U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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| Licensee: | Commonwealth Edison Company |
| Facility: | LaSalle County Station, Units 1 and 2 |
| Location: | 2601 N. 21st Road<br>Marseilles, IL 61341 |
| Dates: | April 28, 1997 - June 20, 1997 |
| Inspector: | E. Duncan, Reactor Engineer |
| Approved by: | M. Ring, Chief, Lead Engineers Branch<br>Division of Reactor Safety |

## EXECUTIVE SUMMARY

LaSalle County Station, Units 1 and 2
NRC Inspection Report 50-373/97008(DRS); 50-374/97008(DRS)

Engineering

- The inspector reviewed Unresolved Item 50-373/374/97004-04 regarding a residual heat removal (RHR) heat exchanger waterhammer concern. The inspector determined that concerns regarding waterhammer on division 2 of the residual heat removal service water (RHRSW) system had been previously identified by the licensee due to a high vertical piping loop unique to division 2. However, the licensee did not consider the effects of design lake level in a subsequent evaluation of the potential consequences of a worst case waterhammer event until after questions were raised by NRC inspectors. As a result, the licensee failed to recognize that division 2 of the RHRSW system was inoperable from initial plant startup. This was an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions." (Section E1.1)

- As discussed in inspection report 50-373/374/97004, the inspector determined that the licensee failed to identify that the Unit 1 and Unit 2 division 1 RHRSW heat exchangers were susceptible to tube voiding and waterhammer. During this inspection, the inspector concluded that a detailed evaluation was required to demonstrate that the division 1 RHRSW system was operable, which was an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions." (Section E1.1)

- The inspector reviewed modifications planned by the licensee to address the division 2 RHRSW system waterhammer issue. No concerns were identified. (Section E2.1)

- The inspector observed testing of the RHRSW keep-fill system modification and identified numerous problems including poor test scheduling and preparation, weak coordination of resources, improper use and approval of overtime, unclear backshift engineer expectations, and inadequate communications. (Section E4.1)

- The licensee's prompt investigation report regarding RHRSW keep-fill system post-modification testing problems failed to clearly identify that Technical Specification requirements regarding overtime approval were not met and failed to identify issues regarding the roles and responsibilities of a backshift engineer. (Section E4.2)

## Report Details

### Exercise of Discretion

Two examples of an apparent violation described in Section E1.1 of this report are based upon activities which satisfy the appropriate criteria in Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, and a Notice of Violation (NOV) is not being issued for this apparent violation. In particular, significant NRC enforcement action was recently taken against LaSalle County Station for a service water sealant intrusion event for which the licensee's corrective actions encompass the root causes for the violation under consideration, and the licensee voluntarily entered an extended shutdown on both units to address wide ranging performance problems which encompass the causes for the apparent violation discussed in the report. In addition, actions specified in Confirmatory Action Letter (CAL) RIII-96-008B effectively prevent the licensee from starting up LaSalle County Station without NRC approval.

## III. Engineering

### E1 Conduct of Engineering

#### E1.1 Residual Heat Removal Service Water (RHRSW) System Waterhammer Concern

a. Inspection Scope

The inspector reviewed Unresolved Item 50-373/374/97004-04 regarding a RHRSW system waterhammer concern on Unit 1 and Unit 2.

b. Observations and Findings

Background

As discussed in NRC inspection reports 50-373/374/96011 and 50-373/374/97004, the inspectors identified that the RHR heat exchanger tubes were at an elevation 30'-3" higher than normal lake level and 40'-3" higher than design lake level. As a result, the inspectors postulated that the heat exchangers could be susceptible to tube voiding as a result of an event which caused lake level to decrease from the normal level of 700 feet to the design level of 690 feet, or due to boiling in the RHR heat exchanger tubes during a design basis event. In either case, once the RHRSW system was manually initiated, the inspectors were concerned that a void in the tubes would rapidly collapse, resulting in a waterhammer which could rupture the heat exchanger and render the system inoperable.

The licensee responded during the inspection that a waterhammer would occur as postulated. At the end of that inspection, the licensee had not determined the consequences of a worst case waterhammer event. Subsequently, the licensee formally responded to the inspectors' concern in a letter dated December 20, 1996. In that letter, the licensee provided the following additional information:

Division 1

Due to the physical configuration of the Unit 1 and Unit 2 division 1 RHRSW system, the only location within the system where the postulated waterhammer event could occur, under certain circumstances, was in the upper elevation of the RHR heat exchanger tubes. For example, if prior to starting the RHRSW pumps, the RHR heat exchanger tubes were heated up due to suppression pool heatup, which would occur during a loss-of-coolant-accident or safety relief valve (SRV) blowdown, tube voiding could occur. In addition, the situation would be worsened if the lake level decreased from the normal level to the design level following a failure of the nonsafety-related dike.

