

June 13, 1994

60-283  
60-310

MEMORANDUM FOR: Brian K. Grimes, Director  
 Division of Operating Reactor Support

FROM: Alfred E. Chaffee, Chief  
 Events Assessment Branch  
 Division of Operating Reactor Support

SUBJECT: OPERATING REACTORS EVENTS BRIEFING  
 JUNE 8, 1994 - BRIEFING 94-19

On June 8, 1994, we conducted an Operating Reactors Events Briefing (94-19) to inform senior managers from offices of the Commission, NRR, EDO, AEOD, OE and regional offices of selected events that occurred since our last briefing on June 1, 1994. Enclosure 1 lists the attendees. Enclosure 2 presents the significant elements of the discussed events.

Enclosure 3 contains reactor scram statistics for the week ending June 5, 1994. No significant events were identified for input into the NRC Performance Indicator Program.

[original signed by]

Alfred E. Chaffee, Chief  
 Events Assessment Branch  
 Division of Operating  
 Reactor Support

Enclosures: As stated

cc w/enclosures:  
 See next page

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

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A handwritten signature in cursive script that reads "Alfred E. Chaffee".

Alfred E. Chaffee, Chief  
Events Assessment Branch  
Division of Operating  
Reactor Support

Enclosures: As stated

cc w/enclosures:  
See next page

cc:

W. Russell, NRR (O-12G18)  
F. Miraglia, NRR (O-12G18)  
F. Gillespie, NRR (O-12G18)  
Acting ADPR, NRR (O-12G18)  
S. Varga, NRR (O-14E4)  
J. Calvo, NRR (O-14A4)  
G. Lainas, NRR (O-14H3)  
J. Roe, NRR (O-13E4)  
J. Zwolinski, NRR (O-13H24)  
E. Adensam, NRR (O-13E4)  
A. Thadani, NRR (O-12G18)  
B. Sheron, NRR (O-7D26)  
M. Virgilio, NRR (O-8E2)  
S. Rosenberg, NRR (O-10E4)  
C. Rossi, NRR (O-9A2)  
B. Boger, NRR (O-10H3)  
F. Congel, NRR (O-10E2)  
D. Crutchfield, NRR (O-11H21)  
W. Travers, NRR (O-11B19)  
D. Coe, ACRS (P-315)  
E. Jordan, AEOD (T-4D18)  
G. Holahan, AEOD (T-4A9)  
L. Spessard, AEOD (T-4D28)  
K. Brockman, AEOD (T-4A23)  
S. Rubin, AEOD (T-4D28)  
M. Harper, AEOD (T-4A9)  
V. McCree, EDO (O-17G21)  
F. Ingram, PA (O-2G5)  
E. Beckjord, RES (T-10F2)  
A. Bates, SECY (O-16G15)  
T. Martin, Region I  
R. Cooper, Region I  
S. Ebnetter, Region II  
J. Johnson, Region II  
S. Vias, Region II  
J. Martin, Region III  
E. Greenman, Region III  
L. Callan, Region IV  
A. Beach, Region IV  
K. Perkins, Region IV/WCFO

R. Hernan (PDI-4)  
J. Stolz (PDI-4)  
V. Nerses (PDII-3)  
D. Matthews (PDII-3)

bcc: Mr. Sam Newton, Manager  
Events Analysis Department  
Institute of Nuclear Power Operations  
700 Galleria Parkway  
Atlanta, GA 30339-5957

ENCLOSURE 1

LIST OF ATTENDEES

OPERATING REACTORS EVENTS FULL BRIEFING (94-19)

JUNE 8, 1994

<u>NAME</u>	<u>OFFICE</u>	<u>NAME</u>	<u>OFFICE</u>
A. CHAFFEE	NRR	M. DAVIS	NRR
T. KOSHY	NRR	H. RICHINGS	NRR
E. BENNER	NRR	B. BOGER	NRR
E. GOODWIN	NRR	C. ROSSI	NRR
T. YAMADA	NRR	B. GRIMES	NRR
K. GRAY	NRR	S. VARGA	NRR
A. DROMERICK	NRR	J. CALVO	NRR
R. HANDAYANI	NRR	R. HERNAN	NRR
G. LAINAS	NRR	S. ROSENBERG	NRR
D. GAMBERONI	NRR	V. NERSES	NRR
M. SHANNON	NRR	J. BEALL	OE
D. O'NEAL	NRR	W. DEAN	OEDO
D. MATTHEWS	NRR	J. ROSENTHAL	AEOD

TELEPHONE ATTENDANCE  
(AT ROLL CALL)

Regions

Region I  
Region II  
Region III  
Region IV

Resident Inspectors

G. Maxwell (McGuire)  
M. Evans (TMI)  
D. Beaulieu (TMI)  
T. Cooper (Crystal River)

IIT/AIT Team Leaders

Misc.

OPERATING REACTORS EVENTS BRIEFING 94-19

LOCATION: 0-10B11, WHITE FLINT  
WEDNESDAY, JUNE 7, 1994 11:00 A.M.

THREE MILE ISLAND, UNIT 1

INCREASE IN CONTROL ROD  
DROP TIME

MCGUIRE, UNIT 2

NITROGEN ACCUMULATION IN  
SAFETY INJECTION SYSTEM

PRESENTED BY: EVENTS ASSESSMENT BRANCH  
DIVISION OF OPERATING REACTOR  
SUPPORT, NRR

THREE MILE ISLAND, UNIT 1  
INCREASE IN CONTROL ROD DROP TIME  
MARCH 25 AND JUNE 1, 1994

PROBLEM

INCREASE IN CONTROL ROD DROP TIME FOR MULTIPLE RODS.

PROBABLE CAUSES

LONGER FUEL CYCLE AND THEREFORE HIGHER BORON CONCENTRATION  
CAUSING CRUD BUILD UP IN CRDM THERMAL BARRIERS.

SAFETY SIGNIFICANCE

REDUCES MARGIN IN SCRAM TIME.

BACKGROUND

- ROD DROP TIMES BEFORE CYCLE 10 WAS CONSISTENTLY 1.37 SEC. OR LOWER.
- LONGER FUEL CYCLES STARTED WITH CYCLE 9.
- AT THE END OF CYCLE 10, ROD DROP TIME FOR THREE RODS EXCEEDED 1.66 SEC. (TECH SPEC LIMIT). MAXIMUM DROP TIME WAS 1.83 SEC.
- POST OUTAGE TESTING CONDUCTED IN MARCH 1994 REVEALED 12 RODS EXCEEDING TECH SPEC LIMIT. A MAXIMUM DROP TIME WAS 2.89 SEC.

