1 CLOSING
1:40:20	LOW FW FLOW ALARM
1:41:03	SFRCS SG LOW LEVEL TRIP, CHANNEL 1 (SEE 1:41:04:345)
1:41:04:345	SFRCS FULL TRIP (SAME AS 1:41:03)
1:41:08	MANUAL SFRCS TRIP, LOW STEAM PRESSURE, BOTH CHANNELS
1:41:10	AFW TO SG ISOLATION VALVES START TO CLOSE
1:41:13	SFRCS SG LOW LEVEL TRIP, CHANNEL 2
1:41:31	AUXILIARY FW (AFW) PUMP TURBINE #1 OVERSPEED TRIP
1:41:44	AFW PUMP TURBINE #2 OVERSPEED TRIP
1:42:00	MANUAL SFRCS TRIP, LOW STEAM PRESSURE, RESET
1:45:50	AFW PUMP TURBINE #2 OVERSPEED TRIP RESET
1:46:32	#1 AFW PUMP STARTS
1:47:48	AFW TO #2 SG ISOLATION VALVE OPEN
1:48:49	PORV OPEN (2432.8 PSI ACTUAL, 2425 PSI SETPOINT)
1:48:52	PORV CLOSED (2376.7 PSI ACTUAL, 2375 PSI SETPOINT)
1:49:28	AFW TO #1 SG ISOLATION VALVE OPEN
1:50:09	PORV OPEN (2434.1 PSI ACTUAL)
1:50:12	PORV CLOSED (2369.4 PSI ACTUAL)
1:51:18	PORV OPEN (2435.3 PSI ACTUAL)
1:51:21	#1 SG LEVEL DROPS BELOW 8"
1:51:23	STARTUP FW PUMP ON TO FEED #1 SG FROM DEARATOR
1:51:42	PORV ISOLATION VALVE CLOSED BY OPERATOR AT 2141.0 PSI
1:51:43	#2 SG LEVEL STOPS DROPPING AT 9.8"
1:51:44	#1 SG LEVEL STOPS DROPPING AT 7.3"
1:51:49	PORV CLOSED (2112.9 PSI ACTUAL)
1:51:54	#1 SG PRESSURE STOPS DROPPING AT 749.6 PSI
1:51:57	#1 SG LEVEL STARTS INCREASING
1:52:03	#2 SG PRESSURE STOPS DROPPING AT 910.2 PSI
1:52:06	#2 SG LEVEL STARTS INCREASING
1:52:21	#2 AFW PUMP PUMP STARTS
1:52:25	#1 SG LEVEL RAISED ABOVE 8"
1:53:20	MAXIMUM INCORE TEMPERATURE REACHED, 601.5 F
1:53:25	AFW FLOW STARTS TO #2 SG
1:53:31	MAXIMUM Tavg REACHED, 592.3 F
1:53:35	MAXIMUM TH REACHED, 593.5 F

1:53:56	FORV ISOLATION VALVE OPENED BY OPERATOR
1:54:33	AFW FLOW STARTS TO #1 SG
1:58:21	HPI PUMP #1 ON
1:58:30	LPI PUMP #1 ON
1:58:37	HPI FLOW BEGINS
1:58:40	#1 AFW PUMP SUCTION TRANSFERS TO SERVICE WATER
1:59:06	HPI FLOW STOPS
2:00:07	#1 AFW PUMP SUCTION TRANSFERED BACK TO CONDENSATE ST
2:09:21	HPI PUMP #1 OFF
2:09:24	LPI PUMP #1 OFF

