

NOTE TO: Bill Ruland
AIT team leader

FROM: Bob Spence *in AS*
Jose Ibarra
AEOD/DSP/ROAB

DATE: Dec. 15, 1992

SUBJECT: Salem 2 Dec 13, 1992 Loss of Annunciators AIT

Attached are our initial information and interview requests, ENS report, and excerpts from the draft memoranda of Understanding with States. We are bringing a cassette recording of the ENS phone call made by the licensees and will need to use a tape recorder to hear it.

Human Factors Interviews

Can we use the simulator facility for interviews with the operators who were on shift during the event? If so, the simulator should be set for the plant conditions that existed at the time of event discovery. The use of the simulator can greatly help jog the operators memories and let them point out indication they looked at, how they used their procedures, and other human factors.

Can the operator interviews be scheduled from the bottom to the top, i.e from the person closest to the event up to shift management. If so, we can understand the facts from the lower echelon personnel, then ask the shift management how and why they reacted. Can the interviews be scheduled as soon as possible after the licensee briefing to make best use of the operators memory?

Suggested interview order:

- reactor operators
- extra reactor operators (if any)
- control room SRO
- shift technical advisor
- shift supervisor
- shift engineer (manager)
- plant management contacted by shift personnel

INFORMATION REQUEST

The human factors portion of the AIT will need the following, if possible before the operator interviews:

- *Annunciator Response Procedure
- *EPIP on EAL declaration on loss of annunciators/computer
- *Partial and total loss of annunciator procedures
- *Partial and total loss of computer (SPDS, plant, process...) procedures
- *Computer rebooting procedure
- *Individual events statements and operator logs for:
 - reactor operators
 - reactor building auxiliary operator
 - control room supervisor (SRO)
 - shift technical advisor
 - shift supervisor
 - shift manager
- *Loss of annunciator and computer trouble shooting procedures
- *Loss of annunciator and computer post-maintenance functional test procedures
- *Compensatory measures check-off procedure/sheets used for LOA/LOC
- *Manual reactor physics calculation procedure on loss of computer
- Technical Specifications relying on or affected by loss of computers/annunciators
- FSAR statements regarding reliance on computers and annunciators
- 50.59 Evaluation and supporting documentation of the latest computer modification
- Electrical diagrams and description of annunciator system
- Lessons plans/training manual chapter on annunciator and computer systems
- Lesson plans dealing with loss of annunciator and/or computer systems
- Loss of Annunciator/Computer training scenarios

POWER REACTOR

EVENT NUMBER: 24752

PLANT: SALEM
UNIT: [] [2] []
RX TYPE: [1] W-4-LP, [2] W-4-LP

REGION: 1
STATE: NJ

NOTIFICATION DATE: 12/14/92
NOTIFICATION TIME: 17:04 [ET]
EVENT DATE: 12/14/92
EVENT TIME: 17:00 [EST]
LAST UPDATE DATE: 12/14/92

NRC NOTIFIED BY: SAUER
HQ OPS OFFICER: CHAUNCEY GOULD

NOTIFICATIONS

EMERGENCY CLASS: NOT APPLICABLE
10 CFR SECTION:
AARC 50.72(b) (1) (v) OTHER ASMT/COMM INOP

| | |
|----------------|------|
| RICHARD KEIMIG | RDO |
| CALVO | EO |
| JORDAN | AEOD |
| GIITTER | IRB |
| CHAFTEE | EO |

| UNIT | SCRAM CODE | RX CRIT | INIT PWR | INIT RX MODE | CURR PWR | CURR RX MODE |
|------|------------|---------|----------|-----------------|----------|-----------------|
| 2 | N | Y | 100 | POWER OPERATION | 100 | POWER OPERATION |

EVENT TEXT

7 LICENSEE REPORTED THAT THEY HAD LOST OVERHEAD ANNUNCIATORS ON 12/13/92 21:26 BUT IT WAS NOT DETERMINED TO BE REPORTABLE UNTIL 12/14/92 @ 17:00.

