

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Conference Report No. 50-388/84-19

Docket No. 50-388

License No. NPF-22

Licensee: Pennsylvania Power and Light Company
2 North Ninth Street
Allentown, Pennsylvania 18101

Facility Name: Susquehanna Steam Electric Company, Unit 2

Meeting At: USNRC, Region I, King of Prussia, Pennsylvania

Meeting Conducted: May 7, 1984

Prepared By: *Gene Kelly*
E.M. Kelly, Project Engineer

May 11, 1984
date

Approved By: *E.C. McCabe*
E.C. McCabe, Chief, Project Section 1C

5/11/84
date

Meeting Summary:

Enforcement conference at NRC Region I on May 7, 1984, to discuss the findings of Special Inspection Report 50-388/84-19 pertaining to the inoperability of source range monitor (SRM) channel A (bypass of reactor scram function) while loading fuel in Unit 2 core quadrant A on April 10-11, 1984, which violated Technical Specification LCO 3.9.2. The event was fundamentally characterized as operator error. Immediate and longer-term PP&L corrective action is to assess the strength of and improve licensee watchstanding practices.

The meeting was attended by NRC Region I and Pennsylvania Power & Light management, and lasted approximately 1½ hours.

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DETAILS

1. Participants

Pennsylvania Power and Light Company (PP&L)

B. D. Kenyon, Vice President, Nuclear Operations
H. W. Keiser, Superintendent of Plant
W. Barberich, Manager, Nuclear Licensing
H. Palmer, Supervisor of Operations
A. Piemontese, Compliance Engineer

Nuclear Regulatory Commission (NRC)

T. E. Murley, Regional Administrator
J. M. Allan, Deputy Regional Administrator
J. Gutierrez, Regional Counsel
D. Holody, Enforcement Specialist
T. Martin, Director, Division of Engineering and Technical Programs
E. Blackwood, Acting Chief, Project Branch 1
E. McCabe, Chief, Project Section 1C
L. Bettenhausen, Chief, Test Programs Section, DETP
R. Jacobs, Senior Resident Inspector, Susquehanna
D. Florek, Reactor Engineer, DETP
E. Kelly, Project Engineer, DPRP

2. Introduction

a. Purpose

The enforcement conference was held at NRC Region I request to discuss the violation of Unit 2 Technical Specification (TS) Limiting Condition 3.9.2 which requires, in part, an operable source range monitor (SRM) channel for any core quadrant in which core alterations (bundle loading or rod movement) are being performed. On April 10-11, 1984, fuel loading and rod withdrawals were performed in the "A" core quadrant for approximately nine hours with SRM channel "A" in bypass, thereby defeating its upscale reactor scram function. Details of this event were presented in NRC Region I Special Inspection Report Number 50-388/84-19, conducted during April 11-16, 1984 and issued on May 1, 1984.

b. NRC Concerns

In opening the conference, Dr. Murley and Mr. Blackwood expressed a concern that the SRM channel "A" bypass condition was allowed to exist through two shift turnovers, and that neither indicator lights nor on-shift surveillance were apparently successful in bringing this to the attention of control room operators. Accordingly, Pennsylvania Power & Light (PP&L) had been asked in the cover letter which transmitted Report 84-19 to be prepared to discuss shift turnover practices, operator awareness of control board/plant status, and

other watchstanding factors which may have contributed to this event. Also mentioned was a concern for the fact that, while corrective action proposed and implemented by PP&L for other recent problems (e.g. missed surveillances, valve lineup errors, misinterpretation of TS) seemed to be thorough and adequate, TS violations have been a problem of increasing concern at Susquehanna Station over the past year.

c. PP&L Overview

Mr. Kenyon provided an overview of PP&L corporate concerns and commitments in regard to both this event, and its relation to other recent enforcement issues, stating that PP&L: (1) would continue to review the effectiveness of their corrective actions, including those proposed at previous Region I conferences; (2) continues to hold a high level of confidence in the competence of their plant operators; and, (3) will approach a solution with the purpose of strengthening Susquehanna Station watchstanding performance. Mr. Kenyon characterized the SRM channel bypass as fundamentally an operator error. Major aspects of PP&L's presentation would be to recount the details of the incident and outline appropriate corrective action, in order to either confirm or refute their conclusion that this incident involved an isolated lapse on the part of the operating staff as opposed to being indicative of some generic weakness or programmatic deficiency. Two actions were described: one involving PP&L management assessment of watchstanding, both on an interim and indefinite basis; the other entailing an independent evaluation, partially completed by the licensee's Nuclear Safety Assessment Group (NSAG), and planned to be supplemented by outside consultant study including an INPO assistance visit.