PDR

TO: M. RING
 FROM DAN WILCZYNSKI EVENT

TIME
 1:35:36 FAC. ENGINEERING MSIV #2 CLOSED
 1:35:37 EXTRACTED FROM ALARM PRINTER MSIV #1 CLOSED
 1:41:03 FOR AFP #2 SFRCS FULL TRIP (Q963)
 1:41:06 OVERSPEED TRIP MS 106 BEGINS TO OPEN (Z003)
 EVALUATION STROKE 36 sec
 1:41:08 MANUAL SFRCS INIT. ON LOW PRES. (P680, 681)
 1:41:10 LOPING 106A + 107A
 1:41:10 AF 599 BEGINS TO CLOSE (Z970)
 1:41:10 AF 608 BEGINS TO CLOSE (Z962)
 1:41:13 SFRCS CH. 2 TRIP
 1:41:22 MS 106 CLOSED (Z003)
 1:41:28 AF 3870 BEGINS TO CLOSE (Z008)
 1:41:31 AFP #1 OVERSPEED TRIP (S007)
 1:41:34 AF 3869 OPEN (Z009)
 1:41:35 AF 3871 OPEN (Z011)
 1:41:44 AFP #2 OVERSPEED TRIP (S017)
 1:42:00 SFRCS LO. PRES. SHOWS NORM. (P680, 681)
 1:42:01 MS 106 BEG. TO OPEN (Z003)
 1:42:01 MS 107 BEG. TO OPEN (Z006)
 1:42:01 AF 3871 BEG. TO CLOSE (Z011)
 1:42:02 AF 3869 BEG. TO CLOSE (Z009)
 1:42:24 AF 3870 OPEN (Z008)
 1:42:27 AF 3872 OPEN (Z010)
 1:45:50 AFP #2 OVERSPEED SHOWN NORM (S017)
 1:46:12 MANUAL CONT - AFP #2 AUTO-ESS. LVL CTRL XFER SW (Z013)
 1:46:50 AFP #1 AUTO-ESS. LVL CTRL XFER SW (Z012)
 1:47:02 AFP #1 AUTO-ESS. LVL CTRL XFER SW (Z012)
 1:47:26 AFP #1 AUTO-ESS. LVL CTRL XFER SW (Z012)

6/9 /85 SCENARIO

Pg 2/

TIME

EVENT

1.47.48

AF 599 OPEN (Z 970)

1.49.28

AF 608 OPEN (Z 962)

1.

1.58.51

AFP #1 OST RESET

Sunday June 9, 1985

R. G. Homan 184 2327 Seismic Equip
A. Young 184 2710 Firebarriers
10-18 184 2611 C15005-5002
184 2311 A/T 1
184 2100 1437 PPH
C825 2100 1437 PPH

Mode 1 RAB 78.01 844446

0000 Check point 1 & 2 updated
0130 Completed ST89901, 89902, & 89905
0135 ~~Ry Rye~~ RV TRIP. RAB POSITION 78% GP 7, RCS
BORON 790 PPM, PWR Level \approx 85%, TAVE 582
0134 #1 MRP Tripped. Plant started Runback to 55%
0136 A/cted MCR closed
0141 Manually Tripped SERCS and both Aux
Feed Pumps. Tripped on overspeed
0151 Startup Feed pump started & started Feeding
#1 & 2
0225 Universal Event declared
0250 RIS ROWN at 961 PPM
0300 SDM Verified > 190 WITH NO XENON
TTRU INTO ACCOUNT
0332 STOPPED emergency boration added total
of 1100 gal acid
0343 TURBINE ON GEAR
0351 RCS BORON AT 922
0400 34620 opened
0404 RCS ODINE .057
0427 REESTABLISHED RNR BUT closed 34560 & 61

519185

No. 8375

0435 ESTABLISHED VACUUM

0445 RCS BROWN AS 1028

0450 CLOSE MS 107A & 106A

0530 RESET STALLS

0535 RES BORON AS 1040

0545 MS 100A & 101A

0605 MS NRUC CHAIN TALES OPEN

0620 ISOLATED #1 PURIA DE MINA

0640 REOPENED MS/US

0645 RCS Exam AT 1044

0625 NI 1 AND 2 DECLARED OPERABLE PER SEC

0710 DISCOVERED BROKEN WAKE ON SP13A2

MS 611 AND 603 OPENED

0715 2CS 11A & B IN AUTO

0723 closed MS 106

0745 STARTED LOGGDOWN OF RES

0745 RCS Temp @ 547°

0800 RCS BARN 1034 PPM

 $\Delta 8.15 \text{ RLS } 75 \text{ MPa @ } 543^\circ$

0516 ADDSD 270 GAL SEMIN WATER AND

34 GAL ACID TO THIS M/U TANK

0845 RLS TEMP @ 538°

Am. mast. layer 2232 Sigsbee Group

Tim Hagers ~~PH~~ 2.7.10 Jim Isners

C8-16

Salmonella typhimurium 3.6.11 CV 705-707

24

21

513

34

538

2150

140

6/9/85

Shift 00-08 Shift Supervisor T. Schuman Mode 1, Rx @ 90.01%, 817 Mw
Assistant Shift Supervisor D. Hume T.S. Action: Seismic Equip (3.3.3.3);
Reviewed Safety Tagging Log TH / SA CV5005 thru CV5008 (3.6.1.1); Fire
Reviewed Jumper and Lifted Wire Log TH / SA Barriers per status board (3.7.10
Reviewed D-B Daily Status TH / SA & Dec 50-346); Rm's 324 & 501, Pa
Reviewed Unit Log TH / SA 318, FD's 1138, 1177 (3.7.10); C3570
Reviewed Reactor Operator's Log TH / SA Fire Pail (3.3.3.8); NI 1 (3.3.1.1)
Reviewed Alarms TH / SA Equip 005; RE's per status board;
Reviewed Blue Status Lights TH / SA RW Exh Fan #1; SAC #1 & 2;
Reviewed Locked Valve Log TH / SA Htr Dm Pump 2; SFP Skinner
Reviewed Capped Valve Log TH / SA Pump.
Reviewed Passive Valve Log TH / SA
RCS Temperature 582°F Pressure 2155 psig Flow 143 gpm
See Technical Specifications for Limits

