UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 129 TO FACILITY OPERATING LICENSE NO. NPF-11

COMMONWEALTH EDISON COMPANY

LASALLE COUNTY STATION, UNIT 1

DOCKET NO. 50-373

1.0 INTRODUCTION

By letter dated November 24, 1997, Commonwealth Edison Company (ComEd, the licensee) proposed a revision to the LaSalle County Station, Unit 1, Technical Specifications (TS). The proposed changes add or revise isolation setpoints for leak detection of the Reactor Water Cleanup (RWCU) system. The changes are necessary to support modifications that will restore RWCU pump suction from "cold" to "hot" and also to correct design deficiencies identified during re-evaluation of the high energy line break analysis. In addition, the amendment eliminates isolation actuation trip functions for the Residual Heat Removal (RHR) system steam condensing mode and shutdown cooling mode. The April 16, 1998, supplement provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

The original RWCU system design for LaSalle, Unit 1, included "hot" pump suction from the Reactor Recirculation System. Because of problems with pump seal design, the RWCU system was modified to provide the pumps with "cold" suction and the temperature monitoring function of the leak detection system in the pump rooms was eliminated by license Amendment No. 20 to NPF-11. The licensee is currently installing a modification to return the RWCU system to the original "hot" suction configuration by utilizing improved design pumps. Therefore, the temperature monitoring function of the leak detection system must be re-established in the pump and pump valve rooms.

Setpoints are also proposed to be added for temperature monitoring in the RWCU Holdup Pipe and Filter/Demineralizer Valve Rooms and flow monitoring for RWCU pump suction based on High Energy Line Break analysis re-evaluation. This re-evaluation determined that some portions of the "hot" piping would not isolate in time to prevent temperatures in adjacent areas from exceeding environmental qualification (EQ) limits. The additional leak detection will provide a more rapid response to isolate these areas.

An additional design deficiency was identified in the temperature setpoints for the RWCU heat exchanger rooms. It was discovered that the current setpoint would have required a leak of greater than 25 gallons per minutes (gpm) to actuate isolation during nominal and winter conditions. The licensee proposed revised temperature setpoints for this area based on new leak rate and setpoint calculations for the modified system design.

Changes were also proposed to the leak detection setpoints for the RHR system. The steam condensing mode of RHR was deleted and reported to the NRC in 1992. The licensee has proposed deleting the setpoints for this mode from TS 3/4.3.2 at this time for consistency. The shutdown cooling mode of RHR currently contains temperature sensors and associated TS setpoints. The licensee has determined that, because the shutdown cooling lines are moderate energy lines, the temperature sensors are not affected significantly by a lea. and, therefore, the high temperature and ∆temperature functions are proposed to be deleted.

3.0 EVALUATION

3.1 Reactor Water Cleanup System

3.1.1 Function

The RWCU system is a non-safety system provided for coolant purification. The RWCU system operates by taking a small, continuous flow of water from the reactor coolant system (RCS) and passing it through the containment wall into the reactor building where it passes through pumps, heat exchangers, and demineralizers, is reheated in the heat exchangers, and returned to the RCS in containment via the feedwater system.

10 CFR Part 50, Appendix A, General Design Criterion 54, requires that piping penetrating containment be provided with leak detection, isolation, and containment capabilities having redundancy, reliability, and performance capabilities which reflect the importance to safety of isolation. To meet this requirement, the RWCU isolation valves are provided with instrumentation that automatically senses a loss-of-coolant accident (LOCA) inside containment or high energy line break (HELB) outside containment and actuates the isolation valves to close. Such isolation is necessary to ensure that: (1) fission products and coolant inventory are confined to containment in the event of a LOCA, and (2) RWCU line breaks outside primary containment will not create local dynamic or environmental effects that would preclude safe shutdown or result in radiological conditions exceeding acceptable values. The various means of detecting RWCU line breaks include differential flow measurement (supply flow exceeds return flow), high ambient area temperature (steam flash from leak heating the compartment), high differential temperature (steam leak causes greater than normal vent supply/exhaust temperature difference), and sump drain monitoring.