CONTACT: THOMAS KOSHY, NRR/DORS/OEAB  
REFERENCE: 10 CFR 50.72 #26954, #27333

AIT: NO  
SIGEVENT: TBD

- GROUP 7 RODS WERE STROKED OFTEN AND ROD DROP TIME REMAINED UNAFFECTED.
- REPETITIVE ROD DROPS FROM 1 TO 47 TIMES BROUGHT ALL RODS WITHIN SPECIFICATION.
- RODS NEAR CENTER OF CORE DID NOT INCREASE IN DROP TIME AS MUCH AS OUTER RODS.
- CONFIRMATORY ACTION LETTER (CAL) ISSUED ON MARCH 29, 1994 TO CONFIRM:
  - WITHDRAWAL OF LICENSEE'S REQUEST TO RAISE THE TECH. SPEC. LIMIT ON ROD DROP TIME.
  - INCREASED LITHIUM CONCENTRATION TO MINIMIZE CRUD BUILD UP IN THE CONTROL ROD DRIVE MECHANISM (CRDM).
  - CRDMs TO BE EXERCISED EVERY TWO WEEKS AT TEN PERCENT LENGTH DURING REMINDER OF CYCLE 10.
  - ROD DROP TIMES TO BE OBTAINED WITHIN THREE MONTHS OF REACTOR START UP (BY JUNE 1, 1994).
  - IF DROP TIME ON ANY ROD EXCEEDS TECH SPEC LIMIT, AT LEAST ONE CRDM WILL BE REMOVED AND INSPECTED.

#### DISCUSSION

- FOUR BALL CHECK VALVES LOCATED IN THERMAL BARRIER ARE CRITICAL FOR ACCEPTABLE DROP TIME. IF THESE ARE ALL BLOCKED BY CRUD BUILD UP, THE DROP TIME COULD INCREASE TO 2.86 SEC.

- SLOW DROP TIMES ARE DUE TO INCREASED FLUID DRAG.
- SIMILAR PROBLEM WAS NOTED AT OCONEE; NRR APPROVAL GIVEN FOR TWO CONTROL RODS TO HAVE DROP TIME UP TO 3.0 SEC. FOR CYCLE 15.
- HIGHER LITHIUM CONCENTRATIONS (HIGHER pH) NOW USED AT TMI SHOULD LEAD TO SLOWER CRUD BUILD UP.
- EXERCISE OF RODS THROUGH 10 PERCENT LENGTH EVERY TWO WEEKS SHOULD CYCLE THE TRAPPED FLUID IN CRDMs AND HELP TO REDUCE CRUD DEPOSITS.
- TESTS CONDUCTED IN JUNE 1994 AFTER THREE MONTHS OF OPERATION (AS REQUIRED BY CAL) IDENTIFIED THREE RODS OUTSIDE THE SPECIFICATION.

GROUP 4 ROD 5	2.008 SEC.
GROUP 6 ROD 5	2.200 SEC.
GROUP 1 ROD 3	2.072 SEC.

- LICENSEE INSPECTED THE ABOVE THREE AND ANOTHER CRDM (3-6); TWO HAD ALL FOUR CHECK VALVES PLUGGED AND TWO CRDMs HAD THREE CHECK VALVES PLUGGED FROM CRUD BUILD UP.
- THESE CRDMs WERE MODIFIED WITH AN IMPROVED DESIGN OF THERMAL BARRIER TO REDUCE THE PROBABILITY OF CHECK VALVE BINDING.

