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SUBJECT: Requests permanent relief from ISI requirements of 10CFR50.55a(g) for volumetric exam of circumferential RPV welds (ASME Code Section XI,Table IWB-2500-1,Evaluation Category B-A,Item 1.11,Circumferential Shell Welds).

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Niagara Mohawk

Richard B. Abbott
Vice President
Nuclear Engineering

Phone: 315.349.1812
Fax: 315.349.4417

December 10, 1998
NMP1L 1391

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

RE: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Subject: ***Proposed Alternatives for Examination of Reactor Pressure Vessel Shell Welds***

Gentlemen:

Pursuant to NRC Generic Letter 98-05, "Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief From Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Shell Welds," Niagara Mohawk Power Corporation (NMPC) requests permanent relief from the inservice inspection requirements of 10CFR50.55a(g) for the volumetric examination of circumferential reactor pressure vessel (RPV) welds (ASME Code Section XI, Table IWB-2500-1, Evaluation Category B-A, Item 1.11, Circumferential Shell Welds). This proposed alternative is requested pursuant to 10CFR50.55a(a)(3)(i), 10CFR50.55a(a)(3)(ii), and 10CFR50.55a(g)(6)(ii)(A)(5). NMPC intends to perform an examination of the Nine Mile Point Unit 1 (NMP1) RPV shell welds during the next refueling outage (RFO15), scheduled to commence in April 1999. This proposal to inspect only the longitudinal (i.e., axial) shell welds constitutes a request for permanent relief from, i.e., an alternative to, the required inspections for RPV shell welds specified in 10CFR50.55a(g)(6)(ii)(A)(2).

Additionally, NMPC requests approval of an alternative to the examination requirements specified in 10CFR50.55a(g) for the volumetric examination of longitudinal RPV shell welds and the shell-to-flange weld (ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item 1.12, Longitudinal Shell Welds and Item 1.30, Shell-to-Flange Weld). This proposed alternative is requested pursuant to 10CFR50.55a(a)(3)(i) and 10CFR50.55a(g)(6)(ii)(A)(5). NMPC proposes to perform an automated inspection of certain RPV welds using personnel and procedures qualified to the "Performance Demonstration Initiative," (PDI). The examinations will be performed using the General Electric Remote Inspection System (GERIS-2000). The use of these inspection procedures is an alternative to the requirements of 10CFR50.55a(b)(2).

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Attachment 1 contains NMPC's proposed alternative and supporting justification for the examination of the RPV shell welds for NMP1. The examination of the RPV axial shell welds and incidental examination of approximately 2 to 3 percent of intersecting circumferential shell

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welds will be performed to the maximum extent practicable from the inner diameter surface within the constraints of vessel design and internal interference. The remaining portion of the RPV circumferential shell weld examinations would be permanently deferred for the life of the unit license. Also provided is the intended scope of examination and anticipated examination coverage to be obtained for each axial shell weld. These projections are based on an in-vessel access study performed by General Electric during a previous refueling outage. Actual examination of the axial shell welds may yield a variance from the expected examination coverage. This is consistent with the provisions set forth in NRC Generic Letter 98-05. Based on the evaluation contained in Attachment 1, NMPC has concluded that this alternative provides an acceptable level of quality and safety. Furthermore, compliance with the specified requirements of 10CFR50.55a(g)(6)(ii)(A)(2) would result in hardship and unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, this proposed alternative satisfies the requirements of 10CFR50.55a(a)(3)(i) and 10CFR50.55a(a)(3)(ii).

Attachment 2 contains NMPC's request of an alternative and supporting justification for the use of the GERIS-2000 system and associated procedures and personnel to examine the longitudinal RPV shell welds and the shell-to-flange weld. Based on the evaluation contained in Attachment 2, NMPC has concluded that this alternative provides an acceptable level of quality and safety. Accordingly, this proposed alternative satisfies the requirements of 10CFR50.55a(a)(3)(i).

Review and approval of the proposed alternatives is requested prior to February 15, 1999.