It is a generic General Electric design specification that RWCU leak detection systems have sufficient sensitivity to isolate a 25 gpm leak using one or more of these leak detection methods. The methods that rely on detection of increased ambient temperature or increased differential temperature are not suitable for detection of breaks in piping where the fluid temperature is relatively low such as downstream of coolers or in large unenclosed areas. An extensive discussion of RWCU leak detection and isolation is provided in "Engineering Evaluation Report AEOD/E705 - RWCU System Isolation and Safety Considerations," March 1987, Neil Thomason, Office for Analysis and Evaluation of Operational Data, USNRC.

3.1.2 RWCU System Modifications

The RWCU system consists of pumps, heat exchangers, filter-demineralizers and associated valves and piping. The major components are located outside primary containment. In the original design at LaSalle, the RWCU pumps pumped high temperature water directly from the RCS. Due to pump seal problems, the piping was rearranged such that the RWCU pumps were downstream of the heat exchangers and, thus, pumped cooler water. The rearrangement alleviated the pump seal problems, but introduced new problems of flashing at the regenerative heat exchanger and pump vibration. The proposed modifications will return the flow path to its original configuration. The new modification is also intended to correct problems reported in LER 97-033 relating to capability to meet design basis criteria.

The LaSalle, Unit 1, RWCU system is being modified as follows:

- Pumps A & C in pump rooms are being replaced with larger pumps.
- Pump drive motors are being changed from air cooled to water cooled.
- Pump B is being eliminated - Pump Room B becomes Pump Valve Room.
- Piping is being rerouted as necessary to accommodate changes.
- RWCU system operating temperatures and pressures are being changed.
- Temperature-based leak detection is being provided in the RWCU Holdup and Filter/Demineralizer Valve Rooms.
- RWCU pump suction high flow break detection is being added.

The modified RWCU piping and components are located among the following compartments:

- RWCU Pump Rooms A & C (elevation 761'0").
- RWCU Pump Valve Room (elevation 761'0").
- RWCU Mezzanine Area (Holdup Pipe Room, elevation 774'0").
- RWCU Heat Exchanger Rooms/Valve Rooms (elevation 786'0").
- RWCU Filter/Demineralizer Room (elevation 807'0").

3.1.3 Proposed Technical Specifications

A.3.b Heat Exchanger Area Temperature - High trip setpoint of ≤181 degrees Fahrenheit would be changed to ≤149 degrees Fahrenheit.

A.3.b Heat Exchanger Area Temperature - High allowable value setpoint of ≤187 degrees Fahrenheit would be changed to ≤156.8 degrees Fahrenheit.

New TS would be added as follows:

A.3.f Pump and Valve Area Temperature - High, with a setpoint of ≤ 201 degrees Fahrenheit and an allowable value of ≤ 209 degrees Fahrenheit.

A.3.g Pump and Valve Area Ventilation ΔT - High, with a setpoint of ≤ 86 degrees Fahrenheit and an allowable value of ≤ 92.5 degrees Fahrenheit.

A.3.h Holdup Pipe Area Temperature - High, with a setpoint of ≤ 201 degrees Fahrenheit and an allowable value of ≤ 209 degrees Fahrenheit.

A.3.i Holdup Pipe Area Ventilation ΔT - High, with a setpoint of ≤ 86 degrees Fahrenheit and an allowable value of ≤ 92.5 degrees Fahrenheit.

A.3.j Filter/Demineralizer Valve Room Area Temperature - High, with a setpoint of ≤ 201 degrees Fahrenheit and an allowable value of ≤ 209 degrees Fahrenheit.

A.3.k Filter/Demineralizer Valve Room Area Ventilation ΔT - High, with a setpoint of ≤ 86 degrees Fahrenheit and an allowable value of ≤ 92.5 degrees Fahrenheit.

A.3.l Pump Suction Flow - High, with a setpoint of ≤ 560 gpm and an allowable value of ≤ 610 gpm.

