October 6, 2004

Mr. Edward J. Weinkam
Director of Regulatory Services
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

SUBJECT: DUANE ARNOLD ENERGY CENTER AND MONTICELLO NUCLEAR GENERATING PLANT RE: REQUEST FOR AUTHORIZATION TO UTILIZE CODE CASE N-613-1 (TAC NOS. MC2374 AND MC2375)

Dear Mr. Weinkam:

By letter dated February 27, 2004, as supplemented by letter dated July 21, 2004, Nuclear Management Company LLC (NMC) requested U.S. Nuclear Regulatory Commission (NRC) approval for the Duane Arnold Energy Center (DAEC) and Monticello Nuclear Generating Plant (MNGP) to use the alternative examination volume requirements of Code Case N-613-1 in lieu of certain American Society of Mechanical Engineers *Boiler and Pressure Vessel Code*, Section XI, requirements. Specifically, NMC proposed to incorporate reduced ultrasonic examination volume requirements for Class 1 reactor pressure vessel nozzle-to-vessel welds.

The NRC staff has evaluated the above request and concludes that NMC's proposed alternative examination volume requirements provide an acceptable level of quality and safety. Therefore, the NRC authorizes NMC's proposed alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section, 50.55a(a)(3)(i) for DAEC's third 10-Year Inservice Inspection Interval and MNGP's fourth 10-Year Inservice Inspection Interval.

Enclosed is our safety evaluation.

Sincerely,

/RA/

L. Raghavan, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-331 and 50-263

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF, 10-YEAR INSERVICE INSPECTION INTERVAL

NUCLEAR MANAGEMENT COMPANY, LLC

DUANE ARNOLD ENERGY CENTER

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NOS. 50-331 AND 50-263

1.0 INTRODUCTION

By letter dated February 27, 2004, as supplemented by letter dated July 21, 2004, Nuclear Management Company LLC, (NMC) requested U.S. Nuclear Regulatory Commission (NRC) approval for the Duane Arnold Energy Center (DAEC) and Monticello Nuclear Generating Plant (MNGP) to use the alternative examination volume requirements of Code Case N-613-1 in lieu of certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, requirements. Specifically, NMC proposed to incorporate reduced ultrasonic examination volume requirements for Class 1 reactor pressure vessel nozzle-to-vessel welds.

2.0 REGULATORY EVALUATION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section, 50.55a(g)(4), components (including supports) which are classified as ASME Code Class 1, 2, and 3 shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection [ISI] 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 120-month 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.

Inservice inspection of Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable Addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). As stated in 10 CFR 50.55a(a)(3), proposed 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 of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.1 Regulatory Background

For DAEC, the applicable inservice inspection ASME Code edition of record is the 1989 Edition of the ASME Code, Section XI. The third 10-Year Inservice Inspection Interval at DAEC is scheduled to end on November 1, 2005.

For MNGP, the applicable inservice inspection ASME Code edition of record is the 1995 Edition, 1996 Addenda of the ASME Code, Section XI. The fourth 10-Year Inservice Inspection Interval at MNGP is scheduled to end on May 31, 2012.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

Code Class:	Class 1
Code Edition:	DAEC: ASME Code Section XI, 1989 Edition MNGP: ASME Code Section XI, 1995 Edition, 1996 Addenda
Examination Category:	B-D
Item Number:	B3.90, "Reactor Vessel Full Penetration Nozzle-to-Vessel Welds"
Component Numbers:	Various, see Tables 1 and 2

3.2 ASME Code Requirements

Pursuant to 10 CFR 50.55a(a)(3)(i), NMC is requesting relief from ASME, Section XI, Table IWB-2500-1, Examination Category B-D, Item B3.90 "Reactor Vessel Full Penetration Nozzle-to-Vessel Welds," examination requirement IWB-2500-7. Specifically, Figure IWB-2500-7(b) requires examination of a distance of $t_s/2$ adjacent to the weld, where t_s equals the vessel wall thickness.