Very truly yours,

Richard B. Abbott

Richard B. Abbott
Vice President - Nuclear Engineering

RBA/KWK/kap
Attachment

xc: Mr. H. J. Miller, NRC Regional Administrator
Mr. S. S. Bajwa, Director, Project Directorate I-1, NRR
Mr. G. K. Hunegs, Senior Resident Inspector
Mr. D. S. Hood, Senior Project Manager, NRR
Records Management

ATTACHMENT 1

Proposed Alternatives For Examination of Reactor Pressure Vessel Shell Welds

A. COMPONENT IDENTIFICATION

ASME Section XI, Table IWB-2500-1, Code Category B-A, "Pressure Retaining Welds in Reactor Vessel," Code Item No. B1.10, "Shell Welds"

Circumferential Welds	Axial Welds	
RV-WD-100	RV-WD-130	RV-WD-131
RV-WD-101	RV-WD-132	RV-WD-133
RV-WD-137	RV-WD-134	RV-WD-135
RV-WD-138	RV-WD-139	RV-WD-140
	RV-WD-141	RV-WD-142
	RV-WD-143	RV-WD-144

B. EXAMINATION REQUIREMENTS

10CFR50.55a(g)(6)(ii)(A)(2) states that all licensees shall augment their reactor vessel inservice inspection program by implementing the examination requirements for Reactor Pressure Vessel (RPV) shell welds specified in Code Item No. B1.10 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of Subsection IWB of the 1989 Edition of Section XI, Division 1, of the ASME Boiler and Pressure Vessel Code, subject to the conditions specified in 10CFR50.55a(g)(6)(ii)(A)(3) and (4). As stated in 10CFR50.55a, for the purposes of this augmented examination, essentially 100 percent as used in Table IWB-2500-1 means more than 90 percent of the required examination volume for each weld. Additionally, 10CFR50.55a(g)(6)(ii)(A)(5) requires licensees that are unable to completely satisfy the augmented RPV shell weld examination requirement to submit information to the Nuclear Regulatory Commission (NRC) to support the determination, and propose an alternative to the extent necessary as to provide an acceptable level of quality and safety.

C. ALTERNATIVE FROM EXAMINATION REQUIREMENTS

The proposed examinations are an alternative to the augmented examinations required for RPV shell welds specified in 10CFR50.55a(g)(6)(ii)(A)(2), and to the inservice inspection requirements of the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition (Table IWB-2500-1, Examination Category B-A, Item No. B1.10). The proposed alternative includes performing an examination, from the internal ID surface, of only the RPV axial shell welds (Item No. B1.12) and approximately 2-3 percent of the intersecting circumferential RPV shell weld (Item No. B1.11) to the maximum extent practicable. The examination of the remaining portions of the RPV circumferential shell welds will be permanently deferred for the life of the unit license.

D. BASIS FOR THE ALTERNATIVE

1. ELIMINATION OF RPV CIRCUMFERENTIAL WELDS FROM INSPECTION

On November 10, 1998, NRC Generic Letter 98-05, "Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Shell Welds" was issued. The letter stated that BWR licensees may seek permanent relief from performing examinations of the RPV circumferential shell welds for the duration of the original operating license. This determination was supported by NRC staff's Safety Evaluation Report to the BWRVIP, dated July 28, 1998 which would require, on a plant-specific bases, licensees demonstrate that: 1) at the end of a unit's license the RPV circumferential welds will continue to satisfy the limiting conditional failure probability, and 2) licensees have implemented operator training and established procedures that limit the frequency of beyond design basis low temperature over-pressure (LTOP) events to the limits specified in NRC Safety Evaluation Report. The plant specific evaluation against both criteria is provided below.

Demonstrate at the end of license, the circumferential welds will satisfy the limiting conditional failure probability for circumferential welds in the NRC's July 28, 1998, safety evaluation to the BWRVIP-05 report.