ON 12/13/92 @ 21:26EST, THE LICENSEE DISCOVERED THAT UNIT 2 OVERHEAD ANNUNCIATOR SYSTEM WAS NOT OPERABLE. WITHIN 15 MINS (ACTUAL TIME APPROX 2 MINS) OF DISCOVERY, THE OVERHEAD ANNUNCIATORS WERE RETURNED TO SERVICE AND SATISFACTORILY TESTED. SUBSEQUENT INVESTIGATION REVEALED THAT THE ANNUNCIATOR SYSTEM WAS INOPERABLE FOR APPROX. 1 1/2 HRS PRIOR TO ITS INITIAL DISCOVERY. THE ALERT CLASSIFICATION EMERGENCY ACTION LEVELS WERE NOT EXCEEDED BECAUSE THE INITIAL INFORMATION DID NOT INDICATE THAT ANNUNCIATORS WERE LOST FOR GREATER THAN 15MINS. SUBSEQUENT INFORMATION, HOWEVER, WARRANTS A MAJOR LOSS OF ASSESSMENT CAPABILITY NOTIFICATION. THE CAUSE IS STILL BEING INVESTIGATED. NO PRESS RELEASE WILL BE MADE. THE RI WAS INFORMED.

HOO NOTE: AN AIT HAS BEEN FORMED AND DISPATCHED TO THE SITE.

S, ZCP-50, ANN-0001(A) - Rev 0

reschedule vs windows - maybe ZCP not
represented on MCB

Gen Start Closing System

TST trouble

conservative - no console alarm

5 sec SW pump trip + auto start
40 sec EDC start + 4KV "B" bus
1 sec EDC line ^{SS} control room
10 sec EDC trip

24M510 - Power Up RV

5 sec 24M514 - SV open

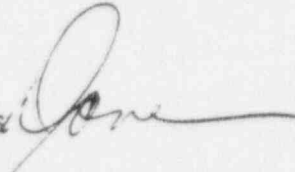
Tripped Rx on 2 S / opens T / PORV

2/1/16

DATE: December 19, 1992

TO: Robert Gallaher
Operating Engineer

FROM: David W. Lyons
Technical Engineer - I&C Systems



SUBJ: CONTROL OF OHA REMOTE CONTROL WORKSTATION

=====

In order to help ensure integrity of the Overhead Annunciator System (OHA) the Technical Department requests you instruct the Sr. Nuclear Shift Supervisors (SNSS) to do the following:

1. Disconnect the keyboard from the Remote Control Workstation.
2. Place a Shift Supervisor's Administrative Blocking Tag on the keyboard plug. The "Special Instructions" on the Tagging Request should state, "To be released only for System Engineer use."
3. Release the Blocking Tag only when the designated System Engineer is present or is in direct communication with the SNSS, such that he may direct the evolution being performed on keyboard.

Currently, the only designated System Engineers are:

William Lowry
Daniel Laughman.

This list will be updated if the System Engineering assignments are changed.

Thank you for your assistance in this matter. If there are any questions, please call me at 2087.

12/14/92

TITLE: JUSTIFICATION FOR INTERIM OPERATION OF SALEM UNITS 1 AND 2
WITH OVERHEAD ANNUNCIATOR CONCERNS

NLR-I92621

1.0 PURPOSE

This evaluation has been prepared to justify the continued safe operation of the Salem Unit Nos. 1 and 2 in light of the recent overhead annunciator system lockup without immediate detection. This evaluation will provide a discussion of the functional condition of the overhead annunciator system and the temporary compensatory actions that have been initiated by PSE&G.

2.0 SCOPE

This evaluation is applicable to the operation of both Salem Unit Nos. 1 and 2.

3.0 DISCUSSION

3.1 History of Overhead Annunciator System Lockup

On December 13, 1992, Salem Unit No. 2 experienced an overhead annunciator failure that caused a lock up of a Beta SER A Main/Aux controller system, disabling the overhead annunciator system. Upon discovery, the system was reset and returned to normal operation in approximately three minutes. Investigation revealed that the system had been locked up for approximately 90 minutes. SER A (primary SER) had locked up, and SER B (backup SER) had failed to take control of the overhead annunciators. SER B had recorded all alarms received during the lock up of SER A, including the "Annunciator Logic Failure" on SER A.

