



WITHHOLD UNDER 10 CFR 2.390
Attachments 3, 4, and 5 contains proprietary information; upon removal of Attachments 3, 4, and 5, this cover letter, Attachments 1, 2, 6, 7, 8, 9, 10, and 11 are decontrolled.

Exelon Generation®

200 Exelon Way
 Kennett Square, PA 19348

www.exeloncorp.com

10 CFR 50.55a

LG-18-068

May 4, 2018

U.S. Nuclear Regulatory Commission
 Attn: Document Control Desk
 Washington, DC 20555-0001

Limerick Generating Station, Unit 2
 Renewed Facility Operating License No. NPF-85
NRC Docket No. 50-353

Subject: Proposed Relief Request Associated with Reactor Pressure Vessel Nozzle Repairs

Reference: 1) Letter from J. Danna (U.S. Nuclear Regulatory Commission) to B. Hanson (Exelon Generation Company, LLC), "Limerick Generating Station, Unit 2 - Relief Request I4R-17, Associated with the Alternate Repair of a 2-Inch Instrument Line Nozzle at Penetration N-16D on the Reactor Pressure Vessel (CAC No. MF9702)," dated August 14, 2017

In accordance with 10 CFR 50.55a, "Codes and standards," paragraph (z)(2), Exelon Generation Company, LLC (EGC) requests approval of the attached relief request associated with the repair of a 2-inch instrument line nozzle at penetration N-16D on the Reactor Pressure Vessel (RPV). A relief request concerning this nozzle repair was previously approved in the Reference 1 letter for one operating cycle. The attached relief request applies to the remainder of the fourth 10-year Inservice Inspection (ISI) interval and the remainder of the plant life, which is currently scheduled to conclude on June 22, 2049.

The fourth 10-year ISI interval for Limerick Generating Station (LGS), Unit 2 began on February 1, 2017 and will conclude January 31, 2027. The fourth 10-year ISI interval complies with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 2007 Edition through 2008 Addenda.

We request your approval by April 14, 2019.

A summary of the regulatory commitments contained in this submittal is provided in Attachment 1. Attachment 2 contains Relief Request I4R-17, Revision 1.

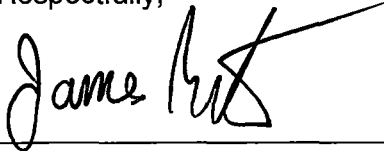
A047
NRR

WITHHOLD UNDER 10 CFR 2.390
Attachments 3, 4, and 5 contains proprietary information; upon removal of Attachments 3, 4, and 5, this cover letter, Attachments 1, 2, 6, 7, 8, 9, 10, and 11 are decontrolled.

Limerick Generating Station, Unit 2
Proposed Relief Request Associated with the
RPV Nozzle Repairs
May 4, 2018
Page 2

If you have any questions or require additional information, please contact Tom Loomis at 610-765-5510.

Respectfully,



James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

- Attachments:
- 1) Summary of Commitments
 - 2) Relief Request I4R-17, Revision 1
 - 3) "Limerick Unit 2 Instrumentation Nozzle N-16D As-Left J-Groove Weld Analysis," AREVA Document No. 32-9277252-000, Proprietary Version
 - 4) "Limerick Unit 2 Instrument Nozzle N-16D Repair Weld Residual Stress Analysis," AREVA Document No. 32-9274303-001, Proprietary Version
 - 5) "Corrosion Evaluation of the Limerick Unit 2 N-16D Reactor Vessel Nozzle Modification," Framatome Document No. 51-9271544-003, Proprietary Version
 - 6) "Limerick Unit 2 Instrumentation Nozzle N-16D As-Left J-Groove Weld Analysis - Non-Proprietary," AREVA Document No. 32-9281804-000, Non-Proprietary Version
 - 7) "Limerick Unit 2 Instrument Nozzle N-16D Repair Weld Residual Stress Analysis (Non-Proprietary)," AREVA Document No. 32-9277502-000, Non-Proprietary Version
 - 8) "Corrosion Evaluation of the Limerick Unit 2 N-16D Reactor Vessel Nozzle Modification - Non-Proprietary," Framatome Document No. 51-9271770-002, Non-Proprietary Version
 - 9) Affidavit Associated with AREVA Document No. 32-9277252-000
 - 10) Affidavit Associated with AREVA Document No. 32-9274303-001
 - 11) Affidavit Associated with Framatome Document No. 51-9271544-003

