Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

September 25, 1992

Mr. A. Bert Davis
Regional Administrator
U.S. Nuclear Regulatory Commission
799 Roosevelt Road - RIII
Glen Ellyn, IL 60137

Subject: LaSalle County Station Units 1 and 2
Response to Confirmatory Action Letter
CAL-RIII-92-011
NRC Docket Nos. 50-373 and 50-374

Reference: (a) Confirmatory Action Letter (CAL-RIII-92-011) from A. Bert Davis (NRC) to Cordell Reed (CECo) dated August 27, 1992

Dear Mr. Davis:

Confirmatory Action Letter (CAL) CAL-RIII-92-011 addressed the scram and equipment failures at LaSalle Unit 2 which occurred on August 27, 1992. The CAL requested CECo to perform the following: investigate and determine the cause(s) of the equipment failures; place specific equipment in quarantine until released by the NRC's Augmented Inspection Team (AIT); maintain evidence of our investigations and provide this information to the AIT team; evaluate the equipment failures and operator actions to determine any necessary actions; and to evaluate the applicability of the equipment failures to LaSalle Unit 1. Attachment A provides Commonwealth Edison Company's response to the CAL.

If there are any questions regarding this response, please contact JoAnn Shields, Nuclear Licensing Administrator, at (708)-515-7282.

Very truly yours,

D. Galle 9/25/92

D. Galle
Vice President-BWR Operations

Attachment

cc: Document Control Desk - NRR
D.L. Siegel, Project Manager - NRR
D.L. Hills, Senior Resident Inspector - LSCS

SEP 28 1992

ZNLD211W23

ATTACHMENT A

RESPONSE TO CONFIRMATORY ACTION LETTER
CAL-RIII-92-011

Description of the Event

Reactor power was being reduced from 1100 Mwe to 850 Mwe at 120 Mwe/hour using Reactor Recirculation Flow Control. At the time of the scram, actual flow control manipulations were briefly suspended to allow for xenon burnout.

On August 27, 1992 at 0305 hours, Unit 2 experienced a Reactor Scram as a result of a Main Turbine Stop Valve (TSV) closure trip. The turbine trip was caused by a Thrust Bearing Wear Detector Turbine Trip signal to the Electro Hydraulic Control (EHC) System. As a result of the automatic scram signal, all control rods inserted to their full in position.

During the first seconds of the event, the Reactor Core Isolation Cooling (RCIC) System auto started due to a spurious Level 2 (-50 inches) initiation signal.

During the scram response, in an attempt to control reactor water level, the Motor Driven Reactor Feed Pump (MDRFP) was successfully started in preparation for tripping of the Turbine Driven Reactor Feed pumps (TDRFP). When attempting to shutdown the TDRFPs, all methods of tripping them initially failed including remote manual trip operation, High Reactor Level 8 automatic trip, or local mechanical trip operation.

As a result of this failure, the Reactor Water level increased above the Level 8 High Level setpoint (+55.5 inches) resulting in a trip of the MDRFP and the RCIC System. The Outboard Main Steam Isolation Valves (MSIV) were manually closed when the +73 inch reactor level administrative limit was reached. This limit is provided to prevent flooding in the steam lines outboard of the MSIVs (bottom of the Main Steam lines is at 108 inches). The level transient resulted in a maximum level of +130 inches.

The closure of the MSIVs resulted in TDRFP shutdown and also caused a loss of the Main Condenser as a heat sink.

The loss of the Main Condenser as a heat sink required use of the Safety Relief Valves (SRV) for manual control of reactor pressure. During operation of 'A' and 'B' SRVs, remote position indication failed to show that the valves fully closed when demanded. Subsequent review showed that earlier in the event 'U' SRV had automatically cycled on reactor pressure as designed, with final position indicated as full closed. No "SRV Full Open" Alarm was seen by the operators during any SRV operation. Additional review of SRV tailpipe temperatures showed that the SRVs had closed.

After reactor water level was returned to the normal operating range and brought under control, an attempt was made to reestablish the Main Condenser as a heat sink. All the inboard MSIVs were closed and all outboard MSIVs were opened. Pressure was being equalized across the Inboard MSIVs. When the "A" Inboard MSIV was opened, a MSIV (Group 1) isolation High Steam flow signal was received resulting in closure of all five open MSIVs.

Attempts to use the RCIC System to help control reactor pressure were made and the turbine tripped on high exhaust pressure on the first two start attempts. The system was successfully started on the next attempt and operated normally to control pressure.

