MEMORANDUM FOR: Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

FROM: Johns P. Jaudon, Acting Branch Chief
Events Assessment Branch
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

SUBJECT: THE OPERATING REACTORS EVENTS MEETING
September 6, 1988 - MEETING 88-36

On September 6, 1988, an Operating Reactors Events meeting (88-36) was held to brief senior managers from NRR, OSP, AEOD, Commission Staff, and Regional Offices on events which occurred since our last meeting on August 30, 1988. The list of attendees is included as Enclosure 1.

The events discussed and the significant elements of these events are presented in Enclosure 2. Enclosure 3 presents one event suggested for long term followup and a summary of reactor scrams for the week ending September 4, 1988. Two significant events were identified for input to NRC's Performance Indicator Program.

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Events Assessment Branch
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Enclosures:
As stated

cc w/Enclo.:
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1/1
IDIR-5-1
OPERATING
EXPERIENCE

OFC	:EAB:NRR	:C:EAB:NRR	:	:	:	:	:
NAME	:MLReardon	:JPJaudon	:	:	:	:	:
DATE	:09/07/88	:09/07/88	:	:	:	:	:

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cc:
T. Murley, 12G-18
F. Miraglia, 12G-18
E. Jordan, AEOD
E. Beckjord, NL-007
W. Russell, RI
B. Davis, RIII
J. N. Grace, RII
R. D. Martin, RIV
J. B. Martin, RV
W. Kane, RI
L. Reyes, RII
E. Greenman, RIII
J. Callan, RIV
D. Kirsch, RV
S. Varga, 14E-4
D. Crutchfield, 13A-2
B. Boger, 14A-2
G. Holahan, 13H-4
G. Lainas, 14H-3
L. Shao, 8E-2
J. Partlow, 7D-24
B. Grimes, 9A-2
F. Congel, 10E-4
E. Weiss, AEOD
T. Martin, 12G-18
J. Guttmann, SECY
A. Thadani, 7E-4
S. Rubin, AEOD
R. Barrett, 10E-2
M. Harper, MNBB 4210
J. Sniezek, 12G-18
J. Forsyth, INPO
W. Lanning, MNBB 3302
C. Patel, 14H-22
H. Berkow, 14H-22
G. Dick, 13D-18
J. Calvo, 13D-18
T. Wambach, 13H-15
M. Virgilio, 13E-15
T. Colburn, 13E-21
K. Perkins, 13E-21

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

SEP 07 1988

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As stated

cc w/Enclo.:
See Next Page

ENCLOSURE 1

LIST OF ATTENDEES

OPERATING REACTORS EVENTS BRIEFING (88-36)

September 6, 1988

NAME	ORGANIZATION	NAME	ORGANIZATION
D. Crutchfield	NRR/DOEA	P. Baranowsky	NRR/DOEA
S. Varga	NRR/DRP	B. Boger	NRR/ADR-1
G. Lainas	NRR/ADR-2	J. Jaudon	NRR/DOEA
C. Schulten	NRR/DOEA	J. Guttmann	SECY
B. Clayton	DEDRO	M. L. Reardon	NRR/DOEA
A. DeAgazio	NRR/DRSP	R. Gilbert	NRR/DRSP
C. Patel	NRR/DRP	M. Virgilio	NRR/DRSP
M. Chiramal	AEOD	S. Juergens	SECY
E. Rossi	NRR/DOEA	L. Rubenstein	NRR/PDSNP
W. Minners	RES/DRPS	T. Murley	D:NRR
R. Auluck	OSP/TVA	J. Carter	NRR/DOEA
W. LeFave	NRR/SPLB	J. Wermiel	NRR/SPLB
G. M. Holahan	NRR/DRSP	E. B. Tomlinson	NRR/PD4
T. Quay	NRR/PD3-1	K. Eccleston	NRR/DRP1-2
B. Grimes	NRR/DRIS	T. Silko	AEOD
T. Colburn	NRR/PD3-3	W. LeFave	NRR/SPLB

ENCLOSURE 2

OPERATING REACTORS EVENTS BRIEFING 88-36
EVENTS ASSESSMENT BRANCH
LOCATION: 12-B-11 WHITE FLINT

TUESDAY, SEPTEMBER 6, 1988, 11:00 A.M.

SURRY UNIT 1	FAILURE OF REFUELING CAVITY FLUOR SEAL
SOUTH TEXAS UNIT 2	(UNLICENSED) COOPER-BESSEMER DIESEL FAILED
PALISADES	FUEL BUNDLE STUCK TO BOTTOM OF UPPER GUIDE STRUCTURE DURING REMOVAL
PERRY UNIT 1	FIRE IN CHARCOAL ADSORBERS

SURRY UNIT 1
FAILURE OF REFUELING CAVITY FLOOR SEAL
MAY 17, 1988

PROBLEM

- REFUELING CAVITY FLOOR SEAL FAILURE
  - LOSS OF INSTRUMENT AIR PRESSURE TO THE INFLATABLE SEAL
  - FAILURE OF THE NITROGEN BACKUP SYSTEM TO INITIATE
  - PASSIVE "J" SEAL FAILED
- EVENT WAS NOT REPORTED TO THE NRC UNTIL SEPTEMBER 1, 1988 AND THE LICENSEE WAS RELUCTANT TO PROVIDE INFORMATION WHEN ASKED.
- IMPROPER OPERATOR ACTION IN RESTORING LEVEL COULD HAVE SIGNIFICANTLY REDUCED THE SPENT FUEL POOL RESULTING IN HIGH RADIATION IN THAT AREA.