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, LGS
USNRC Project Manager, LGS
R. R. Janati, Pennsylvania Bureau of Radiation Protection (w/o Attachments)

ATTACHMENT 1

Summary of Commitments

Attachment 1
Summary of Commitments

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	Programmatic (Yes/No)
EGC will perform a bare metal VT-2 examination of the N-16D location from the OD of the LGS, Unit 2 vessel.	Each refueling outage during the Class 1 System Leakage Test.	No	Yes
EGC will perform a best-effort UT of the RPV low alloy steel surrounding the N-16D penetration to confirm that the as-left j-groove weld flaw does not propagate into the vessel wall material.	During the next refueling outage (Li2R15) and every 10 years thereafter.	No	Yes

Attachment 2

**Limerick Generating Station, Unit 2
Proposed Relief Request Associated with Reactor Pressure Vessel Nozzle Repair
Relief Request I4R-17, Revision 1**

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 1 of 9)

1. ASME CODE COMPONENTS AFFECTED

Code Class:	1
Reference:	IWB-2500, Table IWB-2500-1
Exam Category:	B-P
Item Number:	B15.10
Description:	Reactor Pressure Vessel (RPV) Instrument Penetration – 2-inch Nominal Pipe Size
Component Number:	N-16D

2. APPLICABLE CODE EDITION AND ADDENDA

The current Edition for the Inservice Inspection (ISI) interval is the American Society of Mechanical Engineers (ASME) Code, Section XI, 2007 Edition with the 2008 Addenda. The code of construction for the RPV is the ASME Code Section III, 1968 Edition up to and including Summer 1969 Addenda except that Article 4 of the Winter 1969 Addenda applies.

3. APPLICABLE CODE REQUIREMENT

Flaw Removal

- IWA-5250(a)(3) states "Components requiring corrective action shall have repair/replacement activities performed in accordance with IWA-4000 or corrective measures performed where the relevant condition can be corrected without a repair/replacement activity."
- IWA-4412 states "Defect removal shall be accomplished in accordance with the requirements of IWA-4420."
- IWA-4611.1(a) states "Defects shall be removed in accordance with IWA-4422.1. A defect is considered removed when it has been reduced to an acceptable size."
- N-528 of Section III, 1968 Edition up to and including Summer 1969 Addenda except that Article 4 of the Winter 1969 Addenda applies, requires repair of weld defects including removal of defects detected by leakage tests.

Flaw Evaluation

- IWB-3522.1 states, in part, "A component whose visual examination (IWA-5240) detects any of the following relevant conditions shall meet IWB-3142 and IWA-5250 prior to continued service ... "

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 2 of 9)

- IWB-3142.1(b) states "A component whose visual examination detects the relevant conditions described in the standards of Table IWB-3410-1 shall be unacceptable for continued service, unless such components meet the requirements of IWB-3142.2, IWB-3142.3, or IWB-3142.4."
- IWA-3300(a) states, in part, "Flaws detected by the preservice and inservice examinations shall be sized ... "
- IWA-3300(b) states, in part, "Flaws shall be characterized in accordance with IWA-3310 through IWA-3390, as applicable ... "
- IWB-3610(b) states, in part, "For purposes of evaluation by analysis, the depth of flaws in clad components shall be defined in accordance with Fig. IWB-3610-1 ... "
- The implementing reply of N-749 states "It is the opinion of the Committee that, in lieu of IWB-3610 and IWB-3620, flaws in ferritic steel components operating in the upper shelf temperature range may be evaluated using the following acceptance criteria." The methods and criteria of N-749 are based on the methods of elastic-plastic fracture mechanics (EPFM).
- IWB-3420 states "Each detected flaw or group of flaws shall be characterized by the rules of IWA-3300 to establish the dimensions of the flaws. These dimensions shall be used in conjunction with the acceptance standards of IWB-3500."

4. REASON FOR REQUEST

On May 8, 2017, during the pre-startup system leakage testing of the Limerick Generating Station (LGS), Unit 2 RPV following a routine refueling outage, a leak of approximately one pint per minute was observed between the RPV wall and a 2-inch instrument line nozzle (see Enclosure 1) at penetration N-16D.

