

October 23, 1996

MEMORANDUM TO: Thomas T. Martin, Director  
Division of Reactor Program Management

FROM: Alfred E. Chaffee, Chief [Original signed by]  
Events Assessment and  
Generic Communications Branch  
Division of Reactor Program Management

SUBJECT: OPERATING REACTORS EVENTS BRIEFING  
OCTOBER 16, 1996 - BRIEFING 96-12

On October 16, 1996, we conducted an Operating Reactors Events Briefing (96-12) to inform senior managers from offices of the Commission, OE, AEOD, NRR and regional offices of selected events that occurred since our last briefing on September 18, 1996. Attachment 1 lists the attendees. Attachment 2 presents the significant elements of the discussed events.

Attachment 3 contains reactor scram statistics for the weeks ending September 22, September 29, October 6, and October 13, 1996. Two significant events were identified for input into the NRC Performance Indicator Program (Attachment 4).

Attachments: As stated (4)

cc w/atts:  
See next page

CONTACT: Kathy Gray, NRR  
(301) 415-1166

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OFFICE	PECB <i>KGray</i>	E	PECB	E	PECB <i>FG</i>	N	C/PECB	N
NAME	KGray:jkd		TKoshy <i>JK</i>		EGoodwin <i>JK</i>		AChaffee <i>JK</i>	
DATE	10/18/96		10/21/96		10/21/96		10/23/96	

OFFICIAL RECORD COPY

ID#2-5 Facility  
License

X-DM-6 meeting

96-135

9610300061 961023  
PDR ORG NRRB  
PDR

ORG

cc:

F. Miraglia, NRR (O-12G18)  
F. Gillespie, NRR (O-12G18)  
R. Zimmerman, NRR (O-12G18)  
A. Thadani, NRR (O-12G18)  
B. Sheron, NRR (O-12G18)  
S. Varga, NRR (O-14E4)  
J. Zwolinski, NRR (O-14H3)  
J. Roe, NRR (O-13E4)  
E. Adensam, NRR (O-13E4)  
G. Lainas, NRR (O-7D26)  
G. Holahan, NRR (O-8E2)  
M. Virgilio, NRR (O-8E2)  
D. O'Neal, NRR (O-10E4)  
B. Boger, NRR (O-9E4)  
M. Markley, ACRS (T-2E26)  
E. Jordan, AEOD (T-4D18)  
C. Rossi, AEOD (T-4A9)  
F. Congel, AEOD (T-4D28)  
R. Barrett, AEOD (T-4A43)  
S. Rubin, AEOD (T-4D28)  
M. Harper, AEOD (T-4A9)  
W. Leschek, AEOD (T-4A9)  
V. McCree, EDO (O-17G21)  
J. Gilliland, PA (O-2G4)  
D. Morrison, RES (T-10F12)  
W. Hill, SECY (O-16G15)  
H. Miller, Region I  
R. Cooper, Region I  
S. Ebnetter, Region II  
E. Merschhoff, Region II  
S. Vias, Region II  
A. Beach, Region III  
J. Caldwell, Acting, Region III  
L. Callan, Region IV  
J. Dyer, Region IV  
K. Perkins, Region IV/WCFO  
G. Fader, INPO  
J. Zimmer, DOE

D. LaBarge, NRR (O-14H25)  
H. Berkow, NRR (O-14H25)

LIST OF ATTENDEES

OPERATING REACTORS EVENTS FULL BRIEFING (96-12)

OCTOBER 16, 1996

<u>NAME</u>	<u>OFFICE</u>	<u>NAME</u>	<u>OFFICE</u>
T. Koshy	NRR	D. Desaulniers	NRR
A. Chaffee	NRR	K. Jabbour	NRR
K. Gray	NRR	J. Kauffman	OE
E. Goodwin	NRR	J. Sharkey	OCM/McGaffigan
J. Carter	NRR	J. Beall	OE/McGaffigan
T. Martin	NRR	E. Rossi	AEOD
G. Hornseth	NRR		
G. Hammer	NRR		
R. Wessman	NRR		

TELEPHONE ATTENDANCE  
(AT ROLL CALL)

Regions  
Region I  
Region II  
Region III  
Region IV

Resident Inspectors

Misc.  
T. Peebles, AIT Team Leader

OPERATING REACTORS EVENTS BRIEFING 96-12

LOCATION: O-10B11, WHITE FLINT  
WEDNESDAY, OCTOBER 16, 1996 11:00 A.M.