3. Presentation and Discussion

a. PP&L Presentation

Mr. Keiser, the Superintendent of Plant, presented a detailed summary of the circumstances associated with this event. As of April 10, 1984, over 500 of the total 764 fuel bundles had been loaded into the Unit 2 reactor vessel. During most of the last shift (3-11pm) on April 10, and for the initial part of the following shift (11pm-7am), a total of 11 fuel bundles were loaded into the "A" core quadrant and two control rods were individually moved (a total of 6 times) with the corresponding SRM detector channel bypassed. The SRM's were operable in the two adjacent core quadrants during these 9½ hours of core alterations. The transfer of core monitoring, from the temporary fuel loading chamber (FLC) to the permanent SRM detector (and vice versa), was described as a frequent occurrence (done on the order of 30 times) during the fuel load evolution up to that time.

During this particular event, the swapover (from FLC to SRM) was prevented by high noise associated with a cable problem, although the

transfer was accomplished 5 times prior to the event. The SRM channel must be bypassed (thereby inhibiting an upscale scram signal) to effect the transfer and, in this instance, remained bypassed once the noise problem was corrected. Other reactor scram functions remained in effect (intermediate range monitors), as well as the non-coincident ("shorting links" removed) scram signal channels for the other SRM's. Ample core protective features were available, and the loss of one channel of SRM only reduced the scram logic to a non-coincident, 1 out of 17 signal (reduced from any 1 of 18) from any individual nuclear instrumentation.

b. Discussion

Region I questioned the use of procedures during the SRM-FLC transfer, including those administrative controls in effect which would govern the bypass of an SRM scram during the transfer. No step-by-step procedure was available or used by the licensee to bypass an SRM channel when swapping between detectors. Only a shift surveillance could administratively ensure that an operable SRM was available in the core quadrant (as well as in an adjacent quadrant) where core alterations were underway. Verbal communication, between an additional reactor operator (RO) stationed at a Unit 2 control board panel and a senior licensed operator (SRO) at the refueling floor, was the principal means by which coordination of fuel loading with the control room took place. Both of these operators were dedicated to fuel load operations. The licensee stated that this would be the only time (Refueling-Condition 5) during unit operation when the SRM bypass switch would be selected to a bypass condition - the point being that, while this is an unusual position for this switch (taking into consideration other operational conditions), it is not uncommon during initial fuel loading to be in bypass of one of the four SRM channels.

The Unit 2 plant control room operator (PCO) responsible for all Unit 2 control room activities (including shift surveillance of SRM operability) who was on the 3-11pm shift on April 10, apparently based his conclusion that SRM detector "A" was operable on the fact that there existed indication of a reasonable count rate at the monitor. Region I personnel questioned the understanding, by Susquehanna Operations Staff, of the term operable - its definition being more importantly associated with an ability to perform a safety function (e.g. the detector providing for a reactor scram signal) rather than simply functioning (ie. count rate indication at the monitor).

Also discussed was the format for shift turnover logs, and how the operability of an SRM was verified by this administrative control. The turnover sheet contains a standard block which indicates if any nuclear instrumentation is bypassed; this was not highlighted by either of the last two shifts on April 10, although the log has a provision for general entries. The point was made by NRC that these logs do not adequately highlight abnormal plant conditions. The

surveillance logs explicitly ask whether an SRM is operable in the core quadrants in which (and adjacent to where) fuel is being loaded, and these sheets are specific to differing plant conditions (ie. different format and questions for power operation and refueling).