3.2 Current Status of the Overhead Annunciator System

The functional capability of the overhead annunciator system was proved after the manual reset on December 13, 1992. The control operator verified the Beta CRT time was updating, overhead alarm windows A-9 Annun Logic Fail, A-41 Aux Alm Sys Printer, and A-6 RMS Trbl alarmed and were reset by the control operators. The alarm summary associated with the Beta system had no error messages.

The shift supervisor requested the system engineer perform additional checks to verify functionality. The system engineer performed functional tests and confirmed that the system was functioning properly.

On December 14, 1992, additional testing to demonstrate the functional capability of the software, hardware, and the capability to receive an alarm from a field parameter was initiated. The specific actions taken were:

- a. Verify OHA Window A-1 Annun Pwr Fail, A-9 Annun Logic Fail, and A-17 Annun Grd Det are clear.
- b. Verify the Beta CRT clock is updating to the correct time
- c. At the Annunciator's Panel, perform a functional test and an alarm summary test.
- d. Verify the primary LED's are lit on the SER boards.
- e. Open a Reactor Protection Cabinet Door causing an OHA alarm. In addition, Reactor Protection System surveillance tests are being performed six days per week which bring up various overhead alarms and verify the functionality of the overhead annunciator system. The surveillance procedures which are used are Category 1 procedures.

In addition, it should be noted that any plant operation or condition that initiates an alarm will verify the status of the overhead annunciator system.

On December 18, 1992, procedure TS2.IC-ZZ.OHA-0001(Q) 4100 Beta Sequential Events Recorder Troubleshooting Procedure was performed on the overhead annunciator system. A summary of the test is described below:

A jumper was removed from SER A and automatic swap-over to SER B was observed. Functional tests were performed to ensure SER B was controlling. SER A main controller board was removed. A spare main controller board was installed in SER A and automatic swap-over to SER A was observed. Functional tests were performed to ensure SER A was functioning properly. In addition, actuation of at least two alarms on each scanner and two alarms on each window except the F (First Out) window were performed. The test was completed satisfactorily.

3.3 Alternate Indications ?

The control room overhead annunciator system consists of ten panels each containing 48 alarms for a total of 480 windows. Of the 480 possible alarm windows, 379 windows are utilized. 304 of the 379 windows contain at least one alternate indication in the control room. Based on a review of the annunciators without alternate monitoring capability, contingency assignments have been identified.

Sources of alternate indication in the control room are many and varied. These include the control console, the RP (back) panels, the Doric alarm scanner, the process (P-250) computer, the auxiliary alarm typewriter, and the SPDS computer.

In addition to alternate indication in the control room, many overhead annunciators are initiated from local alarm panels located throughout the plant. These local panels can be monitored periodically to ensure no alarms have been initiated. They can also be used to initiate an overhead alarm in the control room by using local test pushbuttons to verify proper operation of the system.

3.4 Compensatory Actions

In order to ensure continued safe operation of Salem Unit Nos. 1 and 2, the following compensatory actions have been initiated:

- a. An additional licensed reactor operator has been stationed in each control room to provide additional monitoring of the above listed alternate indication without increasing the work load of the normal board operator.
- b. The hourly functional test and an alarm summary are being manually initiated by the additional reactor operator every 15 minutes. The alarm summary is used to verify that alarms being received by the SERs are alarming on the overhead annunciators.
- c. An additional equipment operator has been stationed in each unit's secondary plant to monitor remote alarm panels and indications. The equipment operator will verify that alarms received in the Control Room are valid, and that alarms indicated on the remote panels are alarming in the control room.
- d. An individual has been stationed in the service water structure as a roving watch. This individual will perform a visual inspection of the entire service water structure to identify any abnormalities.