OCONEE, UNIT 2

STEAM LINE RUPTURE AND  
PERSONNEL INJURIES (AIT)

PRESENTED BY:

EVENTS ASSESSMENT AND GENERIC COMMUNICATIONS BRANCH  
DIVISION OF REACTOR PROGRAM MANAGEMENT, NRR

OCONEE, UNIT 2  
STEAM LINE RUPTURE AND PERSONNEL INJURIES  
SEPTEMBER 24, 1996

PROBLEM

MOISTURE SEPARATOR REHEATER DRAIN PIPE RUPTURE DURING POWER ASCENSION. STEAM FROM THE RUPTURE CAUSED SIGNIFICANT INJURY TO SEVEN MEMBERS OF PLANT STAFF.

CAUSE

WATER HAMMER INDUCED PRESSURE TRANSIENT RESULTED IN A DUCTILE RUPTURE THAT HAPPENED TO INITIATE AT A PRE-EXISTING BASE METAL FLAW. GEOMETRY OF THE PIPING NEAR THE FLAW CAUSED AN AMPLIFICATION OF THE STRESS.

SAFETY SIGNIFICANCE

PERSONNEL HAZARD  
PLANT TRANSIENT

DISCUSSION

- ON SEPTEMBER 24, 1996 NON-LICENSED OPERATORS AND INSTRUMENT TECHNICIANS WERE REALIGNING MOISTURE SEPARATOR REHEATER DRAINS. (OPERATION PERFORMED AT APPROX. 50% POWER LEVEL)
- THE REALIGNING WAS TO DIVERT MOISTURE SEPARATOR DRAIN TANK WATER FLOW FROM THE MAIN CONDENSER TO THE FEEDWATER HEATERS BY MANUALLY OPENING HD-94 AND HD-91.

CONTACT: T. KOSHY, NRR/DRPM/PECB  
T. PEEBLES, AIT TEAM LEADER  
REFERENCE: 10 CFR 50.72 #31053;  
PN29665

AIT: YES

SIGEVENT: YES

- THE 18-INCH HEADER RUPTURED AT A JUNCTION WITH AN ABANDONED 45-DEGREE CAPPED STUB. THE HEADER JOINS TWO LOOPS OF 12-INCH HEATER DRAIN PIPING.
- THE RUPTURE OPENED THE STUB TO ITS FULL LENGTH INCLUDING 45 DEGREE OPENING ON THE WELDED CAP. ON THE 18 INCH PIPE IT OPENED ABOUT EIGHT INCHES THROUGH THE SADDLE PLATE.
- THE LICENSEE BELIEVES THAT THE LINE THAT CONNECTED THE SECOND STAGE REHEATER DRAIN TANKS TO THE FEED WATER HEATERS HAD WATER AT ROOM TEMPERATURE, AND WATER STEAM MIXTURES AT LOOP SEALS.
- WHEN MANUAL VALVES 2HD-94 AND 95 WERE OPENED, FLOW TO THE CONDENSER THROUGH DIVERT VALVES (2HD 25 AND 26) ACCELERATED WATER IN LOOP SEALS. WHEN STEAM SUBSEQUENTLY PASSED THROUGH THE RELATIVELY COLD PIPES THE STEAM RAPIDLY COLLAPSED, WHICH FURTHER ACCELERATED THE WATER SLUG BEHIND IT. THE COLLISION OF THE WATER SLUG WITH THE UPSTREAM WATER IS HYPOTHESIZED TO HAVE CAUSED A WATER HAMMER.
- THE RUPTURE COULD HAVE OCCURRED WHEN THE "WATER-HAMMER-CAUSED" IMPACT FORCE TRAVELED DOWN THE FLUID AND WAS CONCENTRATED BY THE REDUCER AND 45 DEGREE DEAD LEG.
- HOT WATER AT APPROXIMATELY 406F / 250psig FLASHED TO STEAM, SEVERELY BURNING PERSONNEL IN THE AREA.