As a result of leakage indications on the RPV penetration N-16D, Exelon Generation Company, LLC (EGC) performed a half-nozzle repair which partially replaced the existing nozzle assembly with a nozzle penetration that is resistant to Intergranular Stress Corrosion Cracking (IGSCC).

EGC applied a welded pad to a pre-existing weld pad on the Outer Diameter (OD) of the RPV using IGSCC resistant nickel Alloy 52M (ERNiCrFe-7A) filler metal. The pre-existing weld pad was installed as part of the RPV initial design. The new weld pad was installed using a machine Gas Tungsten Arc Welding (GTAW) Ambient Temperature Temper Bead (ATTB) welding technique. Then, EGC attached an IGSCC resistant nozzle to the new weld pad with a partial penetration weld using a non-temper bead manual welding technique and IGSCC resistant nickel Alloy 52M filler metal.

The original partial penetration attachment weld and a remnant of the original nozzle remains in place. A one-cycle flaw evaluation was performed to demonstrate the acceptability of leaving the original partial penetration attachment weld, with a maximum postulated flaw, in place for one cycle. NRC approval was sought and received for one cycle via Safety Evaluation dated August 14, 2017 (Reference ML17208A090). In Revision 1 of this relief request, approval is being requested for the proposed alternatives which now includes a multi-cycle flaw evaluation

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 3 of 9)

(see "Flaw Analytical Evaluation" below). Additionally, IWA-4410 and IWA-4611 contain requirements for the removal of, or reduction in size of defects. The defect on N-16D was not removed; therefore, relief is also sought from these requirements.

IWB-3400 and IWB-3600 were written with the expectation that volumetric Non-Destructive Examination (NDE) techniques such as Ultrasonic Testing (UT) would be used to determine the flaw size and shape. In support of the flaw evaluation and comparison to the applicable acceptance criteria, the ASME Code paragraphs IWB-3420 and IWB-3610(b) require characterization of the flaw in the N-16D penetration. Although demonstrated, there is not a qualified technique to perform NDE of the partial penetration weld in this configuration that can be used to accurately characterize the location, orientation, or size of a flaw in the weld.

The flaw evaluation methods presented in IWB-3610 and Appendix A of Section XI are based on Linear Elastic Fracture Mechanics (LEFM) methods. Code Case N-749 was developed to provide criteria for the use of Elastic-Plastic Fracture Mechanics methods (EPFM) as acceptable alternatives to the LEFM methods currently contained in IWB-3610 and Appendix A, for operating conditions where ferritic vessel materials are operating on the material toughness upper shelf. This Code Case is Conditionally Accepted in Revision 18 of NRC Regulatory Guide 1.147.

NB-4620 requires all welds to be post-weld heat treated except as otherwise permitted in NB-4622.7. Relief was initially requested and approved to install a welded pad using ATTB welding in accordance with ASME Code Case N-638-4. The NRC conditionally approved ASME Code Case N-638-4 in Revision 17 of NRC Regulatory Guide 1.147 to allow ATTB welding of dissimilar materials.

5. PROPOSED ALTERNATIVES AND BASIS FOR USE

In accordance with 10 CFR 50.55a, "Codes and standards," paragraph (z)(2), EGC proposes the following alternatives to the requirements specified in Section 3 above on the basis that performing a Code required repair results in a hardship without a compensating increase in quality and safety. A repair in accordance with the ASME Code, which would remove the flaw from the inner portion of the vessel, would require a full core offload to access the repair location, result in significant risk associated with the inclusion of loose parts and foreign material, and result in significant increase in radiological exposure. These areas of concern result in a significant hardship over the currently planned modification.

- As an alternative to flaw removal or reduction in size to meet the applicable acceptance standards IWA-5250(a)(3), EGC implemented an OD repair of the RPV instrument nozzle N-16D utilizing an OD weld pad as described in the repair of nozzle penetration section below.
- As an alternative to performing the NDE required to characterize the flaw under IWB-3420 and IWB-3610(b) in penetration N-16D, EGC proposes analyzing a maximum postulated flaw that bounds the range of flaw sizes that could exist in the original J-groove weld and nozzle.

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 4 of 9)

Basis for Use

A. Background

The LGS, Unit 2 RPV is manufactured from SA-533, Grade B quenched and tempered low alloy steel that is ID clad with stainless steel. There is an 11 5/8 inch diameter 2-inch thick nozzle reinforcement weld build-up on the outside of the RPV shell that was installed using E8018-NM weld material. The RPV instrument penetrations are fabricated with Alloy 600 components. See Enclosure 1 for a sketch of N-16D.