3.3 Reason for Request (as stated)

The required examination volume for the reactor vessel pressure retaining nozzle-to-vessel welds extends far beyond the weld into the base metal, and is unnecessarily large. This proposed alternative would re-define the examination volume boundary to one-half (½) inch of base metal on each side of the widest portion of the weld, removing from examination the base metal that was extensively examined during prior inspections, and is not in the high residual stress region associated with the weld.

3.4 Licensee's Proposed Alternative to the ASME Code

NMC proposes to use a reduced examination volume according to ASME Code Case N-613-1, which extends to one-half (½) inch from the widest part of the weld, in lieu of the examination volume requirements of ASME Code Section XI, Figure IWB-2500-7(b), which specify an examination volume extending to a distance of $t_s/2$ from the widest part of the weld.

3.5 Licensee's Bases for Alternative

In their February 27, 2004, submittal, the licensee provided the following basis for use:

> "The required examination volume for the reactor pressure vessel (RPV) nozzle-to-vessel welds extends far beyond the weld into the base metal, and is unnecessarily large. This proposed alternative would re-define the examination volume boundary to one-half (½) inch of base metal on each side of the widest portion of the weld. This reduction in base metal inspection will not affect the flaw detection capabilities in the weld and heat affected zone. The proposed reduction in exam volume is base metal only.
>
> The creation of flaws during plant service in the volume excluded from the proposed reduced examination is unlikely because of the low stress in the base metal away from the weld. The stresses caused by welding are concentrated at, or near, the weld. Cracks, should they initiate, occur in the high-stressed areas of the weld. These high stress areas are contained in the volume that is defined by [ASME] Code Case N-613-1 and are thus subject to examination. During previous examinations, no indications exceeding the allowable limits of the preservice or inservice criteria were found in the reactor pressure vessel [RPV] nozzle-to-shell examination volumes including the base metal areas proposed for exclusion from examination in this request. The prior thorough examination of the base metal and the examination of the high-stressed areas of the weld provide an acceptable level of quality and safety."

On June 15, 2004, the staff issued a request for additional information (RAI) to support the request for relief. In this letter, the staff requested that the licensee provide a supplemental diagram showing the proposed examination volume. In their RAI response dated July 21, 2004, the licensee provided a sketch and a list of all nozzle-to-vessel welds within the scope of this relief request and are included in Attachment 1 and Attachment 2, respectively.

In their RAI response dated July 21, 2004, the licensee clarified that the manual ultrasonic testing (UT) will be performed from the outside diameter (OD) using performance demonstration initiative (PDI) qualified techniques and personnel. The vessels and nozzles are composed of carbon steel; the weld material is ferritic. Nozzle bore sizes range from approximately 2 inches to 28 inches in diameter.

The staff inquired about the positive means of examination to be used to identify the weld extremities. NMC responded that use of the proposed examination boundaries will be conducted in conjunction with their programmatic implementation of the mandated use of ASME Code Section XI, Appendix VIII, Performance Demonstration for Ultrasonic Examination Systems. NMC will implement these requirements in accordance with ASME Code Section XI, Appendix VIII, of the 1995 Edition with the 1996 Addenda, as amended by the Final Rule and approved reliefs/alternatives, as applicable. NMC will comply with these requirements through the use of the Electric Power Research Institute (EPRI) PDI Program. Use of the PDI Program will ensure that the techniques and UT methodologies will be qualified and examination personnel certified by a performance demonstration. The experienced PDI-qualified examiners who will perform the inspections are capable of visually identifying the extremities (widest sections) of the nozzle-to-vessel weld.

The staff also requested that the licensee provide the technical basis to conclude that the portions of the base metal that would be excluded from examination by this relief request are not susceptible to service-induced degradation. In response, the licensee stated that the technical basis for the conclusion was provided in the EPRI Technical Report 1003557, BWRVIP-108: BWR [Boiling Water Reactor] Vessel and Internals Project [BWRVIP] - Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii (letter dated November 25, 2002, C. Terry, BWRVIP, to NRC.)

4.0 STAFF EVALUATION

The licensee has requested relief from the examination volume requirements specified in Table IWB-2500-1 of the ASME Code Section XI, pertaining to full penetration nozzles in the RPV. NMC proposed to use a reduced examination volume, extending to one-half (½) inch from each side of the widest part of the nozzle-to-vessel weld in lieu of an examination volume extending to a distance equal to one-half (½) the through-wall thickness from each side of the widest part of the nozzle-to-vessel weld.