SAFETY SIGNIFICANCE

- POTENTIAL FOR UNCOVERING A SUSPENDED SPENT FUEL ASSEMBLY WITH SUBSEQUSENT CLADDING DAMAGE AND RADIATION HAZARDS.
- POTENTIAL FOR LOSS OF LEVEL IN THE SPENT FUEL POOL.

DISCUSSION

- UNIT 1 DEFUELED.
- APPROX 30,000 GAL OF BORATED WATER INTO THE INCORE ROOM.
- INCREASED RADIATION LEVEL FORCED EVACUATION OF W PERSONNEL ON MANIPULATOR CRANE.
- USAR INCORRECTLY STATED THAT THE "J" SEAL WOULD PREVENT EXCESSIVE LEAKAGE.
- IE IN 84-93, NRC IE BULLETIN 84-03, AND INPO SOER 85-01 HAD BEEN ISSUED TO ALERT LICENSEES TO THE POSSIBILITY OF SEAL PROBLEMS.
- AT THIS TIME THE LICENSEES PROCEDURES FOR MANY ASPECTS OF THIS EVENT ARE NOT ADEQUATE.
- CAVITY LEVEL COULD HAVE BEEN MAINTAINED BY USE OF THE LPSI OR RHR PUMPS, BUT THE PUMPS WERE OUT-OF-SERVICE BECAUSE NO FUEL WAS IN THE VESSEL.

CONTACT: R. KARSCH

REFERENCES: PNO-RII-88-52, 50.72 # 13347, MORNING REPORTs 09/01/88 AND 09/02/88

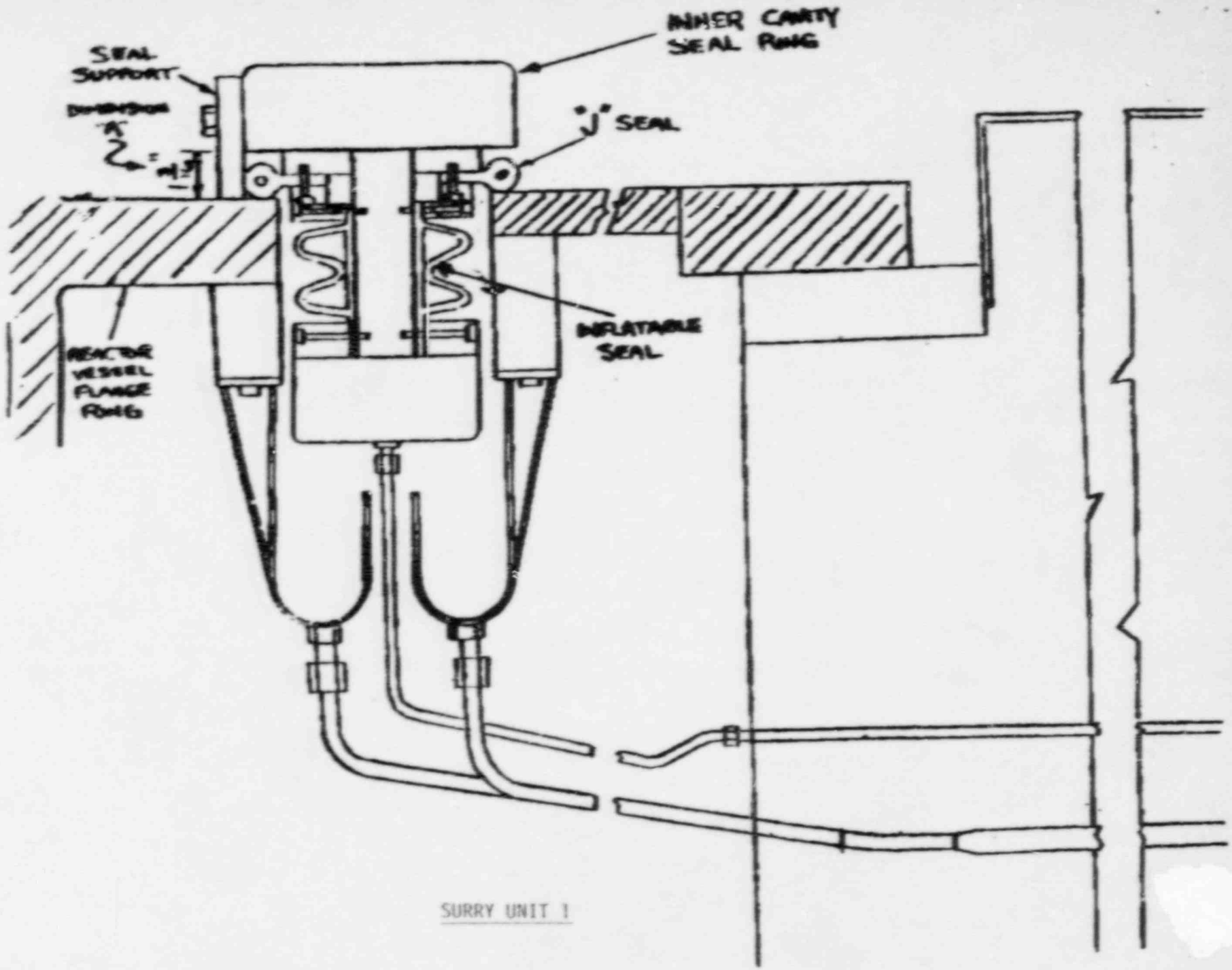
- o SURRY 2 IS ALSO SUSCEPTABLE TO THIS TYPE OF SEAL FAILURE AND WILL ENTER REFUELING SOON.
- o EVENT TERMINATED BY OPERATOR ADJUSTING THE NITROGEN REGULATOR AND OPENING A SHUT LOCAL INSTRUMENT AIR ISOLATION VALVE TO THE SEAL.
- o WATER LEVEL IN THE REFUELING CAVITY WAS RESTORED BY IMPROPERLY OPENING THE FUEL TRANSFER CANAL GATE VALVE.
- o MANUFACTURER (PRESRAY) SAYS THAT THE SURRY SEAL ARRANGEMENT ("J" SEAL WITHOUT A BACKING PLATE) IS UNIQUE.