- e. Once per shift, each overhead alarm window except the F (First Out) Window panel will have at least one alarm initiated from a remote location.
- f. Three times per week, the system engineer will download the overhead annunciator computers to monitor for error messages.
- g. Upon failure of the overhead annunciator system, the unit will be placed in a stable condition, additional personnel will be stationed at various locations in the plant, and the actions of the Event Classification Guide will be followed.

4.0 CONCLUSIONS

The continued operation of Salem Unit Nos. 1 and 2 is justified based on the previous discussion. The use of compensatory measures ensures the continued safe operation of the plant. These actions provide reasonable assurance that both the overhead annunciator system is functional, and that failure of the overhead annunciator would be detected in a timely manner. Upon completion of the investigation and implementation of the appropriate corrective actions, compensatory actions will be re-evaluated.

5.0 SIGNATURES

| | |
|--|-----------------|
| <u>Howard Unruh</u> | <u>12/19/92</u> |
| Originator | Date |
| <u>Donald J. DeGroot</u> | <u>12-19-92</u> |
| Verifier | Date |
| <u>Howard Unruh</u> | <u>12/19/92</u> |
| Nuclear Electrical Engineering Manager | Date |
| <u>Salim Alwan</u> | <u>12/19/92</u> |
| SORC Chairman | Date |
| <u>Salim Alwan</u> | <u>12/19/92</u> |
| General Manager - Salem Operations | Date |

TO: V. POLIZZI
FROM: R. GALLAHER
SUBJECT: OHA QUESTIONS
DATE: 12-21-92

THE OPERATIONS DEPARTMENT LICENSED ON SHIFT OPERATORS WERE ASKED ABOUT THE OHA'S. 11 NSS'S AND 18 NCO'S PROVIDED THE FOLLOWING RESPONSES:

WERE YOU AWARE OF THE RESETS OF THE OHA CONTROLLERS?

15 NCO'S WERE NOT AWARE OF THIS FEATURE UNTIL THIS RECENT EVENT. 3 NCO'S AND 1 NSS WERE AWARE OF THE MANUAL RESET FEATURE.

1 NCO RESET THE CONTROLLER COMING OUT OF UNIT 2 OUTAGE DURING TESTING AND TROUBLESHOOTING OF THE SYSTEM. THE NSS AND THE NSSS ALONG WITH THE INSTALLATION ENGINEER WERE AWARE OF THIS RESET.

ANOTHER NCO HAS RESET THE SYSTEM 3 TIMES. THE FIRST TIME WAS BACK IN NOVEMBER. THE NCO WAS TROUBLESHOOTING THE A-45 WINDOW ALARM. THE NSSS WAS WORKING WITH THE NCO IN ATTEMPTING TO FIND THE INPUT FOR THE ALARM. THE NCO CLEARED THE OHA WITH THE NSSS PERMISSION BY MANUALLY RESETTING THE SYSTEM. THE TWO OTHER TIMES WERE ON 12/12/92 AND 12/13/92. THE 12/12 RESET WAS TO CLEAR OHA A-45 WITH NSS PERMISSION AND THE 12/13 WAS THE EVENT. NO WORK REQUEST WAS GENERATED FOR THE NOVEMBER OCCURRENCE.

THE 3rd NCO ONLY NEW ABOUT THE RESET, HE NEVER UTILIZED THIS FUNCTION.

THE NSS WAS AWARE OF THE MANUAL RESET FROM TESTING BEING COMPLETED DURING THE OUTAGE.

DID YOU EVER USE THE KEYBOARD TO ACCESS THE SYSTEM?

6 NCO'S AND 1 NSS HAVE USED THE KEYBOARD TO ACCESS THE SYSTEM. NO INDIVIDUAL HAS USED PROCOMM. IN ALL BUT 2 CASES, A PROCEDURE WAS USED TO OBTAIN REPORTS EITHER FOR GETTING ALARM DATA ASSOCIATED WITH A REACTOR TRIP OR DETERMINE A PARTICULAR ALARM POINT HAS BEEN RECEIVED.

