Commonwealth Edison
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Downers Grove, Illinois 60515

March 11, 1994

Mr. William T. Russell, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

Subject: Dresden Nuclear Station Units 2 and 3
Quad Cities Nuclear Station Units 1 and 2
Application for Amendments to Facility Operating
Licenses DPR-19/25 and DPR-29/30
Appendix A, Technical Specifications
Addition of Reference Leg Backfill Check Valves
NRC Docket Nos. 50-237/249 and 50-254/265

Reference: L.O. DelGeorge to T.E. Murley letter dated December 22, 1993

Mr. Russell:

In the referenced letter, Commonwealth Edison Company (CECo) described proposed modifications to the Reactor Vessel Level Instrumentation System (RVLIS) in response to NRC Bulletin (IEB) 93-03, "Resolution of Issues Related to Reactor Water Level Instrumentation in BWRs." The installation of these modifications will enhance plant safety by assuring that the degassing phenomenon described in IEB 93-03 will not be encountered.

The configuration of the modifications connects the non-safety-related CRD system piping to each safety-related division of Reactor Pressure Vessel (RPV) instrumentation, post accident indication and the feedwater level control instrumentation. The proposed modification includes redundant check valves (Reference Leg Backfill Check Valves) to isolate the safety related piping from non-safety-related piping, thereby limiting the loss of reactor coolant in the event of a postulated failure in the non-safety-related CRD system.

In accordance with 10 CFR 50.90, Commonwealth Edison (CECo) proposes to amend Appendix A, Technical Specifications, of Facility Operating Licenses DPR-19/25 and DPR-29/30. The proposed amendment requests changes to Technical Specification 3/4.7.D, "Primary Containment Isolation Valves." This specification defines the limiting conditions for operation for Primary Containment Isolation Valves. The proposed change will add the Reference Leg Backfill Check Valves to Technical Specification 3.7.D.1 and 3.7.D.2 to ensure that the valves are maintained and monitored as primary containment isolation valves.

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The amendment request is subdivided as follows:

1. Attachment A provides an Executive Summary of CECo's actions in response to NRC Bulletin (IEB) 93-03, "Resolution of Issues Related to Reactor Water Level Instrumentation in BWRs."

2. Attachment B provides a description and safety analysis of the proposed changes to the Technical Specifications.

3. Attachment C provides a list of affected Technical Specification pages for Dresden and Quad Cities Stations, and includes the marked-up Technical Specification pages with the requested changes indicated.

4. Attachment D describes CECo's evaluation performed in accordance with 10CFR50.92(c), which confirms that no significant hazards consideration is involved.

5. Attachment E provides the Environmental Assessment.

This proposed amendment has been reviewed and approved by On-Site Review at Dresden and Quad Cities Stations, the Plant Operating Review Committee at Quad Cities Station, and CECo Off-Site Review in accordance with Commonwealth Edison procedures and policies.

Commonwealth Edison is notifying the State of Illinois of this application for amendment by transmitting a copy of this letter and its attachments to the designated State Official.

Commonwealth Edison requests review and approval of these proposed Technical Specification amendments by May 15, 1994, to support the start-up of Dresden Station Unit 3 and Quad Cities Station Unit 1 following the thirteenth refuel outage on each unit.

To the best of my knowledge and belief, the statements contained above are true and correct. In some respects, these statements are not based on my personnel knowledge, but upon information furnished by other Commonwealth Edison and contractor employees. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

Please direct any questions you may have concerning this amendment request to this office.

OFFICIAL SEAL
MARY JO YACK
NOTARY PUBLIC STATE OF ILLINOIS
MY COMMISSION EXPIRES 11/29/97

Respectfully,

John L. Schrage
Nuclear Licensing Administrator

Mary Jo Yack 3/11/94.

