March 28, 2001

MEMORANDUM TO: Marsha K. Gamberoni, Chief
Section 1
Project Directorate I
Division of Licensing Project Management

FROM: George T. Hubbard, Chief **/RA/**
Balance of Plant and Containment Systems Section
Plant Systems Branch
Division of Systems Safety and Analysis

Mark P. Rubin, Chief
Safety Program Section
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis

SUBJECT: SAFETY EVALUATION - ONE-TIME EXTENSION OF APPENDIX J TYPE A INTEGRATED LEAKAGE RATE TEST INTERVAL AT INDIAN POINT 3 (TAC NO. MB0178)

The Plant Systems Branch and the Probabilistic Safety Assessment Branch have completed their review and evaluation of the licensee's letters dated September 6, 2000, and January 18, 2001, proposing a one-time Technical Specification change to extend the test interval for their Appendix J Type A test from the required 10 years to a test interval of 15 years, at the Indian Point Nuclear Power Plant, Unit 3.

Based on our review, we find the licensee's proposal to be acceptable. Our evaluation is attached.

We consider our efforts on TAC No. MB0178 to be complete.

Docket No.: 50-286

Attachment: As stated

CONTACT: J. Pulsipher, SPLB/DSSA
301-415-2811

M. Snodderly, SPSB/DSSA
301-415-2047

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ATTACHMENT

SAFETY EVALUATION BY THE
OFFICE OF NUCLEAR REACTOR REGULATION
PLANT SYSTEMS BRANCH AND
PROBABILISTIC SAFETY ASSESSMENT BRANCH
ONE-TIME EXTENSION OF APPENDIX J TYPE A INTEGRATED
LEAKAGE RATE TEST INTERVAL
INDIAN POINT NUCLEAR POWER PLANT, UNIT 3
DOCKET NO. 50-286

## 1.0 INTRODUCTION

By letters dated September 6, 2000, and January 18, 2001, the New York Power Authority, the licensee for the Indian Point, Unit 3, nuclear power plant, requested a Technical Specification change that would allow a one-time change in their Appendix J Type A test interval from the required 10 years to a test interval of 15 years. Without an extension, the licensee would have to perform a Type A test during their next refueling outage, scheduled to begin in Spring 2001.

## 2.0 BACKGROUND

10 CFR Part 50, Appendix J, Option B requires that a Type A test (containment integrated leakage rate test) be conducted at a periodic interval based on historical performance of the overall containment system. Indian Point 3 Technical Specification 6.14 requires that a program shall be established to implement the leakage rate testing of the containment as required by
10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. It further requires that this program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. This regulatory guide references NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," dated July 26, 1995.

A Type A test is an overall (integrated) leakage rate test of the containment structure. NEI 94-01 specifies an initial test interval of 48 months, but allows an extended interval of 10 years, based upon two consecutive successful tests. There is also a provision for extending the test interval an additional 15 months under certain circumstances.

The most recent two Type A tests at Indian Point 3 have been successful, so their current interval requirement is 10 years.

The licensee is requesting an addition to Technical Specification 6.14, which would indicate that they are allowed to take an exception to the guidelines of Regulatory Guide 1.163 regarding the Type A test interval. Specifically, the proposed Technical Specification says that the first Type A test performed after the December 2, 1990, Type A test shall be performed no later than December 1, 2005. This would make the interval 15 years since the last test.

The licensee states that they expect a rule change to be sought that could eliminate altogether the need for Type A testing, and that the requested extension would allow time for this rule change to be processed. Although the staff has not received a petition for rulemaking, we have initiated preliminary discussions with the industry concerning possible generic changes to the rule, Regulatory Guide 1.163, or NEI 94-01 to permanently extend the test interval or perhaps completely eliminate the test requirement.

## 3.0 EVALUATION

The licensee has performed a risk impact assessment of extending the Type A test interval to 15 years. The assessment was provided to the staff in a January, 18, 2001, letter from the licensee (ADAMS Accession No. ML010300222). In performing the risk assessment, they followed the guidelines of NEI 94-01, the methodology used in EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing," and the guidelines of Regulatory Guide 1.174," An Approach For Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."

The basis for the current 10-year test interval is provided in Section 11.0 of NEI 94-01, Revision 0, and was established in 1995 during development of the performance-based Option B to Appendix J. Section 11.0 of NEI 94-01 states that NUREG-1493, "Performance-Based Containment Leak-Test Program," September 1995, provides the technical basis to support rulemaking to revise leakage rate testing requirements contained in Option B to Appendix J. The basis consisted of qualitative and quantitative assessments of the risk impact (in terms of increased public dose) associated with a range of extended leakage rate test intervals. To supplement the NRC's rulemaking basis, NEI undertook a similar study. The results of that study are documented in EPRI Research Project Report TR-104285.

The EPRI study used an analytical approach similar to that presented in NUREG-1493 for evaluating the incremental risk associated with increasing the interval for Type A tests. The EPRI study estimated that relaxing the test interval from 3 in 10 years to 1 in 10 years, will increase the average time that a leak detectable only by a Type A test goes undetected from 18 to 60 months. Since Type A tests only detect about 3 percent of leaks (the rest are identified during local leak rate tests based on industry leakage rate data gathered from 1987 to 1993), this results in a 10% increase in the overall probability of leakage. The risk contribution of leakage, in percent of person-rem/year, for the PWR representative plant was estimated to increase from .032 percent to .035 percent. This confirmed the NUREG-1493 conclusion that a reduction in the frequency of Type A tests from 3 per 10 years to 1 per 10 years leads to an imperceptible increase in risk.