0125 F. Moss, duty Appendix "R" electrician is on site.

0133 MFPT #1 trip, plant running back.

0135 Rx trip. MSTIV's went closed.

0141 Manually tripped SFRCS, both AFP's tripped.

0151 SUFP on.

0225 Declared unusual event.

0300 Verified SDM > 1% ΔK taking no credit for Xenon.

0545 RE 4598 BA inoperable.

0625 NI 1 & 2 operable. Out of TS, 3.3.1.1

0642 MSTIV's open.

0710 Discovered SP13 AZ to have a broken yoke.

LE 0625 Reviewed STEC91.01 for NI 1 & 2.

LE 0212 Called NRC by Red Phone. Talked to Dan Markberry.

6/9/85

0800 Reviewed ST5099.01, 5099.02 & 5099.05.

Relieved by: S. WISE

T. Selman

Shift 08-1600 Shift Supervisor Scott Wise Mode 3, Rx @ 0%, 0 MWE
Assistant Shift Supervisor Tom H. Allen T.S. Actions: Seismic Equip (3.3.3);
Reviewed Safety Tagging Log SW 1.5H CV5005 thru CV5008 (3.6.1.1); Fire
Reviewed Jumper and Lifted Wire Log SW 1.5H barriers per status board (3.7.10+
Reviewed D-D Dolly Status SW 1.5H Do: 50-346); Rms 324+501, Dr 319,
Reviewed Unit Log SW 1.5H FCs 1133, 1177 (3.7.10); C 3520 Fire
Reviewed Reactor Operator's Log SW 1.5H Panel (3.3.3.3); ~~NI 1~~ (2) AFW Train
Reviewed Alarms SW 1.5H #1 (3.7.1.2)
Reviewed Blue Status Lights SW 1.5H Equip 005: RF's per status board, RW
Reviewed Locked Valve Log SW 1.5H Exh fan #1, SAC 1+2, HTR Drain
Reviewed Capped Valve Log SW 1.5H pump #2, SFP Skimmer Pump
Reviewed Passive Valve Log SW 1.5H
RCS Temperature 543°F Pressure 2155 Flow 140 GPM
See Technical Specifications for Limits

0840 Downgraded from Varsuit Event per Plant Manager

L.E. 0140 AFW Train #1 is inoperable entered T.S. 3.7.1.2

L.E. 0720 During the transient of the previous shift
the following Tech Spec actions were
entered: T.S. 3.4.5b for both OTSG's; T.S. 3.3.1.1
for NIZ