To evaluate the effects of the postulated waterhammer on the division 1 RHRSW system, the licensee conducted the following evaluations:

- General Electric (GE) performed a study which developed waterhammer pressure pulses resulting from a worst case waterhammer in the RHR heat exchanger tubes. GE concluded that the bounding waterhammer pressures which could occur in the RHR heat exchangers were acceptable.

- Sargent and Lundy (S&L) performed an evaluation which provided further confirmation of the adequacy of the RHR heat exchangers following a postulated worst case waterhammer in the RHR heat exchanger tubes.

- S&L performed additional evaluations of the piping, equipment, and supports for a postulated worst case waterhammer event in the RHR heat exchanger tubes. These evaluations concluded that the stresses in the system piping, valves, penetrations, strainers, pumps, and supports were acceptable.

The inspector obtained the evaluations performed by GE and S&L. These evaluations have been forwarded to the Office of Nuclear Reactor Regulation (NRR) for further review.

10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," requires that measures shall be established to assure that conditions adverse to quality, such as deficiencies, are promptly identified and corrected and that in the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

As discussed in inspection reports 50-373/374/96011 and 50-373/374/97004, and as described above, from initial plant construction to 1996, the licensee failed to identify that the Unit 1 and Unit 2 division 1 RHRSW system was susceptible to tube voiding and waterhammer as a result of an event which caused lake level to decrease from the normal level of 700 feet to the design lake level of 690 feet, or due to boiling in the RHR heat exchanger tubes during a design basis event. In addition, because detailed evaluations were required to demonstrate that division 1 of the RHRSW system was operable under the above conditions, this was an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XVI (50-373/374/97008-02a).

However, because this violation satisfied the criteria in Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, a Notice of Violation (NOV) is not being issued.

Division 2

The physical configuration of the Unit 1 and Unit 2 division 2 RHRSW system also allowed for a waterhammer event to occur in the RHR heat exchanger tubes similar to division 1. However, the division 2 piping had a large vertical loop with a maximum elevation (733'-6" on Unit 1 and 735'-3" on Unit 2) higher than the RHR heat exchangers (730'-3") and significantly higher than normal lake level (700 feet) or design lake level (690 feet). This loop existed to provide a straight run of piping necessary to ensure the accuracy of flow measuring instrumentation.

To evaluate the effects of a postulated worst case waterhammer event on division 2 of the RHRSW system, the licensee performed additional evaluations. However, in this case, the licensee's evaluations failed to demonstrate that the piping and piping supports could withstand a postulated waterhammer at the design lake level of 690 feet. As a result, a keep-fill system with crossties to both the nonsafety-related service water (WS) system and the diesel generator cooling water (DGCW) system was designed for division 2 of the RHRSW system to maintain the piping system full and eliminate the potential for a waterhammer to occur when the system was started following a design basis event.

The inspector reviewed the licensee's response regarding the susceptibility of division 2 of the RHRSW system to a waterhammer event and determined that waterhammer events had been observed and identified by the licensee previously. In addition, the inspector determined that pressure transient data had been recorded as part of special testing conducted to evaluate the waterhammer issue. Following that testing, procedure changes, including the installation of a temporary hose to provide makeup to the Unit 2 division 2 RHRSW system prior to surveillance testing, had been implemented to minimize the waterhammer consequences. Unresolved Item 50-373/374/97004-04 was opened pending further NRC review.

Inspector Review

During this inspection period, the inspector reviewed the configuration of division 2 of the RHRSW system in detail, and conducted interviews to evaluate the waterhammer issue, including the licensee's identification of the problem and planned corrective actions. The inspector developed the following chronology of events:

05/04/90 LaSalle Special Test (LST) 90-49, "RHR Service Water Pressure Transient Study," was conducted to record and evaluate the pressure transients in the Unit 2 division 2 (2B) loop of the RHRSW system during system startup and to investigate alternate startup methods to mitigate the waterhammer transient. The following results were obtained:

- Using the normal startup method in which the RHRSW discharge valve was opened after the RHRSW pump was started, the maximum recorded pressure in the RHRSW system was about 200 pounds per square inch gauge (psig).

- Using an alternate startup method, in which the RHRSW system discharge valve was partially opened before the RHRSW pumps were started, the maximum recorded pressure in the RHRSW system was only about 100 psig.