CORRECTIVE ACTION

- o DETAILED DESIGN REVIEW OF THE ARRANGEMENT WAS PERFORMED (LACK OF POSITIVE BACKING PLATE ON "J" SEAL. INFLATABLE SEAL SHOULD BE STRONGER MORE RESILIANT, AND HAVE MORE CONTACT SURFACE AREA).

FOLLOWUP

- o AN AIT HAS BEEN DISPATCHED TO THE SITE.
- o CONSIDERING ISSUANCE OF ANOTHER INFORMATION NOTICE.


INNER CAVITY SEAL RING
SEAL SUPPORT
"J" SEAL
INFLATABLE SEAL
REACTOR VESSEL FLANGE RING

SURRY UNIT 1

SOUTH TEXAS UNIT 2
(UNLICENSED) COOPER-BESSEMER DIESEL FAILED
JULY 1988

PROBLEM

JACKET WATER FOUND IN COMBUSTION CHAMBERS WHICH LEAD TO THE DISCOVERY OF CRACKED HEADS ON EACH OF THE DIESEL's 20 CYLINDERS.

CAUSE

THE PROBLEM WAS DETERMINED TO BE CAUSED BY IMPROPER INSTALLATION OF THE TIMING CHAIN.

SAFETY SIGNIFICANCE

MAINTENANCE ACTIVITIES MAY EFFECT DIESEL GENERATOR OPERABILITY SUCH THAT THE PROBLEMS ARE NOT DETECTABLE DURING POST MAINTENANCE TEST SURVEILLANCES.

DISCUSSION

- SOME TIME BEFORE JULY 5, 1988 THE LICENSEE REPAIRED THE UNIT-2 "C" DIESEL GENERATOR LUBE OIL LINE TO THE TWO TIMING CHAIN TIGHTENERS.
- THE CHAIN WAS REINSTALLED AND TENSION TO THE CHAIN WAS APPLIED USING ONLY ONE OF THE TWO TIGHTENERS.
- THIS PROCEDURE ADVANCED THE TIMING CHAIN ABOUT 20 DEGREES.
- THE TIMING ADVANCE PROBLEM CAUSED THE FUEL TO BE INJECTED AND CONSEQUENTLY COMBUSTED BEFORE THE PISTON REACHED TOP DEAD CENTER (TDC).
- PRESSURE STRESSES AND THERMAL STRESSES ON THE DIESEL WERE SEVERE AND RESULTED IN MECHANICAL FAILURES WHICH WERE NOT READILY DETECTABLE.
- UNDER HIGH PRESSURE AND TEMPERATURES THE POTENTIAL EXISTED FOR THE PISTON PIN LUBE OIL FILM TO DEGRADE AND RESULT IN EXCESSIVE WEAR ON THE BEARINGS.
- IN THE CASE OF SOUTH TEXAS:
  - EROSION AND/OR CRACKING OF VALVE RECESS AREAS OCCURRED AT THE TOP OF THE PISTON PROBABLY DUE TO EXCESSIVE HEAT.

CONTACT: C. SCHULTEN

REFERENCE:

- THE HEADS CRACKED, PROBABLY DUE TO THERMAL STRESSES, THIS ENABLED JACKET WATER TO ENTER INTO THE CYLINDER AND ERODE THE PISTON.

o THE DIESEL DID NOT FAIL, IT TESTED SATISFACTORILY AND WAS RUN FOR ABOUT 20 HOURS BEFORE A ROUTINE MAINTENANCE PROCEDURE IDENTIFIED JACKET WATER IN THE CYLINDERS.

FOLLOWUP

o PD-IV HAS PERFORMED AN ONSITE INSPECTION OF THE DIESELS IN CONJUNCTION WITH REGION IV.

o PD-IV RECOMMENDS A FLUSH OF THE DIESEL LUBE OIL SYSTEM TO REMOVE IRON OXIDE CONTAMINANTS IDENTIFIED DURING ITS INSPECTION BUT WHICH IS APPARENTLY UNRELATED TO THE TIMING CHAIN PROBLEMS WITH THE DIESEL.

o PD-IV IS PLANNING TO REVIEW VENDOR MAINTENANCE PROCEDURES.

o EAB RECOMMENDS THE VENDOR BRANCH BE INFORMED OF PD-IV ACTIVITIES.