The licensee provided supplemental information showing the specific configuration of the nozzle-to-vessel welds and the revised examination volume, as well as a listing of all welds included within the scope of this relief request. All of the welds for which relief is requested have a configuration as shown in Figure 2 of the ASME Code Case N-613-1. The specific revised examination volume is defined as region A-B-C-D-E-F-G-H. All other aspects of the examination volumes for RPV nozzle-to-vessel welds remain unchanged by the licensee's request.

NMC will examine the specified nozzle-to-vessel welds from the OD of the vessel welds using manual ultrasonic methods. This will allow for the extremities of the nozzle-to-vessel welds to be precisely located, thereby assuring complete coverage of the modified examination volume on each side of the weld crown. In addition, NMC stated that, in accordance with Appendix VIII of ASME Code Section XI, the examinations will be performed by PDI-qualified examiners who are capable of visually identifying the extremities or widest sections of the weld.

The acceptability of the reduced examination volume is based on prior full volumetric examinations of the welds and base metal, as well as the internal stress distribution near the weld. Previous examinations showed no indications exceeding the allowable limits of the preservice or inservice criteria. Further, the creation of flaws in the volume excluded from the proposed reduced examination is unlikely because of the low stress in the base metal away from the weld. The stresses caused by welding are concentrated at or near the weld. Cracks, should they initiate, occur in the highly stressed areas of the weld. To provide adequate coverage, these high stress areas and previously repaired areas are to be included in the reduced examination volume proposed by NMC.

Based on the above, the staff finds that the areas to be excluded from examination by the relief request have been found to be free of unacceptable flaws by previous examinations performed during inservice inspection and fabrication. The staff has determined that the initiation of flaws in these regions is highly unlikely due to the lower weld-induced stresses. Therefore, the proposed alternative to reduce the UT examination volume to one-half (½) inch from the widest part of the nozzle-to-vessel weld on each side of the weld crown will provide an acceptable level of quality and safety as required in 10 CFR 50.55a(a)(3)(i).