78 1100 I+C Starting ST5031.14, S-G Level in SFRCS CH2

1230 Performing ST5071.02 Phase I on AFW Train #2

1245 Reviewed ST5099.01 and ST5099.05

1245 Notified by NRC Region III via ENS that we are not to start
up without adequate discussions of the incident

1400 I+C Completed ST5031.14 for SGLIC CH2, this was a
test for the SRA, Does not meet T.S. Requirements

1600 Reviewed ST5071.02 Phase I, for both Trains

78

01:23:17	LOW	P024	CONT ELEV 714 FT AIR TEMP	-0.06		
01:23:17	LOW	P024	HEFT 2 HFF END DRG VIB (MILS)	-0.06		
01:24:03	CONT	P703	RC LOOP 1 HLG PRESS	-0.11		
01:24:17	NORM	V667	HEFT 2 HFF END DRG VIB (MILS)	-0.10		
01:24:36	LOW	P024	AUX STM 2304 HUR PRESS	188.28		
01:24:37	CONT	X955	TREND RECORDER OUT 06			
01:25:23	NORM	P678	NN FW 2 CTRL VLV DF PDT-SAI(PST)	60.40		
01:25:24	NORM	P679	NN FW 2 CTRL VLV DF PDT-SAI(PST)	60.12		
01:25:33	CONT	P956	T-G LIFT FMP DISCH PRESS			
01:25:33	CONT	S962	T-G ROTOR			
01:25:36	CONT	P966	T-G LIFT FMP 2 DISCH PRESS			
01:25:36	CONT	X040	T-G TURN GEAR NOT ENGAGE/OFFERABLE			
01:25:37	CONT	P965	T-G LIFT FMP 1 DISCH PRESS			
01:25:38	HIGH	P678	NN FW 2 CTRL VLV DF PDT-SAI(PST)	60.52		
01:25:38	HIGH	P679	NN FW 2 CTRL VLV DF PDT-SAI(PST)	60.27		
01:25:38	END	V667	HEFT 1 HFF END DRG VIB (MILS)	-0.16		
01:25:38	END	V667	HEFT 2 HFF END DRG VIB (MILS)	-0.09		
01:25:38	CONT	X955	TREND RECORDER OUT 06			
01:25:38	NORM	V667	HEFT 1 HFF END DRG VIB (MILS)	-0.16		
01:25:38	NORM	V667	HEFT 2 HFF END DRG VIB (MILS)	-0.09		
01:25:38	NORM	P024	AUX STM 2304 HUR PRESS	203.49		
01:25:38	NORM	P724	RC LOOP 1 HLG WR PRESS-SFAS CH 1	2087.88		
01:25:38	CONT	X955	TREND RECORDER OUT 06			
01:25:38	LOW	P459	HF FW HTR 2-6 SHELL PRESS	21.47		
01:25:38	NORM	P769	RC PRZR PRESS	2090.80		
01:25:38	CONT	X955	TREND RECORDER OUT 06			
01:25:38	CONT	X955	TREND RECORDER OUT 06			
01:25:40	NORM	P732	RC LOOP 2 HLG WR PRESS-SFAS CH 2	2087.88		
01:25:40	NORM	T027	AUX STM 2304 HUR TEMP	392.57		
01:25:40	HIGH	T609	LPT 1 G/E EXH HOOD TEMP	150.68		
01:25:40	CONT	X955	TREND RECORDER OUT 06			
01:25:43	CONT	G545	ICS SG 2 LO LVL LIMIT			
01:25:43	CONT	Z473	HF FW HTR 2-6 HI LVL DRN VLV			
01:25:43	NORM	P733	RC LOOP 2 HLG WR PRESS-SFAS CH 4	2087.88		
01:25:43	CONT	X955	TREND RECORDER OUT 06			
01:25:43	NORM	P678	NN FW 2 CTRL VLV DF PDT-SAI(PST)	67.21		
01:25:43	LOW	P679	NN FW 2 CTRL VLV DF PDT-SAI(PST)	67.40		
01:25:43	END	V667	HEFT 2 HFF END DRG VIB (MILS)	-0.13		
01:25:43	CONT	X955	TREND RECORDER OUT 06			
01:25:43	FLAG	0166	CHDS FMP RECDRC VLV			
01:25:43	CONT	T955	TOPS BYPASS VLV 2-1 OUT TEMP	210.98		
01:25:43	CONT	0742	RC HU BATCH FLO CMPLTD OR TRMTD			
01:25:43	CONT	0747	RC HU BATCH STOP VLV			
01:25:43	FLAG	0741	RC HU BATCH FLO CMPLTD OR TRMTD			
01:25:43	NORM	V667	HEFT 2 HFF END DRG VIB (MILS)	-0.09		
01:25:43	CONT	0746	RC HU BATCH STOP VLV			
01:25:43	CONT	0742	RC HU BATCH FLO CMPLTD OR TRMTD			
01:25:43	NORM	P703	RC LOOP 1 HLG WR PRESS-SFAS CH 3	2087.88		
01:25:43	CONT	0746	RC HU BATCH STOP VLV			
01:25:43	FLAG	0166	CHDS FMP RECDRC VLV			
01:25:43	FLAG	0741	RC HU BATCH FLO CMPLTD OR TRMTD			
01:25:43	CONT	0747	RC HU BATCH STOP VLV			
01:25:43	CONT	X955	TREND RECORDER OUT 06			
01:25:43	CONT	G545	ICS SG 2 LO LVL LIMIT			
01:25:43	NORM	P678	NN FW 2 CTRL VLV DF PDT-SAI(PST)	67.72		
01:25:43	CONT	0166	CHDS STPS IN OUT VLV TO LP TOND			
01:25:43	NORM	P714	RC HLG TOTAL FLOW (MPPH)	147.01		
01:25:43	CONT	0167	EWST OUT VLV - IN7A			
01:25:43	LOW	P024	AUX STM 2304 HUR PRESS	188.02		
01:25:43	HIGH	T955	TOPS BYPASS VLV 2-1 OUT TEMP	213.69		
01:25:43	CONT	0742	TREND RECORDER OUT 06			

PDR

34

LOW
STPD
NORM
TRIL
NORM

ON
CLOS
2233.10

NO
YES

NO
CLOSE

NO
2233.10
NO
NORM
TRIL
NO

OFF
70.10
NO
1000.00
NO

188.00
250.00