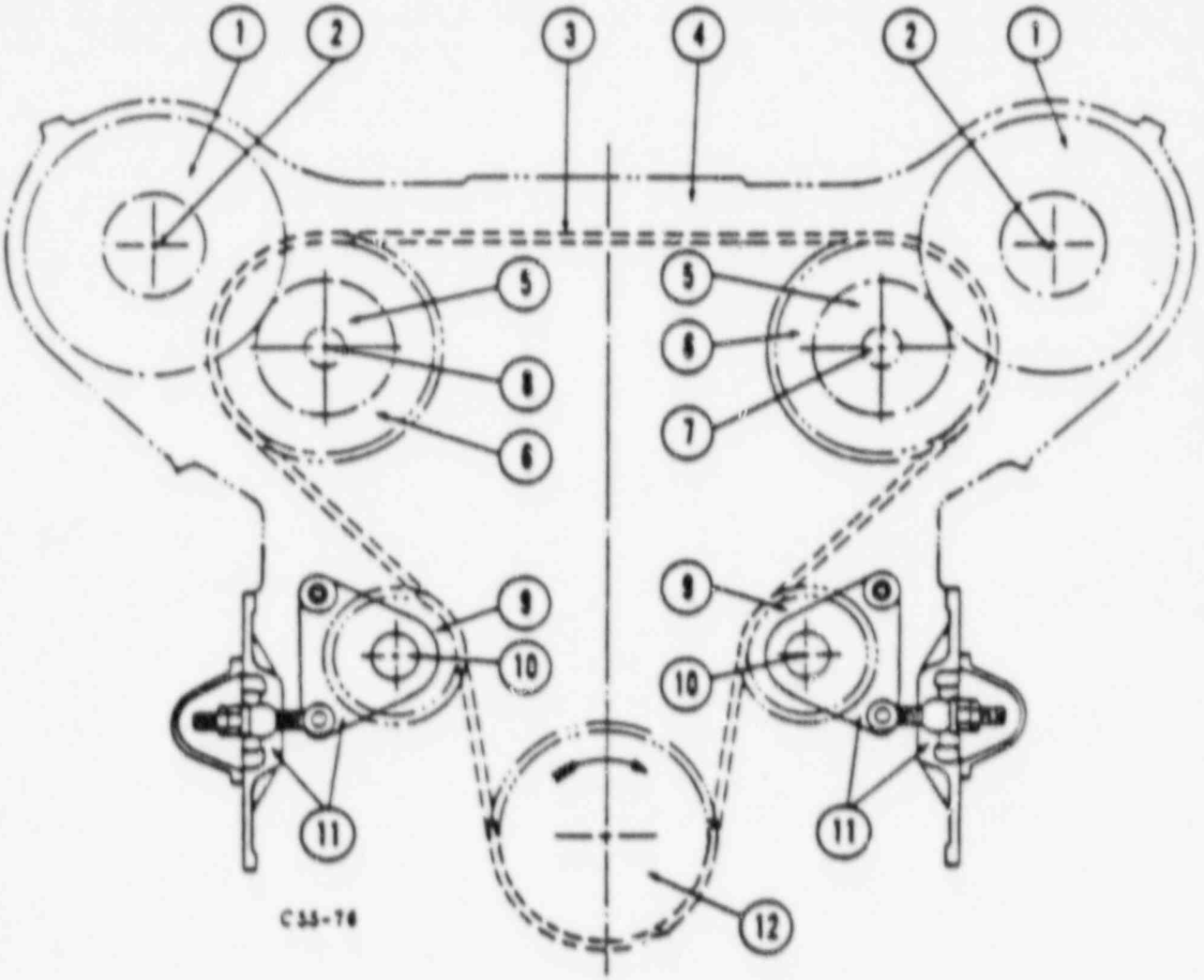
SECTION 13
AUXILIARY DRIVE, CAMSHAFT AND DRIVE

Camshaft and Governor Drive

A split type drive sprocket (12, Fig. 13-1) is mounted and keyed on the aft end of the crankshaft. Two camshaft drive sprockets (6), mounted on a shaft with the camshaft drive gear (5), are driven by the main drive chain (3). The drive gear mounted with the sprocket drives the gears (1) mounted on the ends of the camshafts (2). Two adjustable chain tightener (11) and sprocket assemblies (9) are mounted one on each side of the centerframe, so that chain tension can be adjusted. The shaft (10, Fig. 13-2) carrying the sprocket and drive gear rotates in two bearings which have retainers mounted in the camshaft housing. Lubrication of the sprocket bearings and the chain is from the engine lube oil system.

Speed Regulating Governor and Overspeed Governor Drives

The drives for the governors are off the ends of the sprockets and drive gear shafts Fig. 13-2. A splined male end on the governor driven shaft mates with a female end on the sprocket and gear shaft. A bevel gear on the opposite end of the governor driven shaft mates with a bevel gear on the governor drive shaft turning the governor.



1. Camshaft Gear
2. Camshaft
3. Chain
4. Cam Housing
5. Camshaft Drive Gear
6. Camshaft Drive Sprocket
7. Overspeed Gov. Drive
8. Main Gov. Drive
9. Tightener Sprocket
10. Pin and Bearings
11. Chain Tightener
12. Sprocket on Crankshaft

Camshaft and Governor Drive Chain

PALISADES
FUEL BUNDLE STUCK TO BOTTOM OF UPPER GUIDE STRUCTURE DURING REMOVAL
SEPTEMBER 3, 1988

PROBLEM
DURING REMOVAL OF THE REACTOR VESSEL UPPER GUIDE STRUCTURE (UGS) IN PREPARATION FOR PLANT REFUELING, ONE FUEL BUNDLE WAS FOUND TO BE STUCK TO, AND HANGING FROM, THE BOTTOM OF THE UGS (BOTTOM OF BUNDLE WAS 19 INCHES ABOVE THE CORE).

CAUSE
UNKNOWN; STILL UNDER INVESTIGATION.