Attachments:

A. Executive Summary
B. Description and Evaluation of the Proposed Changes
C. Marked-up Technical Specification Pages
D. Evaluation of Significant Hazards Consideration
E. Environmental Assessment

cc: J.B. Martin, Regional Administrator - RIII
C. Miller, Senior Resident Inspector - Quad Cities Station
M. Leach, Senior Resident Inspector - Dresden Station
C. Patel, Project Manager - NRR
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ATTACHMENT A
EXECUTIVE SUMMARY

Commonwealth Edison Company (CECo) is proposing to modify the Reactor Vessel Level Instrumentation System (RVLIS) at Dresden and Quad Cities Stations in response to NRC Bulletin (IEB) 93-03, "Resolution of Issues Related to Reactor Water Level Instrumentation in BWRs." The installation of these modifications will enhance plant safety by assuring that the degassing phenomenon described in IEB 93-03 will not be encountered.

The proposed modifications eliminate the phenomenon described in IEB 93-03 (Dissolved gases in the RVLIS piping may produce uncertainties in the level instrumentation during RPV depressurization) by providing degassed Control Rod Drive (CRD) water to the RVLIS reference leg piping. The proposed design ensures that a continuous column of water, free of non-condensible gases, is maintained in the RVLIS reference leg piping.

The piping design of the proposed modifications was chosen to physically eliminate the consequences of an inadvertent closure of the instrument rack reference leg root valve associated with the RVLIS configuration that provides the trip actuation function as described in Information Notice (IN) 93-89, "Potential Problems with BWR Level Instrumentation Backfill Modifications."

The configuration of the modifications connects the non-safety-related CRD system piping to each safety-related division of Reactor Pressure Vessel (RPV) instrumentation, post accident indication and the feedwater level control instrumentation. The proposed modification includes redundant check valves to isolate the safety related piping from non-safety-related piping, thereby limiting the loss of reactor coolant in the event of a postulated failure in the non-safety-related CRD system.

The proposed modifications meet the intent of General Design Criterion (GDC) 55. GDC 55 requires piping lines that penetrate the Primary Containment and that are part of the reactor coolant boundary to have a specific valving configuration, "unless it can be demonstrated that the design is acceptable on some other defined basis." The basis for the acceptability of the proposed RVLIS configuration is described in Attachments B-E.

ATTACHMENT B
Description and Safety Analysis of the Proposed Change

Background and Description of the Backfill Line Reference Leg Modifications

Modifications are being made to add a backfill system for the Reactor Vessel Level Instrumentation System (RVLIS) reference legs at Dresden and Quad Cities Stations in response to NRC Bulletin (IEB) 93-03, "Resolution of Issues Related to Reactor Water Level Instrumentation in BWRs."

The design evaluation for these modifications determined that NRC approval would be required for Technical Specification Amendments for Dresden Station Units 2 and 3 and Quad Cities Station Units 1 and 2.

The modifications will connect backfill piping to the Reactor Pressure Vessel (RPV) reference leg instrument lines. The purpose of the backfill piping is to provide a continuous flow of degassed Control Rod Drive (CRD) system water to the RVLIS reference leg piping. This will ensure that a continuous column of water, free of any non-condensible gases, is maintained in the reference leg piping. This modification will eliminate the occurrence of the "notching" effect in the RPV level instrumentation during RPV depressurization due to the presence of dissolved gases. The design of the backfill system injects water from the CRD system to the instrument reference legs between the containment penetration and the existing primary containment isolation valves (excess flow check valves). Figure 1 provides a simplified diagram of the backfill modification.

Basis of the Backfill Line Reference Leg Modifications

The modification design chosen for the backfilled reference legs physically eliminates the consequences of an inadvertent RVLIS reference leg root valve manipulation error as described in Information Notice (IN) 93-89, "Potential Problems with BWR Level Instrumentation Backfill Modifications."

Simple check valves in series were selected for use as the containment/system isolation valves. These check valves have a low opening pressure and a soft valve seat. Opening and closing of the check valves, therefore, will not cause pressure spikes in downstream instruments that can occur with power operated valves. Such spikes have been known to cause undesirable actuations, trips and alarms. Furthermore, the proposed RVLIS modifications will result in the non-safety-related CRD system being connected to each safety-related division of RPV instrumentation, post accident indication, and the feedwater level control system. Reference leg leakage from multiple divisional instrumentation line penetrations due to failure of the CRD piping integrity or a CRD pump trip is mitigated by the isolation action of the backfill line check valves, which could not automatically occur with other valves such as motor, solenoid or air operated valve designs. The backfill line check valves will be added to the station check valve programs.