AIT FINDINGS

- PLANT HAD LONG HISTORY OF WATER HAMMER PROBLEMS. SUBSTANTIAL CHANGES RECOMMENDED IN NOVEMBER 1995 AND BEFORE BUT NOT IMPLEMENTED WERE AS FOLLOWS:
  - INSTALLATION OF CHECK VALVES TO PREVENT BACKFLOW BETWEEN SECOND STAGE REHEATER DRAINS
  - IMPROVEMENTS TO MOISTURE SEPARATOR REHEATER LEVEL CONTROLS
  - REHEATER STEAM CONTROL VALVE DESIGN CHANGES
- A GENERAL PROCEDURE THAT WAS USED ONCE BEFORE WITHOUT A WATER HAMMER WAS SCHEDULED TO BE CHANGED.
- WITH SIGNIFICANT ENGINEERING INVOLVEMENT, VALVE REALIGNMENT WAS SUCCESSFULLY DONE IN JULY. THE MANUAL VALVES WERE CRACKED OPEN AND LEFT FOR 35 MINUTES BEFORE OPENING THEM FURTHER.
- TEMPERATURE DIFFERENCE BETWEEN DRAIN TANKS AND PRESSURES AT VARIOUS LOCATIONS IN THE DRAIN SYSTEM WERE MONITORED CLOSELY TO ASSURE THE FLOW WOULD BE IN THE FORWARD DIRECTION.
- PRIOR TO THIS EVENT, OPERATORS WERE NOT BRIEFED ON LESSONS LEARNED FROM THE SUCCESSFUL JULY EVOLUTION OTHER THAN TO OPEN THE VALVES SLOWLY. THIS RESULTED IN AN INITIAL OPENING OF 1/4 OF THE WAY.
- THE LICENSEE'S SUBSEQUENT METALLURGICAL EXAMINATIONS WERE WELL ORGANIZED. OTHER THROUGH-WALL CRACKS FOUND ON THE PIPING FROM OTHER LOOP HEATER DRAIN LINES AT CONNECTION TO THE HEADER.



- VISUAL AND NON-DESTRUCTIVE EXAMINATIONS AT UNITS 2 & 3 REVEALED MISSING WELD SADDLE PLATES (WHICH HAVE NOT YET BEEN CONFIRMED TO BE REQUIRED BY THE ASME B31.1 CODE), AND INDICATIONS IN UNIT 1 OF PIPING AND HANGER DISCREPANCIES.
- THE ABOVE FINDINGS PROMPTED THE LICENSEE TO SHUT DOWN UNITS 1 & 3.
- METALLURGICAL EXAMINATION OF THE BREAK RESULTED IN PRELIMINARY CONCLUSION THAT THE RUPTURE WAS DUE TO 100% DUCTILE FRACTURE DUE TO OVERPRESSURE, THE MAGNITUDE OF WHICH WOULD HAVE RUPTURED A NEW PIECE OF PIPE.

#### NRC ACTIONS

- THE SPECIAL INSPECTION THAT STARTED ON SEPTEMBER 25, 1996 WAS CHANGED TO AN AIT ON SEPTEMBER 28, 1996, BASED ON MANAGEMENT REVIEW OF THE EVENT.
- NRR & AEOD PROVIDED SPECIALISTS FOR ON-SITE SUPPORT OF THE INSPECTION.
- AN INFORMATION NOTICE IS BEING CONSIDERED TO INCREASE FACILITY AWARENESS OF THE POTENTIAL SERIOUSNESS OF WATER HAMMER EVENTS.