SAFETY SIGNIFICANCE
DROPPED FUEL BUNDLE ONTO CORE COULD RESULT IN DAMAGE TO FUEL CLADDING. NO REACTIVITY CONCERN DUE TO HEAVILY BORATED CONDITIONS DURING REFUELING. A DROPPED FUEL BUNDLE IS A FSAR CHAPTER 15 ANALYZED EVENT IN ACCORDANCE WITH THE STANDARD REVIEW PLAN (NUREG-0800).

DISCUSSION
- ON SEPTEMBER 3, 1988 WHILE IN MODE 6 (REFUELING), A FUEL BUNDLE WAS DISCOVERED HANGING FROM THE BOTTOM OF THE UPPER GUIDE STRUCTURE DURING REMOVAL OF THE STRUCTURE. NO APPARENT FUEL DAMAGE; AREA RADIATION MONITOR READINGS BELOW ALARM SETPOINTS.
- CONTAINMENT ACCESS PENETRATIONS AND LINES IN DIRECT CONTACT WITH THE CONTAINMENT ATMOSPHERE WERE MANUALLY ISOLATED AS A PRECAUTIONARY MEASURE. NON-ESSENTIAL PERSONNEL WERE EVACUATED FROM CONTAINMENT.
- WIRES WERE PLACED SEVERAL INCHES FROM SIDES OF BUNDLE (NOT TOUCHING) FIVE FEET BELOW TOP OF BUNDLE TO PREVENT BUNDLE FROM FALLING OVER IN CASE IT DISLODGED FROM UGS.
- LICENSEE PREPARED PROCEDURE FOR FREEING BUNDLE FROM UGS WITH WORKER IN BASKET SUPPORTED BY JIB CRANE USING SPECIAL TOOLS. LICENSEE FABRICATED TOOLS AND PERFORMED MOCKUP TRAINING.

CONTACT: R. KENDALL AND J. THOMPSON
REFERENCE: 50.72 #s 13367, 13374, AND 13384

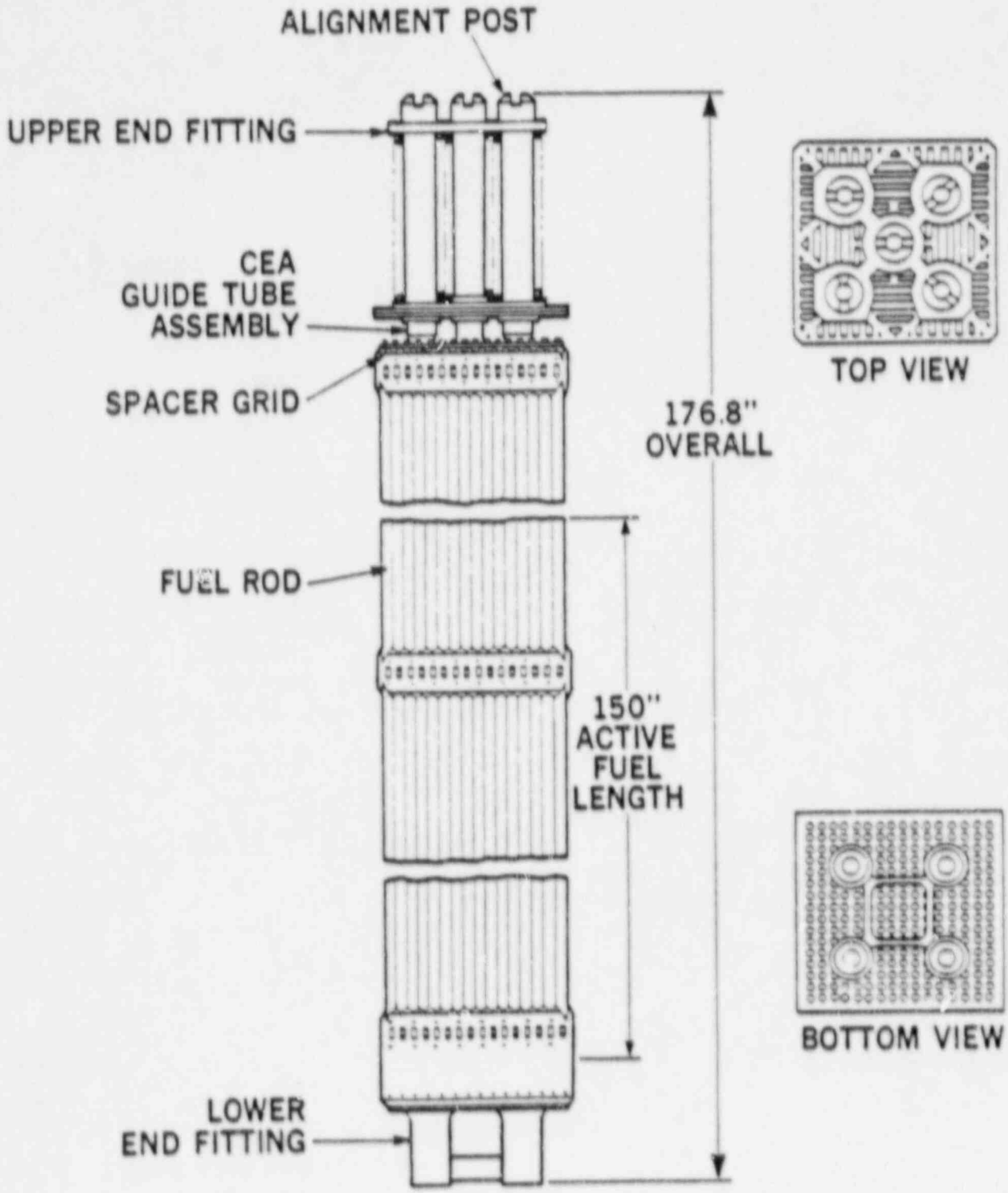
- o USING PROCEDURE, LICENSEE SUCCESSFULLY GAINED CONTROL OF STUCK FUEL BUNDLE, FREED BUNDLE FROM UGS, AND LOWERED BUNDLE ONTO ADJACENT FUEL ASSEMBLY AND SECURED BUNDLE BY LEANING IT AGAINST THE SIDE OF THE CORE BARREL.