THE 2 NCO'S WHO DID NOT UTILIZE A PROCEDURE WHEN TO THE MENU SCREEN FOR INFORMATION ON CORRECTING THE TIME IN OCTOBER AND TO RETRIEVE RCP LOW BEARING FLOW ALARM INFORMATION.

ALL INDIVIDUALS INDICATED SOME TRAINING IN THE SIMULATOR. NO OPERATORS COULD RECALL TRAINING ON THE BACK PANEL.

7/49

NUCLEAR LICENSING WORK STANDARD
NRC INSPECTION MANAGEMENT

ATTACHMENT 1
QUESTION AND ANSWER TRACKING FORM

ITEM NUMBER:

SOURCE: NRC/PSE&G (SELECT ONE)

DATE: 12/23/92

NRC CONTACT: Spence

NRC QUESTION: What would be the effect ~~to~~ on ECCS systems/pumps if the operators do not go into the recirculation phase in Lo & Lolo RWST levels at the appropriate level. This should include ~~use of~~ switching to the recirc phase at all levels of the RWST, or turnoff the CS pump, etc.

PSE&G CONTACT:

LICENSING CONTACT:

PSE&G RESPONSE:

When pressurization starts or
pumps fail ie at what RWST
water level does RHR, SIS, & CS pumps
start cavitating, due to NPSH problems,
at the LOCA design flows. How much
time does the control room operators have to
make the recirc swap over from the time the
RWST Lo & Lolo level at the design flow rates,

DATE:

NLR REVIEW: YES / NO (SELECT ONE)

RESPONSE ACCEPTED BY NRC: YES / NO (SELECT ONE)

INSPECTOR'S NAME:

DATE:

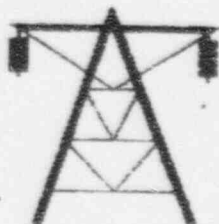
AH/9
A/150

HERE'S THE FAX !!!!

• TO: Bill Lutarel

FAX # 215-337-5320

PHONE # _____



• FROM: DAVID W. LYONS
SALEM GENERATING STATION
PUBLIC SERVICE ELEC & GAS
PHONE: 609-339-2087
FAX: 609-339-2749

• TOTAL PAGES 2
(INCLUDES THIS COVER SHEET)

• TIME/ DATE OF TRANSMITTAL

(609) 339-2087

Bill

① Keyboard checks
were sat.

② Attached are RWST
drain down times -
the 15 min. to Lo-Level
give sufficient time to
anticipate swap.

Beeper 609-478-5610

PSEG

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

MEC-92-844

Nuclear Department

TO: D. Lyons
Technical Engineer

FROM: H. Berrick *H.G. Berrick* 12/27/92
Salem Mechanical Engineering Supervisor

SUBJECT: RWST DRAIN TIMES

DATE: December 29, 1992

While specific engineering calculation could not be located in our files for the requested response times, the time involved can be readily determined using the methodology and FSAR references as provided below.

- It would take a minimum of 15 to 15.7 minutes to drain RWST from the Tech Spec. minimum volume of 364,500 gallons to the volume of 150,500 gallons corresponding to the RWST low level alarm setpoint.
- It would take a minimum of 9 to 9.5 minutes to drain the RWST from the low level set point of 150,500 gallons to the low-low level set point of 21,200 gallons.

These times are based on all ECCS pump running as indicated on FSAR Table 6.3-13 with a combined flow of 13,600 gpm and FSAR Table 6.3-8 with a combined derived flow of 14,300 gpm.

As identified in FSAR Section 6.3.2.6, considering the volume of 15,500 gallons below the ECCS suction line, it leaves approximately 5,700 gallons of available water at the RWST low-low level setpoint.

As identified in FSAR Table 6.3-13, there is adequate NPSH available to all the ECCS pumps corresponding to the RWST low-low level and further to the RWST zero level point of 101'-8".

MRD:kb

C J. Carey
M. Danak
J. Ranalli
J. Rowey
J. Wiedmann
MEC File
Standards Records Coordinator