Acceptability of the Reference Leg Backfill Lines

The basis for acceptability of the Reference Leg Backfill lines is twofold. First, the backfill system must adhere to general primary containment requirements. Second, the intent of General Design Criterion (GDC) 55 must be met.

In order to meet primary containment requirements, the valving provided for each line penetrating the primary containment must reflect the importance of two safety functions: 1) The function the line performs; and 2) The need to maintain containment integrity.

Functional performance

The backfill lines are connected in such a manner that they do not have an adverse effect on the capability of the connected instruments to perform their function. The backfill lines have no effect on the response time and an insignificant impact on instrument accuracy. The design of the backfill system does not impact the redundancy, independence and testability requirements of the Reactor Protection System. The backfill lines are designed to the same level of quality as the existing instrument lines. The check valves will not close inadvertently during normal operation but will isolate when the backfill instrument line integrity is challenged during normal or accident conditions. The backfill line check valves will isolate if CRD system pressure falls below reactor pressure and will re-open under conditions that necessitate re-opening because the CRD water pressure is greater than reactor pressure.

Containment integrity

For the reference leg backfill lines, the criteria for acceptable containment integrity is: 1) maintenance of the integrity and functional performance of the secondary containment system; 2) maintenance of the rate and extent of coolant loss within makeup capability; and 3) ensuring that the calculated offsite exposures from a single failure during normal operations are substantially below 10CFR100 limits.

Integrity/functional performance of secondary containment

The instrument line break accident, as described in UFSAR Section 15.6.2, limits reactor coolant leakage below 10CFR100 limits for line breaks inside or outside the containment. The addition of the reference leg backfill lines does not change the description or consequences of the instrument line break scenario. Outside of containment, isolation is provided by two simple check valves located as close as practical to the containment (within 15 feet). The same provisions are made for visual inspection of the backfill piping as for the original instrument lines up to and including the containment isolation check valves. The check valves will be leak tested by use of procedural methods which are adequate to accurately verify leakage below the chosen criteria. This leak testing method will account for measurement accuracy effects at the low flow rates needed to preserve reference leg inventory.

Maintenance of the check valve leakage rate and extent of coolant loss within makeup capability

The check valves themselves provide greater leak tightness than other valves used on similarly sized lines. They have low opening pressure and a soft seat which will not cause pressure spikes in the downstream instruments. The isolation capability of the backfill line check valves will be periodically verified by testing to leak rate criteria that

is significantly more restrictive than the 10CFR50 Appendix J minimum leak rate testing requirements.

Offsite exposures below 10 CFR 100 limits

The proposed plant modifications for the reference leg backfill check valves do not increase the radiological consequences of any previously evaluated accident. The radiological impact from a reference leg backfill instrument line break is bounded by Dresden and Quad Cities' Instrument Line Break analysis (UFSAR Section 15.6.2). Therefore, the offsite exposures from a line break associated with the backfill lines during normal operations are substantially below 10 CFR 100 limits.

Compliance to General Design Criterion (GDC) 55

The backfill piping connects into the reference legs on each Unit inboard of the existing containment isolation valves. These new lines are part of the reactor coolant pressure boundary. Therefore, the intent of GDC 55 is applicable to these reference leg backfill lines.

GDC 55 requires each line that is part of the reactor coolant pressure boundary and penetrates primary reactor containment be provided with containment isolation valves meeting specific criteria. GDC 55 allows deviation from these specific criteria if it can be demonstrated that the containment isolation provisions for a specific class of lines are acceptable on some other defined basis. The proposed new RVLIS backfill reference leg backfill system piping will be a class of lines accepted on some other defined basis. The following review describes a suitable basis which may be used to implement the intent of GDC 55 by demonstrating the acceptability of a particular group of lines, namely, the reference leg backfill lines. The acceptability of the backfill lines is demonstrated as follows:

1) The backfill piping is not a part of a protection system.