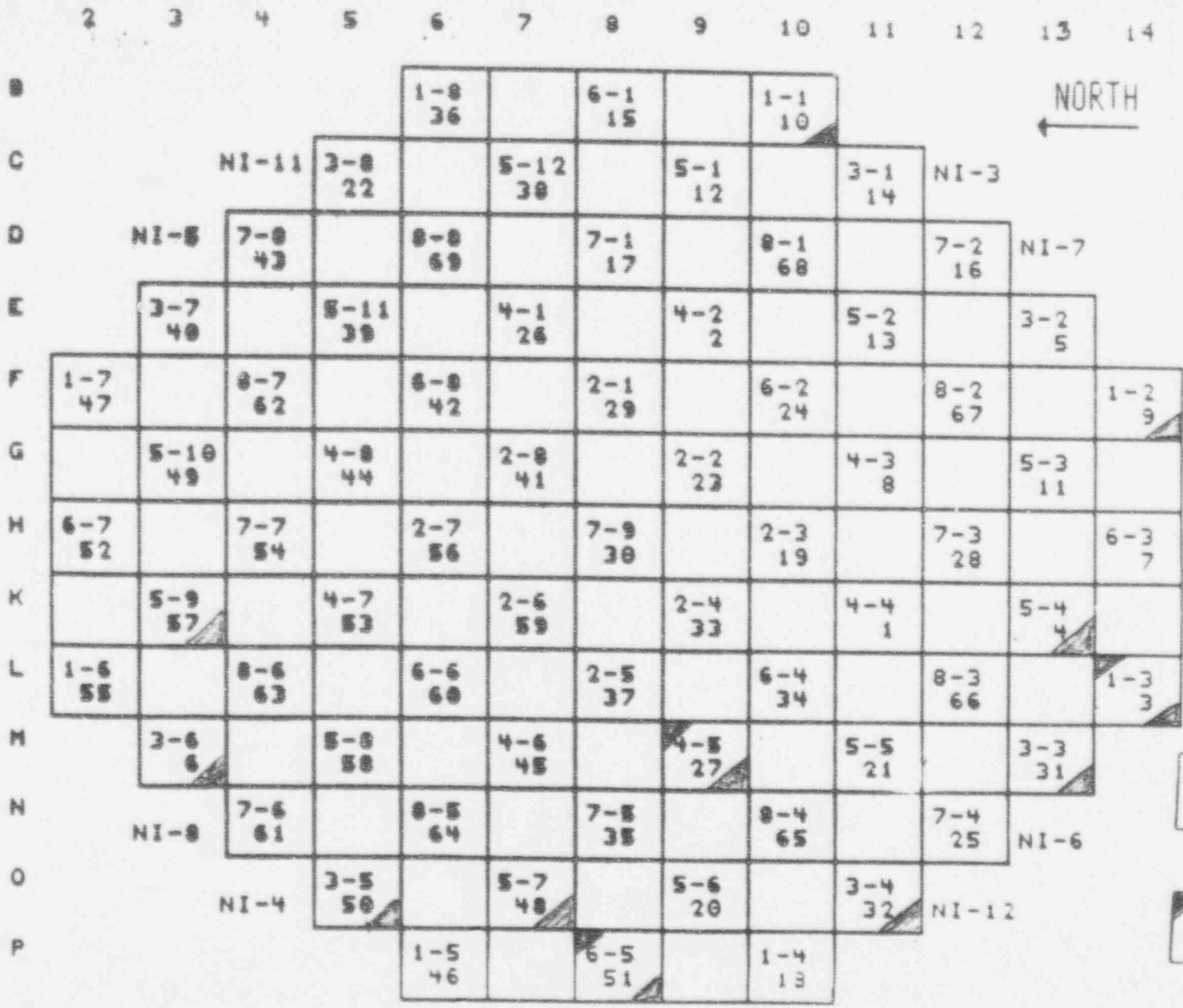


FOLLOW UP

- NRR AND REGION ARE ASSESSING LICENSEE'S CORRECTIVE ACTIONS AND INSPECTION RESULTS.
- LICENSEE HAS REQUESTED TECH SPEC RELIEF FOR 12 AFFECTED RODS TO HAVE A LIMIT OF 2.11 SEC.
- A MEETING WITH LICENSEE IS SCHEDULED FOR JULY 12, 1994.
- NRR/REGION EVALUATING THE NEED FOR INFORMATION NOTICE.


