Commonwealth Edison Company
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ComEd

November 4, 1996

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Subject: Application for Amendment to Appendix A,
Technical Specifications, for Facility Operating Licenses:

Byron Nuclear Power Station, Unit 1
Facility Operating Licenses NPF-37
NRC Docket No. 50-454

Braidwood Nuclear Power Station, Unit 1
Facility Operating Licenses NPF-72
NRC Docket No. 50-456

"Containment Vessel Structural Integrity"

Pursuant to Title 10, Code of Federal Regulations, Part 50, Section 90 (10 CFR 50.90), Commonwealth Edison Company (ComEd) proposes to amend Appendix A, Technical Specifications, for Facility Operating Licenses NPF-37 and NPF-72 for Byron Nuclear Power Station, Unit 1 (Byron), and Braidwood Nuclear Power Station, Unit 1 (Braidwood), respectively. ComEd proposes to revise Technical Specification (TS) 3.6.1.6, "Containment Vessel Structural Integrity" to allow a one-time exemption to the requirements of Technical Specification Surveillance Requirement (TSSR) 4.6.1.6.1.e.1) in support of Unit 1 steam generator replacement at each station. ComEd wishes to remove the sheathing filler grease in the tendon sheathing in up to thirty-five tendons in advance of the steam generator replacement outages (SGROs).

This package consists of the following:

Attachment A	Description and Safety Analysis of Proposed Changes to Appendix A
Attachment B	Proposed Changes to the Technical Specification Pages for Byron and Braidwood Stations
Attachment C	Evaluation of No Significant Hazards
Attachment D	Environmental Assessment

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The proposed changes in this license amendment request have been reviewed and approved by both On-site and Off-site Review in accordance with ComEd procedures.

ComEd is notifying the State of Illinois of our application for this license amendment request by transmitting a copy of this letter and its attachments to the designated State Official.

ComEd respectfully requests that the NRC Staff review and approve this licensee amendment request no later than May 1, 1997. The Steam Generator Replacement Outage(SGRO) start dates are currently planned for February, 1998, for Byron and September, 1998, for Braidwood. It is estimated that grease removal may take up to 15 weeks to complete; therefore, it is essential that the removal activities begin as soon as the weather is sufficiently warm to facilitate grease removal. ComEd requests a 30-day implementation period in order to facilitate procedure revisions.

To the best of my knowledge and belief, the statements contained in this document are true and correct. In some respect these statements are not based on my personal knowledge, but on information furnished by other ComEd employees, contractor employees, and/or consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

Please address any comments or questions regarding this matter to Marcia Lesniak, Nuclear Licensing Administrator at 630/663-6484.

Sincerely,

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

John B Hosmer

John B. Hosmer
Vice President

Signed before me on this 4th day of November, 1996

by Mary Jo Yack

Notary Public

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Attachment A: Description and Safety Analysis of the Proposed Changes

Attachment B-1: Proposed Changes to Appendix A, Technical Specification, for the Byron Nuclear Power Plant, Unit 1

Attachment B-2: Proposed Changes to Appendix A, Technical Specification, for the Braidwood Nuclear Power Plant, Unit 1

Attachment C: Evaluation of Significant Hazards

Attachment D: Environmental Assessment

cc: A. B. Beach, Regional Administrator-RIII
G. F. Dick Jr., Byron Project Manager-NRR
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ATTACHMENT A

DESCRIPTION AND SAFETY ANALYSES FOR PROPOSED CHANGES TO APPENDIX A, TECHNICAL SPECIFICATIONS, OF FACILITY OPERATING LICENSES NPF-37, NPF-66, NPF-72 AND NPF-77

A. DESCRIPTION OF THE PROPOSED CHANGE

Commonwealth Edison Company (ComEd) proposes to amend Technical Specification (TS) 3.6.1.6, "Containment Vessel Structural Integrity," for Byron Nuclear Power Station, Units 1 and 2 (Byron) and Braidwood Nuclear Power Station, Units 1 and 2 (Braidwood). The proposed amendment will allow a one-time exemption to the requirements of Technical Specification Surveillance Requirement (TSSR) 4.6.1.6.1.e.1) in support of Unit 1 steam generator replacement at each station. ComEd wishes to remove the sheathing filler grease in the tendon sheathing in up to thirty-five tendons in advance of the steam generator replacement outages (SGROs).

The proposed change is described in detail in Section E of this Attachment. Affected TS pages showing the proposed change are included in Attachments B-1 and B-2 for Byron and Braidwood, respectively.