**Note: This testing was performed at normal lake level (about 700 feet) and failed to account for the effects of design lake level (690 feet).**

05/08/90 LaSalle Operating Procedure (LOP) RH-05, "Operation of the RHR Service Water System," was revised to mitigate the observed waterhammer effects as follows:

- Procedure steps were revised to open the division 2 RHRSW system discharge valve, wait 5 to 6 seconds after receiving dual position indication, start one RHRSW pump, and then after flow indicated greater than 3000 gallons per minute (gpm), to start the other RHRSW pump.

- A precaution was added which required that the division 2 RHRSW system discharge valve should indicate dual position (both open and closed lights illuminated) for 5 to 6 seconds prior to starting an RHRSW pump to avoid waterhammer damage to the system.

05/09/90 Action Item Request (AIR) 373-251-90-00072, "Waterhammer in the Division 2 RHRSW System," was generated to track a long-term engineering resolution for the division 2 RHRSW system waterhammer issue.

07/31/90 AIR 373-251-90-00072 was updated to discuss the results of LST-90-49. The update also stated that the issue was to be discussed at an 8/6/90 technical review committee (TRC) meeting.

08/06/90 TRC meeting discussed the division 2 RHRSW system waterhammer issue. During the meeting, it was suggested that a special test be performed to crosstie the WS system with the RHRSW system as a keep-fill system.

10/25/90 LST-90-105, "RHR Service Water Pressure Transient Monitoring During System Startup," was conducted which crosstied the WS system with division 2 of the RHRSW system to evaluate a keep-fill crosstie.

The licensee's evaluation of LST-90-105 test results concluded that no significant transients were noted and that a permanent crosstie should be an effective method to prevent severe pressure transients during RHRSW system startup.

10/26/90 AIR 373-251-90-00072 was updated to reflect the following:

- The suggestion in the 8/6/90 TRC meeting to crosstie the WS system with the RHRSW system.
- LST-90-105 was completed on 10/25/90 and demonstrated that a WS system crosstie was an effective method to prevent severe waterhammer transients.

11/05/90 TRC meeting discussed the results of LST-90-105. A decision was made to submit a modification request to install a permanent WS system crosstie.

11/27/90 AIR 373-251-90-00072 was updated to reflect the following:

- The results of LST-90-105 were discussed at the 11/5/90 TRC meeting.
- A WS crosstie modification request was on the 1/22/91 senior management review committee (SMRC) agenda.

02/07/91 S&L letter (Chron 162880) was received by ComEd regarding the results of an S&L study which evaluated the division 2 RHRSW system waterhammer issue. The following important points were noted in the letter:

- Waterhammer was measured with transient pressures of up to 200 psig.
- An alternate startup method in which the RHRSW pumps were started after the discharge valve was partially opened reduced the maximum waterhammer pressure to 100 psig.
- The root cause was a vertical loop in the division 2 RHRSW system piping.
- Potential corrective actions included a piping re-route to lower the height of the vertical loop or a keep-fill modification from the WS system.
- The RHR heat exchangers were also reviewed and determined to be acceptable since the top of the RHR heat exchanger tubes were less than 31'-7" higher than lake level.

**Note: Design basis lake level was not considered in the S&L evaluation.**

02/14/91 AIR 373-251-90-00072 was updated to reflect that the modification request was not discussed at the 1/22/91 SMRC meeting, but would be placed on the agenda for the next SMRC meeting.

03/04/91 Internal ComEd letter (Chron 163763) recommended that LaSalle continue to implement the alternate system startup method (opening the division 2 RHRSW discharge valve just prior to RHRSW pump operation) which would easily and cost-effectively eliminate the possibility of waterhammer without additional funding.

Modification options were recommended to not be investigated any further.

07/01/91 AIR 373-251-90-00072 was updated to reflect the following:

- The keep-fill modification request was presented to the SMRC.
- The SMRC cancelled the modification request since the alternate RHRSW system startup method had significantly reduced the pressure transients experienced during system startup, and since this method had been implemented there had been no further instances of system damage due to waterhammer.

AIR 373-251-90-00072 was closed.

02/11/93 Problem Identification Form (PIF) 373-201-93-00111 was generated to document a loud waterhammer which occurred when the 2B RHRSW system was started, followed by a metallic clanging noise in the RHRSW system piping and heat exchanger.