Table 1 illustrates that NMP1 has conservatism in comparison to the NRC Final Evaluation of BWRVIP-05 Limiting Plant Specific Analysis. The chemistry factor, adjustment of the reference temperature (ΔRT_{NDT}), and mean RT_{NDT} are calculated consistent with the guidelines of NRC Regulatory Guide 1.99, Rev. 2. The data presented for NMP1 in the BWRVIP response to the NRC Request for Additional Information (RAI) on BWRVIP-05 is shown in Table 1. The fluence value on Table 1 bounds the highest fluence beltline circumferential weld. The maximum Cu% and Ni% variability from the most current data available is also bounded.

TABLE 1

PARAMETER DESCRIPTION	NMP1 COMPARATIVE PARAMETERS AT 32 EFPY (BOUNDING CIRCUMFERENTIAL WELD)	USNRC LIMITING PLANT SPECIFIC ANALYSIS PARAMETERS AT 32 EFPY SE TABLE 2.6-4	
		SE "VIP"	SE "CEOG"
Fluence, n/cm^2	2.21×10^{18}	2.0×10^{18}	2.0×10^{18}
Initial RT_{NDT} °F	-50	0	0
Chemistry Factor	112	151.7	172.2
Cu%	0.22*	0.13	0.183
Ni%	0.20*	0.71	0.704
ΔRT_{NDT} °F	66.5	86.4	98.1
Mean RT_{NDT} °F	16.5	86.4	98.1

Notes: SE = NRC Safety Evaluation, entitled, "Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC NO. M93925)," dated July 28, 1998

* The Cu% and Ni% bounds the maximum GL 92-01 NMP1 weld chemistry variability as documented in NMPC's September 4, 1998 RAI response to TAC NO. MA1200.

As shown above, the impact of irradiation results in lower plant-specific mean RT_{NDT} for the NMP1 circumferential weld material as compared to that for any of the Staff's plant-specific analyses which were performed for the CE fabricated RPV's with the highest adjusted reference temperatures. Comparison of the NMP1 specific data and the data used in the NRC Final Safety Evaluation indicates the difference is the combined effects of the Ni% and Cu% on the Chemistry Factor, which is by itself bounded by the NRC Independent Assessment, and the initial RT_{NDT}. Therefore, the limiting plant-specific conditional probability of failure P(FIE), determined by the Staff, bounds the NMP1 case through the projected end of license.

Thus, the BWRVIP specific results relative to NMP1 as presented in BWRVIP-05 and subsequent RAI responses are consistent with those in the NRC Independent Assessment. Both analyses conclude that the failure probability associated with the circumferential welds is extremely small, and that it is orders of magnitude less than that for axial welds. Therefore, the NMP1 circumferential weld satisfies, at the end of license, the limiting conditional failure probability for circumferential welds stated in the NRC Staff's July 28, 1998, Safety Evaluation.

Demonstrate that licensees have implemented operator training and established procedures that limit the frequency of cold over-pressure events to the amount specified in NRC Safety Evaluation Report to the BWRVIP, dated July 28, 1998.

The NRC staff indicated that the potential for, and consequences of, non-design basis events not discussed in the BWRVIP-05 report should be addressed. In particular, the NRC stated that non-design, low temperature over-pressure transients (LTOP) should be considered. The NRC further went on to describe several types of events that could be precursors to an LTOP. The BWRVIP provided a response to this issue concluding that Condensate and Control Rod Drive (CRD) pumps could cause such a condition leading to an LTOP event. This was summarized in the NRC Safety Evaluation of BWRVIP-05.

NMPC has in place procedural controls which monitor and control reactor temperature and water inventory during cold shutdown, minimizing the likelihood of an RPV LTOP event. Additionally, these controls are reinforced through NMPC's reactor operator training program.