The MSIVs were subsequently successfully opened, and the plant stabilized in a hot shutdown condition. After stabilization, a decision was made to proceed to cold shutdown to complete investigations and repairs. During this event, several additional minor deviations from desired equipment performance were noted, and included in the investigations. These include:

1. 2E51-F066 RCIC Testable Check Valve Position Indication showed the valve to not be full closed (RCIC Running Alarm).
2. Scram Annunciator "First Out" Indication did not function.
3. High Drywell Temperature Alarm.

Request:

1. Conduct an investigation to determine the cause of: (a) the failure of the Main Feedwater Pumps (MFP) to trip, (b) the failure of the Safety Relief Valves (SRV) to reposition and/or failure of the SRV indicating circuitry, (c) the failure of the Reactor Core Isolation Cooling (RCIC) testable check valves or its indicating circuitry, (d) failure of the first out "Red" annunciator, (e) an unexpected trip of RCIC while in the pressure control mode, (f) the Group 1 isolation during attempts to equalize pressure across the Main Steam Isolation Valves (MSIV), and (g) the turbine/reactor trip.

Response to 1(a): Failure of the MFPs to trip.

Upon disassembly of the pumps, particulate matter was found in the oil and on the hydraulic disc dump valves of the 2A and 2B turbine driven reactor feed pump (TDRFP). Analysis of this oil by CECo's System Materials Analysis Department (SMAD) indicated the presence of wood chips, silk, fiberglass, cellulose, and a clay-like material (aluminum and sodium silicate), which accumulated over the life of the plant.

Oil to each TDRFP is supplied by the main turbine lube oil system. The particulate matter in the disk dump valve assembly caused mechanical binding of the TDRFP disc dump valve, preventing the valve from repositioning, thereby preventing the pump from tripping upon automatic, remote, or local trip signals.

The oil system, including the valve ports, was flushed and the reservoir filter was inspected. No particulate buildup was observed in the reservoir. The feedwater oil system will be flushed during every refuel outage to prevent the accumulation of particulate in low flow areas of the system.

The "A" feed pump dump valve had a 0.005 inch runout, which was discovered upon disassembly. The "B" SV-12 pilot valve experienced similar runout, 0.003 inch. The dump valve and the pilot valve were replaced and satisfactorily tested. The "B" trip dump valve o-ring contributed to the restricted movement. The dump valves and pilot valves will be inspected during each Unit's next refuel outage. Further inspections will be performed as determined by LaSalle Management.

The trip circuit for each pump was tested during Unit 2 startup and within one week of startup. The circuitry will be tested two months after startup, and then will resume its normal six month test frequency.

Response to 1(b): Failure of the SRVs to reposition and/or failure of the SRV indicating circuitry.

Review of the event indicated that the SRVs operated properly but the low voltage differential transformer position indication (LVDT) for the A and B valves did not indicate properly. These two LVDTs were disassembled, and fretting was noted on the outer bushing and along the lower portion of the LVDT shaft. Three more LVDTs were then inspected, with fretting noted on one of these. Based upon these findings, all 18 Unit 2 LVDTs were inspected, with no further evidence of fretting observed. As a precautionary measure, all the ADS valves were given new LVDTs in addition to replacing those with visible damage. Further evaluation revealed the fretting to be vibration induced. All the LVDTs will be inspected and replaced as necessary during every refuel outage.

Failure of the annunciator, which indicates that the SRVs were not closed, was due to a failed connector on the annunciator logic card. The faulty card was replaced, and proper operation of the alarm was verified. However, when tested in the maintenance shop, the card operated properly. At that time, some corrosion on the card input pins was noted. As we have not been able to repeat the failure, no further root cause investigation is possible.

Response to 1(c): Failure of the RCIC testable check valves or its indicating circuitry.

Investigation revealed that the inboard testable check valve 2E51-F066 did not fully close during the shutdown of the RCIC system, but that the valve's position indication functioned properly. As the RCIC system was shut down, the outboard check valve fully closed, eliminating backflow through the system, and equalizing pressure across the inboard testable check valve.

To reduce frictional forces in the indicating hinge pin stuffing box on the outboard testable check valve, 2E51-F066, packing rings were removed and replaced with graphite spacers. The original concern on the valve remaining open due to opposing frictional forces had been resolved, allowing the valve to close on its own accord from approximately 60% open.

Response to 1(d): Failure of the first out "Red" annunciator.

Troubleshooting determined that both red "first out" bulbs on panel 2H13-P603, window B308, "CHAN A2/B2 TSV NOT FL OPEN ALARM", were blown. Upon replacement of the bulbs, proper operation was verified. Review of the Hathaway alarm typer indicated that this was the first RPS alarm to annunciate.

A test was performed on the "first out" windows, and no other "first out" windows on Unit 2 were found inoperable.

Investigation revealed that surveillance procedure LES-AN-101 had been generated in 1988 to test these windows, but had not been entered in the station surveillance tracking system. This surveillance is now included in the tracking system, and will be performed annually on each unit.