# CONTROL ROD ID MAP

BRIEFING 94-19  
TMI, UNIT 1  
FIGURE 1

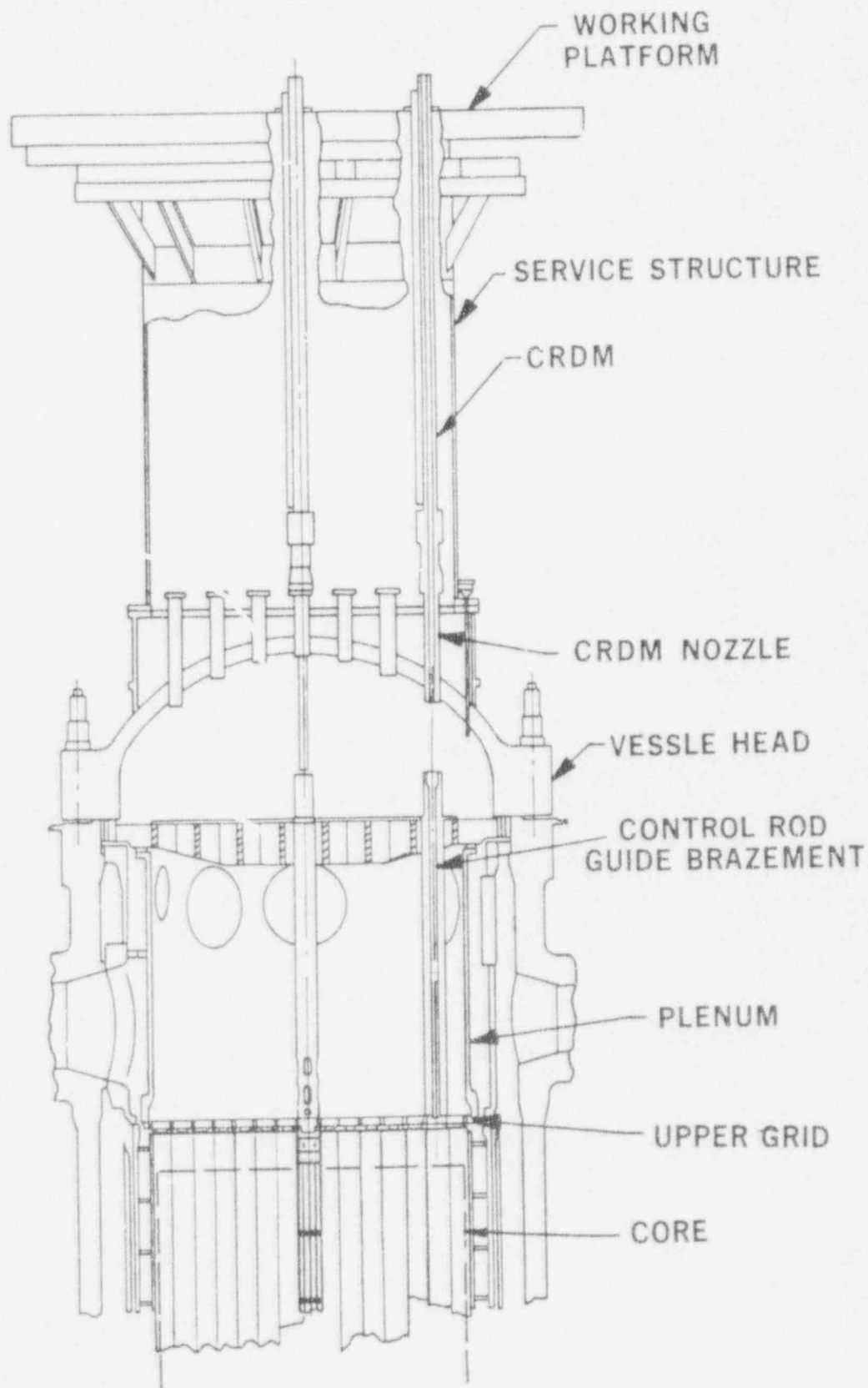


NORTH  
←

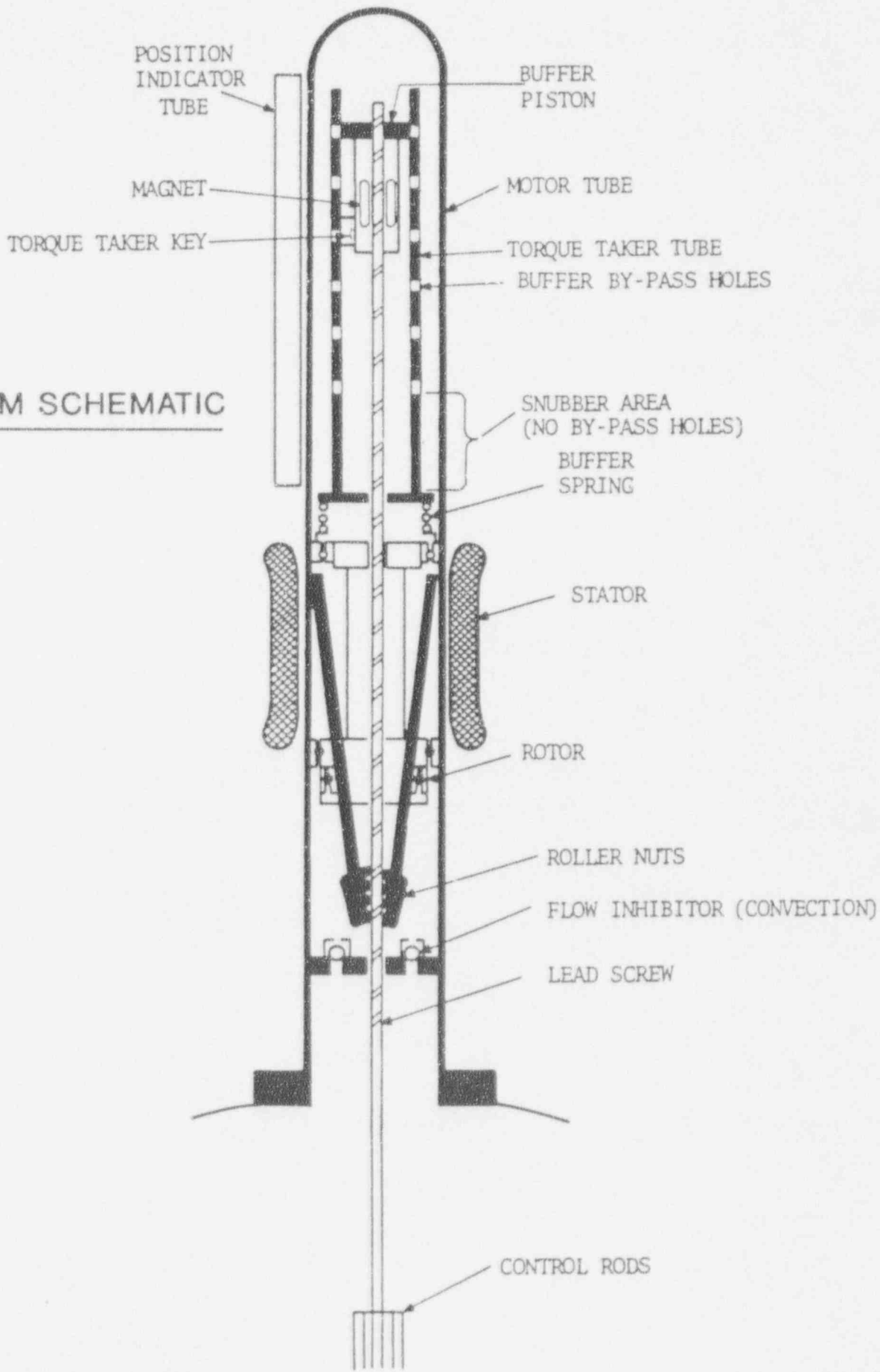
 SLOW IN MAR '94

 SLOW IN JUN '94

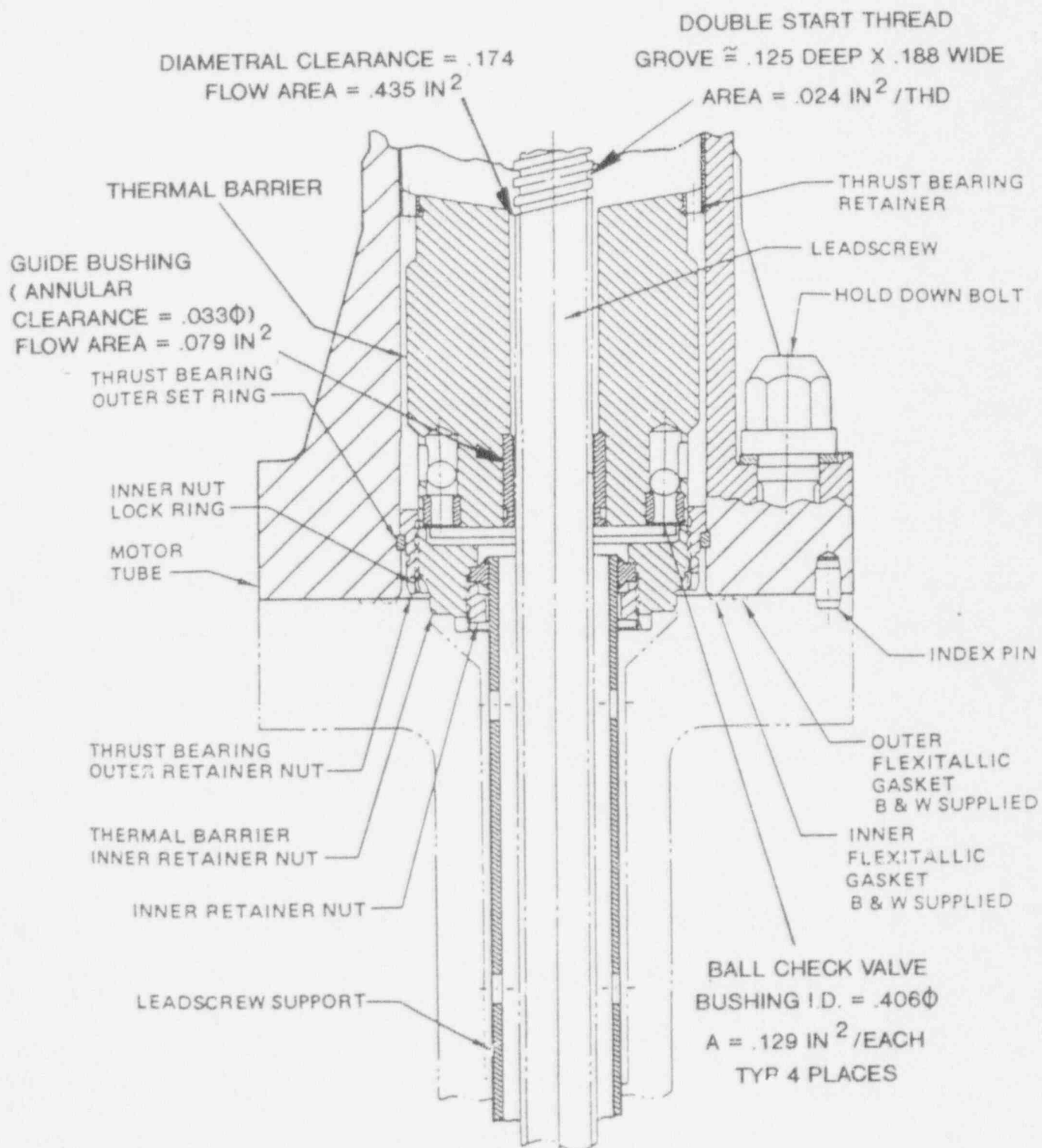
# REACTOR & SERVICE STRUCTURE



CRDM SCHEMATIC



## CRDM THERMAL BARRIER REGION

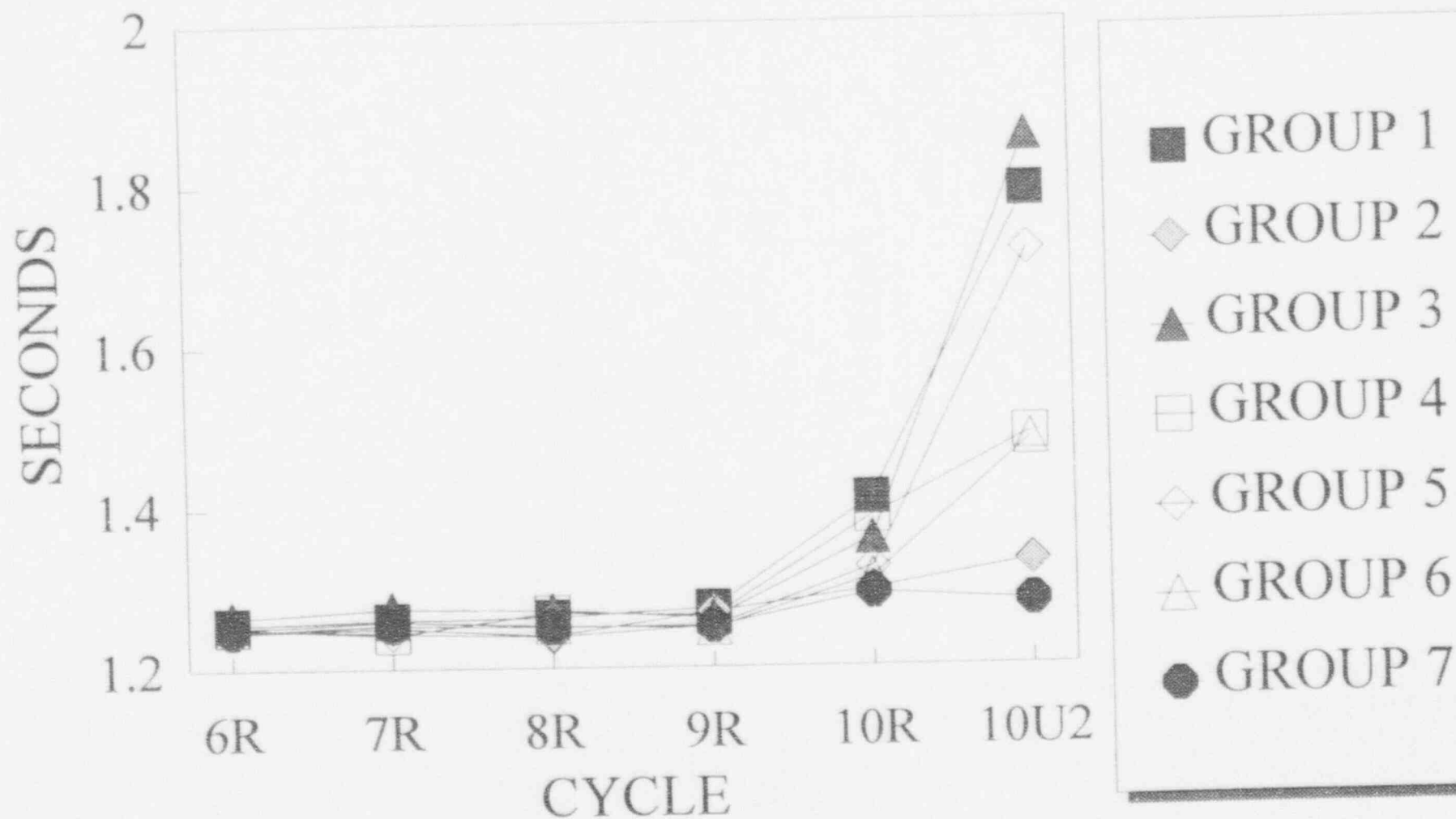


## *Predicted Drop Times*

<i>4 Vent Paths Open</i>	<i>1.39</i>
<i>3 Vent Paths Open</i>	<i>1.40</i>
<i>2 Vent Paths Open</i>	<i>1.43</i>
<i>1 Vent Paths Open</i>	<i>1.51</i>
<i>Zero Vent Path Open</i>	<i>2.14</i>
<i>Guide Bushing Nominal Clearance</i>	
<i>Zero Vent Path Open</i>	<i>2.80</i>
<i>.017 Diametrical Clearance</i>	

