

March 6, 2002

Mr. Oliver D. Kingsley, President
and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

SUBJECT: CLINTON POWER STATION, UNIT 1 - RELIEF REQUESTS CIP 6111 AND 4207
(TAC NO. MB2548)

Dear Mr. Kingsley:

By letter dated July 23, 2001, supplemented by letter dated October 19, 2001, AmerGen Energy Company (AmerGen), LLC, submitted requests for relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, requirements for the Clinton Power Station, Unit 1. The relief request CIP 6111 proposes changes to Paragraph IWL-2310, "Visual Examination and Personnel Qualification," related to minimum illumination and maximum direct examination distance for all concrete surfaces. The relief request 4207 proposes changes to Appendix VIII, Supplement 4, Subparagraph 3.2(c), related to reactor pressure vessel (RPV) longitudinal and circumferential shell welds and RPV head welds ultrasonic testing performance demonstration.

The U.S. Nuclear Regulatory Commission staff has evaluated relief requests CIP 6111 and 4207. The staff finds that relief request CIP 6111 may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety and that the licensee's proposed alternative provides reasonable assurance of structural integrity. The staff finds that relief request 4207 may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the licensee's proposed alternative provides an acceptable level of quality and safety. Our safety evaluation for both relief requests is enclosed.

The proposed alternatives are only being authorized for the remainder of the first 10-year containment inspection and second 10-year inservice inspection intervals, which both end December 31, 2009, for relief requests CIP 6111 and 4207, respectively. Relief requests for subsequent inspection intervals, if necessary, should be submitted at a later date.

Sincerely,

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure: Safety Evaluation

cc w/encl: See next page

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cc w/encl: See next page

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Clinton Power Station, Unit 1

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- 2 -

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE INSPECTION REQUIREMENTS

RELIEF REQUESTS CIP 6111 AND 4207

CLINTON POWER STATION, UNIT 1

AMERGEN ENERGY COMPANY, LLC

DOCKET NO. 50-461

1.0 INTRODUCTION

1.1 Relief Request CIP 6111:

In the *Federal Register* dated August 8, 1996 (61 FR 41303), the Nuclear Regulatory Commission (NRC) amended its regulations to incorporate by reference the 1992 edition with 1992 addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." Subsection IWA provides general requirements. Subsections IWE and IWL provide the requirements for inservice inspection (ISI) of Class CC (concrete containment), and Class MC (metallic containment) components of light-water cooled plants. The effective date for the amended rule was September 9, 1996, and it requires the licensees to incorporate the new requirements into their ISI plans and to complete the first containment inspection by September 9, 2001. However, a licensee may propose alternatives to or submit a request for relief from the requirements of the regulation pursuant to 10 CFR 50.55a(a)(3) and (g)(5).

By letter dated July 23, 2001, supplemented by letter dated October 19, 2001, AmerGen Energy Company (AmerGen, the licensee), LLC, requested relief from the requirements of ASME Code, Section XI, Paragraph IWA-2210, "Visual Examinations," related to minimum illumination and maximum direct examination distance for all Class CC components under Paragraph IWL-2310, "Visual Examination and Personnel Qualification," for its Clinton Power Station (Clinton), Unit 1. AmerGen proposed to use alternative minimum illumination and maximum direct examination distances to those specified in Table IWA-2210-1 when performing remote visual examinations required by Paragraph IWL-2510, "Examination of Concrete."

1.2 Relief Request 4207:

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part that alternatives to the requirements of

paragraph (g) may be used, when authorized by the NRC, if the applicant demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ISI Code of record for Clinton for the second 10-year ISI interval is the 1995 Edition with the 1996 Addenda of Section XI of the ASME Code.

By letter dated July 23, 2001, supplemented by letter dated October 19, 2001, AmerGen requested relief from the requirements of the ASME Code, Section XI, Appendix VII, Supplement 4, "Qualification Requirements of the Clad/Base Metal Interface of Reactor Vessel," Subparagraph 3.2, related to reactor pressure vessel (RPV) longitudinal and circumferential shell welds and RPV head welds ultrasonic testing (UT) performance demonstration for Clinton. AmerGen proposed to use an alternative length sizing qualification criterion of 0.75 inch root mean square (RMS) error in lieu of the length sizing requirements of Subparagraph 3.2(b) and to use the RMS error calculations of Subparagraphs 3.2(a) and 3.2(b) in lieu of the statistical parameters of Subparagraph 3.2(c).

2.0 EVALUATION

2.1 Relief Request CIP 6111:

2.1.1 Code Requirements:

The ASME Code, Section XI, 1992 Edition, 1992 Addenda, Paragraph IWL-2310, "Visual Examination and Personnel Qualification," and Paragraph IWA-2210, "Visual Examinations," require specific minimum illumination and maximum direct examination distance specified in Table IWA-2210-1 for all Class CC concrete surfaces as required by Paragraph IWL-2510, "Examination of Concrete."