B. DESCRIPTION OF THE CURRENT REQUIREMENT

TSSR 4.6.1.6.1.e.1) requires that sheathing filler grease contain no voids in excess of 5% of the net duct volume. Per TS 3.6.1.6.b., if TSSR 4.6.1.6.1.e.1) is not satisfied, the required level of integrity must be restored within 72 hours, an evaluation performed, and a Special Report to the Commission provided within fifteen days or the unit must be taken to cold shutdown conditions.

C. BASES FOR THE CURRENT REQUIREMENT

The provisions of TS 3.6.1.6 ensure that the structural integrity of the containment will be maintained comparable to the original design standards for the life of the facility. This integrity is necessary to ensure that the containment will withstand the peak pressures that could develop following an accident within containment.

The tendons sheathing duct is filled with grease to provide corrosion protection. The purpose of the surveillance for duct voids is to identify initial underfill conditions or

leakage of grease from the tendon sheathings. The Surveillance Requirements were chosen to be in compliance with the recommendations of proposed Revision 3 to Regulatory Guide 1.35, "Inservice Surveillance of Ungrouted Tendons in Prestressed Concrete Containment Structures," April 1979 and the proposed Regulatory Guide 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," April 1979.

D. NEED FOR REVISION OF THE REQUIREMENT

ComEd plans to replace the Unit 1 steam generators in Spring and Fall of 1998 for Byron and Braidwood Stations, respectively. The old steam generators will be removed through a containment opening that will be created for the replacement outage. A maximum of thirty-five tendons will need to be detensioned and removed in order to create the opening. One factor affecting the force required to remove tendons is sheathing filler grease viscosity. Reduced tendon grease temperatures result in viscosity increase. The increased tendon removal forces required to overcome increased grease viscosity could result in damage to the tendons or sheathing system. The outside air temperatures during the scheduled SGROs are expected to result in increased removal forces due to reduced grease temperature. To overcome the effect of increased grease viscosity on removal forces, a majority of the sheathing filler grease will be removed prior to the SGROs. Grease removal will take place during the warm weather months to ensure that the maximum volume of grease is removed.

The current TS needs to be revised to permit extended operation with sheathing filler grease voids in excess of 5% of the net duct volume. The proposed TS amendment will allow operation until the end of each SGRO with a portion of the filler grease removed without invoking reporting or shutdown action statements.

E. DESCRIPTION OF THE REVISED REQUIREMENT

ComEd proposes to add a note to TS 3.6.1.6, "Containment Vessel Structural Integrity," to allow sheathing filler grease voids in excess of 5% of the net duct volume for up to 35 tendons. For Byron, the provision applies from approval of this request until the end of the SGRO (B1R08). For Braidwood, the provision would be effective from May 1, 1998, until the end of the SGRO (A1R07).

F. BASES FOR THE REVISED REQUIREMENT

The judgment that the tendons will retain sufficient corrosion protection while the filler grease is removed is based on the following:

- the initial corrosion protection for the tendons,
- Byron/Braidwood data which provides insight into the current state of the tendon corrosion protection,
- reports from other domestic utilities on instances where grease voids greater than five percent of the tendon duct volume were discovered,
- industry experience with protected tendons in uncontrolled environments, and
- the observed tendon condition following operation with grease removed.

Inherent design margins exist in the tendon and containment systems.

Overview

The containment structure for Byron and Braidwood Stations consists of a cylinder topped with a shallow dome roof and supported by a flat circular foundation slab. To accommodate the replacement of the steam generators at Braidwood Unit 1 and Byron Unit 1, a temporary access opening through the containment wall will be required. This opening is approximately 20 feet wide and 22 feet high, centered at approximately 0° azimuth and located 62 feet above grade (see Figures 1 and 2). The cylindrical wall is prestressed by a Birkenheimer, Brandestini, Ross, and Vogt (BBRV) post-tensioning system consisting of horizontal (hoop) and vertical tendons. Each tendon consists of 170 stress relieved, cold drawn wires. As shown in Figure 3, it is planned to detension and remove 21 hoop and 10 vertical tendons. Operation with grease removed in up to 35 tendons is requested to account for the potential for additional tendon removal.

Long term corrosion protection for the tendon wires and the end anchorage components has been assured by filling the tendon sheathing (including the grease cans) with grease. The grease adheres to steel surfaces and provides a protective film not easily penetrated by free water and has a reserve alkalinity for long term acid neutralization.