# TMI-1 RCD DROP HISTORY

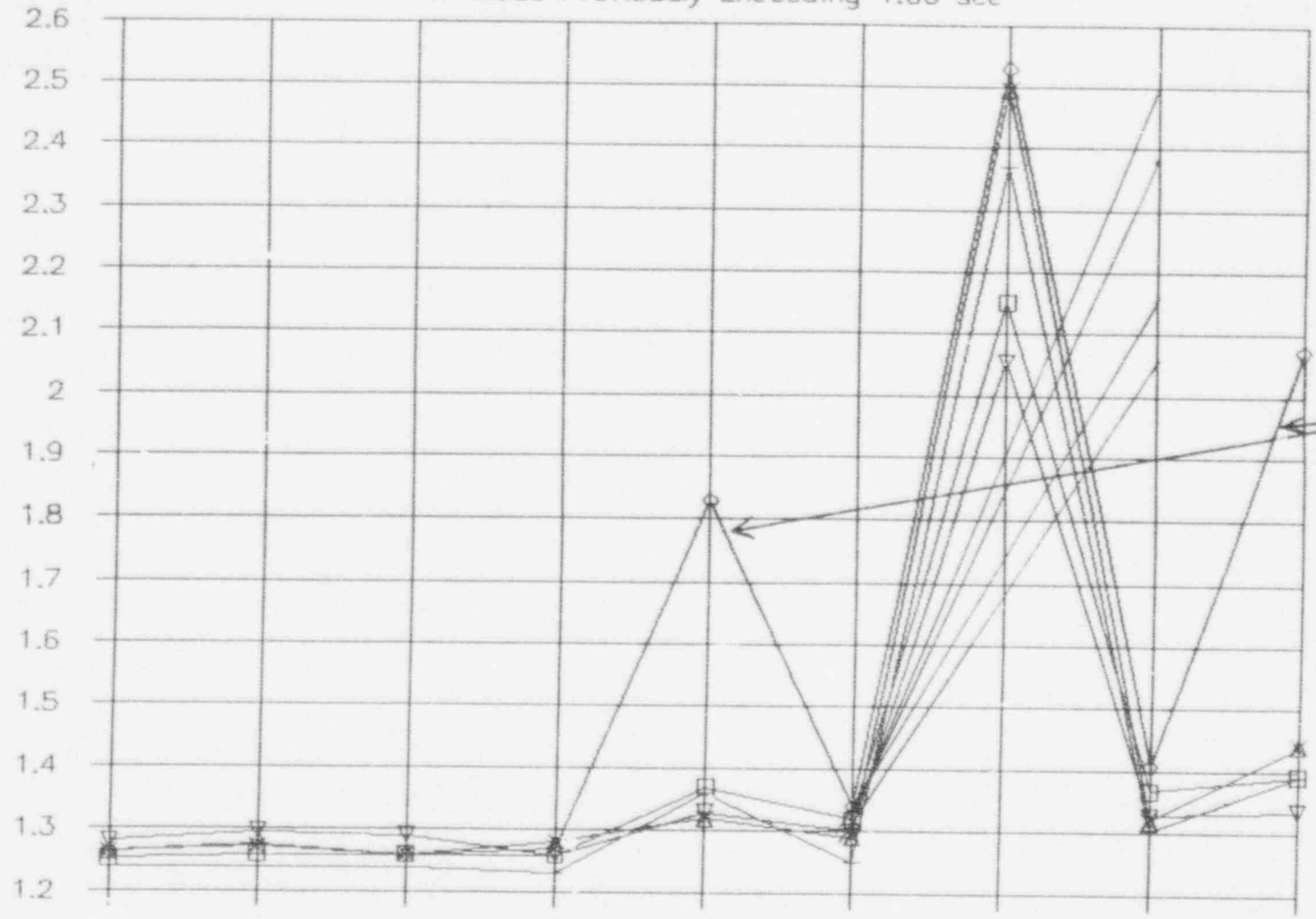
## GROUP AVG DROP TIMES



# ROD DROP TIME HISTORY

For Rods Previously Exceeding 1.66 sec

Seconds



1-3  
 (46 drops-MAR)

- |   |                 |   |                 |   |                 |
|---|-----------------|---|-----------------|---|-----------------|
| □ | ROD B-10 (1-1)✓ | + | ROD F-14 (1-2)✓ | ◇ | ROD L-14 (1-3)✓ |
| △ | ROD M-13 (3-3)✓ | x | ROD O-11 (3-4)✓ | ▽ | ROD O-05 (3-5)✓ |