Plant alarms were discussed, and Mr. Keiser mentioned that the NSAG study had found an average of 5 alarms per hour (120 daily), with the majority occurring during the day shift. Typically, only 1 out of the total 120 are valid alarms (for which an operator must respond to an off-normal plant condition). Others are either "nuisance" alarms, equipment malfunctions, or the result of planned operations such as surveillances where the alarm condition is expected and is not indicative of a problem. Operators must respond to and are accountable for every alarm, even though they would then typically discount 119 of the total 120. The licensee felt that many of those alarms may be unnecessary, and actually distracting to the operators, and expressed an interest in exploring that topic at a later date with the NRC. There are on the order of 300 monthly surveillances (not including daily and weekly checks) required by TS at Susquehanna. Nonetheless, the licensee has found that the response of their licensed operators to control room alarms has been very good. It was noted that, in this event, the indication of a bypassed SRM was present (a small white indicating light) and obvious, although it is not an "alarm."

c. Corrective Action

Immediate actions taken by the licensee consisted of halting core alterations, removal of the SRM channel "A" bypass, a review of the applicable TS 3.9.2, and a verification of SRM/FLC status in all core quadrants. Short term actions were then undertaken to administratively require all 4 SRM's to be operable whenever performing core alterations. The responsible operators were disciplined and the event was reviewed with all station shift superintendents. Turnover practices were critically examined, to determine their connection (if any) to the root cause of this event. A more formal practice, other than verbal assurance, was instituted which now includes increased panel walkdowns and a half-hour early arrival for unit supervision so that they may have a better feel for previous shift conditions and unusual situations, prior to assuming their watchstand.

The longer term corrective action will be focused upon strengthening Susquehanna watchstanding performance with the goal of improving operator awareness/control of plant status/alarms. An independent evaluation was performed by the PP&L NSAG, involving 142 hours of continuous control room surveillance and 44 additional hours in the balance-of-plant. The NSAG study concluded that operators are well-trained, and perform extremely well as part of a highly professional staff, in a high quality control facility. Even though no fundamental or obvious weaknesses were found at this time, separate assessments have been planned which will include a one-week INPO

assistance visit in late May, 1984, and possible employment of an outside consultant to further study this situation, as well as visits to other BWR facilities to compare watchstand practices.

4. Concluding Statements

NRC Region I personnel questioned PP&L's process for analyzing events such as occurred with the bypass of SRM channel "A". More in-depth diagnosis was suggested so as to determine a true root cause. There seemed to be a very positive, timely, and thorough reaction by PP&L to this event, yet no cause (other than operator error) or general problem was detected. Region I management also expressed a concern about this event in light of the past excellent performance of PP&L. The role of Operations Supervision, and the fact that numerous people (not just the PCO) should have been aware of the bypass condition, was another NRC concern which was voiced.

Dr. Murley ended the conference by indicating that PP&L would be notified with regard to the enforcement action which would result from this violation. In addition, he acknowledged the open and informative dialogue which took place during the meeting.

