June 28, 2002

Mr. John L. Skolds, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 - RELIEF REQUEST CR-35, INSERVICE INSPECTION PROGRAM RELIEF REGARDING EXAMINATION COVERAGE FOR THIRD INSERVICE INSPECTION PROGRAM INTERVAL (TAC NOS. MB2735 AND MB2736)

Dear Mr. Skolds:

By letter dated July 30, 2001, Exelon Generation Company, LLC (the licensee) submitted Relief Request CR-35 related to the Third 10-Year Interval Inservice Inspection (ISI) Program for Quad Cities Nuclear Power Station (Quad Cities), Units 1 and 2. The licensee requested relief from certain ISI requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, for those weld examinations performed during the second period of the third 10-year ISI interval where coverage achieved was less than or equal to 90 percent. Specifically, this includes inspections performed during refueling outage Q2R15 and examinations credited to the second period during refueling outage Q1R16.

Based on the information provided in the Relief Request CR-35, the Nuclear Regulatory Commission (NRC) staff concludes that compliance with the specified requirements is impractical due to the plant design, and that examination coverage of the accessible weld volumes and the surface areas provides reasonable assurance of the structural integrity of the subject welds. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), the NRC staff authorizes relief from the ASME Code examination coverage requirements proposed in Relief Request CR-35 for the third 10-year ISI interval for Quad Cities Units 1 and 2, which is scheduled to conclude on February 17, 2003, and March 9, 2003, respectively.

The detailed results of the staff's review are provided in the enclosed safety evaluation. If you have any questions concerning this action, please call Mr. F. Lyon of my staff at 301-415-2296.

Sincerely,

/RA/

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

Docket Nos. 50-254 and 50-265

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF THE THIRD TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUEST FOR RELIEF CR-35

EXELON GENERATION COMPANY, LLC

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-254 AND 50-265

1.0 INTRODUCTION

By letter dated July 30, 2001, Exelon Generation Company, LLC (the licensee), requested relief from certain inservice examination requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, 1989 Edition, in regard to surface and volumetric examinations conducted on reactor vessel nozzle-to-shell welds and other pipe-to-valve welds identified in Tables CR-35.1 and CR-35.2 during the third 10-year inspection interval of Quad Cities Units 1 and 2. The licensee stated that the Code-required examination coverages of essentially 100 percent for the welds were impractical due to weld geometry, physical obstructions and other limitations imposed by design and materials of construction of the component. However, all components received, as a minimum, the required examination(s) applicable to the extent practical due to limited or lack of access available. The staff has evaluated the reduction in examination coverage pursuant to 10 CFR 50.55a(g)(6)(i).

2.0 BACKGROUND

Inservice inspection (ISI) of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee 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) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable ISI Code of Record for the third 10-year ISI interval of Quad Cities Nuclear Power Station, Units 1 and 2, is the 1989 Edition of ASME Code, Section XI.

2.1 REQUEST FOR APPROVAL OF AN ALTERNATIVE

Pursuant to 10 CFR 50.55a(g)(5), if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit, as specified in Section 50.4, information to support the determinations. 10 CFR 50.55a(g)(6)(i) states that the Commission will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.0 DISCUSSION (RELIEF REQUEST NO. CR-35)

3.1 IDENTIFICATION OF COMPONENTS

Code Classes:	1 and 2
References:	Subarticles IWB-2500 and IWC-2500 of ASME Code, Section XI
Examination Categories:	B-D, C-C, C-F-1 and C-F-2
Item Numbers:	B3.90, C3.20, C5.11 and C5.51
Examination Methods:	Volumetric and Surface Examination
Component Numbers:	Various, see Table CR-35.1 and Table CR-35.2 for examination completed during the third 10-year inspection interval

3.2 CODE REQUIREMENTS

Table IWB-2500-1 of ASME Code, Section XI, 1989 Edition requires a volumetric examination of welds in Examination Category B-D, Item Number B3.90 and Table IWC-2500-1 requires a surface examination of welds in Examination Category C-C, Item Number C3.20 and a surface and a volumetric examination of welds in Examination Categories C-F-1 and C-F-2, Item Numbers C5.11 and C5.51 respectively.

3.3 CODE REQUIREMENT FROM WHICH RELIEF IS REQUESTED: (as stated)

Relief is requested from performing a complete coverage examination of the entire volume or area required. Entire volume or area required is defined by ASME Section XI Code Case N-460 entitled, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1." Code Case N-460 states in part, "... when the entire examination volume or area cannot be examined...a reduction in examination coverage...may be accepted provided the reduction in coverage for that weld is less than 10%."