2) The safety-related portion of the backfill piping is designed to the same quality requirements of the current instrument lines. The piping and supports on the containment side, including the check valves, are safety related and seismically qualified.

3) The reference leg backfill line check valves for all four (4) reference legs are located as close as practical to the containment penetration. In all cases, the check valves will be located within 15 feet of the containment penetration.

4) The same provisions are made for visual inspection of the backfill piping as for the original instrument lines up to and including the containment isolation check valves. These valves are being added to the IST and LLRT programs.

5) The backfill line connection made to the reference legs is such that the response time of the connected instrumentation is not affected.

6) The backfill lines will not close accidentally during normal reactor operation because CRD drive water flow will keep the check valves open. The CRD drive water flow is checked daily on operator rounds.

7) The backfill line will be isolated by the use of simple check valves if CRD system pressure is lost during normal reactor operation or under accident conditions.

8) The backfill lines will re-open under conditions that necessitate re-opening because the CRD water pressure is greater than reactor pressure. If a CRD pump is not operating, the backfill check valves will remain closed and cannot be re-opened until a CRD pump is operating with adequate water pressure to re-establish backfill flow.

9) The isolation capability of the check valves will be periodically verified by testing to leak rate criteria that exceeds the 10CFR50 Appendix J minimum requirements.

10) The offsite exposure due to a line break in the backfill system is below 10CFR100 limits. The leakage from the reactor pressure vessel assuming a single failure of a check valve in addition to the line break is substantially less than the instrument line break evaluated in UFSAR section 15.6.2.

Based upon the previous discussion, the proposed modifications do not adversely affect the function that the reference leg performs, and maintain containment leakage within established limits for Dresden Station and Quad Cities Station. The function of the Reactor Vessel Level Instrumentation System (RVLIS) is not impaired because the backfill piping is designed to the same quality as the existing instrument lines and does not have a significant impact on existing instrument accuracy. The design of the backfill system satisfies the redundancy, independence and testability requirements of the reactor protection system. The containment integrity is maintained because the radiological impact from a reference leg backfill instrument line break is bounded by Dresden and Quad Cities' Instrument Line Break analysis (UFSAR Section 15.6.2). The design of the check valves provides greater leak tightness than other valves used on similarly sized lines. The isolation capability of the backfill check lines will be periodically verified to stringent requirements that ensure the integrity of the lines are maintained. The radiological impact of the proposed modification is insignificant as existing line break analyses bound the consequences of a loss of backfill line integrity. Therefore, the proposed modifications to the reference leg backfill lines meet the intent of GDC 55.

Reference Leg Integrity with CRD System Flow

The non-safety-related CRD system piping will be connected to each of the safety-related divisions of RPV and Feedwater Level Control instrumentation. The connection of the non-

safety-related backfill piping to the safety-related vessel instrumentation line requires the establishment of an isolation boundary. The isolation boundary will ensure that the vessel reference leg piping remains filled in the event of challenges to the piping integrity or depressurization of the CRD system piping. This boundary is provided by two (2) safety-related check valves in series. The backfill check valves will eliminate the potential for reference leg leakage if CRD piping integrity is lost. These check valves are designed for use in an instrument application and have soft seats which provide for very tight backseating and low leakage rates. The check valves allow flow to the vessel instrumentation reference leg piping and prevent flow out of the reference leg piping.

Leakage criteria has been established to provide assurance that vessel level instrumentation integrity is adequately maintained in the event of CRD system depressurization. The basis for the check valve leakage is provided below:

CECo has calculated the critical seat leakage rate for the RVLIS backfill instrument check valves to be 30 ml/hr. To establish a comfortable margin of safety, CECo has established a maximum test leakage rate of 3.0 ml/hr for the RVLIS backfill check valves. This provides significant leak rate margin for assurance that instrument accuracy will be maintained.

Leakage criteria was established to provide assurance that vessel level instrumentation integrity is adequately maintained in the event of CRD system depressurization. The basis for the check valve leakage is the maximum leakage which ensures that the loss of water inventory from the reference leg piping over an acceptable time period is limited to that corresponding to a 6" level change. This ensures that adequate vessel level indication is provided to the operator for assessing plant operating conditions.