Building upon the methodology of the EPRI study, the licensee assessed the change in the predicted person-rem/year frequency. The staff considers the licensee's assessment an improvement of the EPRI study because the leakage from sequences that have the potential to result in large releases if a pre-existing leak were present were quantified. Since the Option B rulemaking in 1995, the staff has issued RG 1.174 on the use of probabilistic risk assessment (PRA) in risk-informed changes to a plant's licensing basis. The licensee has proposed using RG 1.174 to assess the acceptability of extending the Type A test interval beyond that established during the Option B rulemaking. RG 1.174 defines very small changes in the risk-acceptance guidelines as increases in core damage frequency (CDF) less than $10^{-6}$ per reactor year and increases in large early release frequency (LERF) less than $10^{-7}$ per reactor year.

Since the Type A test does not impact CDF the relevant criterion is the change in LERF which the licensee estimated. RG 1.174 also discusses defense-in-depth and encourages the use of risk analysis techniques to help ensure and show that key principles, such as the defense-in-depth philosophy, are met. The licensee estimated the increase in the conditional containment failure probability which helps to ensure that the defense-in-depth philosophy is maintained.

The licensee examined plant specific accident sequences from their Individual Plant Examination. The following sequences were considered in the assessment:

- Core damage sequences in which the containment remains intact initially and in the long term.

- Core damage sequences in which containment integrity is impaired due to random isolation failures of plant components other than those associated with Type B or Type C test components. For example, liner breach, or steam generator manway leakage.

- Core damage sequences in which containment integrity is impaired due to containment isolation failures of pathways left 'opened' following a plant post-maintenance test. For example, valve failing to close following a valve stroke test.

- Accident sequences involving containment failure induced by severe accident phenomena, containment bypassed, large containment isolation failures, and small containment isolation 'failure-to-seal' events were not accounted for in this evaluation. These sequences are impacted by changes in Type B and C test intervals, not changes in the Type A test interval.

The steps taken by the licensee to perform the risk assessment are as follows:

- Quantified the base-lined risk in terms of frequency per reactor year for each of the eight accident classes evaluated in EPRI TR-104285.

- Developed plant specific person-rem dose (population dose) per reactor year for each of the eight accident classes.

- Evaluated the risk impact of extending the Type A test interval from 10 to 15 years.

- Determined the change in risk in terms of LERF in accordance with RG 1.174.

Determining the change in risk in terms of LERF involves the potential that a core damage event that normally would result in only a small radioactive release from containment could in fact result in a large release due to failure to detect a pre-existing leak during the extension period. The licensee designated these sequences as Class 3B sequences and estimated a frequency of $1.02 \times 10^{-6}$/year, based on a 10 year test interval. The licensee then used the EPRI methodology to estimate the impact of the Type A test interval on the leakage probability. Extending the Type A test interval from 10 to 15 years increases the average time that a leak detectable only by a Type A test goes undetected from 60 to 90 months. For a 15-year interval there is a 15% increase in the overall probability of leakage (3 * 90/18) versus 10% for a 10-year interval. Thus, increasing the Type A test interval from 10 years to 15 years results in a 5% increase in the overall probability of leakage. Multiplying the above LERF frequency (1.02 x

$10^{-6}$/year) by the increase in overall probability of leakage (0.05) gives an increase in LERF of 5.1 x$10^{-8}$/year. If the risk increase is measured from the original 3 in 10 year interval, the increase in LERF is 1.1 x $10^{-7}$/year.

The following conclusions can be drawn from the licensee's risk assessment associated with extending the Type A test frequency:

1. The risk assessment predicted a slight increase in risk when compared to that estimated from current requirements. Given the change from a 10-year test interval to a 15-year test interval, the increase in the total integrated plant risk (person-rem/year within 50 miles) was found to be 0.048 percent. The increase in the total integrated plant risk, given the change from a 3 in 10-year test interval to a 15-year test interval, was found to be 0.43 percent. This is just slightly greater than the range of risk increase, 0.02 to 0.14 percent, estimated in NUREG-1493 when going from a 3 in 10-year test interval to a 10-year interval. NUREG-1493 concluded that a reduction in the frequency of tests from 3 per 10 years to 1 per 10 years leads to an imperceptible increase in risk. Therefore, the increase in the total integrated plant risk for the proposed change is considered small.

2. RG 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. RG 1.174 defines very small changes in the risk-acceptance guidelines as increases in CDF less than $10^{-6}$ per reactor year and increases in LERF less than $10^{-7}$ per reactor year. Since the Type A test does not impact CDF, the relevant criterion is LERF. The increase in LERF resulting from a change in the Type A test interval from 1 in 10 years to 1 in 15 years is estimated to be 5.1 x $10^{-8}$/year. The increase in LERF resulting from a change in the Type A test interval from the original 3 in 10 years to 1 in 15 years is estimated to be 1.1 x $10^{-7}$/year. Increasing the Type A interval to 15 years is considered to be a very small change in LERF.

3. RG 1.174 also encourages the use of risk analysis techniques to help ensure and show that the proposed change is consistent with the defense-in-depth philosophy. Consistency with the defense-in-depth philosophy is maintained if a reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation. The change in the conditional containment failure probability was estimated to be 0.1 percent for the proposed change and 0.4 percent for the cumulative change of going from a test interval of 3 in 10 years to 1 in 15 years. The staff finds that the defense-in-depth philosophy is maintained based on the change in the conditional containment failure probability for the proposed change.

Based on these conclusions, the staff finds that the increase in predicted risk due to the proposed change is within the acceptance criteria while maintaining the defense-in-depth philosophy of RG 1.174 and, therefore, is acceptable.

## 4.0 CONCLUSION

Based on the foregoing evaluation, the staff finds that the interval until the next Type A test at Indian Point 3 may be extended to 15 years, and that the proposed changes to Technical Specification 6.14 are acceptable.