# REACTOR SCRAM

Reporting Period: 10/07/96 to 10/13/96

<u>DATE</u>	<u>PLANT &amp; UNIT</u>	<u>POWER</u>	<u>TYPE</u>	<u>CAUSE</u>	<u>COMPLICATIONS</u>	YTD ABOVE 15%	YTD BELOW 15%	YTD TOTAL
10/09/96	MAINE YANKEE 1	90	SA	Maintenance Error	NO	2	0	2
10/11/96	SEQUOYAH 2	47	SM	Equipment Failure	NO	1	2	3

Note: Year To Date (YTD) Totals Include Events Within The Calendar Year Indicated By The End Date Of The Specified Reporting Period

COMPARISON OF WEEKLY SCRAM STATISTICS WITH INDUSTRY AVERAGES

PERIOD ENDING 10/13/96						
<u>SCRAM CAUSE</u>	NUMBER OF SCRAMS	1996 WEEKLY AVERAGE (YTD)	1995 WEEKLY AVERAGE	1994 WEEKLY AVERAGE	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE
POWER GREATER THAN OR EQUAL TO 15%						
EQUIPMENT FAILURE	1	1.51	1.83	1.52	1.83	2.62
DESIGN/INSTALLATION ERROR	0	0.12	0.12	0.08	0.04	-
OPERATING ERROR	0	0.07	0.15	0.21	0.27	0.31
MAINTENANCE ERROR	1	0.56	0.38	0.54	0.52	0.50
EXTERNAL	0	0.17	0.21	0.17	0.13	-
OTHER	0	0.10	0.06	-	0.02	-
Subtotal	2	2.53	2.75	2.52	2.81	3.43
POWER LESS THAN 15%						
EQUIPMENT FAILURE	0	0.22	0.10	0.27	0.38	0.42
DESIGN/INSTALLATION ERROR	0	0.00	-	0.02	-	-
OPERATING ERROR	0	0.10	0.13	0.08	0.13	0.15
MAINTENANCE ERROR	0	0.07	0.08	-	0.02	0.08
EXTERNAL	0	0.00	-	-	0.04	-
OTHER	0	0.00	-	-	-	-
Subtotal	0	0.39	0.31	0.37	0.57	0.65
TOTAL	2	2.92	3.06	2.89	3.38	4.08

<u>SCRAM TYPE</u>	NO. OF SCRAMS	1996 WEEKLY AVERAGE (YTD)	1995 WEEKLY AVERAGE	1994 WEEKLY AVERAGE	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE
TOTAL AUTOMATIC SCRAMS	1	1.80	1.92	2.19	2.44	3.06
TOTAL MANUAL SCRAMS	1	1.12	1.13	0.69	0.94	1.02

TOTALS MAY DIFFER BECAUSE OF ROUNDING OFF

# REACTOR SCRAM

Reporting Period: 09/30/96 to 10/06/96

<u>DATE</u>	<u>PLANT &amp; UNIT</u>	<u>POWER</u>	<u>TYPE</u>	<u>CAUSE</u>	<u>COMPLICATIONS</u>	<u>YTD ABOVE 15%</u>	<u>YTD BELOW 15%</u>	<u>YTD TOTAL</u>
10/06/96	PEACH BOTTOM 2	88	SA	Maintenance Error	NO	1	0	1

Note: Year To Date (YTD) Totals Include Events Within The Calendar Year Indicated By The End Date Of The Specified Reporting Period

## COMPARISON OF WEEKLY SCRAM STATISTICS WITH INDUSTRY AVERAGES

PERIOD ENDING  
10/06/96

SCRAM CAUSE	NUMBER OF SCRAMS	1996 WEEKLY AVERAGE (YTD)	1995 WEEKLY AVERAGE	1994 WEEKLY AVERAGE	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE
POWER GREATER THAN OR EQUAL TO 15%						
EQUIPMENT FAILURE	0	1.53	1.83	1.52	1.83	2.62
DESIGN/INSTALLATION ERROR	0	0.13	0.12	0.08	0.04	-
OPERATING ERROR	0	0.08	0.15	0.21	0.27	0.31
MAINTENANCE ERROR	1	0.55	0.38	0.54	0.52	0.50
EXTERNAL	0	0.18	0.21	0.17	0.13	-
OTHER	0	0.10	0.06	-	0.02	-
Subtotal	1	2.57	2.75	2.52	2.81	3.43
POWER LESS THAN 15%						
EQUIPMENT FAILURE	0	0.23	0.10	0.27	0.38	0.42
DESIGN/INSTALLATION ERROR	0	0.00	-	0.02	-	-
OPERATING ERROR	0	0.10	0.13	0.08	0.13	0.15
MAINTENANCE ERROR	0	0.08	0.08	-	0.02	0.08
EXTERNAL	0	0.00	-	-	0.04	-
OTHER	0	0.00	-	-	-	-
Subtotal	0	0.41	0.31	0.37	0.57	0.65
TOTAL	1	2.98	3.06	2.89	3.38	4.08