NRC - PP&L ENFORCEMENT CONFERENCE

SUBJECT: SRM INOPERABILITY

DATE: MAY 7, 1984

SOURCE RANGE MONITOR
BYPASSED DURING FUEL LOAD

EVENT DATE: 4/10/84

DURATION: 9½ HOURS

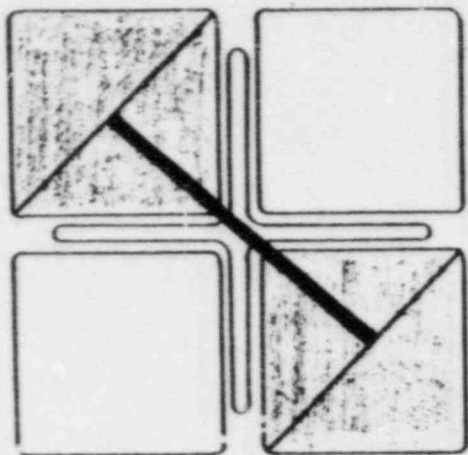
2 RODS MOVED AND 11 BUNDLES LOADED

INTO AFFECTED QUADRANT

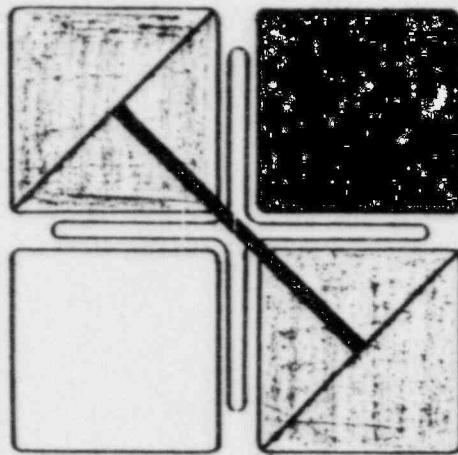
SOURCE RANGE MONITOR SYSTEM

- DETECTS CHANGES IN REACTOR REACTIVITY
- SRM REQUIREMENTS:
 - 1 IN QUADRANT WHERE ALTERATIONS ARE BEING MADE
 - 1 IN ADJACENT QUADRANT
- REMOVING "SHORTING LINKS" PROVIDES
 - 1 OUT OF 18 PROTECTION
 - 4 - SRMs
 - 8 - IRMs
 - 6 - APRMs
- SRM TRIP AT 10^5 CPS
IRM TRIP AT $\sim 10^8$ CPS *EQUIVALENT*