02/17/93 PIF 373-201-93-00111 was closed. The following actions were documented:

- The RHRSW system was walked down for leaks or damage. None were identified.
- A work request was generated to inspect the 2B RHRSW backwash strainer during refueling outage L2R05.
- Work requests had been previously written to inspect the 2B RHR heat exchanger and 2B RHRSW system flow element during L2R05.

07/14/93 A memorandum from R. Ayer, LaSalle System Engineering, to J. Schmeltz, LaSalle Station Manager, discussed RHRSW system

waterhammer. In that memorandum, the following information was noted:

- The Unit 2 division 2 loop of the RHRSW system was susceptible to waterhammer due to a vertical loop of piping. However, the 1B loop and both division 1 subsystems did not have piping above 734' and therefore were not likely to be susceptible to waterhammer.

**Note: Design lake level effects were not considered.**

- On 2/11/93, a severe waterhammer occurred when the 2B RHRSW system was started to support an RHR heat exchanger differential pressure test which may have caused damage to the 2B RHRSW system backwash strainer tube assembly.

- On 6/30/93, another waterhammer occurred while performing a differential pressure test. (Note: the licensee was unable to provide this PIF to the inspector and the inspector was unable to determine any additional information regarding this event).

- These two events indicated that further corrective actions were necessary. The following actions were recommended:

  - Testing to identify additional procedural methods to alleviate the waterhammer problem.

  - Re-opening the investigation for a long-term engineering resolution to the problem.

08/31/93 LST-93-063 was performed which monitored the effectiveness of a keep-fill crosstie from the service water (WS) system to the RHRSW system. Testing results were similar to those obtained on 10/25/90.

10/18/93 LOP-RH-05 was revised to add steps to fill the 2B RHRSW loop prior to startup. These steps consisted of connecting a temporary hose between a WS system test tap and the RHR heat exchanger inlet drain valve to fill any voided piping in the 2B RHRSW system.

11/16/93 PIF 374-200-93-01347 was generated to document a loud waterhammer which occurred when the 2B RHRSW system was manually initiated without filling the loop in accordance with the revised LOP-RH-05 procedure.

PIF 373-200-93-0134701 was generated to track completion of corrective actions from PIF 374-200-93-01347.

12/01/93 The licensee completed an investigation of PIF 374-200-93-01347. The following findings and corrective actions were documented:

- Procedure LOP-RH-05 was not written in such a manner as to make it clear that the crosstie fill was required at all times unless waived by the shift engineer.

- The reactor operator in charge of starting the 2B RHRSW system assumed that because of a note in his turnover, the system was already filled.

- No material condition problems were identified during walkdowns by operations and system engineering personnel following the waterhammer event.

- Caution cards were added to the Unit 2 "C" and "D" RHRSW pump control switches to indicate a required crosstie fill until LOP-RH-05 was revised.

- The event was discussed with the operating crew and upper station management.

PIF 374-200-93-01347 was closed.

01/04/94 LOP-RH-05 was revised to more clearly identify filling requirements for the 2B RHRSW system.

01/10/94 PIF 373-200-93-0134701 was closed.

08/14/95 TRC meeting discussed the 2B RHRSW system waterhammer issue. The TRC meeting notes documented the following:

- Unit 2 had a unique piping arrangement on the division 2 RHRSW system that had resulted in a number of severe waterhammer transients.

- The problem had been minimized by procedural controls and a manual keep-fill process which was an operator workaround.

- TRC approved a solution which permanently crosstied the WS system to the RHRSW system (ER9500167).

- TRC determined that the proposed crosstie was the most cost-effective solution and approved the change as a modification for installation in 1997.

09/03/96 NRC System Operational Performance Inspection (SOPI) began at LaSalle to assess the operational performance of the RHRSW system.

09/18/96 NRC inspectors questioned a potential waterhammer in the RHR heat exchangers documented as Comment 20, "Potential for RHRSW System Waterhammer," in NRC inspection report 50-373/374/96011. Specifically, the inspectors were concerned that since the top of the

RHR heat exchanger tubes were greater than 32 feet above the design lake level of 690 feet, tube voiding, which could result in a severe waterhammer transient, was possible.

09/24/96 NRC SOPI team exit meeting held. Unresolved Item 96011-19 was opened to track the RHR heat exchanger waterhammer concern.

09/26/96 PIF 96-2824, "1B and 2B RHR Heat Exchanger Service Water Piping Potential for Waterhammer," was generated to identify a problem regarding a potential waterhammer at design lake level due to the vertical loop in the division 2 RHRSW system piping.