The level change criteria (six inches) is based upon the total instrument calibration tolerance from sensor to control room indicator. The time criteria (ten hours) is based upon the detection of a level gauge discrepancy by the control room operator within 8 hours, and implementation of corrective actions (isolation of the potentially leaking backfill system) within an additional 2 hours.

Based upon the inputs described above, CECo determined the volume of water in the condensate pot and reference leg that, if lost, would provide a 6" level discrepancy. This value was then divided by 10 hours. This yielded a critical seat leakage rate for the RVLIS backfill instrument check valves of 30 ml/hr. However, in order to establish a margin of safety, CECo has established a maximum test leakage rate of 3.0 ml/hr, which is a factor of 10 less than the critical seat leakage. The RVLIS backfill instrument check valves will be periodically tested as part of the IST program.

The Dresden Station and Quad Cities Station IST programs are committed to the 1986 Edition of ASME Section XI. Per this edition of ASME Section XI, the leakage rate for check valves will be "owner supplied", or as calculated using the following formula, 2*30*D (ml/hr), where D is the check valve nominal valve size. Given the

nominal valve size of 3/8", the calculated leakage (22.5 ml/hr) is consistent with the critical seat leakage calculation (30 ml/hr) described above. The maximum test leakage rate of 3.0 ml/hr provides margin to both values.

Current Technical Specification Requirements

Technical Specification 3/4.7.D, "Primary Containment Isolation Valves," defines the limiting conditions for operation for Primary Containment Isolation Valves. Adding the reference leg backfill check valves to Technical Specification 3.7.D.1 and 3.7.D.2 will ensure that the valves are maintained and monitored as primary containment isolation valves.

Basis for Amending the Technical Specifications

For the backfilled reference legs, the backfill piping connects into the reference legs inboard of the primary containment isolation valves. This design categorizes these lines as part of the reactor coolant pressure boundary. Therefore, the check valves associated with the active trip backfill instrument lines are considered primary containment isolation valves and meet the criteria for inclusion in Technical Specification 3.7.D.1 and 3.7.D.2.

Conclusions

The valving provided for each line penetrating the primary containment must reflect the importance of two safety functions: 1) the function that the line performs and 2) the need to maintain containment integrity. The proposed backfill designs comply with the intent of GDC 55, have no adverse effect on the capability of the associated instrumentation to measure RPV water level, and maintain the integrity of the primary containment system boundary.

Schedule

The approval of the Technical Specification Amendment will be required by May 15, 1994 to support the following schedule for modification implementation. The Technical Specification amendment will become effective upon the startup from the outages as defined below:

Quad Cities Unit 1:

CECo will fully install the backfill modification during the 13th refuel outage (Q1R13 scheduled to begin in March 1994).

Quad Cities Unit 2:

CECo will fully install the backfill modification during the 13th refuel outage (Q2R13 scheduled to begin in Spring 1995).

Dresden Unit 2:

CECo will fully install the backfill modification during the 14th refuel outage (D2R14 planned for March 1995) or during the first Cold Shutdown beginning either after the completion of the 13th refuel outage on Unit 3 (D3R13 currently scheduled for completion on June 17, 1994) or June 30, 1994, whichever comes first.

Dresden Unit 3:

CECo will fully install the backfill modification during the 13th refuel outage (D3R13 planned for March 1994).

CECo requests that the License Amendment be approved by May 15, 1994 and made effective to support startup following installation of the RVLIS modifications as discussed in the aforementioned installation schedule.

ATTACHMENT C
PROPOSED AMENDMENTS TO THE TECHNICAL SPECIFICATIONS

QUAD CITIES
(Marked-Up Pages)

DPR-29	DPR-30
3.7/4.7-18	3.7/4.7-9
3.7/4.7-19	3.7/4.7-10

DRESDEN
(Marked-Up Pages)

DPR-19	DPR-25
3.7/4.7-27	3.7/4.7-27
3.7/4.7-28	3.7/4.7-28
3.7/4.7-29	