SIMILAR EVENTS

- o ON APRIL 23, 1988 AT WATERFORD 3, A CONTROL ELEMENT ASSEMBLY WAS FOUND TO BE STILL LATCHED TO THE BOTTOM OF THE UGS DURING REMOVAL OF THE UGS FROM THE REACTOR VESSEL FOR REFUELING.
- o EVENTS SIMILAR TO WATERFORD HAVE OCCURRED AT ANO-1 AND CRYSTAL RIVER.

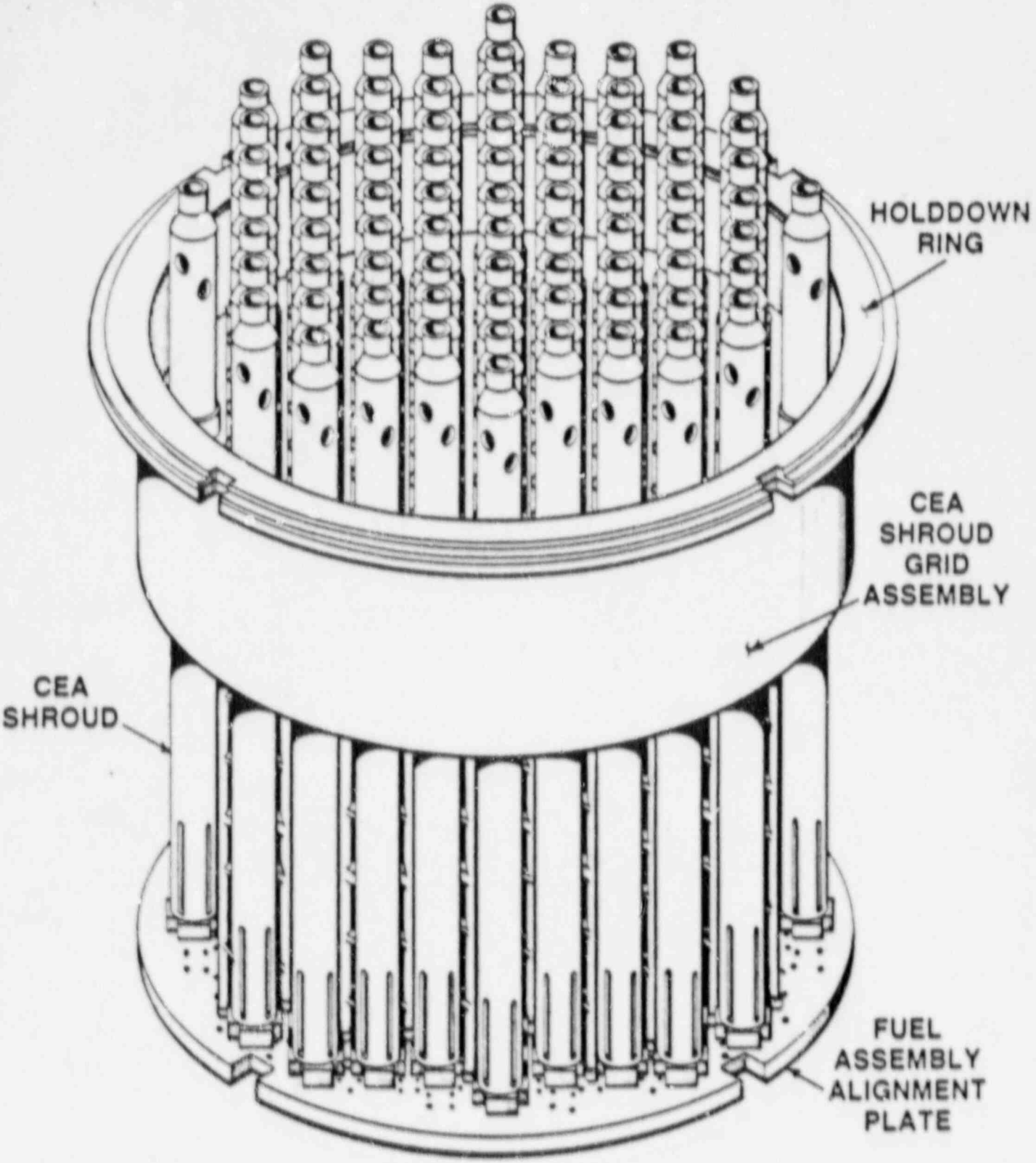
FOLLOWUP

REGION III HAS SENT ADDITIONAL INSPECTORS TO THE SITE AND IS CONTINUING TO FOLLOWUP.



FUEL ASSEMBLY

PALISADES



UPPER GUIDE STRUCTURE ASSEMBLY

PALISADES

PERRY UNIT 1
FIRE IN CHARCOAL ADSORBERS
SEPTEMBER 3, 1988

PROBLEM
FIRE IN OFF GAS SYSTEM.