3.1.4 Evaluation

The Pump Suction Flow - High trip function provides for sensing of large breaks in areas outside of the RWCU equipment rooms. These locations were found to need additional instrumentation that will provide rapid isolation of large breaks to preclude area temperatures from exceeding EQ limits. The process flow at the conservatively established 650 gpm has been demonstrated by calculations to be sufficiently low to ensure the break flow will be detected prior to exceeding the EQ limits.

The design bases of new instrumentation will be consistent with that of the existing instrumentation. The new TS include operability and surveillance requirements with appropriate action statements, applicability, and test frequencies consistent with the existing RWCU instrumentation TS with the exception of the RWCU Pump Suction Flow - High trip function. This trip function utilizes analog loops which require Channel Checks once per shift.

New and revised setpoints are based on analyses described in reports included as part of the licensee's application. The ambient and differential temperature setpoints were determined by compartment energy balance methods that calculate the steady-state condition for each space, then calculate the heating effect of flash steam discharged from the postulated line break. The isolation setpoints have been selected to be low enough to meet the 25 gpm leakage detection criterion, yet high enough to preclude unwanted actuations due to weather and ventilation system transients. The use of both ambient temperature and ΔT parameters for equipment spaces provides diversity. For the heat exchanger rooms, the revised setpoints are based on a break in the 437 degrees Fahrenheit return line instead of the 533 degrees Fahrenheit supply line. This provides increased leak detection sensitivity. The staff's review of the analyses indicates that

conservative methodology has been used. Based on the analyses, the proposed new and revised setpoints are acceptable.

3.2 RHR System Isolation

3.2.1 RHR System Steam Condensing Mode

The steam condensing mode of RHR was deleted in 1993, as reported in an October 20, 1992, letter to the NRC. This change was reflected in the Updated Final Safety Analysis Report (UFSAR). As stated in LER 97-031-01, the licensee did not, at that time, remove the related TS requirements for isolation instrumentation because it was considered low priority and the action statements were being met by isolating the function. The licensee now proposes to delete these functions from the TS because availability of the steam condensing mode of operation is no longer part of the system design basis.

The licensee proposes to delete the following TS from Tables 3.3.2-1, 3.3.2-2, 3.3.2-3, and 4.3.2.1-1:

A.5.a RHR Equipment Area ΔT - High

A.5.b RHR Area Temperature - High (Tables 3.3.2-2 and 3.3.2-3 identify this trip function as RHR Area Cooler Temperature - High)

A.5.c RHR Heat Exchanger Steam Supply Flow - High

Guidance to evaluate the scope of the TSs is provided in 10 CFR 50.36, as follows:

Criterion 1 Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

Criterion 2 A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 3 A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Criterion 4 A structure, system or component which operating experience or probabilistic safety assessment has shown to be significant to public health and safety.

Requirements that are in the existing TSs, but do not meet the guidance set forth in 10 CFR 50.36 for inclusion in TS, can be relocated to appropriate licensee-controlled documents.

Criterion 1 The temperature and flow measurement instrumentation for the RHR system steam condensing mode isolation was originally used to detect leaks in the RHR system. However, since 1993, the steam condensing mode has not been used and was removed from the plant's

design basis and the isolation function has been isolated. Therefore, this criterion does not apply.

Criterion 2 The isolation actuation trip functions are not process variables, design features, or operating restrictions. Therefore, this criterion does not apply.

Criterion 3 The trip functions related to RHR steam condensing mode isolation have been isolated because that mode is no longer used. Therefore, these functions are not used to mitigate an accident and this criterion does not apply.

Criterion 4 Because the isolation actuation functions discussed above do not function to isolate the RHR system, they are not significant to public health and safety. Therefore, this criterion does not apply.

Since TS Tables 3.3.2-1, 3.3.2-2, 3.3.2-3, and 4.3.2.1-1 trip functions A.5.a, A.5.b, and A.5.c do not satisfy any of the four criteria from 10 CFR 50.36, they may be removed from the TS.