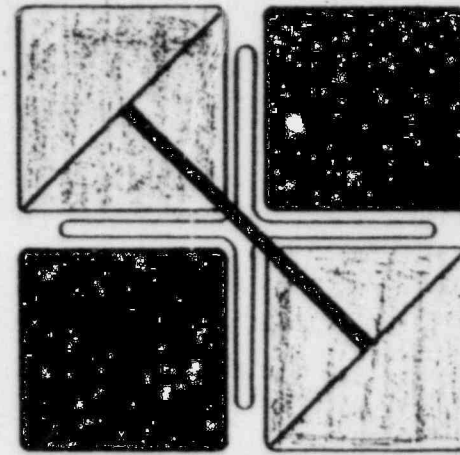
LOADING SEQUENCE



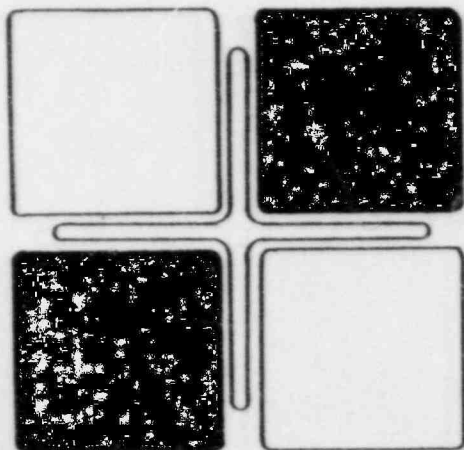
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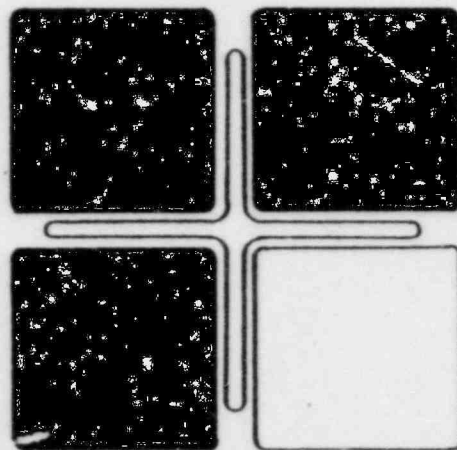
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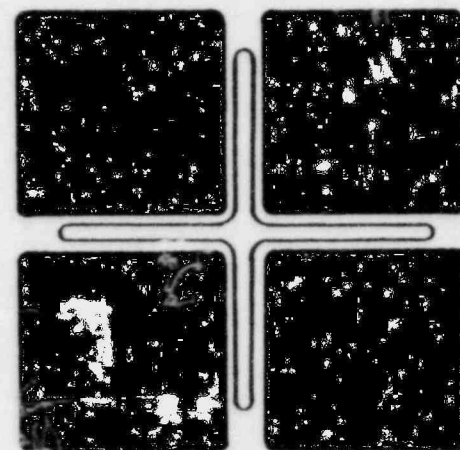