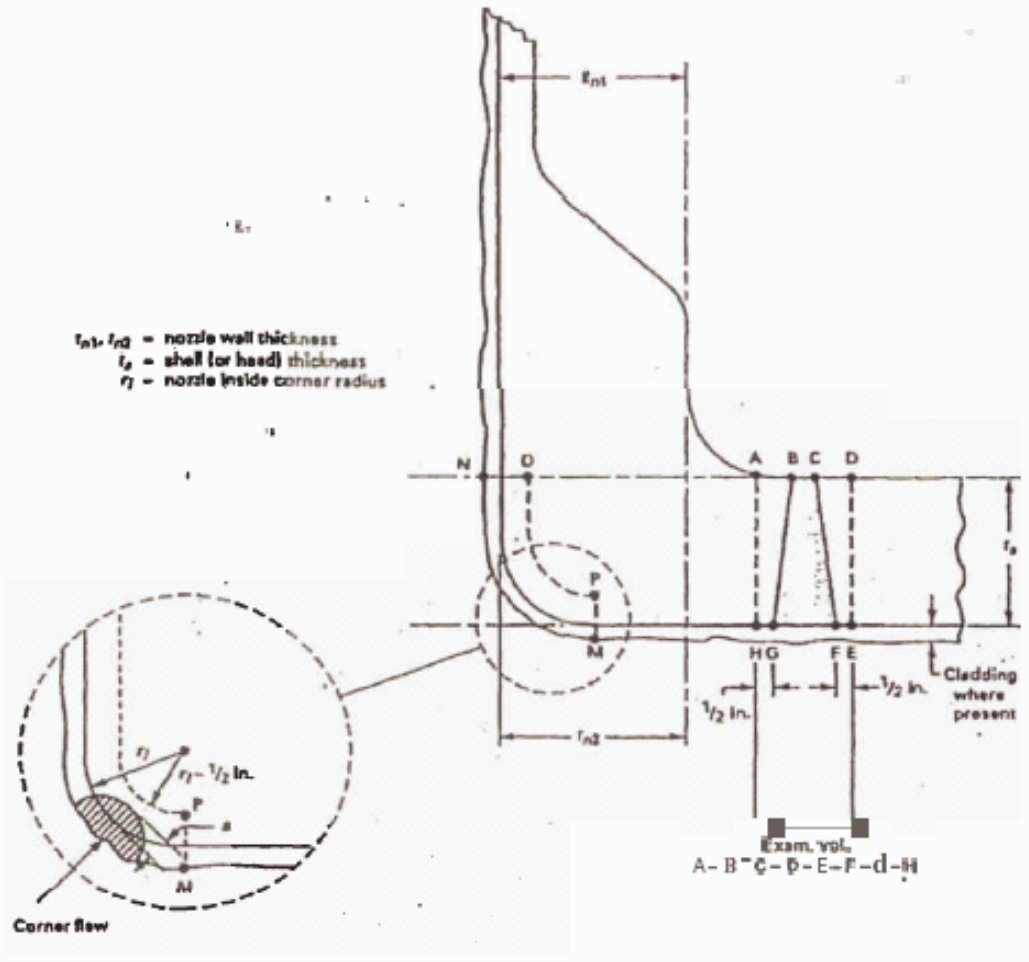
5.0 CONCLUSION

The staff has reviewed the licensee's submittal and concludes that the proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the use of ASME Code Case N-613-1 for the remainder of the third 10-Year Interval of the Inservice Inspection Program at DAEC, and for the remainder of the fourth 10-Year Interval of the Inservice Inspection Program at MNGP.

Principal Contributor: V. Rodriguez

Date: October 6, 2004

Attachment 1
ASME Code Case N-613-1, Figure 2



EXAMINATION REGION (Note (1))	EXAMINATION VOLUME (Note (2))
Shell (or head) adjoining region	C-D-C-F
Attachment weld region	B-C-F-G
Nozzle cylinder region	A-B-G-H
Nozzle inside corner region	M-N-O-P

NOTES:
(1) Examination regions are identified for the purpose of differentiating the acceptance standards in IWB-3512
(2) Examination volumes may be determined either by direct measurements on the component or by measurements based on design drawings.

FIG. 2 NOZZLE IN SHELL OR HEAD
(Examination Zones in Flange Type Nozzles Joined by Full Penetration Butt Welds)

Attachment 2

Table 1
Duane Arnold Energy Center
Nozzle-to-Vessel Welds Within Scope of Request

Summary Number	Weld Identification and Description	Nozzle Configuration	Full Volume Exam Previously Completed to Extent Achievable	Nondestructive Examination Method
008700	MSC-D001, Reactor Vessel Nozzle - Main Steam	Code Case N-613-1 Figure 2	Examined in 1993 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
008900	MSD-D001, Reactor Vessel Nozzle - Main Steam	Code Case N-613-1 Figure 2	Examined in 1993 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
005800	FWB-D001, Reactor Vessel Nozzle - Feed Water	Code Case N-613-1 Figure 2	Examined in 1996 with General Electric Reactor Inspection System (GERIS); no recordable indications.	UT-0 UT-45 UT-60
006300	FWC-D001, Reactor Vessel Nozzle - Feed Water	Code Case N-613-1 Figure 2	Examined in 1996 with GERIS; no recordable indications.	UT-0 UT-45 UT-60
006800	FWD-D001, Reactor Vessel Nozzle	Code Case N-613-1 Figure 2	Examined in 1996 with GERIS. One indication was recorded with the 45° T-scan exam that required evaluation per ASME Code Section XI, 1980 Edition, Winter 1981 Addenda and Regulatory Guide 1.150 and was found to be acceptable.	UT-0 UT-45 UT-60
010900	RRG-D001, Reactor Vessel Nozzle - Recirc. System Riser	Code Case N-613-1 Figure 2	Examined in 1993; no recordable indications.	UT-0 UT-45 UT-60
007900	JPB-D001, Reactor Vessel Nozzle - Jet Pump Instrumentation	Code Case N-613-1 Figure 2	Examined in 1993; no recordable indications.	UT-0 UT-45 UT-60
008100	LCA-D001,, Reactor Vessel Nozzle	Code Case N-613-1 Figure 2	Examined in 1993; no recordable indications.	UT-0 UT-45 UT-60
011500	VIB-D001, Reactor Vessel Nozzle	Code Case N-613-1 Figure 2	Examined in 1993; no recordable indications.	UT-0 UT-45 UT-60