3.2.2 RHR System Shutdown Cooling Mode

TS Tables 3.3.2-1, 3.3.2-2, 3.3.2-3, and 4.3.2.1-1 contain isolation actuation trip functions for the shutdown cooling mode of RHR. The variables used to detect a leak and isolate the system while in shutdown cooling include: reactor vessel water level, reactor vessel pressure, RHR pump suction flow, RHR area temperature, and RHR differential temperature. The licensee has determined that the RHR shutdown cooling lines are moderate energy lines rather than high energy lines and, therefore, area temperature monitoring and differential temperature monitoring would not have sufficient sensitivity to detect leaks in these lines. The licensee proposes to delete the temperature and differential temperature isolation function TS for these areas. Adequate leak detection for the RHR system in the shutdown cooling mode is provided by sump and radiation monitoring, vessel level and makeup monitoring, and periodic visual inspection.

The licensee proposes to delete the following TS from Tables 3.3.2-1, 3.3.2-2, 3.3.2-3, and 4.3.2.1-1:

A.6.d RHR Area Temperature - High (Tables 3.3.2-2 and 3.3.2-3 identify this trip function as RHR Area Cooler Temperature - High)

A.6.e RHR Equipment Area ΔT

These trip functions related to RHR system shutdown cooling mode isolation are proposed to be deleted because these are moderate energy lines and the heating effect from a 25 gpm break would not produce a detectable increase in area temperature. Therefore, the licensee's analyses indicate that these functions are incapable of providing leak detection.

The criteria of 10 CFR 50.36 are addressed below:

Criterion 1 The RHR area ambient and differential temperature instrumentation was originally designed to detect leaks while in the RHR shutdown cooling mode. However, it was determined that these sensors are not affected significantly as a result of a leak because the shutdown

cooling lines are moderate energy lines. Therefore, these functions are not used to detect degradation of the reactor coolant pressure boundary and this criterion does not apply.

Criterion 2 The isolation actuation trip functions are not process variables, design features, or operating restrictions. Therefore, this criterion does not apply.

Criterion 3 The RHR area ambient and differential temperature sensors for RHR shutdown cooling mode isolation are not used to mitigate an accident because they are ineffective at detecting a leak in moderate energy lines and actuating isolation. Therefore, this criterion does not apply.

Criterion 4 Because the isolation actuation functions discussed above do not function to isolate the RHR system, they are not significant to public health and safety. Therefore, this criterion does not apply.

Since TS Tables 3.3.2-1, 3.3.2-2, 3.3.2-3, and 4.3.2.1-1 trip functions A.6.d, and A.6.e do not satisfy any of the four criteria from 10 CFR 50.36, they may be removed.

3.3 Standards, References, and Setpoint Methodology

The methodology used by the licensee for the proposed setpoint changes is contained in licensee document NES-EIC-20.04, "Analysis for Instrument Channel Setpoint Error and Instrument Loop Accuracy." This document states that the methodology is based upon ANSI/ISA S67.04, Parts 1 and 2 of the 1994 version, and Technical Reports ISA-RP67.04.08-1996 and ISA-dTR76.04.09-1996. None of these ISA standards, working documents, or technical reports have been reviewed or approved by the staff. The licensee stated, in a letter dated March 11, 1996 that, "The ComEd setpoint methodology does not deviate from nor require ComEd to take any exception to Regulatory Guide 1.105." The NRC inspected the ComEd setpoint methodology as part of an instrumentation and control inspection at Dresden Nuclear Power Station in 1994. Inspection Report 50-237/94016; 50-249/94016 issued October 21, 1994, states that, "the methodology was technically sound, consistent with the current industry practice, such as ISA 67.04-1988, and sufficiently comprehensive for their purpose." The staff has found that certain parts of NES-EIC-20.04 are acceptable, but other portions would require review and possible modification prior to being found suitable for use in establishing safety-related setpoints in nuclear power plants. For this reason, acceptance of the methodology used in the calculations under review does not constitute endorsement of either the licensee's document NES-EIC-20.04, nor any of the referenced ISA standards or technical reports.