The maximum amount of grease will be removed from the sheathing, however, a residual layer of grease will remain on the tendon surface. The removal process will be performed using ComEd approved procedures. A source of dry air will be used to pressurize the tendon sheathing to assist grease flow. Use of dry air will ensure that no moisture is introduced into the sheathing. The pressure will be monitored so as not to exceed the original grease installation pressure. This will ensure the tendon sheathing is not damaged.

Corrosion Protection Provided During Initial Tendon Fabrication/Installation

During tendon fabrication all tendon wires were completely immersed in rust protective coating. The coiled tendons and the interior surface of the tendon sheathing were coated after fabrication to provide additional corrosion protection during storage and handling until the tendons were installed and grease injection was complete. Initial installation of the grease involved pumping heated grease into the tendon sheathing (duct) from one end of the tendon until hot grease exited from the opposite end of the tendon in a continuous stream that was free of air bubbles. The sheathing system was vented at high points to permit release of trapped air during the greasing operation.

The initial tendon fabrication and installation process ensured tendon corrosion protection through the use of multiple protective coatings. The following discussion reviews results of Byron and Braidwood surveillances that demonstrate that these coatings are still in place and are still active in protecting the tendons.

Previous Tendon Surveillance Results at Byron and Braidwood Unit 1

The containment building tendon surveillance program is a systematic means of assessing the condition and functional capability of the post-tensioning system. The tendon surveillance at the Byron and Braidwood Stations is performed in accordance with TS 4.6.1.6.1, which is based on Proposed Revision 3 to Regulatory Guide 1.35 and Proposed Regulatory Guide 1.35.1. The surveillance consists of an inspection for the physical condition of a randomly selected group of tendons.

The first- through the tenth-year tendon surveillances at Byron and Braidwood Unit 1 for the hoop and vertical tendon wires, end anchorages and the concrete condition adjacent to the bearing plates have been reviewed. The results of this review, described below, establish the baseline for the existing condition of the post-tensioning system at each Unit 1:

- All tendon grease samples met the acceptance criteria for water-soluble chlorides, nitrates and sulfides, water content, and the neutralization number.

- The anchorage components (anchorhead, bushing, shims, buttonheads, and bearing plate) had acceptable corrosion levels and no cracks.

- The concrete surrounding the bearing plates had no cracks that exceeded the acceptable limit or were judged to be of any structural significance.

- All removed wires satisfied the requirements of tensile testing.
- During the fifth tendon surveillance at Byron, one of the hoop tendons within the area of the proposed construction opening (planned to be removed during the SGRO) was randomly selected for inspection. The results of this surveillance indicated no abnormal conditions (corrosion, cracks or presence

of water). The corrosion level for the end anchorage components was Level 1 (no visible oxidation or pitting).

- In 1985, water was observed dripping from a vertical tendon in the Unit 2 containment at Braidwood Station. Since that time, there have been special surveillance programs conducted at Braidwood Units 1 and 2 to monitor water intrusion into the tendon assemblies. The following summarizes the findings up to 1992:

  - All hoop tendons which contained water were located below grade level (close to the shell/base slab junction).

  - Unit 1 vertical tendons have not shown signs of water intrusion.

  - Tendon grease samples met the acceptance criteria.

  - The anchorhead assemblies exhibited no abnormal conditions (corrosion or cracks), indicating that the tendon grease is continuing to provide adequate corrosion protection for the anchorage hardware in spite of water intrusion.

Therefore, it can be concluded that the tendon systems at Byron and Braidwood Unit 1 are in excellent condition and exhibit no signs of impairment of corrosion protection or tendon integrity.

Data From Other Plants

The following discussion explores a few cases from domestic nuclear facilities with post-tensioning systems similar to Byron/Braidwood where tendons were found with grease voids in excess of 5% of the tendon duct volume.

Due to physical characteristics of the tendon grease material and industry standard installation techniques, voids up to approximately 10% to 15% have been found at some facilities after the initial filling operation. There have been surveillances where voids in excess of 15% were discovered. Special reports prepared to address these grease voids demonstrated that the existence of grease voids in excess of 5% in the tendon duct have not led to adverse effects on the tendons. The following discussions summarize two cases where large grease voids occurred:

- Fort Calhoun Station (Report No. LIC-92-168S, dated May 11, 1992)

  A dome tendon was found to have approximately 36 percent grease void during the nineteenth year tendon surveillance. This tendon had not been inspected prior to this surveillance. The tendon was detensioned to allow removal of a sample wire for inspection and tensile testing, and a small spot of rust suspected to have been caused by contamination introduced during construction was found on the sample wire. The sample wire satisfied the tensile testing requirements.