During refueling outage Li2R14 (2017), EGC discovered a leak at the instrument penetration nozzle N-16D located on the RPV. Visual examination detected active leakage at the nozzle interface (annular gap) with the RPV OD during the Class 1 system leakage test. EGC performed a half-nozzle repair at the N-16D location based on the discussion provided in the following sections.

B. Cause of Leakage

Following discovery of the leak, a sealing plug was installed in the N-16D nozzle inside diameter to facilitate the half nozzle repair (see Enclosure 2). Following plug installation, leakage was still observed indicating the flaw propagated either through the nozzle into the weld or through the weld alone. A visual examination was performed of the N-16D wetted surfaces from the inside of the RPV with both black and white and color cameras and a volumetric ultrasonic examination was performed from the RPV exterior surface. The initial volumetric ultrasonic examination was performed prior to plug installation for informational purposes only and is not qualified in accordance with ASME Section XI, Appendix VIII (see "Examination of the J-groove Weld" below).

The NDE data does not provide sufficient information to definitively determine the leak path; however, the available data combined with the fabrication information can be used to determine a most-probable leak path. The Alloy 600 nozzle was machine bored from a solid forging. This machining operation may have introduced residual stresses from the cold work process on the nozzle Inner Diameter (ID). Additionally, an Alloy 82 weld overlay was applied over the Alloy 182 J-groove weld inside the RPV. Alloy 82 is considered resistant to IGSCC and is used to mitigate the risk of cracking; however, if a defect such as a pore in the cladding were to exist, then the susceptible Alloy 182 material would be exposed to a reactor water (i.e., wetted) environment. From this information, it is possible that an IGSCC flaw initiated from the nozzle inside surface or from an Alloy 82 overlay defect and then propagated through-wall into and along the fusion line of the J-groove weld.

C. Extent of Condition

As a result of the leak identified on the N-16D, all nozzles with the same design as the N-16D had a bare metal VT-2 performed at a minimum pressure of 1045 psig. This exam looked for evidence of through-wall leakage, degradation due to corrosion of a pressure retaining boundary and evidence of pressure/flow loss or flow impairment. Nine nozzles were visually inspected (N-16A, N-16B, N-16C, N-11A, N-11B, N-12A, N-12B, N-12C, N-12D) and there was no evidence of leakage identified on any of the nozzles during the examination.

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 5 of 9)

D. Examination of the J-groove Weld

Two separate visual examinations were performed from the RPV ID at the N-16D location. The first exam used a black and white camera prior to installation of the nozzle plug. The exam volume encompassed the Alloy 82 weld overlay and the outer portions of the Alloy 600 nozzle bore. No surface cleaning was performed prior to examination. There were two suspect areas identified, but no definitive crack-like indications observed on either the weld overlay or the nozzle bore.

The second visual exam used a color camera after completion of the repair and removal of the nozzle plug. The exam volume was the same as the first exam; however, cleaning of the surface was performed via hydrolazing (~1500 psi). This second visual exam identified two "relevant" indications at the N16D location: 1) a hole/pore in the Alloy 82 cladding at 11 o'clock (as viewed from inside the RPV), and 2) a linear indication at 3 o'clock (as viewed from inside the RPV) which appears to be a radial-axial "crack-like" flaw on the ID of the Alloy 600 nozzle.

A volumetric (UT) examination was performed on the N-16D J-groove prior to the repair weld from the RPV OD in accordance with BWRVIP-03, Rev. 19. This examination was conducted for informational purposes to supplement visual examinations performed from the RPV ID. This volumetric exam has been demonstrated to provide crack detection within the J-groove weld material and to detect planar flaw indications in the low alloy vessel material, but has not been qualified in accordance with ASME Section XI, Appendix VIII. The exam volume included the J-groove weld, weld butter, and the RPV low alloy steel interface. The weld overlay and nozzle could not be distinguished with this volumetric technique. No crack-like indications were identified in the RPV low alloy steel or the Alloy 182 weld butter. Several aligned fabrication-like flaws were detected along the nozzle to J-groove weld fusion line although IGSCC could not be ruled out. As the Inconel 82 weld overlay at the RPV ID surface could not be distinguished by this exam, no determination of whether the fabrication defects were open to the surface could be made by this UT; however, this exam provides reasonable confidence that the flaw has not propagated into the RPV low alloy steel.