The RPV Leakage and Hydrostatic pressure test procedures used at NMP1 have sufficient procedural guidance to prevent LTOP. The leakage test is performed at the conclusion of each refueling outage, while the hydrostatic test is performed once every ten years. These pressure tests are infrequently performed, complex tasks, and the test procedures are controlled as Special Plant Evolutions. As such, a requirement is included in the procedures for an extensive "pre-job" briefing to be conducted with all essential personnel including Operations management. The briefing discusses the anticipated testing evolution with special emphasis on conservative decision making, plant safety awareness, lessons learned from similar in-house or industry operating experiences, the importance of open communications and finally the process in which the test would be aborted if plant systems responded in an adverse manner. Vessel pressure and temperature are required to be monitored throughout the tests to ensure compliance with the plant Technical Specification pressure-temperature curve limits. Also, the procedures require the designation of a "Principal Test Engineer" for the duration of the test who is a single point of accountability, responsible for coordinating testing from initiation to closure, and maintaining operations and plant management cognizant of the test status.

With regard to inadvertent system injection resulting in an LTOP condition, NMP1 high pressure makeup system, (i.e., the High Pressure Coolant Injection (HPCI)) as well as the normal feedwater system are interconnected. The portion of the system for HPCI operation is comprised of two (2) motor driven condensate, feedwater booster and feedwater pumps. HPCI is a mode of operation of the Condensate and Feedwater systems rather than an independent, stand alone system. As such, the HPCI system contains only I&C components as

its own dedicated equipment. HPCI initiation is prompted by the Reactor Protection System under the following conditions: 1) a turbine trip, or 2) low reactor water level. During shutdown of the unit, the associated booster and feedwater pumps in the system are secured in accordance with operating procedures. Equipment malfunction or inappropriate operational action would be necessary to cause inadvertent system operation.

During normal cold shutdown conditions, with the RPV head installed, RPV level and pressure are controlled with the CRD System, Condensate Feedwater System, and Reactor Water Cleanup (RWCU) System using a "feed and bleed" process. The RPV is not taken solid during these times, and plant procedures require opening of the head vent valves after the reactor has been depressurized to approximately 15 psig.

The Liquid Poison System is another high pressure water source to the RPV, however, there are no means of automatic system activation. System injection requires an operator to manually reposition a key-locked control switch to start the system from the Control Room. The system may also be operated from a remote local test station. The only injection path to the RPV is through two explosive actuated injection valves that are interlocked with the key-locked switch in the Control Room. Local testing of the pumps uses demineralized water from a test tank and is a closed test loop. The injection rate for each pump is approximately 30 gpm, which would give the operator sufficient time to control reactor pressure.

Procedural controls are in place to respond to an unexplained rise in reactor pressure which could result from a spurious activation of an injection source. Actions specified include determination and isolation of the pressure source, verification of reactor head vents and/or MSIVs open and, as necessary, relieving reactor pressure using available plant equipment (e.g., electromagnetic relief valves, reactor water cleanup and reactor bottom drain).

During normal cold shutdown conditions, reactor water level and temperature are maintained within established ranges in accordance with operating procedures. The Operations manual governing Control Room activities requires that the Control Room operators frequently monitor for indications and alarms to detect problems and abnormalities as early as possible. An Operations procedure also requires that the control room supervisor be notified immediately of any change or abnormality in plant indications and controls. Furthermore, reactor water level and temperature operating bands and changes thereto are established under the direction of the Station Shift Supervisor. Therefore, any deviations in reactor-water level or temperature from a specified band will be identified and corrected. Finally, plant conditions and on-going activities are discussed during each shift turnover. This ensures that on-coming operators are cognizant of activities that could adversely affect reactor level, pressure, or temperature.

Plant specific procedures have been developed to provide operator guidance regarding compliance with the plant Technical Specification RPV pressure-temperature curve limits. Additionally, operators receive training on RPV brittle fracture and the relationship of these pressure-temperature curve limits.