Table 2

Monticello Nuclear Generating Plant
Nozzle-to-Vessel Welds Within Scope of Request

Summary Number	Weld Identification and Description	Nozzle Configuration	Full Volume Exam Previously Completed to Extent Achievable	Nondestructive Examination Method
102652	N-1A NV, RPV N-1A Nozzle, Recirc Suction	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102654	N-1B NV, RPV N-1B Nozzle, Recirc Suction	Code Case N-613-1 Figure 2	Examined in 2001 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102656	N-2A NV, RPV N-2A Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 2001 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102658	N-2B NV, RPV N-2B Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 2001 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102660	N-2C NV, RPV N-2C Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102662	N-2D NV, RPV N-2D Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102664	N-2E NV, RPV N-2E Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102666	N-2F NV, RPV N-2F Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102668	N-2G NV, RPV N-2G Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 1998 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102670	N-2H NV, RPV N-2H Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 1998 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102672	N-2J NV, RPV N-2J Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102674	N-2K NV, RPV N-2K Nozzle, Recirc Riser Inlet	Code Case N-613-1 Figure 2	Examined in 2001 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102676	N-3A NV, RPV N-3A, Main Steam Outlet	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60

Summary Number	Weld Identification and Description	Nozzle Configuration	Full Volume Exam Previously Completed to Extent Achievable	Nondestructive Examination Method
102678	N-3B NV, RPV N-3B, Main Steam Outlet	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102680	N-3C NV, RPV N-3C, Main Steam Outlet	Code Case N-613-1 Figure 2	Examined in 1998 from RPV shell side only due to nozzle configuration; One indication was recorded with the 60° scan which required evaluation per ASME Code Section XI, 1986 Edition with no Addenda and was found to be acceptable. Indication is contained within the reduced volume of Code Case N-613-1, Figure 2.	UT-0 UT-45 UT-60
102682	N-3D NV, RPV N-3D, Main Steam Outlet	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102684	N-4A NV, RPV N-4A, Feedwater Inlet	Code Case N-613-1 Figure 2	Examined in 1996 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102686	N-4B NV, RPV N-4B, Feedwater Inlet	Code Case N-613-1 Figure 2	Examined in 1998 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102688	N-4C NV, RPV N-4C, Feedwater Inlet	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102690	N-4D NV, RPV N-4D, Feedwater Inlet	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102692	N-5A NV, RPV N-5A, Feedwater Inlet	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102694	N-5B NV, RPV N-5B, Core Spray Inlet	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102375	N-6A NV, RPV N-6A, Spare (formerly Reactor Vessel Head Spray)	Code Case N-613-1 Figure 2	Examined in 1996 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102377	N-6B NV, RPV N-6B, Spare	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102379	N-7 NV, RPV N-7, Reactor Vessel Head Vent	Code Case N-613-1 Figure 2	Examined in 1998 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102696	N-8A NV, RPV N-8A, Jet Pump Instrumentation	Code Case N-613-1 Figure 2	Examined in 1994 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60

Summary Number	Weld Identification and Description	Nozzle Configuration	Full Volume Exam Previously Completed to Extent Achievable	Nondestructive Examination Method
102698	N-8B NV, RPV –8B, Jet Pump Instrumentation	Code Case N-613-1 Figure 2	Examined in 2001 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102700	N-9 NV, RPV –9, Spare (formerly CRD Return)	Code Case N-613-1 Figure 2	Examined in 1996 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60
102623	N-10 NV, RPV –10, Standby Liquid Control Injection	Code Case N-613-1 Figure 2	Examined in 2000 from RPV shell side only due to nozzle configuration; no recordable indications.	UT-0 UT-45 UT-60

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