Calculation No. L-001420, Unit 1, RWCU Room Setpoint Margin Analysis and Loop Accuracy

The staff compared the methodology used in Calculation No. L-001420 to the methodology shown in licensee document NES-EIC-20.04. The staff determined that the methodology as shown in NES-EIC-20.04 and Appendix A, B, and C of that document was suitable for use in Calculation No. L-001420 because it contained the proper terms for establishing setpoints. The final equation for the setpoint (NTSC), is NTSC = AL-(2TE2 + MAR), and is acceptable. The results of the calculations are as follows:

ΔT					Ambient			
Rooms	Inst No. (1E31-)	Allowable Value (°F)	Isolation Setpoint (°F)	Alarm Setpoint (°F)	Inst No. (1E31-)	Allowable Value (°F)	Isolation Setpoint (°F)	Alarm Setpoint (°F)
RWCU Pump Rooms	N600A,B N600E,F	92.5	86	28	N601A,B N601E,F	209	201	131
RWCU Valve Room	N600C,D	92.5	86	37	N601C,D	209	201	140
RWCU HX Rooms (A,B)	N600G,H N600J,K	40.3	33	20	N601G,H N601J,K	156.8	149	124
RWCU Mezzanine Area	N621A,B	92.5	86	37	N620A,B	209	201	140
RWCU F/D Valve Room	N623A,B	92.5	86	40	N622A,B	209	201	143

These values for Allowable Value, Isolation Setpoint, and Alarm Setpoint are acceptable to the staff.

Calculation No. L-001443, Reactor Water Cleanup High Flow Isolation Error Analysis

In the evaluation of Calculation No. L-001443, Reactor Water Cleanup High Flow Isolation Error Analysis, the staff compared the methodology used in this calculation to the methodology shown in licensee document NES-EIC-20.04. The staff determined that the methodology as shown in NES-EIC-20.04 and Appendix A, B, and C was suitable for use in Calculation No. L-001443 because it contained the correct terms for establishing setpoints and was adequately applied. Therefore, a setpoint of 560 gpm and an allowable value of 610 gpm with a 95/95 confidence limit are acceptable for this variable.

Based upon the above review, the staff concludes that the calculations as provided in Calculation No. L-001420, Unit 1, RWCU Room Setpoint Margin Analysis and Loop Accuracy, and Calculation No. L-001443, Reactor Water Cleanup High Flow Isolation Error Analysis are suitable for use, and that the setpoints as shown in the calculations are approved. It should be noted that this approval is not based on the reference to ANSI/ISA S67.04-Parts 1 and 2 of the 1994 version, and Technical Reports ISA-RP67.04.08-1996 and ISA-dTR76.04.09-1996. These ISA standards, working documents, or technical reports have not been reviewed or approved by the staff, and approval of the calculations discussed above does not constitute approval of these references, nor does approval constitute approval of licensee document NES-EIC-20.04, "Analysis for Instrument Channel Setpoint Error and Instrument Loop Accuracy."

3.4 Conclusion

The licensee has reanalyzed the leak detection capability of the existing RWCU/RHR leak detection systems and has proposed modifications that would improve leak detection performance and RWCU equipment operation. Heat-based area temperature and differential temperature detection instruments will be eliminated in areas where it is not functionally suitable, and added to areas containing new hot RWCU piping. All compartments containing RWCU/RHR piping have been considered, and found to have (or will be provided with) adequate means of leak detection if heat-based leak detection is impractical due to the physical arrangement of the compartment or fluid conditions. New analytical limits have been calculated using rigorous analytical methods to determine sensor performance requirements. Statistical methods have been used to determine sensor setpoint allowable values that will ensure, with a high degree of reliability, that analytical limits are not exceeded. The proposed TS reflecting the modifications and associated setpoints described above are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (63 FR 2278). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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