SCRAM TYPE	NO. OF SCRAMS	1996 WEEKLY AVERAGE (YTD)	1995 WEEKLY AVERAGE	1994 WEEKLY AVERAGE	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE
TOTAL AUTOMATIC SCRAMS	1	1.83	1.92	2.19	2.44	3.06
TOTAL MANUAL SCRAMS	0	1.13	1.13	0.69	0.94	1.02

TOTALS MAY DIFFER BECAUSE OF ROUNDING OFF

# REACTOR SCRAM

Reporting Period: 09/23/96 to 09/29/96

<u>DATE</u>	<u>PLANT &amp; UNIT</u>	<u>POWER</u>	<u>TYPE</u>	<u>CAUSE</u>	<u>COMPLICATIONS</u>	<u>YTD ABOVE 15%</u>	<u>YTD BELOW 15%</u>	<u>YTD TOTAL</u>
09/24/96	OCOMEE 2	60	SM	Design or Installati	NO	1	0	1

Note: Year To Date (YTD) Totals Include Events Within The Calendar Year Indicated By The End Date Of The Specified Reporting Period

COMPARISON OF WEEKLY SCRAM STATISTICS WITH INDUSTRY AVERAGES

PERIOD ENDING 09/29/96						
SCRAM CAUSE	NUMBER OF SCRAMS	1996 WEEKLY AVERAGE (YTD)	1995 WEEKLY AVERAGE	1994 WEEKLY AVERAGE	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE
POWER GREATER THAN OR EQUAL TO 15%						
EQUIPMENT FAILURE	0	1.56	1.83	1.52	1.83	2.62
DESIGN/INSTALLATION ERROR	1	0.13	0.12	0.08	0.04	-
OPERATING ERROR	0	0.08	0.15	0.21	0.27	0.31
MAINTENANCE ERROR	0	0.54	0.38	0.54	0.52	0.50
EXTERNAL	0	0.18	0.21	0.17	0.13	-
OTHER	0	0.10	0.06	-	0.02	-
Subtotal	1	2.59	2.75	2.52	2.81	3.43
POWER LESS THAN 15%						
EQUIPMENT FAILURE	0	0.23	0.10	0.27	0.38	0.42
DESIGN/INSTALLATION ERROR	0	0.00	-	0.02	-	-
OPERATING ERROR	0	0.10	0.13	0.08	0.13	0.15
MAINTENANCE ERROR	0	0.08	0.08	-	0.02	0.08
EXTERNAL	0	0.00	-	-	0.04	-
OTHER	0	0.00	-	-	-	-
Subtotal	0	0.41	0.31	0.37	0.57	0.65
TOTAL	1	3.00	3.06	2.89	3.38	4.08

SCRAM TYPE	NO. OF SCRAMS	1996 WEEKLY AVERAGE (YTD)	1995 WEEKLY AVERAGE	1994 WEEKLY AVERAGE	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE
TOTAL AUTOMATIC SCRAMS	0	1.85	1.92	2.19	2.44	3.06
TOTAL MANUAL SCRAMS	1	1.15	1.13	0.69	0.94	1.02