F: AS FOUND  
 L: AS LEFT

Outage Data

MAR 94

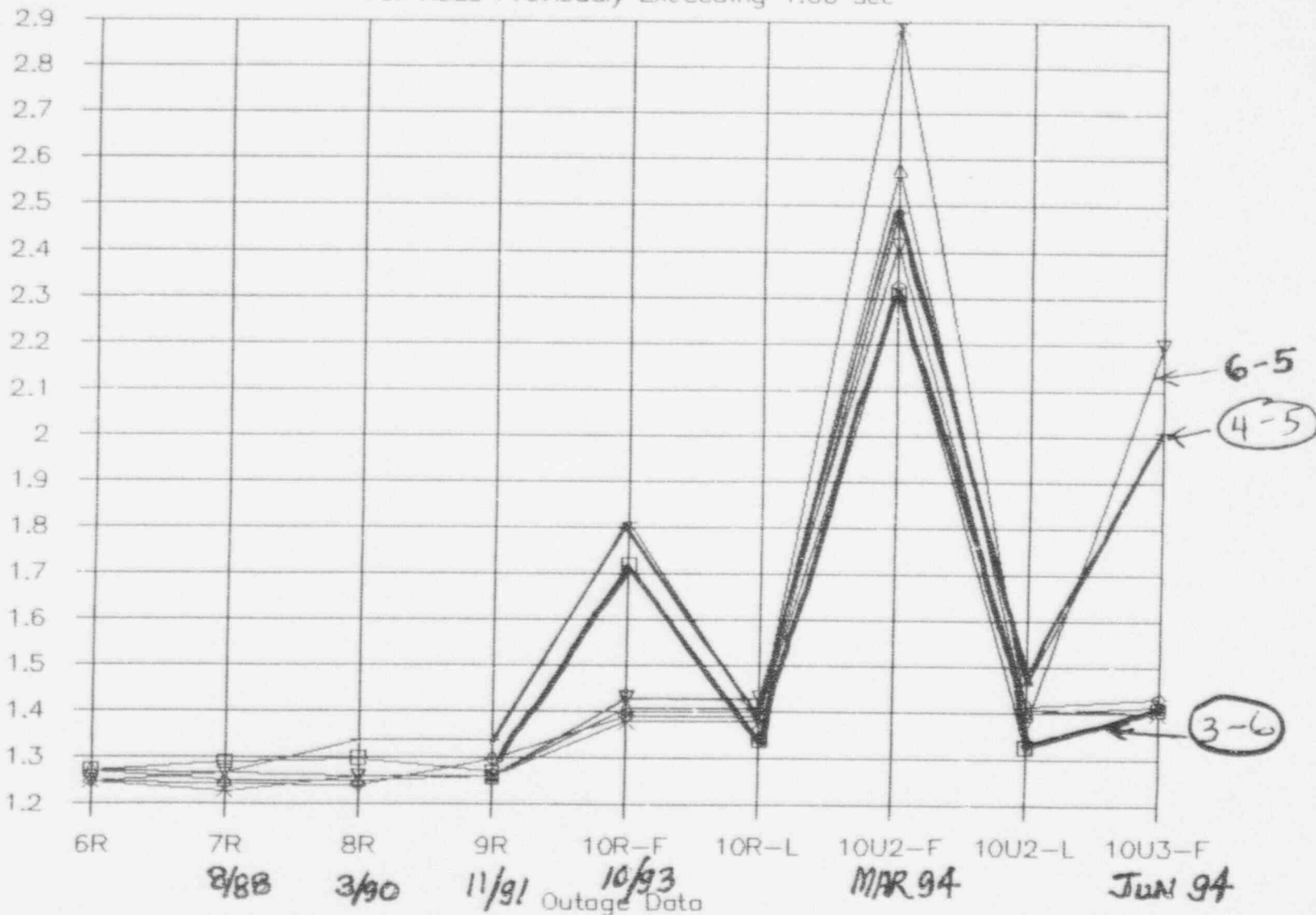
JUN 94



# ROD DROP TIME HISTORY

For Rods Previously Exceeding 1.66 sec

Seconds



- |   |                  |   |                  |   |                  |
|---|------------------|---|------------------|---|------------------|
| □ | ROD M-03 (3-6) ✓ | + | ROD M-09 (4-5) ✓ | ◇ | ROD K-13 (5-4) ✓ |
| △ | ROD O-07 (5-7) ✓ | x | ROD K-03 (5-9) ✓ | ▽ | ROD P-08 (6-5) ✓ |

MCGUIRE, UNIT 2  
NITROGEN ACCUMULATION IN SAFETY INJECTION SYSTEM  
MAY 26, 1994

PROBLEM

NITROGEN (N<sub>2</sub>) ACCUMULATION IN THE DISCHARGE PIPING OF THE SAFETY INJECTION (SI) PUMPS.

CAUSE

TWO LEAKING CHECK VALVES IN THE SI SYSTEM ALLOWED N<sub>2</sub> TO MIGRATE FROM THE COLD LEG ACCUMULATORS TO THE SI PUMP DISCHARGE PIPING.

SAFETY SIGNIFICANCE

POTENTIAL EXISTS FOR WATER HAMMER AND INJECTION OF N<sub>2</sub> INTO THE REACTOR COOLANT SYSTEM (RCS) DURING A LOSS OF COOLANT ACCIDENT.

DISCUSSION

SEPTEMBER 1993: UNIT 2 RESTARTS, ACCUMULATOR "2B" REQUIRES FREQUENT MAKEUP VIA THE SI SYSTEM (FOUR TIMES PER DAY). LICENSEE SUSPECTED INTERFACING CHECK VALVE LEAKAGE AND SCHEDULED REPAIR FOR NEXT OUTAGE.