During plant outages, NMP1 work control processes ensure that the outage schedule and

changes to the schedule receive a thorough shutdown risk assessment review to ensure defense-in-depth is maintained. Work is coordinated through the Work Control Center which provides an additional level of Operations oversight. In the Control Room, the Station Shift Supervisor is required to maintain cognizance of any activity that could potentially affect reactor safety during refueling outages. Expected plant responses and contingency actions to address unexpected conditions, that may be encountered, are required to be evaluated as stated in the administrative controls for risk management and management of outages.

As discussed above, NMPC has implemented procedural controls and training to minimize the probability of an LTOP event. Accordingly, the above information and the supporting technical documentation contained in the BWRVIP-05 report and NRC Safety Evaluation provide a basis for excluding RPV circumferential welds from the augmented examination requirements of 10CFR50.55a(g) and ASME Section XI.

2. WELD ACCESSIBILITY

NMP1, a BWR/2, has an RPV that was designed and fabricated to the rules of ASME Sections I and VIII, including Nuclear Code Cases 1270N and 1273N. Additionally, General Electric's Specification for design and fabrication included additional requirements for materials and inspection that were similar to ASME Section III. Early vintage plants of this type were designed, fabricated and erected prior to the examination and inspection requirements of ASME Section XI. Specific ultrasonic (UT) examination criteria were not required by ASME I, III, or VIII for preservice inspection of the vessel and not factored into the plant design, hence external access to the RPV axial shell welds is constrained due to inadequate clearances between the bioshield wall and vessel insulation.

The NMP1 examination plan requires examination of 100% of all accessible regions of the RPV axial welds. The ability to inspect 100% of the axial welds will be limited, in some cases, due to the physical constraints of the RPV internal vessel design and arrangement of internal components. An internal vessel accessibility study of the RPV was performed by General Electric to determine the inspectability of the RPV axial shell welds and to obtain clearance measurements for the GERIS-2000. Several internal vessel components will limit a 100% ID UT examination including interference from the Feedwater Sparger, Specimen Brackets, Vibration Brackets, the Shroud Support Baffle Plate, and Shroud Repair Tie Rod Assembly. Even with these limitations, the overall projected percentage of effective weld examination coverage in the beltline region is approximately 92%. Tables 2 and 3 provide an illustration of the anticipated examination coverage of the axial welds during the forthcoming refueling outage (RFO15). Included in Table 3 is a column identifying the specific limitation precluding essentially 100% of the axial shell welds. A drawing also provides the location of the welds in relation to the reactor pressure vessel.

NMPC concludes that permanent deferral of the examination of the RPV circumferential shell welds for the life of the operating license and the reduced examination coverage of the axial welds is justified and presents an acceptable level of quality and safety to satisfy the requirements of 10CFR50.55a(a)(3)(i), 10CFR50.55a(a)(3)(ii), and 10CFR50.55a(g)(6)(ii)(A)(5).

TABLE 2

PROJECTED EXAMINATION COVERAGE OF RPV BELTLINE REGION AXIAL WELDS			
Weld Number ID	**Weld Length in Beltline Region (in)**	**Projected ID Examination Length In Beltline Region (in)**	**% Of Weld Length In Beltline to be Examined**
RVWD-139	128	128	100%
RVWD-140	128	128	100%
RVWD-141	128	91	71%
RVWD-142	40	40	100%
RVWD-143	40	40	100%
RVWD-144	40	40	100%
TOTAL	504	467	92.6%