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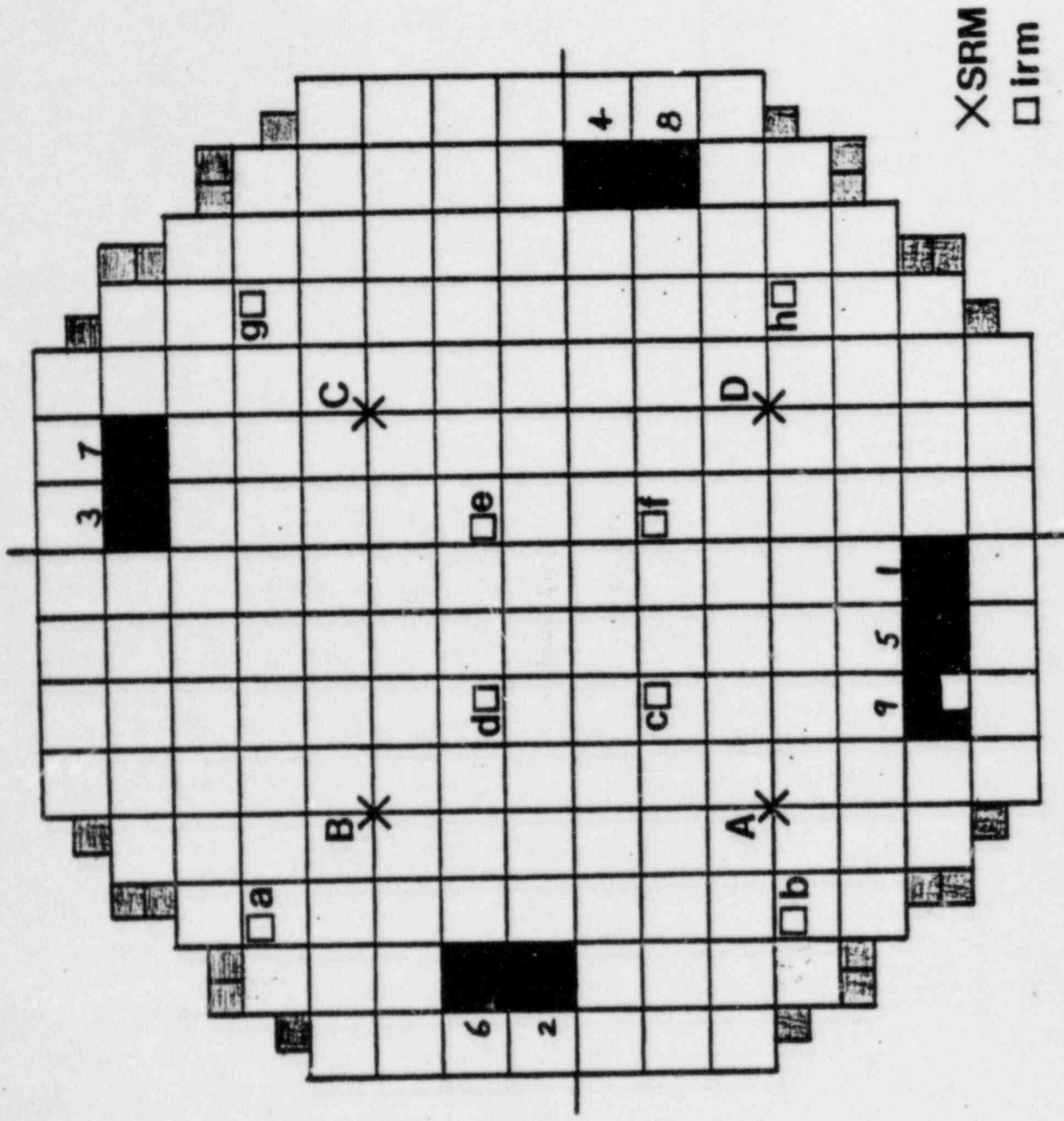
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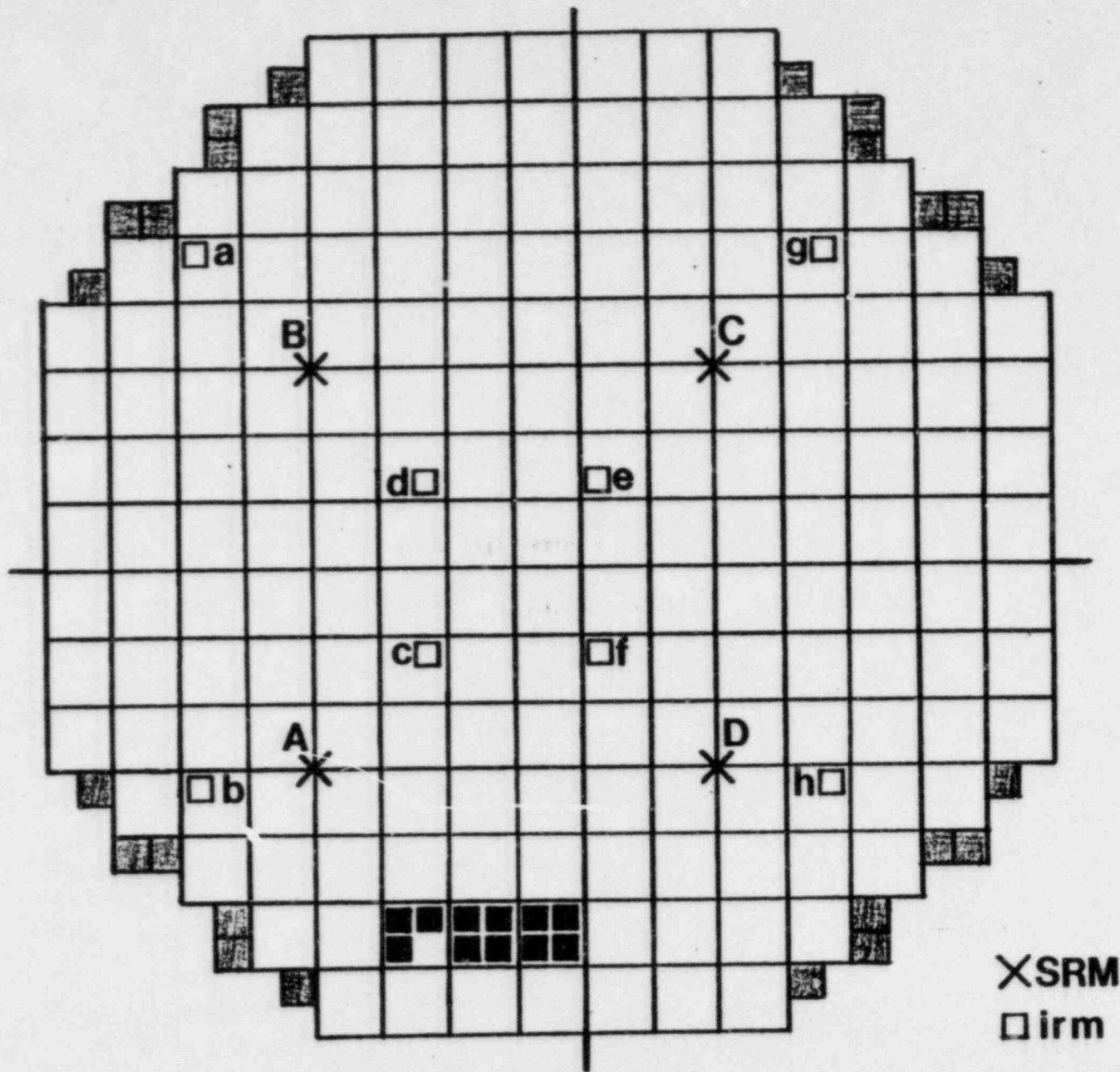
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6