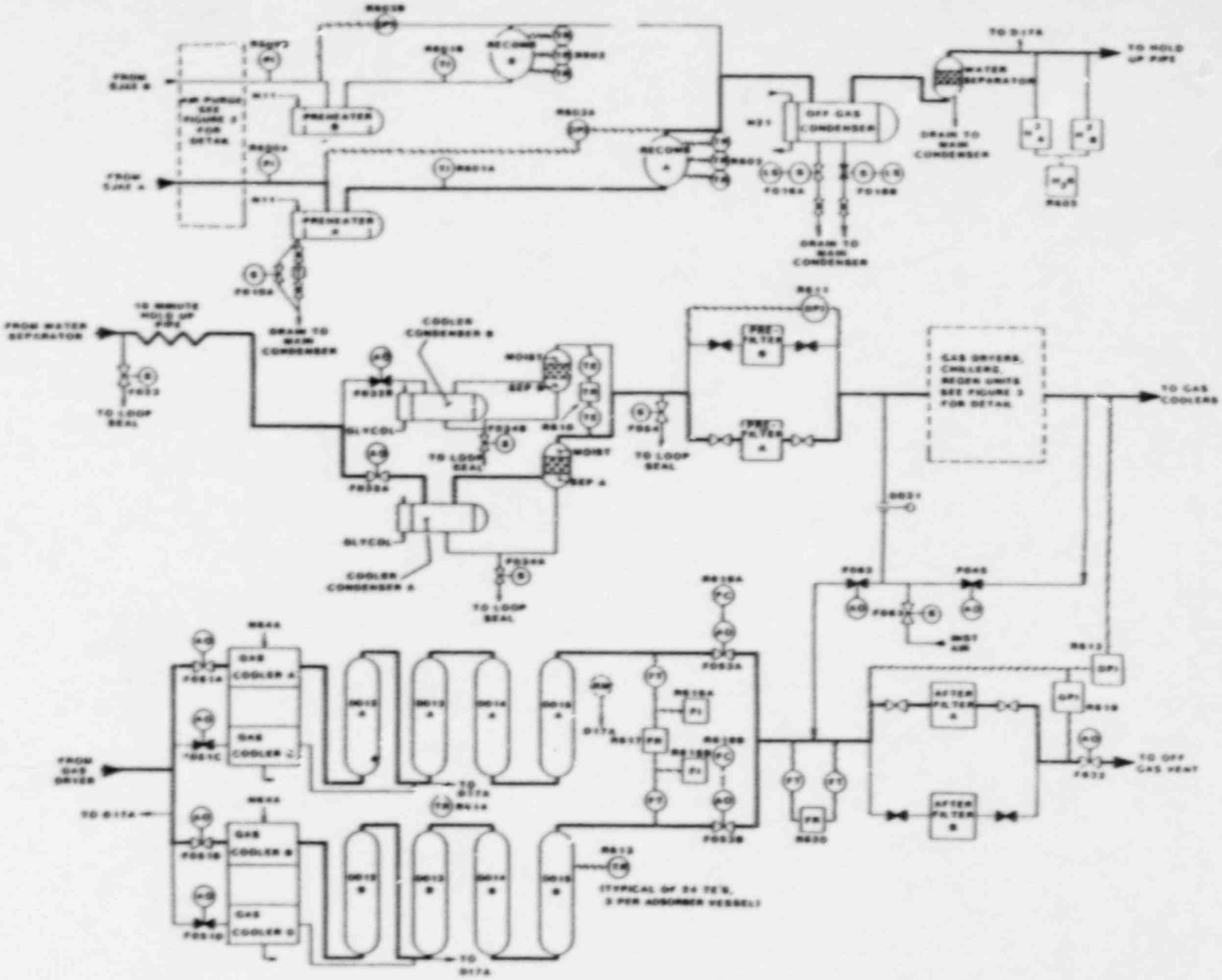
CAUSE
UNKNOWN IGNITION OF HYDROGEN.

SAFETY SIGNIFICANCE
UNAVAILABILITY OF COMPLETE OFF GAS TREATMENT SYSTEM.

DISCUSSION
- OPERATING AT 70% POWER.
- HAD INDICATED LOSS OF AIR EJECTOR.
- STARTED SECOND EJECTOR WITHIN 5 MINUTES.
- HYDROGEN CONCENTRATION INCREASED TO GREATER THAN 5%.
- OBSERVED ELEVATED TEMPERATURE IN FIRST BEDS.
- BYPASSED FIRST BEDS AND ESTABLISHED NITROGEN PURGE.
- NORMAL FLOW MAINTAINED THROUGH REMAINING 3 BEDS PER TRAIN.
- RADIATION LEVEL INCREASED FROM ABOUT 100 TO ABOUT 1,000 CPM DUE TO PURGE.

FOLLOWUP
- LICENSEE TO MAINTAIN NITROGEN PURGE FOR ABOUT 2 WEEKS.
- LICENSEE INVESTIGATING CAUSE OF HYDROGEN IGNITION.
- RESIDENT INSPECTOR TO MONITOR LICENSEE ACTIVITIES.

CONTACT: J. CARTER
REFERENCES: 50.72 #s 13377, 13379, 13383, AND 13386.