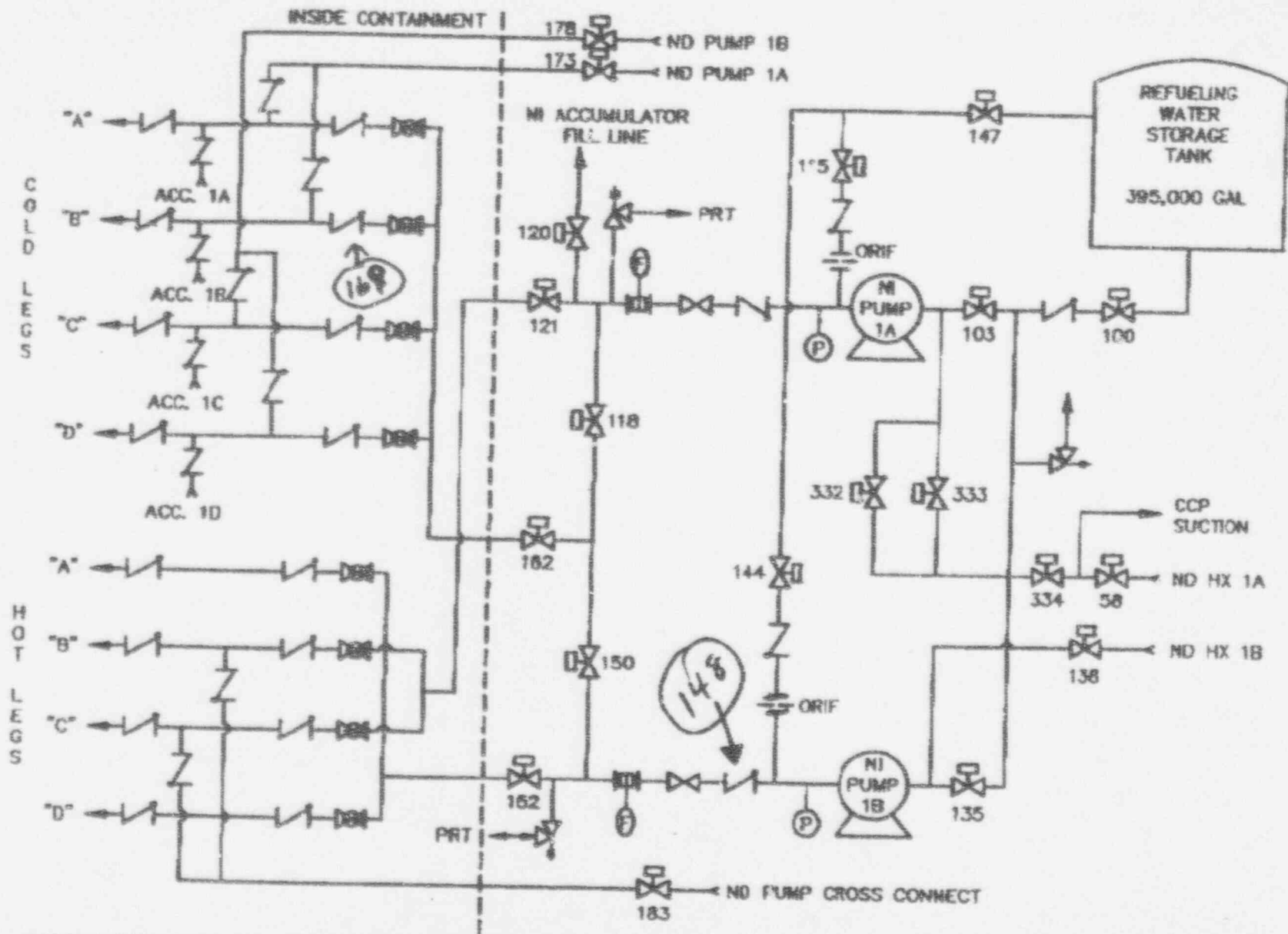
CONTACT: E. BENNER, NRR/DORS/EAB  
REFERENCE: MORNING REPORT #2-94-0038

AIT: TBD  
SIGEVENT: TBD

- SEPTEMBER 1993 - MAY 1994: LICENSEE RECEIVES VARIOUS INDICATIONS OF GAS IN SI PIPING:
  - LEAKAGE PAST SI PUMP DISCHARGE CHECK VALVE 2NI-148
  - SI PUMP SUCTION MILD PRESSURIZATION AFTER PUMP STOP
  - N<sub>2</sub> VENTED FROM SI PUMP DISCHARGE LINE
- LICENSEE INSTALLS PRESSURE INSTRUMENTATION ON DOWNSTREAM SIDE OF SI PUMP TO EVALUATE PRESSURE DECAY AFTER PUMP RUNS; INSTRUMENTATION VERIFIES SUCTION PIPING PRESSURIZATION AFTER PUMP RUN.
- LICENSEE NOTES THAT 2NI-162 (INITIALLY WARM) COOLS IMMEDIATELY AFTER SI PUMP IS STARTED.
- LICENSEE CONCLUDES THAT ACCUMULATOR OUTLEAKAGE IS DEGASSING IN LOWER PRESSURE SI PIPING AFTER LEAKING PAST CHECK VALVE 2NI-169. GAS PASSES THROUGH PUMP MINI-FLOW LINE TO REACTOR WATER STORAGE TANK.
- SI SYSTEM OPERABILITY ASSESSMENT INCLUDED:
  - POTENTIAL FOR WATER HAMMER AND RESULTING DAMAGE
  - POTENTIAL FOR PUMP RUNOUT AS GAS COLLAPSES
  - POTENTIAL FOR GASEOUS RELEASE VIA REACTOR WATER STORAGE TANK VENT
  - EFFECT OF GAS ON RCS
  - DELAY OF WATER INJECTION DURING COLD LEG INJECTION

FOLLOWUP

- SI SYSTEM WAS DECLARED "CONDITIONALLY OPERABLE" BASED ON THE CONDITION THAT THE SI PUMP DISCHARGE PIPING WAS TO BE VENTED ONCE PER DAY, INITIALLY, AND MORE FREQUENTLY IF NECESSARY.
  
- LICENSEE LAPPED DISK AND SEAT OF VALVE 2NI-148; ACCUMULATOR "2B" HAS REQUIRED NO MAKEUP SINCE.
  
- NRR/REGION ASSESSING THE NEED FOR AN INFORMATION NOTICE.



SAFETY INJECTION SYSTEM (NI)	MC-ECC-NI-i	3-28-91
	MC-1562-2.3	TP76153
	BB	WGH
	MCECCN11	TRAINING USE ONLY

## REACTOR SCRAM

Reporting Period: 05/30/94 to 06/05/94

<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>
05/31/94	OYSTER CREEK 1	100	SA	Maintenance Error	NO	2	0	2
06/01/94	BEAVER VALLEY 1	100	SA	Equipment Failure	NO	1	0	1
06/01/94	BEAVER VALLEY 2	100	SA	Equipment Failure	NO	1	0	1
06/04/94	MONTICELLO 1	60	SA	External	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

COMPARISON OF WEEKLY SCRAM STATISTICS WITH INDUSTRY AVERAGES

PERIOD ENDING  
06/05/94

<u>SCRAM CAUSE</u>	NUMBER OF SCRAMS	1994 WEEKLY AVERAGE (YTD)	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE	1991* WEEKLY AVERAGE	1990* WEEKLY AVERAGE
POWER GREATER THAN OR EQUAL TO 15%						
EQUIPMENT FAILURE*	2	1.48	1.83	2.62	2.88	3.38
DESIGN/INSTALLATION ERROR*	0	0.09	0.04	-	-	-
OPERATING ERROR*	0	0.27	0.27	0.23	0.58	0.48
MAINTENANCE ERROR*	1	0.40	0.52	0.40	-	-
EXTERNAL*	1	0.13	0.13	-	-	-
OTHER*	0	0.00	0.02	0.23	-	-
Subtotal	4	2.37	2.81	3.48	3.46	3.86
POWER LESS THAN 15%						
EQUIPMENT FAILURE*	0	0.31	0.38	0.40	0.29	0.40
DESIGN/INSTALLATION ERROR*	0	0.04	-	-	-	-
OPERATING ERROR*	0	0.13	0.13	0.13	0.15	0.08
MAINTENANCE ERROR*	0	0.00	0.02	0.06	-	-
EXTERNAL*	0	0.00	0.04	-	-	-
OTHER*	0	0.00	-	0.06	-	-
Subtotal	0	0.48	0.57	0.65	0.44	0.48
TOTAL	4	2.85	3.38	4.13	3.90	4.34

<u>SCRAM TYPE</u>	NO. OF SCRAMS	1994 WEEKLY AVERAGE (YTD)	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE	1991 WEEKLY AVERAGE	1990 WEEKLY AVERAGE
TOTAL AUTOMATIC SCRAMS	4	2.20	2.44	3.06	3.25	3.21
TOTAL MANUAL SCRAMS	0	0.67	0.94	1.02	0.65	1.19

TOTALS MAY DIFFER BECAUSE OF ROUNDING OFF

\* Detailed breakdown not in database for 1991 and earlier

- EXTERNAL cause included in EQUIPMENT FAILURE

- MAINTENANCE ERROR and DESIGN/INSTALLATION ERROR causes included in OPERATING ERROR

- OTHER cause included in EQUIPMENT FAILURE 1991 and 1990

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	--(YTD 06/05/94)--	64