Response to 1(e): [illegible]ected trip of RCIC while in the pressure control mode.

Investigation into this event determined that the RCIC system operated properly. Due to the high vessel water level, water entered the RCIC supply piping. When RCIC was restarted, water went through the turbine, and flashed in the exhaust line, causing RCIC to trip on high exhaust pressure. The flashing occurred on the first two attempts to start the system. On the third start, RCIC remained operating.

LaSalle is evaluating enhancing our operator training program to increase awareness of this mode of operation.

Response to 1(f): Group 1 isolation during attempts to equalize pressure across the MSIVs.

During recovery actions after the scram, a Group 1 Primary Containment Isolation was received when an attempt was made to open MSIV 2B21-F022A with a 760 psi differential pressure existing between the main steam lines and the reactor vessel.

The Group 1 isolation signal was generated by differential pressure (dp) switches, which monitor the main steam lines and actuate on a high flow condition. These dP switches are calibrated to actuate on 140% rated steam flow. The four sets of dP switches (one set of four for each line) have the capability to isolate all four main steam lines and initiate the rest of the Group 1 Isolation when high flow is seen in any individual line. Prior to the event, all four inboard MSIVs were closed, and were holding reactor pressure. All four outboard MSIVs were open, and the pressure in the steam lines was approximately 120 psi. When the attempt was made to open 2B21-F022A, the flow instruments actuated, causing the Group 1 isolation signal.

Procedural guidance states that the MSIVs should not be opened unless the differential pressure is less than 200 psid. The control room operator read the incorrect indicator when verifying pressure. When the attempt was made to open the MSIVs, the pressure was 760 psid. This pressure is enough to actuate the high flow instrumentation, and cause the primary containment isolation.

All Group 1 isolation valves received their isolation signals. All valves not closed prior to the event closed. The Primary Containment Isolation system functioned properly in response to an actual high flow condition.

LaSalle will revise the operator training program to include all aspects of the scram and equipment failures, including opening of MSIVs.

Response to 1(g): Turbine/reactor trip

The reactor scram was due to closure of the turbine stop valves, which closed due to the turbine trip. The turbine thrust bearing wear detector system actuated to trip the turbine.

Local and remote wear detector operations and turbine rotor thrust checks were performed. These tests identified a change the span between turbine end and generator end trip points had changed from the previously recorded span of 110 mils (-40 to +70) to 84 mils (-80 to + 4). This shift in the span, and not thrust bearing failure is the actual cause of the trip. This test also showed that the wear detector was able to consistently follow thrust collar position accurately.

A loose set screw attaching the lower coupling half to the bushing stem caused a shift in the calibration of the setpoint for the trip. The bushing drive coupling and stem were drilled to accommodate a roll pin, and the set screw was re-applied.

The Unit 1 thrust bearing wear detector will be inspected in the next refuel outage, and appropriate corrective actions will be implemented.

Request:

2. Place the MFP trip circuitry and mechanical actuator, the SRV's and their circuitry operated during the event, and the RCIC testable check valve and its circuitry in quarantine until released by the NRC's Augmented Inspection Team (AIT).

Response to 2:

The above equipment was quarantined until the individual troubleshooting action plans were approved, at which time the NRC AIT team released the specific quarantine.

Request:

3. Maintain documentary evidence of your investigation effort and make this available to the AIT.

Response to 3:

Preliminary information from the scram, including computer data, operator log books, alarm typer output, etc. was provided to the NRC AIT team upon their arrival on site. Requests from the AIT team for information during the course of their investigation were fulfilled, and as CECo's troubleshooting and evaluations were completed, written reports detailing the findings were provided to the AIT team.

Request:

4. Evaluate these most recent equipment failures and operator actions in light of past equipment failures and operator performance to determine if additional actions are necessary.

Response to 4:

A review of Licensee Event Reports and reports of major events which occurred over the past two years was performed to determine whether previous events had common causes with the failures experienced on August 27, 1992. The root causes of the equipment failures and any inappropriate operator actions resulting from this scram were significantly different from any previous events, and therefore, no additional actions are necessary.

Request:

5. Evaluate the applicability of the equipment failures associated with the August 27, 1992 event to LaSalle, Unit 1.

Response to 5:

(a) Failure of the MFPs to trip.

Proper operation of the Unit 1 TDRFP disc dump valves was verified on September 3, 1992. The dump valves will be inspected during the next refuel outage. The lube oil system will be flushed during every refuel outage to prevent accumulation of particulate in the low flow areas of the system.

(b) Failure of the SRVs to reposition and/or failure of the SRV indicating circuitry.