SSES CORE MAP



SSES CORE MAP

EVENT TIME LINE

1245 FLC "A" RELEASED TO CONNECT "A" SRM*

1505 DUE TO NOISE RETURNED TO "A" FLC

1615 "A" FLC DECLARED OPERABLE AFTER RESPONSE
CHECK - TRIP FUNCTION IN BYPASS - FUEL
LOAD RECOMMENCED

0147 "A" FLC DISCOVERED IN BYPASS HALTED FUEL LOAD

(2 RODS MOVED AND 11 BUNDLES LOADED)

* THIS TRANSFER PROCESS WAS DONE
5 TIMES PRIOR TO THE EVENT, ALSO THE SRM'S
WERE BYPASSED ~30 TIMES DURING FUEL LOAD
FOR FLC MOVES

CAUSES OF EVENT

- OPERATOR FAILED TO RETURN SRM TO SERVICE
- FAILURE TO IDENTIFY CONDITION DURING SHIFT TURNOVER
- FAILURE TO RECOGNIZE SIGNIFICANCE OF CONDITION

DURING SHIFTLY SURVEILLANCE

IMMEDIATE CORRECTIVE ACTIONS

- HALTED CORE ALTERATIONS
- REMOVED BYPASS
- REVIEWED TECHNICAL SPECIFICATION
- REVIEWED SRM / FLC STATUS

ADDITIONAL CORRECTIVE ACTIONS

- SPECIFIED NO CORE ALTERATIONS UNLESS ALL 4 SRMs OPERABLE
- DISCIPLINED OPERATOR
- REVIEWED WITH SHIFT SUPERVISORS
- REVISED SHIFT T / O PRACTICES
 - ON COMING AND OFF GOING OPERATORS
WALK DOWN PANELS
 - EARLY IN EACH SHIFT SUPERVISION
WALKS DOWN PANELS WITH OPERATORS

WATCH STANDING STUDY

- SSES OPERATORS ARE AWARE OF AND DO CONTROL PLANT STATUS

GOAL: TO IMPROVE AND DEFINE THE ROLE OF
OPERATORS IN AWARENESS / CONTROL
OF PLANT STATUS / ALARMS

- ASSIGNED PLANT MANAGEMENT TO REVIEW SHIFT LOGS, PANELS, T / O
AND PLANT STATUS
- INITIATED NSAG STUDY
- INITIATED INPO REVIEW
- INITIATED REVIEW OF SSES WATCH STANDING PRACTICES BY SENIOR
MANAGEMENT PERSONNEL FROM OTHER FACILITIES
- EVALUATING MERITS OF HAVING OPERATIONS PERSONNEL VISIT OTHER
FACILITIES TO STUDY WATCH STANDING PRACTICES

LONG TERM CORRECTIVE ACTIONS - OPERATIONS ENHANCEMENT PROGRAM

- PROGRAM DEVELOPMENT INITIATED AFTER HPCI / RCIC EVENT

GOAL: TO REDUCE EVENTS THROUGH MANAGEMENT
IMPROVEMENTS - ADMINISTRATIVE,
TECHNICAL, AND WORK PRACTICES

- 15 - 20 PROBLEM CATEGORIES

EQUIPMENT, PROCEDURES, DELEGATION OF AUTHORITY,
COMMUNICATIONS, CR ATMOSPHERE, TRAINING,
EQUIPMENT STATUS, ETC.

- EACH CATEGORY WILL BE REVIEWED, RECOMMENDATIONS MADE,
AND SOLUTIONS IMPLEMENTED

PROCEDURES

1. ALARM RESPONSE PROCEDURES FOR LOCAL PANELS
2. GENERAL GUIDELINES FOR DAILY BUSINESS
3. NEED FOR CENTRALIZED REVIEW POINT FOR ALL PROCEDURES AND REVISIONS.
4. PROGRAM FOR PERIODIC REVIEWS
5. OFF NORMAL PROCEDURES MUST BE WRITTEN FOR RADWASTE OPERATION AND WATER MANAGEMENT
6. COL GUIDELINES AFTER EXTENDED OUTAGES
7. EMERGENCY OPERATING PROCEDURE PROGRAM

RESULTS OF NSAG STUDY

STUDY CONSISTED OF ~ 142 HOURS OF CONTROL ROOM
OBSERVATION AND ~ 44 HOURS OF IN-PLANT OBSERVATION

- SHIFT TURNOVER THOROUGH AND ADEQUATE
- CONTROL ROOM RESPONSE TO ALARMS EXCELLENT
- PLANT EVOLUTIONS WELL CONTROLLED
- LOGS MAINTAINED SATISFACTORILY
- SENIOR MANAGEMENT INVOLVEMENT ADEQUATE
- BACKGROUND NOISE IN CONTROL ROOM EXCESSIVE