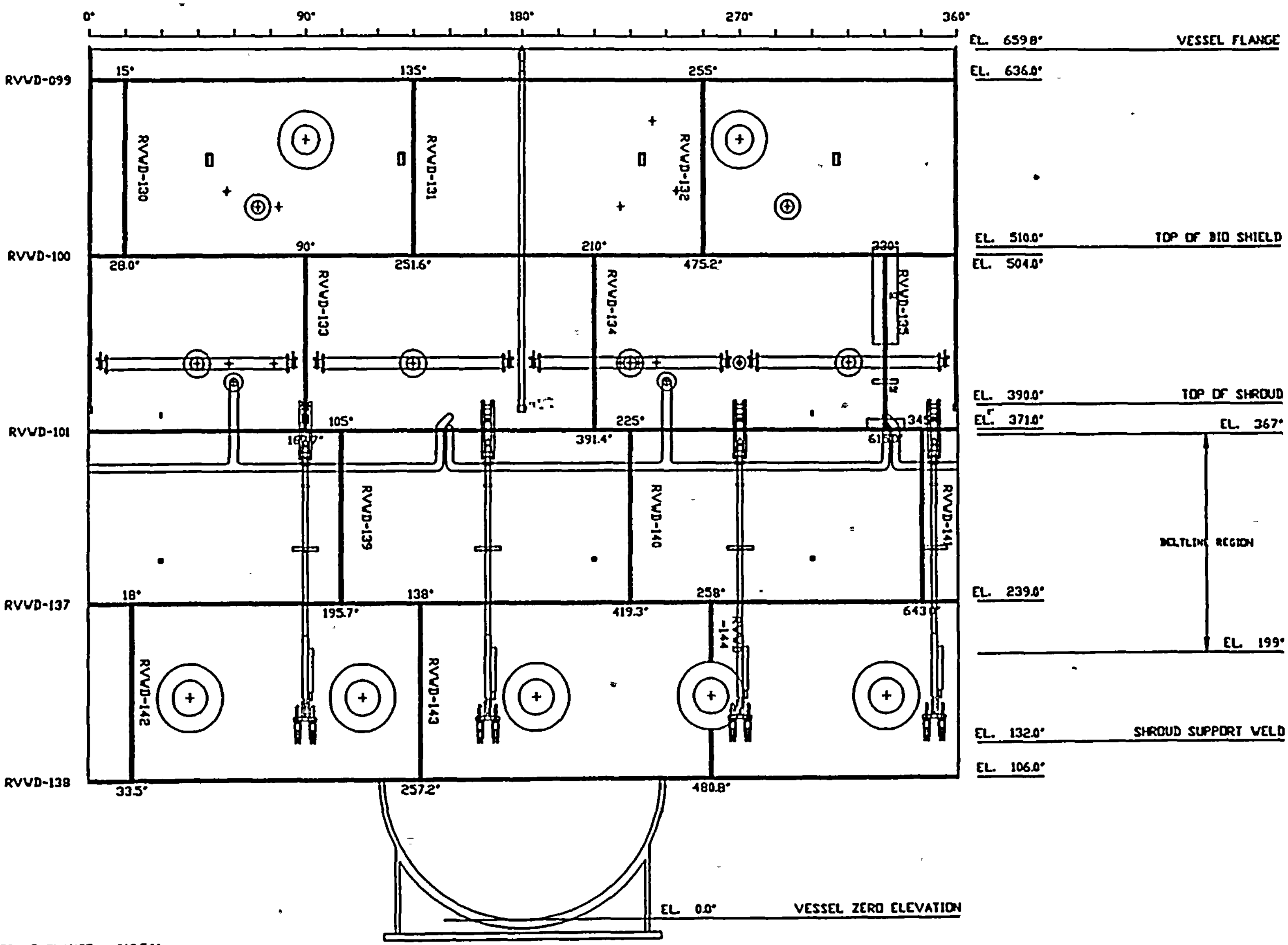
TABLE 3

EXAMINATION OF ALL REACTOR VESSEL AXIAL WELDS				
Weld Number ID	**Total Weld Length (in)**	**Projected ID Examination Total Length (in)**	**% of Total Weld Length to be Examined**	**Cause of Limitation (See Notes)**
RVWD-130	132	132	100%	
RVWD-131	132	132	100%	
RVWD-132	132	132	100%	
RVWD-133	133	76	57%	FWS
RVWD-134	133	76	57%	FWS, VB, SB
RVWD-135	133	80	60%	FWS
RVWD-139	132	132	100%	
RVWD-140	132	132	100%	
RVWD-141	132	91	68%	SRTR
RVWD-142	133	101	76%	SSBP
RVWD-143	133	101	76%	SSBP
RVWD-144	82*	52	63%	SSBP
TOTAL	1538	1230	79.9%	