2.1.2 Licensee's Proposed Alternative to Code Requirements:

Relief is requested from Paragraph IWA-2210 requirements for minimum illumination and maximum direct examination distance of Class CC components under Paragraph IWL-2310.

Relief is requested in accordance with 10 CFR 50.55a, "Codes and Standards," Paragraph (a)(3)(ii). Compliance with the specified requirements of this section would result in unnecessary examination requirements or unusual difficulty without a compensating increase in the level of quality and safety.

10 CFR 50.55a was amended in June 1996 to require the use of the 1992 Edition, 1992 Addenda, of ASME Section XI, when performing containment examinations. In addition to the requirements of Subsection IWL, the rule making also imposed the requirements of Subsection IWA of the 1992 Edition, 1992 Addenda, of ASME Section XI, for minimum illumination and maximum direct examination distance of Class CC components, specifically for the examinations of concrete under Paragraph IWL-2510.

At Clinton, accessibility to higher portions of the containment building itself makes it a hardship to meet Section XI maximum direct examination distance and minimum illumination requirements. The installation of extensive temporary scaffold systems or a climbing scaffold system to access these portions of the containment would be necessary. These scaffolds would provide limited access due to containment geometry restrictions as well as structural and equipment interferences. The installation and removal of these scaffolds would increase both worker radiation exposure and risk to personnel safety in order to meet Paragraph IWA-2210 requirements.

The NRC staff received seven comments that were consolidated into Public Comments No. 2.3 in Part III of Attachment 6A to SECY-96-080, "Issuance of Final Amendment to 10 CFR 50.55a to Incorporate by Reference the ASME Code, Section XI, Division 1, Subsection IWE and Subsection IWL," dated April 17, 1996. The staff response to these concerns is as follows:

Comments received from ASME members on the containment committee indicate that the newer, more stringent requirements of IWA-2210 were not intended to be used for the examination of containments and were inadvertently included in Subsection IWL. The NRC agrees that remote examinations are the only practical method for inspecting much of the containment surface areas. 10CFR 50.55a(b)(2)(x)(B) has been added to the final rule which contain alternative lighting and resolution requirements which may be used in lieu of the requirements contained in Table IWA-2210-1 for Subsection IWE components.

This revision to the rule does not provide alternative requirements; however, it does indicate that the maximum distance may be increased and the minimum illumination may be decreased provided the indications can be detected under the chosen conditions.

When performing the remote visual examinations required by Paragraph IWL-2510, the maximum direct examination distance specified in Table IWA-2210-1 may be extended, and the minimum illumination requirements specified in Table IWA-2210-1 may be decreased, provided that the conditions or indications for which the visual examination is performed can be detected at the chosen distance and illumination.

The licensee has indicated that it will perform demonstrations on indications representing actual inspection conditions to determine the resolution and illumination required to ensure that indications of interest are visually detectable. This alternative will provide sufficient evidence of adequate illumination and distance.

The licensee's proposed alternative is requested for the remaining duration of the first 10-year containment inspection interval for Clinton, which began on January 1, 2000, and ends on December 31, 2009.

2.1.3 Staff Evaluation of CIP 6111:

As described in the section above, because the accessibility to higher portions of the containment building will make it a hardship to obtain the maximum direct examination distance and minimum illumination requirements, the licensee proposed an alternative to the requirements for the measurement of illumination and examination distance for visual examinations specified in ASME Code Section XI, 1992 Edition, 1992 Addenda, IWL-2310, "Visual Examination and Personnel Qualification," and IWA-2210, "Visual Examination." The alternate examinations state that the Table IWA-2210-1 required maximum direct examination distance may be increased and the minimum illumination may be decreased provided that the conditions or indications for which the visual examination is performed can be detected at the chosen distance and illumination.

The staff finds that visual examinations of the containment concrete are performed to determine if damage or degradation (cracks, corrosion or other physical damage) warrant additional evaluation or repair of the structure. In order for the visual examinations to be performed in such a way as to detect critical flaws, proper lighting is essential. Paragraph IWA-2210 allows for remote examination as long as the remote examination procedure is demonstrated to resolve the selected test chart characters. In Reference 2, the licensee stated that the procedure and equipment to be used will demonstrate the capability of detecting the indications of interest under the chosen conditions to the satisfaction of the Authorized Nuclear Inservice Inspector and the Station Level 3 Visual Examiner certified in accordance with Section XI of the ASME Code.

Based on the discussion above, the staff has determined that relief may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the specific requirements of the ASME Code would result in hardship without a compensating increase in the level of quality and safety and that the alternative examination requirements proposed by the licensee will provide reasonable assurance of the functionality and integrity of the concrete containment.