PIF 96-2825, "RHR Heat Exchanger Tubes Potential Waterhammer," was generated to identify a problem regarding a potential waterhammer at design lake level in the RHR heat exchangers.

09/27/96 As documented in NRC inspection report 96011, the licensee responded to Comment 20. In that response, the licensee described procedural steps in place during startup and shutdown of the RHRSW system including discharge valve and RHRSW pump operation sequence.

The response also stated that as a conservative measure Unit 1 and Unit 2 had been shutdown and the waterhammer issue was being investigated to ensure that the RHRSW system was operable prior to unit restart.

12/17/96 The licensee contacted the NRC Operations Center in accordance with 10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Plants," and reported that division 2 of the RHRSW system was outside its design basis due to concerns regarding the consequences of a worst case waterhammer transient.

01/16/97 Licensee Event Report (LER) 96-020, "Potential Waterhammer Concerns of Residual Heat Removal Service Water System Division 2 Piping," Revision 0, was submitted to the NRC.

The inspector reviewed the information documented above and concluded the following:

- Concerns regarding waterhammer on division 2 of the RHRSW system had been identified prior to May 1990.

- The licensee failed to adequately consider the effects of design lake level during an evaluation of the RHRSW system waterhammer consequences prior to NRC questions on September 20, 1996.

- Actions to fill the Unit 2 division 2 RHRSW system prior to routine surveillance testing, although not performed to meet surveillance acceptance criteria, were pre-conditioning activities since the actions enhanced the

testing results by mitigating the waterhammer transient and would not normally be conducted prior to initiating the RHRSW system during an event.

- The initial modification plan to provide a crosstie from the WS system alone was inadequate, since this system could not be relied upon to be available during a loss-of-offsite-power (LOOP), or a seismic event.

Corrective Actions

The inspector determined that the licensee had planned or completed the following corrective actions to address the waterhammer concern:

- A keep-fill system was installed on division 2 of the RHRSW system for Unit 1 and Unit 2 to ensure that the RHRSW system would remain filled and pressurized under all plant conditions.

- The RHRSW system was selected for a design review prior to startup. This review was being conducted to verify adequate design implementation, that there was a documented analytical basis for the design, that no important design features had been overlooked, and that the design provided for the necessary functional operating requirements. The licensee planned to resolve any additional waterhammer problems identified prior to startup.

- The licensee planned to review systems important to safety and systems utilized within the action steps of the emergency operating procedures (EOPs) to identify and correct any similar waterhammer problems.

c. Conclusions

The inspector determined that significant concerns regarding waterhammer on division 2 of the RHRSW system due to a high vertical piping loop had been previously identified by the licensee. However, the licensee did not adequately consider the effects of design lake level during an evaluation of the consequences of a worst case waterhammer event until questions were raised by NRC inspectors on September 20, 1996.

10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," requires that measures shall be established to assure that conditions adverse to quality, such as deficiencies, are promptly identified and corrected and that in the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

As discussed in inspection report 50-373/374/97004, and as described above, from initial plant construction to 1996, the licensee failed to identify that the Unit 1 and Unit 2 division 2 RHRSW system was outside its design basis, a significant condition adverse to quality, and take appropriate corrective actions, which was an example of an apparent violation of 10 CFR 50, Appendix B, Criterion XVI (50-373/374/97008-02b).

However, because this violation satisfied the criteria in Section VII.B.6, "Violations Involving Special Circumstances," of the "General Statement of Policy and Procedures for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600, a Notice of Violation (NOV) is not being issued.

## E2 Engineering Support of Facilities and Equipment

### E2.1 RHRSW Keep-Fill System Modification Review

a. Inspection Scope

The inspector reviewed the licensee's keep-fill modification installed on the Unit 1 and Unit 2 division 2 RHRSW system.

b. Observations and Findings

The inspector determined that to address the waterhammer events on division 2 of the RHRSW system, the following modifications were completed:

- The installation of two crossties to division 2 of the RHRSW system to ensure that it is kept filled and pressurized. One crosstie was from the WS system, while the other was from the diesel generator cooling water (DGCW) system. Two crossties were required because the WS system is nonsafety-related and therefore cannot be relied upon in the event of a LOOP, or seismic event. The DGCW system is safety-related, but does not normally operate continuously. It operates whenever the emergency diesel generators (EDGs) are running. Therefore, the crosstie from the WS system would maintain the RHRSW system filled during normal plant operating conditions, while the crosstie from the DGCW system would maintain it filled during a LOOP.

- The installation of a division 2 RHRSW system low pressure alarm in the control room.