TOTALS MAY DIFFER BECAUSE OF ROUNDING OFF

# REACTOR SCRAM

Reporting Period: 09/16/96 to 09/22/96

<u>DATE</u>	<u>PLANT &amp; UNIT</u>	<u>POWER</u>	<u>TYPE</u>	<u>CAUSE</u>	<u>COMPLICATIONS</u>	<u>YTD</u> <u>ABOVE</u> <u>15%</u>	<u>YTD</u> <u>BELOW</u> <u>15%</u>	<u>YTD</u> <u>TOTAL</u>
09/16/96	FITZPATRICK 1	100	SA	Maintenance Error	YES	1	1	2
09/16/96	BIG ROCK POINT 1	55	SA	Equipment Failure	NO	1	0	1
09/18/96	CONANACHE PEAK 2	100	SA	Other	NO	2	0	2
09/22/96	COOK 1	88	SA	Other	NO	2	0	2

Note: Year To Date (YTD) Totals Include Events Within The Calendar Year Indicated By The End Date Of The Specified Reporting Period



DESCRIPTION OF COMPLICATION(S) 09/16/96 TO 09/22/96

SITE

UNIT

COMPLICATIONS

FITZPATRICK

1

LP AND FWP TURBINES' RUPTURE DISCS RUPTURED, ALLOWING STEAM INTO  
TURBINE BUILDING. UNUSUAL EVENT DECLARED.

## NOTES

1. PLANT SPECIFIC DATA BASED ON INITIAL REVIEW OF 50.72 REPORTS FOR THE WEEK OF INTEREST. PERIOD IS MIDNIGHT SUNDAY THROUGH MIDNIGHT SUNDAY. SCRAMS ARE DEFINED AS REACTOR PROTECTIVE ACTUATIONS WHICH RESULT IN ROD MOTION, AND EXCLUDE PLANNED TESTS OR SCRAMS AS PART OF PLANNED SHUTDOWN IN ACCORDANCE WITH A PLANT PROCEDURE. THERE ARE 111 REACTORS HOLDING AN OPERATING LICENSE.
2. PERSONNEL RELATED PROBLEMS INCLUDE HUMAN ERROR, PROCEDURAL DEFICIENCIES, AND MANUAL STEAM GENERATOR LEVEL CONTROL PROBLEMS.
3. COMPLICATIONS: RECOVERY COMPLICATED BY EQUIPMENT FAILURES OR PERSONNEL ERRORS UNRELATED TO CAUSE OF SCRAM.
4. "OTHER" INCLUDES AUTOMATIC SCRAMS ATTRIBUTED TO ENVIRONMENTAL CAUSES (LIGHTNING), SYSTEM DESIGN, OR UNKNOWN CAUSE.

### OEAB SCRAM DATA

Manual and Automatic Scrams for 1987	-----	435
Manual and Automatic Scrams for 1988	-----	291
Manual and Automatic Scrams for 1989	-----	252
Manual and Automatic Scrams for 1990	-----	226
Manual and Automatic Scrams for 1991	-----	206
Manual and Automatic Scrams for 1992	-----	212
Manual and Automatic Scrams for 1993	-----	175
Manual and Automatic Scrams for 1994	-----	150
Manual and Automatic Scrams for 1995	-----	159
Manual and Automatic Scrams for 1996	--(YTD 10/13/96)--	120

# OPERATING REACTOR PLANTS SIGNIFICANT EVENTS

SORT> Event Date

QUERY> Event Type SIG & Close Out Date >= 05/29/96 & Event Type = "SIG"

PLANT & UNIT	DATE OF EVENT	50.72 NUMBER	DESCRIPTION OF EVENT	SIGNIFICANCE	OR BRIEFING	PRESENTER	CLOSEOUT RECORD
ARKANSAS NUCLEAR 1	05/19/96	30495	A reactor trip occurred after malfunctions of main feedwater pump controls. The "B" OTSG boiled dry after one of its main steam safety valves stuck open.	Other - Reactor trip with complications caused by stuck open main steam safety valve.	96-06	BENEDICT R.	HIGHLIGHT
HADDAM NECK 1	09/01/96	30992	Inadvertent introduction of nitrogen into the RCS during shutdown. Questionable transfer of RCS inventory and level fluctuations.	Safety-Related Cooling System	96-11	BENNER E.	HIGHLIGHT