The Unit 1 SRVs do not use LVDTs for position indication, so no further action is necessary.

(c) Failure of the RCIC testable check valves or its indicating circuitry.

The Unit 1 RCIC inboard and outboard testable check valves will be inspected during L1R05, and each valve's actuator hinge pin packing will be replaced. The indicator hinge pin packing and the necessity of the extended backstop will be evaluated. If the evaluation determines that the packing or the backstop is not necessary, these items will be closed.

(d) Failure of the first out "Red" annunciator.

The Unit 1 "first out" annunciator windows were tested on September 3, 1992, and all were operable. Two windows were found to have one of the two bulbs burned out. These bulbs were replaced and tested satisfactorily. A similar surveillance will be performed annually.

(e) Unexpected trip of RCIC while in the pressure control mode.

Investigation revealed that RCIC operated properly, therefore, there are no actions necessary on Unit 1.

(f) Group 1 isolation during attempts to equalize pressure across the MSIVs.

The Unit 2 isolation was due to operator error, therefore, there are no actions necessary on Unit 1.

(g) Turbine/reactor trip.

The turbine thrust bearing wear detector assembly will be inspected during L1R05, and the appropriate corrective actions will be taken.

Request:

6. Provide within 30 days to NRC Region III a documented evaluation of the above issues including corrective actions you have taken or plan to take.

Response to 6:

This letter constitutes LaSalle's 30 day formal report regarding this event.

ATTACHMENT A
(Continued)
RESPONSE TO CONFIRMATORY ACTION LETTER
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Request:

We further understand that reactor startup (power operation) will not occur until you have informed the Regional Administrator or his designee of the results of your investigation and corrective actions.

Response:

On September 5, 1992, at approximately 1000 hours, G.J. Diederich, LaSalle Station Manager, discussed reactor startup with T.O. Martin, Region III-Deputy Director, Division of Reactor Safety. At that time, Mr. Martin stated that the restriction from reactor startup had been lifted, and that LaSalle could return Unit 2 to power operation.

SUMMARY

In order to minimize the potential for recurrence, LaSalle has taken or will take the following actions:

The Unit 2 TDRFP control oil system was flushed. Each Unit's system will be flushed during every refuel outage.

The dump valves were replaced on both the Unit 2 TDRFPs. Each Unit's dump valves will be inspected during each unit's next refuel outage. Future inspections will be performed as determined by LaSalle Management.

The Unit 2 TDRFP trip circuitry for each pump was satisfactorily tested during Unit 2 startup and one week after startup. The circuitry will be tested 2 months after startup, and then revert to the normal six month test frequency.

The Cleanliness Control Procedure, LAP-300-16, will be reviewed for enhancements.

All 18 Unit 2 LVDTs were inspected for fretting. The three LVDTs showing signs of fretting were replaced. All LVDTs on ADS valves were replaced.

The internals on the Unit 2 LVDTs will be inspected during each refuel outage.

The SRV logic circuit on Unit 2 was tested and a card containing a suspect contact was replaced.

The actuator hinge pin packing on the Unit 2 RCIC outboard testable check valve was replaced. The actuator hinge pin packing on the Unit 1 RCIC outboard testable check will be replaced during L1R05. The indicator hinge pin packing for both Unit 1 valves will be evaluated during L1R05.

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An extended backstop will be added to the Unit 2 RCIC valve during L2R05, and the backstop will be evaluated for the Unit 1 RCIC valves.

The "first out" red annunciator systems for both Unit 1 and 2 were tested. Only the Unit 2 window involved in the scram was found inoperable. A surveillance procedure to test these windows annually was entered into the station surveillance program.

A review is in progress to ensure all appropriate surveillances have been entered into the tracking system. The processing of new surveillance requests to ensure tracking system revision is being reviewed for enhancements.

The LaSalle operator training program will be revised to include training on the Unit 2 scram and equipment failures.

The Unit 2 thrust bearing assembly was disassembled and inspected. Clutch face irregularities were dressed up. The clutch spring was retorqued. The lower ball bearing was exchanged with the upper bearing. The bushing drive coupling and stem were drilled to accommodate a roll pin, and the set screw was re-applied.

The Unit 1 thrust bearing wear detector will be inspected during the L1R05 outage, and the appropriate corrective actions taken.

The Unit 2 drywell temperature monitoring system was modified prior to Unit 2 startup to install a cap on the end of the conduit in which the temperature sensor is located to delay sensor heat-up due to radiant heat. A computer algorithm change is being reviewed for both Unit 1 and 2 to ensure reliable information is annunciated in the control room.

The LaSalle operating training program will be evaluated to enhance training on the importance of accurate, updated information provided in 10 CFR 50.72 notifications.

9(1 & EIC)