- The installation of an interlock to the control logic of the division 2 RHRSW system backwash strainers to permit automatic initiation of the backwash cycle only if the RHRSW pumps are running.

The inspector reviewed the modification packages associated with these design modifications, as well as the design drawings which addressed the changes. The inspector concluded that the design modifications were acceptable to correct the waterhammer problem. No concerns were identified.

c. Conclusions

The inspector concluded that design modifications to address the division 2 RHRSW system waterhammer issue were appropriate. No concerns were identified.

## E4 Engineering Staff Knowledge and Performance

### E4.1 RHRSW Keep-Fill System Post-Modification Testing Observations

a. Inspection Scope

The inspector observed the performance of post-modification testing following the addition of division 2 RHRSW system keep-fill modifications on Unit 1.

b. Observations and Findings

On April 29, 1997, the inspector observed the performance of modification test 9600195 following the installation of division 2 RHRSW system keep-fill modifications on Unit 1. During the testing, the inspector noted the following:

- The testing was considered "critical path" work although the two test engineers performing the test could not explain why this was the case.

- During the pre-evolution test briefing, operations supervision was not aware of required technical specification (TS) limiting condition for operation (LCO) entries until it was brought to their attention by the test engineers. As a result, testing was delayed for about 2 hours while operations department personnel verified the TS LCOs which were required to be entered and the impact on shutdown risk.

- During performance of the portion of the test which confirmed proper operation of the backwash strainer relay, both the "C" and "D" RHRSW pump discharge pressure indicator stop valves could not be isolated sufficiently to allow the testing to proceed as written. As a result, the test engineer conservatively discontinued the test to revise the procedure, prior to proceeding further.

- A test engineer identified that a portion of the test could not be performed since RHRSW system pressure had decreased to below the division 2 RHRSW system low pressure alarm setpoint.

- The inspector identified that the test engineer planned to perform the post-modification testing under a general radiation work permit (RWP) although an RWP specific for the post-modification testing was directed by the procedure. The inspector discussed this with the test engineer who subsequently signed onto the correct RWP.

- The inspector identified that RHRSW strainer control panel 1E12-P450 was missing a nut intended to secure a terminal board to the control panel casing. The licensee subsequently initiated an action request (AR) to identify this condition.

Following the problems encountered regarding stop valve leakage discussed above, the test engineers initiated a revision to the procedure to allow testing of the division 2 RHRSW system low pressure alarm and backwash strainer relay. The

inspector discussed the licensee's progress with the test engineers the next morning. The inspector identified the following additional issues:

- The procedure revision required an excessive amount of time, about 9 hours, to complete. As a result, both test engineers were close to exceeding TS overtime requirements when the test revision was approved.

- The backshift engineer was requested to complete the post-modification test in the absence of the assigned test engineers since they had worked about 16 hours continuously. However, the backshift engineer expressed significant concerns regarding his unfamiliarity with the test. As a result, one of the test engineers was authorized to work up to 20 hours to support the testing. That same engineer returned to work about 4 hours later and under the cognizance of licensee management worked an additional 4 hours before leaving the site.

- The backshift engineer approved the test procedure revision although it was still in draft form, and relied upon the test engineer to ensure that the changes were properly incorporated.

- The RHRSW keep-fill system post-modification testing was originally scheduled to begin on Monday, May 6. However, on the afternoon of Friday, April 25, the test engineers were informed that the test had been moved up a week and would be conducted the following Monday, April 28. This resulted in a very limited amount of time for the test engineers to prepare for the testing.

- Although the system engineering supervisor was promptly informed of problems encountered during the testing, senior management was not made aware of any problems until well after testing was expected to have been completed.

The inspector discussed these issues with licensee management who performed a prompt investigation of the events discussed above. The inspector reviewed the results of the licensee's prompt investigation in conjunction with the information already obtained and concluded the following:

- Test Scheduling and Preparation was Poor

  The test engineers responsible for conducting the post-modification testing were provided minimal time to adequately prepare for the test. In addition, the test was inappropriately classified as critical path work. As a result, when problems were encountered, the decision to push forward with the testing was inappropriate.

- Coordination of Resources was Poor

  Although the testing was expected to require 12 to 16 hours to complete, two test engineers were assigned to support the testing at the same time. In addition, when problems were encountered, both test engineers remained

onsite to revise the post-modification test procedure. As a result, when unexpected delays occurred during the test revision process, no provisions had been established to allow testing to continue without the approval of excessive overtime.