The NRC through Information Notice 98-42 entitled, "Implementation of 10 CFR 50.55a(g) Inservice Inspection Requirements," termed the reduction in coverage of less than 10% to be "essentially 100 percent." Information Notice 98-42 states in part, "The NRC has adopted and further refined the definition of "essentially 100 percent" to mean "greater than 90 percent"... has been applied to all examinations of welds or other areas required by ASME Section XI."

Relief is requested from performing an examination of "essentially 100 percent" of the required volume or area as applicable for the identified components in Table CR-35.1 and Table CR-35.2.

TABLE CR-35.1
UNIT 1 COMPONENTS WITH LESS THAN "ESSENTIALLY 100 PERCENT" COVERAGE

SECTION XI CATEGORY AND ITEM NO.	**COMPONENT SYSTEM AND NUMBER**	**COMPONENT DESCRIPTION**	**CONDITION LIMITING COVERAGE**	**EXAM AND COVERAGE PERCENT**
C-C C3.20	CRD 0318B-W-201 A	Guide w/8 Lugs welded to pipe	Support bracket at end of lugs & Branch Conn.	MT 84.38
C-C C3.20	RHR 1010-W-205A	360 Degree Sleeve welded to pipe	Close proximity of sleeve to structural steel. See sketch of inaccessible area Fig.CR-35.1	PT 66.66
C-C 03.20	RHRB 1012B-W-203A	VSC w/4 Lugs welded to pipe	Bolted pipe clamp was in a radioactive field of 1.2 Rem/Hour.	MT 86.12
C-C C3.20	HPCI 2304-W-204A	Guide w/8 Lugs welded to pipe	Support clamp welded to structural steel.	MT & PT 86.12

TABLE CR-35.2
UNIT 2 COMPONENTS WITH LESS THAN "ESSENTIALLY 100 PERCENT" COVERAGE

SECTION XI CATEGORY AND ITEM NO.	COMPONENT SYSTEM AND NUMBER	COMPONENT DESCRIPTION	CONDITION LIMITING COVERAGE	EXAM AND COVERAGE PERCENT
B-D B3.90	RPV N10NOZ	Vessel-Nozzle (SBLC)	Nozzle, radius blend & weld configuration. See drawing of inaccessible areas, Fig.CR-35.2	UT 58.52
B-D B3.90	RPV N3B NOZ	Vessel-Nozzle (Main Steam)	Nozzle, radius blend & weld configuration and adjacent RPV flange weld.	UT 29.92
B-D B3.90	RPV N3C NOZ	Vessel-Nozzle (Main Steam)	Nozzle, radius blend & weld configuration and adjacent RPV flange weld.	UT 29.92
B-D B3.90	RPV N3D NOZ	Vessel-Nozzle (Main Steam)	Nozzle, radius blend & weld configuration and adjacent RPV flange weld.	UT 29.92
C-C C3.20	RHRB 1012B-W-203A	VSC w/4 Lugs welded to pipe	Support clamp at end of lugs.	MT 88.1
C-C C3.20	RHRA 1024A-W-201A	VSC w/4 Lugs welded to pipe	Support clamp at end of lugs.	MT 85.6
C-C C3.20	CRD 0318B-W-201A	Guide w/8 Lugs welded to Pipe	Support bracket at end of lugs & Branch Conn. See drawing of inaccessible areas Fig.CR-35.3	MT 89.2
C-C C3.20	RHRA 1008A-W-203A	VSC w/4 Lugs welded to pipe	Support clamp at end of lugs.	MT 88.1
C-C C3.20	RHRA 1012A-W-203.1A	HGR w/6 Lugs welded to pipe	Support clamp at end of lugs.	MT 89.3
C-F-1 C5.11	CSB 1404-40	Valve-Pipe (Dissimilar Metal)	Valve configuration. See drawing of inaccessible areas Fig.CR-35.4	UT 88.5
C-F-1 C5.11	CSB 1404-41	Pipe-Valve (Stainless Steel)	Valve configuration.	UT 88.5
C-F-2 C5.51	RHRB 1016C-4	Elbow-Tee (Carbon Steel)	Branch Conn. Overlapped this weld by >35% of length.	MT-64.8 UT-60.2

3.4 BASIS FOR RELIEF: (as stated)

Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that the required "essentially 100 percent" coverage examination is impractical due to physical obstructions and limitations imposed by design, geometry and materials of construction of the component.

Quad Cities Station Units 1 and 2 obtained Construction Permits February 15, 1967, CPPR-23 and CPPR-24 respectively. Quad Cities Station's piping systems and associated components were designed and fabricated before the examination requirements of ASME Section XI were formalized and published. Since this plant was not specifically designed to meet the requirements of ASME Section XI, literal compliance is not feasible or practical within the limits of the current plant design.