2.2 Relief Request 4207:

2.2.1 Code Requirements:

10 CFR 50.55a, "Codes and Standards," paragraph (b)(2), incorporates by reference the 1995 Edition and Addenda through 1996 of ASME Code Section XI for use in preparing ISI programs. Appendix VIII to Section XI of the ASME Code, Supplement 4, "Qualification Requirements of the Clad/Base Metal Interface of Reactor Vessel," Subparagraph 3.2(c), requires that UT performance demonstration results be plotted on a two-dimensional plot with the measured depth plotted along the ordinate axis and the true depth plotted along the abscissa axis. For qualification, the plot must satisfy the following statistical parameters: (1) the slope of the linear regression line is not less than 0.7; (2) the mean deviation of flaw depth is less than 0.25 inches; and (3) the correlation coefficient is not less than 0.70.

2.2.2 Licensee's Proposed Alternative to Code Requirements:

The licensee is requesting relief from the 1995 Edition with 1996 Addenda, Appendix VIII to Section XI of the ASME Code, Supplement 4, Subparagraph 3.2(c).

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed to use the RMS calculations of Subparagraph 3.2(a), which utilize an RMS value of 0.15 inches, and the RMS calculations of Subparagraph 3.2(b), which utilize an RMS value of 0.75 inches, in accordance with 10 CFR 50.55a(b)(2)(xv)(C)(1), in lieu of the statistical parameters specified in Subparagraph 3.2(c).

The licensee's proposed alternative is requested for the remaining duration of the second 10-year ISI interval for Clinton, which began on January 1, 2000, and ends on December 31, 2009.

2.2.3 Staff Evaluation of 4207:

The licensee has proposed eliminating the use of Section XI of the ASME Code, Supplement 4, Subparagraph 3.2(c), which imposes three statistical parameters for depth sizing. The first parameter, 3.2(c)(1), pertains to the slope of a linear regression line. The linear regression line is the difference between actual versus true value plotted along a through-wall thickness. For Supplement 4 performance demonstrations, a linear regression line of the data is not applicable because the performance demonstrations are performed on test specimens with flaws located in the inner 15 percent through-wall. The differences between actual versus true value produce a tight grouping of results which resemble a shotgun pattern. The slope of a regression line from such data is extremely sensitive to small variations, thus, making the parameter of Subparagraph 3.2(c)(1) a poor and inappropriate acceptance criterion. The second parameter, 3.2(c)(2), pertains to the mean deviation of flaw depth. The value used in the code is too lax with respect to evaluating flaw depths within the inner 15 percent of wall thickness. Therefore, the licensee proposed to use the more appropriate criterion of 0.15 inch RMS of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies Subparagraph 3.2(a), as the acceptance criterion. The third parameter, 3.2(c)(3), pertains to a correlation coefficient. The value of the correlation coefficient in Subparagraph 3.2(c)(3) is inappropriate for this application since it is based on the linear regression from Subparagraph 3.2(c)(1).

The staff has previously determined that the use of Subparagraph 3.2(c) requirements for flaw sizing is unworkable and inappropriate. The staff finds that the licensee's proposed alternative to use the RMS values of 10 CFR 50.55a(b)(2)(xv)(C)(1), specifically an RMS value of 0.15 inches, which modifies the criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a), and to use the RMS calculations of Subparagraph 3.2(b), specifically an RMS value of 0.75 inches, in lieu of the statistical parameters of Subparagraph 3.2(c), may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) and will provide an acceptable level of quality and safety. The 0.75 inch RMS value is appropriate, based on the rule change to 10 CFR 50.55a(b)(2)(xv)(C)(1) published in the *Federal Register* (66 FR 16390) on March 26, 2001.

3.0 CONCLUSION

Based on our review of the information provided in the two relief requests and the discussions above, the staff finds that both relief requests may be authorized. Relief request CIP 6111 may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety and that the licensee's proposed alternative provides reasonable assurance of structural integrity at Clinton. Relief request 4207 may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the licensee's proposed alternative provides an acceptable level of quality and safety at Clinton.

The licensee has proposed that CIP 6111 be granted for the remainder of the first 10-year containment inspection interval and that 4207 be granted for the remainder of the second 10-year ISI interval, both of which began on January 1, 2000, and end on December 31, 2009. The licensee's requested reliefs are consistent with the 1995 Edition and 1996 Addenda of the ASME Code requirements which are currently incorporated by reference in 10 CFR 50.55a. This would result in the requested reliefs becoming unnecessary for the subsequent 10-year inspection intervals when that Code Edition and Addenda (or later) are required to be used. Therefore, the proposed alternatives are only being authorized for the remainder of the current inspection intervals. Relief requests for subsequent inspection intervals, if necessary, should be submitted at a later date.

4.0 REFERENCES

- 4.1 Letter from J. M. Heffley, AmerGen to NRC, "Submittal of Relief Requests CIP 6111 and 4207 Related to the Requirements of 10 CFR 50.55a(g), Inservice Inspection Requirements," dated July 23, 2001.
- 4.2 Letter from K. A. Ainger, AmerGen to NRC, "Revision of Relief Request CIP 6111 and 4207 Related to the Requirements of 10 CFR 50.55a(g), 'Inservice Inspection Requirements,' - Clinton Power Station, Unit 1," dated October 19, 2001.

Principal Contributors: T. Cheng and M. Khanna

Date: March 6, 2002