- Use and Approval of Overtime was Poor

The inspector concluded that the implementation of the licensee's overtime approval requirements was poor. The inspector was particularly concerned that management authorized a test engineer to work hours in excess of TS overtime requirements, although the testing was not urgent. The inspector also determined that overtime work without authorized approval occurred despite a recent memorandum from the Plant General Manager regarding an adverse trend in overtime management. A detailed explanation of the circumstances regarding this issue are discussed below.

The inspector obtained an April 15, 1997, memorandum from the Plant General Manager regarding overtime adherence. The inspector noted that the memorandum identified concerns regarding violations of the overtime policy which, as characterized in the memorandum, indicated a lack of adherence to technical specification requirements regarding overtime management, as well as a lack of control by the licensee's management team. In particular, the memorandum directed that authorization to exceed overtime limits must be prudent and not allowed out of convenience, could not be after the fact, and was designed to prevent personal injury and to assure nuclear safety.

LaSalle Administrative Procedure (LAP) 100-17, "Overtime Guidelines For Personnel That Perform Safety-Related Functions," Revision 10, dated June 19, 1996, stated the following:

- The purpose of the procedure was to establish guidelines for working overtime at LaSalle Station that would minimize the possibility of fatigue of plant staff who perform safety-related functions.

- It was station policy not to routinely schedule overtime beyond a 16-hour shift for any personnel, even for extended outages.

- Work should be scheduled in advance to ensure that the potential for exceeding the overtime guidelines was minimized.

- In the event that overtime must be used, the following overtime guidelines shall be followed:

  1) An individual should not be permitted to work more than 16 consecutive hours, not including the time necessary for shift turnover.

  2) The following criteria should normally be used:

- less than or equal to 16 hours in a 24-hour period.
- less than or equal to 24 hours in a 48-hour period.
- less than or equal to 72 hours in a 7-day period.

3) A break of at least 8 hours should be allowed between work periods.

- Authorization for overtime in excess of the above guidelines must be obtained from the Plant General Manager or designee.

Similarly, Technical Specification 6.1.C.7 required that the amount of overtime worked by unit staff members performing safety-related functions shall be limited and controlled in accordance with the NRC Policy Statement on working hours (Generic Letter 82-12). Generic Letter 82-12, "Nuclear Power Plant Staff Working Hours," dated June 15, 1985, stated, in part, that a break of at least 8 hours should be allowed between work periods (including shift turnover time), and in the event that very unusual circumstances arise which may require deviation from the above guidelines, such deviation shall be authorized by the Plant General Manager or designee, or higher levels of management.

The inspector reviewed the hours worked by test engineers and actions taken by station management to authorize overtime deviation and determined that one test engineer had worked 20 hours in a 24-hour period with documented approval from a Plant General Manager designee. However, the inspector also determined that the test engineer returned to work with less than an 8 hour break between work periods without documented approval although licensee management was aware that the individual had returned to work.

The inspector concluded that the licensee failed to meet the requirements of TS 6.1.C.7 which was a violation (50-373/374/97008-01).

In response to the event described above, the licensee planned and/or completed the following corrective actions:

- An article was placed in the June 19, 1997 station newsletter to communicate to station personnel licensee management expectations regarding overtime requirement deviations.

- Department communication meetings were planned for June 30, 1997, to ensure that both workers and supervisors understood their responsibilities for implementing LAP-100-17, "Overtime Guidelines For Personnel That Perform Safety-Related Functions."

- Appropriate disciplinary action was planned for any future violations of the overtime guidelines, to include a review of the performance of both the worker and supervisor involved in the event.

- The number of personnel with Plant General Manager designee authority was significantly reduced.

The inspector concluded that the licensee's corrective actions were appropriate.

- Responsibilities of the Backshift Engineer Were Unclear

The inspector concluded that the roles and responsibilities of the backshift engineer were unclear since expectations differed between the test engineers and the backshift engineer regarding the backshift engineer's role in post-modification testing. In addition, the actions of the backshift engineer to approve the test revision while in draft form was considered a poor practice.

- Communications were Poor

Overall, communications between the system engineering department and other organizations were poor. The following examples illustrate this conclusion:

- The operations department was not aware of required TS LCO entries until after the pre-evolution test briefing had begun.
- Plant management was not adequately apprised of problems encountered during the post-modification testing.
- Test engineers were not aware of why the testing was considered critical path work or why the testing had been rescheduled.

c. Conclusions

The inspector concluded that the performance of testing for the Unit 1 division 2 RHRSW keep-fill system modifications was poor. Problems regarding test scheduling and preparation, coordination of resources, management approval of overtime, expectations of the backshift engineer, and communications were identified by the inspector.