PERRY UNIT 1

OFF GAS SYSTEM

ENCLOSURE 3

SUGGESTED LONGTERM FOLLOWUP

DATE OF EVENT	PLANT NAME AND UNIT	SIGNIFICANT EVENT	INITIAL FOLLOWUP ASSIGNMENT	SUGGESTED RESOLUTION	SUGGEST TRANSFER TO:	EXPECTED COMPLETION DATE
06/15/88	NINE MILE POINT 2	.F.	NINE MILE POINT 2 SGTS SYSTEM CROSS CONNECT VALVES NOT SINGLE FAILURE PROOF. IS THIS APPLICABLE TO OTHER PLANTS?	PLANT SYSTEMS BRANCH (SPLB) SHOULD ADDRESS THE CAPABILITY OF SINGLE OPERABLE FAN TO PROVIDE COOLING FLOW TO BOTH TRAINS OF THE SGTS, THE NEED FOR MANUAL OPERATOR ACTIONS TO EFFECT CHANGEOVER FROM ONE FILTERING SYSTEM TO THE OTHER FOLLOWING A LOSS OF AIR FLOW OR SYSTEM FAILURE, AND GENERIC APPLICABILITY OF THE IDENTIFIED SGTS DESIGN DEFICIENCIES TO OTHER PLANTS.	NRR/SPLB	/ /

PERFORMANCE INDICATORS SIGNIFICANT EVENTS

PLANT NAME	EVENT DATE	EVENT DESCRIPTION	QTR	SIGNIFICANCE
SURRY 1	05/17/88	FAILURE OF BACKUP REFUELING CAVITY SEAL RESULTED IN LOSS OF 15,000 GALLONS OF REACTOR GRADE BORATED WATER AND DRAINDOWN OF REFUELING CAVITY.	0	POTENTIAL FOR OR ACTUAL DEGRADATION OF FUEL INTEGRITY
PALISADES	09/03/88	FUEL BUNDLE INADVERTENTLY REMOVED FROM CORE DURING REMOVAL OF UPPER GUIDE STRUCTURE.	0	POTENTIAL FOR OR ACTUAL DEGRADATION OF FUEL INTEGRITY

REACTOR SCRAM SUMMARY
WEEK ENDING 09/04/88

1. PLANT SPECIFIC DATA

DATE	SITE	UNIT	POWER	SIGNAL	CAUSE	COMPLI-CATIONS	YTD ABOVE 15%	YTD BELOW 15%	YTD TOTAL
08/31/88	SALEM	1	100	A	EQUIPMENT	NO	2	1	3
08/31/88	SALEM	2	71	A	EQUIPMENT	NO	5	1	6
09/01/88	DIABLO CANYON	2	100	A	EQUIPMENT	NO	3	0	3
09/01/88	DIABLO CANYON	1	13	A	EQUIPMENT	NO	3	2	5
09/02/88	CALLAWAY	1	100	A	PERSONNEL	NO	5	1	6
09/04/88	BRAIDWOOD	2	60	M	EQUIPMENT	YES	6	3	9
09/04/88	HATCH	1	100	A	EQUIPMENT	NO	4	0	4

SUMMARY OF COMPLICATIONS

SITE	UNIT	COMPLICATIONS
BRAIDWOOD	2	REACTOR MANUALLY TRIPPED AS STM GEN LVL APPROACHED LOW LVL TRIP ST. PT. LEVEL DECLINED WAS DUE TO INCREASE IN STEAM FLOW. CAUSE UNKNOWN.BROKEN LINE TO PRESSURE TRANSMITTER FROM CONDENSATE DISCHARGE ALONG WITH CLOGGED CONDNST SCREENS HINDERED LVL CONROL

II. COMPARISON OF WEEKLY STATISTICS WITH INDUSTRY AVERAGES

SCRAMS FOR WEEK ENDING
09/04/88

SCRAM CAUSE	POWER	NUMBER OF SCRAMS(5)	1988 WEEKLY AVERAGE YTD	1987 WEEKLY AVERAGE	1986 WEEKLY AVERAGE (3)(4)	1985 WEEKLY AVERAGE (8)(9)
** POWER >15%						
EQUIP. RELATED	>15%	5	3.3	3.9	4.3	5.4
PERS. RELATED(6)	>15%	1	1.0	1.3	1.8	2.0
OTHER(7)	>15%	0	0.7	1.2	0.4	0.6
** Subtotal **		6	5.0	6.4	6.5	8.0
** POWER <15%						
EQUIP. RELATED	<15%	1	0.6	1.2	1.4	1.3
PERS. RELATED	<15%	0	0.4	0.6	0.8	0.9
OTHER	<15%	0	0.2	0.3	0.2	0.2
** Subtotal **		1	1.2	2.1	2.4	2.4
*** Total ***		7	6.2	8.5	8.9	10.4

MANUAL VS AUTO SCRAMS

TYPE	NUMBER OF SCRAMS	1988 WEEKLY AVERAGE YTD	1987 WEEKLY AVERAGE	1986 WEEKLY AVERAGE	1985 WEEKLY AVERAGE
MANUAL SCRAMS	1	1.0	1.4	1.0	1.0
AUTOMATIC SCRAMS	6	5.3	7.0	7.9	9.4

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 109 REACTORS HOLDING AN OPERATING LICENSE.

2. COMPLICATIONS: RECOVERY COMPLICATED BY EQUIPMENT FAILURES OR PERSONNEL ERRORS UNRELATED TO CAUSE OF SCRAM.

3. PERSONNEL RELATED PROBLEMS INCLUDE HUMAN ERROR, PROCEDURAL DEFICIENCIES, AND MANUAL STEAM GENERATOR LEVEL CONTROL PROBLEMS.

4. "OTHER" INCLUDES AUTOMATIC SCRAMS ATTRIBUTED TO ENVIRONMENTAL CAUSES (LIGHTNING), SYSTEM DESIGN, OR UNKNOWN CAUSE.