- Wolf Creek Station (Special Report No. 87-010, Supplement 1, dated December 24, 1987)

  A vertical tendon was found to have approximately 29 percent void during the third year tendon surveillance. A sample wire was removed and subsequent inspection revealed no signs of corrosion.

These examples demonstrate that the combination of a closed environment in conjunction with the grease layer that adheres to the tendons prevents corrosion of the tendon wires and other tendon system components even with large grease voids existing over an extended period of time.

Additional Industry Experience

In the following case, tendon wires were exposed to an environment more severe than expected in a sealed tendon sheathing and did not show signs of corrosion:

- Several tendons were removed from a containment structure (decommissioned plant) with a post-tensioning system similar to that used at the Byron and Braidwood Stations. The tendons were either to be scrapped or used in a commercial project. The tendons were wrapped in plastic and stored outside from April to December, subject to weather elements (rain, sun, snow, and freezing temperatures). In December, the plastic wraps were opened and five to ten gallons of water were found. The inspection of individual wires revealed no signs of corrosion.

This example demonstrates that once the tendon wires are coated with grease, even in an environment subject to weather elements, the corrosion protection is maintained.

Post Grease Removal Inspections

Upon removal of tendons during SGRO, the tendon end anchorage will be visually inspected for any sign of corrosion. In addition, the tendon wires at the perimeter of the bundle will be visually inspected for any sign of corrosion. This visual inspection will provide confirmation that operation with the grease removed had no adverse effects on the tendon wires or the end anchorage components. Following the SGRO, the tendons will be retensioned to their required level of prestressing force and the sheathing will be refilled with grease.

As an additional assurance that the SGRO operations have left the tendon system intact, ComEd will include one SGRO-removed tendon from each group (horizontal and vertical) in the next surveillance, currently scheduled for 2003 and 2001 for Byron and Braidwood Stations, respectively. This will provide after-the-fact confirmation that the tendons and their corrosion protection have been unchanged by the SGRO.

Design Margins

While degradation of tendon integrity is not expected, inherent design margins exist in the tendon and containment systems. The containment structure is designed based on the projected prestressing level at the end of the 40-year design life. Post-tensioning systems experience time-dependent losses due to creep and shrinkage of concrete and relaxation of the tendon wires. The losses are reflected in the form of a reduction in the prestressing level of the tendons. This behavior is typical for all prestressing systems and has been demonstrated in the industry by the results of monitoring programs which have been performed on these tendons. The hoop and vertical tendons, which will be affected by the grease removal operation, were initially stressed in 1979 and 1980. Margin remains in the level of prestressing force since the post-tensioning system has not experienced a total 40-year time-dependent loss.

In addition, the ultimate capacity of the containment shell, as stated in the UFSAR, Section 3.8.1.8, is 125 psi. This corresponds to the initiation of yielding of the hoop tendons in conjunction with yielding of reinforcing steel near the mid-height of the containment wall. The containment design basis pressure is 50 psi as stated in Table 3.8-4 of the UFSAR. Therefore, there is a substantial margin of safety in the design of the containment wall.

Conclusions

Based on the technical justifications presented, it can be concluded that removal of sheathing filler grease from up to thirty-five tendons (representing a grease void greater than 5 percent) for a limited period will not adversely affect the ability of the tendons or the post-tensioning components to maintain their design basis function.

G. IMPACT OF THE PROPOSED CHANGE

Approval of this proposed change will allow Byron and Braidwood Units 1 to operate for a period prior to its respective SGRO with grease voids exceeding 5% in a maximum of 35 tendons. As discussed in Section F, ComEd believes that there will be no impact on the safe operation of the units from this change.

If this change is not approved, tendon removal will be performed with the tendon sheathings full of cold grease. This will extend the period required to remove the tendons and may extend the SGROs. In addition, tendon damage due to high removal forces could result in the need for tendon replacement at a cost of $30,000 per tendon.

H. SCHEDULE REQUIREMENTS

ComEd requests that this proposed change be approved by May 1, 1997. The SGRO start dates are currently planned for February 1998 for Byron (B1R08) and September 1998 (A1R07) for Braidwood. It has been estimated that grease removal may take up to 15 weeks to complete; therefore, it is essential that the removal activities begin as soon as the weather is sufficiently warm to facilitate grease removal.