E4.2 Licensee Prompt Investigation of RHRSW Keep-Fill Modification Test

a. Inspection Scope

The inspector reviewed the results of the licensee's prompt investigation in response to problems encountered during the Unit 1 division 2 RHRSW keep-fill system post-modification testing.

b. Observations and Findings

The inspector reviewed the licensee's prompt investigation report and discussed the information with licensee personnel. The following was noted:

- The report failed to clearly identify that certain overtime approval requirements had not been met.

  The report properly identified that a test engineer had worked 20 hours in a 24-hour period, with Plant General Manager designee approval. However, the report failed to clearly identify that the test engineer returned to work within 8 hours without written approval, which was a violation of TS 6.1.C.7.

- The report failed to identify issues identified by the inspector regarding the performance of the backshift engineer.

  The issue identified by the inspector regarding the roles and responsibilities of the backshift engineer were not addressed in the licensee's report. In addition, the actions of the backshift engineer to approve the test revision while in draft form was not identified by the licensee.

- One report inconsistency was noted.

  The preliminary conclusions of the report stated that two test engineers were authorized to work hours in excess of Generic Letter (GL) 82-12 limits. However, the report details indicated that only one test engineer was authorized to exceed GL 82-12 limits.

c. Conclusions

The inspector concluded that the licensee's investigation was incomplete and failed to identify significant problems identified by the inspector. In particular, the licensee failed to clearly identify that TS requirements for overtime approval had not been met.

## V. Management Meetings

### X1 Exit Meeting Summary

The inspector presented the results of the inspection activities to licensee management at an exit meeting on June 20, 1997. The licensee acknowledged the findings presented. The inspector asked the licensee if any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

## PARTIAL LIST OF PERSONS CONTACTED

Licensee

| | |
|---|---|
| P. Barnes | Regulatory Assurance |
| J. Drago | Regulatory Assurance |
| R. Gremchuk | System Engineering |
| T. Hammerich | System Engineering |
| P. Hildebrandt | Engineering Manager |
| A. Javorik | System Engineering Supervisor |
| D. Kapinus | System Engineering |
| J. Rommel | Design Engineering |
| C. Snyder | System Engineering |

## INSPECTION PROCEDURES USED

| | |
|---|---|
| IP 37550: | Engineering |
| IP 37551: | Onsite Engineering |
| IP 40500: | Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems |
| IP 92701: | Followup |

## ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|---|---|---|
| 50-373/374/97008-01 | VIO | Overtime approval requirements not met |

Closed

| | | |
|---|---|---|
| 50-373/374/97004-04 | URI | RHRSW system waterhammer |
| 50-373/374/97008-02 | NCV | RHRSW system waterhammer |

Discussed

| | | |
|---|---|---|
| 50-373/374/96011-19 | URI | Determination of the effects of waterhammer on the RHR heat exchanger |

## LIST OF ACRONYMS USED

| | |
|---|---|
| AIR | Action Item Request |
| AR | Action Request |
| CAL | Confirmatory Action Letter |
| CFR | Code of Federal Regulations |
| DGCW | Diesel Generator Cooling Water |
| EDG | Emergency Diesel Generator |
| EOP | Emergency Operating Procedure |
| ER | Engineering Request |
| GPM | Gallons Per Minute |
| GE | General Electric |
| GL | Generic Letter |
| IP | Inspection Procedure |
| LAP | LaSalle Administrative Procedure |
| LCO | Limiting Condition for Operation |
| LER | Licensee Event Report |
| LOOP | Loss-Of-Offsite-Power |
| LOP | LaSalle Operating Procedure |
| LST | LaSalle Special Test |
| NOV | Notice of Violation |
| NRC | Nuclear Regulatory Commission |
| NRR | Nuclear Reactor Regulation |
| PDR | Public Document Room |
| PIF | Problem Identification Form |
| PSIG | Pounds Per Square Inch Gauge |
| RHR | Residual Heat Removal |
| RHRSW | Residual Heat Removal Service Water |
| RWP | Radiation Work Permit |
| SMRC | Senior Management Review Committee |
| SOPI | System Operational Performance Inspection |
| SRV | Safety Relief Valve |
| S&L | Sargent and Lundy |
| TIA | Task Interface Activity |
| TRC | Technical Review Committee |
| TS | Technical Specification |
| URI | Unresolved Item |
| VIO | Violation |
| WS | Nonsafety-Related Service Water |