NOTES: FWS - Feedwater Sparger, VB - Vibration Bracket, SB - Specimen Bracket, SRTR - Shroud Repair Tie Rod, SSBP - Shroud Support Baffle Plate

* Weld RVWD 144 is reduced due to the intersection with a Recirculation Nozzle

NINE MILE POINT – UNIT 1



VESSEL DIAMETER AT FLANGE = 213.56"

AZIMUTHS = 1.8637 INCHES PER DEGREE

GE NUCLEAR ENERGY	NINE MILE POINT – UNIT 1	VESSEL ID ROLLOUT	SCALE: NONE	DWG. NM1-0001	REV. 0

ATTACHMENT 2

Proposed Examination Alternative

NMPC requests approval of an alternative to the examination requirements specified in 10CFR50.55a(b)(2) for the volumetric examination of longitudinal RPV shell welds and the shell-to-flange weld (ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item 1.12, Longitudinal Shell Welds and Item 1.30, Shell-to-Flange Weld). Specifically, NMPC proposes to perform an automated inspection of these RPV welds using personnel and procedures qualified to the "Performance Demonstration Initiative," (PDI). The examinations will be performed using the General Electric Remote Inspection System (GERIS-2000). The GERIS-2000 system and procedures were demonstrated and qualified to the satisfaction of PDI and in accordance with ASME Section XI, 1992 Edition with the 1993 Addenda, Appendix VIII.

The examination procedure uses echo-dynamic motion and tip diffraction characteristics of flaws for detection and sizing in lieu of ASME Code amplitude based techniques. All accessible weld examination volumes will be interrogated by the same straight and angle beam search units required by ASME Section V, Article 4 and an additional 70 degree refracted longitudinal search unit will be employed to ensure adequate investigation of the RPV axial weld clad base metal interface.

A comparison between the ASME Section V, Article 4 ultrasonic methods and procedures developed to satisfy the PDI can best be described as a comparison between a prescriptive, compliance procedure (ASME Section V) and a demonstrative results driven procedure (PDI). A typical ASME Section V procedure derives examination sensitivity to detect and size flaws based on the amplitude of a known reflector in a calibration standard. This method provides a means for standardization during examination. This ultrasonic method has, however, since been recognized as potentially providing inaccurate results for the application.

The PDI process, rather than just specifying the means by which an examination will be performed, specifies the results of the examination. Simply stated, a group of inspection specimens containing actual cracks and imbedded flaws provided for demonstration of a procedure. These flaws are typical of those that may be encountered in an insitu inspection of RPV shell welds and are characteristic to the flaw acceptance criteria contained in ASME Section XI, thereby validating the examination through performance. Compliance procedures would have great difficulty even detecting these type of flaws during a PDI process since the reflective amplitudes are very low or even discernible, the difference being that the PDI process requires detection and measurement of tip diffracted signals whereas the compliance process relies on larger specular reflectors.

Regulatory Guide 1.150, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examination" was issued by the Staff in 1981 as a means to initiate a change to ultrasonic procedures to be results based versus compliance based. The regulatory guide contains concepts for flaw detection and sizing but does not provide the means by which to perform the demonstrations. The regulatory guide does not provide for the number of flawed specimens, blind tests, or mandate an expected level of performance as does PDI. The regulatory guide only requires an estimate of expected capability.

The use of PDI qualified personnel and procedures results in a more sensitive examination and will provide added assurance for flaw detection and sizing, and is thereby an acceptable alternative to the requirements of the 1989 Edition of the ASME Section XI Code and Regulatory Guide 1.150. The error band for flaw sizing has been established within the limits of ASME Section XI, Appendix VIII. Accordingly, the proposed alternative to 10CFR50.55a(b)(2) is justified and provides an acceptable level of quality and safety to satisfy the requirements of 10CFR50.55a(a)(3)(i).