Physical obstructions imposed by design, geometry and materials of construction are typical of vessel appurtenances and sacrificial shield, insulation support rings, structural and component support members, adjacent component weldments in close proximity, unique component configurations and dissimilar metal welds. Typical drawings or sketches are depicted in Figure CR-35.1 through Figure CR-35.4 [of the licensee's relief request].

All components received as a minimum, the required examination(s) applicable to the extent practical due to limited or lack of access available. The examinations conducted, confirmed satisfactory results evidencing no unacceptable flaws present, even though "essentially 100 percent" coverage was not attained. Quad Cities Station has concluded that if any active degradation mechanism were to exist in the subject welds, those degradations would have been identified in the examinations performed.

3.5 <u>PROPOSED ALTERNATE EXAMINATIONS:</u> (as stated)

With an earlier design coupled with the examinations completed to the extent practical and results evidencing no unacceptable flaws present, the underlying objectives have been met.

Additionally, a VT-2 examination performed on the subject components during system pressure test per examination category B-P each refueling outage and category C-H, each period provides additional assurance that the structural integrity of the subject components is maintained.

Quad Cities Station maintains continuing alliances with the Electric Power Research Institute (EPRI), the Performance Demonstration Initiative (PDI), Inservice Inspection (ISI) vendors and other industry sources to encourage the development of and provide an awareness of improved examination techniques to enhance coverage and flaw detection commensurate with radiation dose reduction.

No alternative provisions are proposed for this relief request, with the exception of, Quad Cities Station will continue to evaluate the development of new or improved examination techniques with the intent of applying these techniques where practical improvement on the examination of components can be achieved.

4.0 <u>EVALUATION</u>

The ASME Code, Section XI, 1989 Edition, requires volumetric examination coverage of 100 percent of the reactor vessel outlet nozzle to shell weld. However, a reduction in examination coverage of less than 10 percent is acceptable due to interferences as provided by Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," which was approved by the NRC in Regulatory Guide 1.147. During the third 10-year inspection interval, the reactor vessel outlet nozzle-to-shell welds identified in Table CR-35.2 in examination category B-D were ultrasonically examined resulting in volumetric coverage ranging from 30 percent to 58.5 percent in lieu of the Code-required coverage in excess of 90 percent. The limitation in examination coverage was attributed to the configuration of the nozzle into the vessel interior which restricted scanning from one side of each weld from the interior surface of the reactor vessel. For the pipe-to-valve welds in examination category C-F-1, ultrasonic scanning could not be performed from the valve side that has a tapered surface. Each weld has a stainless steel component on the far side which could not be scanned from the same side due to the taper on the examination surface. With stainless steel material, the sound beam is markedly attenuated on the far side to detect and size flaws. Therefore, the volumetric coverage is reduced due to single-side access. The remaining welds identified in Tables CR-35.1 and CR-35.2 were obstructed for volumetric or surface examination. However, the licensee has examined the subject welds to the maximum extent practical by volumetric and surface examination.

The staff has determined that it is impractical to perform the Code-required examination of the subject nozzle to shell welds due to the nozzle configuration, pipe-to-valve welds due to single-side scanning, and of the attachment welds due to obstructions. In order to comply with the Code requirements, a design modification of the reactor vessel and the piping system including the supports would have to be performed which would impose a significant burden on the licensee. The staff, however, believes that the examination conducted for each weld provides reasonable assurance of structural integrity of the weld, since any significant pattern of degradation in the weld would have been detected during examination of the accessible weld volume. Further, in the unlikely event that a service-induced flaw in the weld propagates to the inside surface of the weld, it would most likely be detected during the Code-required VT-3 visual examination of the reactor vessel interior surface. If a flaw were to propagate from inside to outside surface due to stress-corrosion of the subject piping, the Code-required VT-2 examination during a system leakage test would most likely detect it.

5.0 CONCLUSION

The staff has reviewed the licensee’s submittal and concludes that compliance with the Code requirements on volumetric and surface examinations for the reactor vessel nozzle-to-shell welds, the pipe-to-valve welds, and the structural attachment welds identified in Tables CR-35.1 and CR-35.2 are impractical due to component configuration, material composition, and/or other obstructions. The staff has further determined that the nozzles, piping, and structural attachments would require redesign if the Code requirements were to be imposed on the licensee, which would impose a significant burden on the licensee. The staff finds that the examination coverages of the accessible weld volumes and of the surface areas provide reasonable assurance of the structural integrity of the welds identified in the relief request. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) from the Code examination coverage requirements for the third 10-year inservice inspection interval of Quad Cities Units 1 and 2, which is scheduled to conclude on February 17, 2003, and March 9, 2003, respectively. The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Principal Contributor: P. Patnaik

Date: June 28, 2002