E. Flaw Analytical Evaluation

A flaw evaluation was performed as provided in Attachment 3. Additionally, in support of the flaw evaluation, a weld residual stress analysis was performed as provided in Attachment 4. The postulated flaw is shown to be acceptable for 40 years after the installation of the modification.

F. Repair of Nozzle Penetration

EGC replaced the existing N-16D nozzle assembly during 2R14 (Spring 2017 refueling outage) with a new half-nozzle penetration that is resistant to IGSCC, which meets ASME Section XI and Code Case N-638-4 as was conditionally approved by the NRC in Regulatory Guide 1.147, Revision 17 and ASME Section III. See Enclosure 2 for a sketch of the RPV instrument nozzle repair. A welded pad was applied to the existing weld build-up pad on the OD of the RPV using IGSCC resistant nickel Alloy 52M filler metal and was welded using the machine GTAW ATTB welding technique. The IGSCC resistant nozzle was attached to the new weld pad with a partial penetration weld using a non-temper bead manual welding technique and IGSCC resistant filler metal. The original partial penetration attachment weld and a remnant of the original nozzle

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 6 of 9)

remained in place. The completed repair was performed in accordance with ASME Code Section XI, 2007 Edition with the 2008 Addenda.

A design analysis was performed in accordance with the design requirements of ASME Section III. The analysis confirmed that the new nozzle will not eject from the RPV under design conditions. The new design was reconciled to the original construction code and addresses design and transient loads to ensure all Code requirements were met.

The N-16D nozzle is in the beltline region (high fluence region) when projecting fluence values out to 37 Effective Full Power Years (EFPY). The fast neutron fluence value ($E > 1.0$ MeV) determined for this nozzle at the inside diameter (0T) of the vessel is $1.27 \text{ E}+17$ neutron/cm². The outside diameter (1T) value of fast neutron fluence is $2.64 \text{ E}+16$ neutron/cm² at 37 EFPY. These values use the DPA-weighted attenuation methods as described in Regulatory Guide 1.99. However, accumulated exposure for this nozzle area to date of this repair is less. The current accumulated EFPY for LGS, Unit 2 is 25.21. The fast neutron fluence accumulated to date (25.21 EFPY) at the inside diameter (0T) of the vessel is $8.37 \text{ E}+16$ neutron/cm² and the outside diameter (1T) is $1.78 \text{ E}+16$ neutron/cm². Both values are below the threshold level of $1\text{E}+17$ neutron/cm² ($E > 1.0$ MeV). The material in the area of this repair was not expected to have decreased fracture toughness and ductility associated with damage of low alloy steels in the beltline region. Therefore, there was no weldability concern for the repair.

Additionally, NDE was completed on the new half-nozzle repair and assembly as required by ASME Code Case N-638-4. These examinations verified there were no unacceptable defects (cracking or fabrication) within the bore area, newly installed weld pad, or original base metal material.

G. Corrosion Evaluation

A corrosion evaluation was performed to consider potential material degradation due to the repair of the N-16D RPV instrumentation nozzle (Attachment 5). The corrosion evaluation concludes that the modification of the N16-D RPV nozzle, which exposes the low alloy steel RPV to a water environment and introduced new materials (Alloy 690 and Alloy 52M), is acceptable.

H. Loose Parts Evaluations

Given the original N-16D nozzle was not entirely removed, EGC completed a lost-parts evaluation to assess the potential for nozzle segments to enter the RPV during power operation. Two evaluations were completed to address the potential impact on the fuel and the potential impact on internal RPV components. The evaluations determined that the potential for lost parts did not pose any safety concerns. The evaluations considered interfacing systems and other RPV internal components, flow blockage, and adverse chemical reactions.

I. Followup Examinations

EGC will perform a bare metal VT-2 examination of the N-16D location from the OD of the vessel each refueling outage during the Class 1 System Leakage Test. Additionally, EGC will perform a best-effort UT of the RPV low alloy steel surrounding the N-16D penetration during

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 7 of 9)

the next refueling outage and every 10 years thereafter to confirm that the as-left j-groove weld flaw does not propagate into the vessel wall material.

Conclusion

Based on the above, in accordance with 10 CFR 50.55a(z)(2), EGC has concluded that performing a Code required repair results in a hardship without a compensating increase in quality and safety.

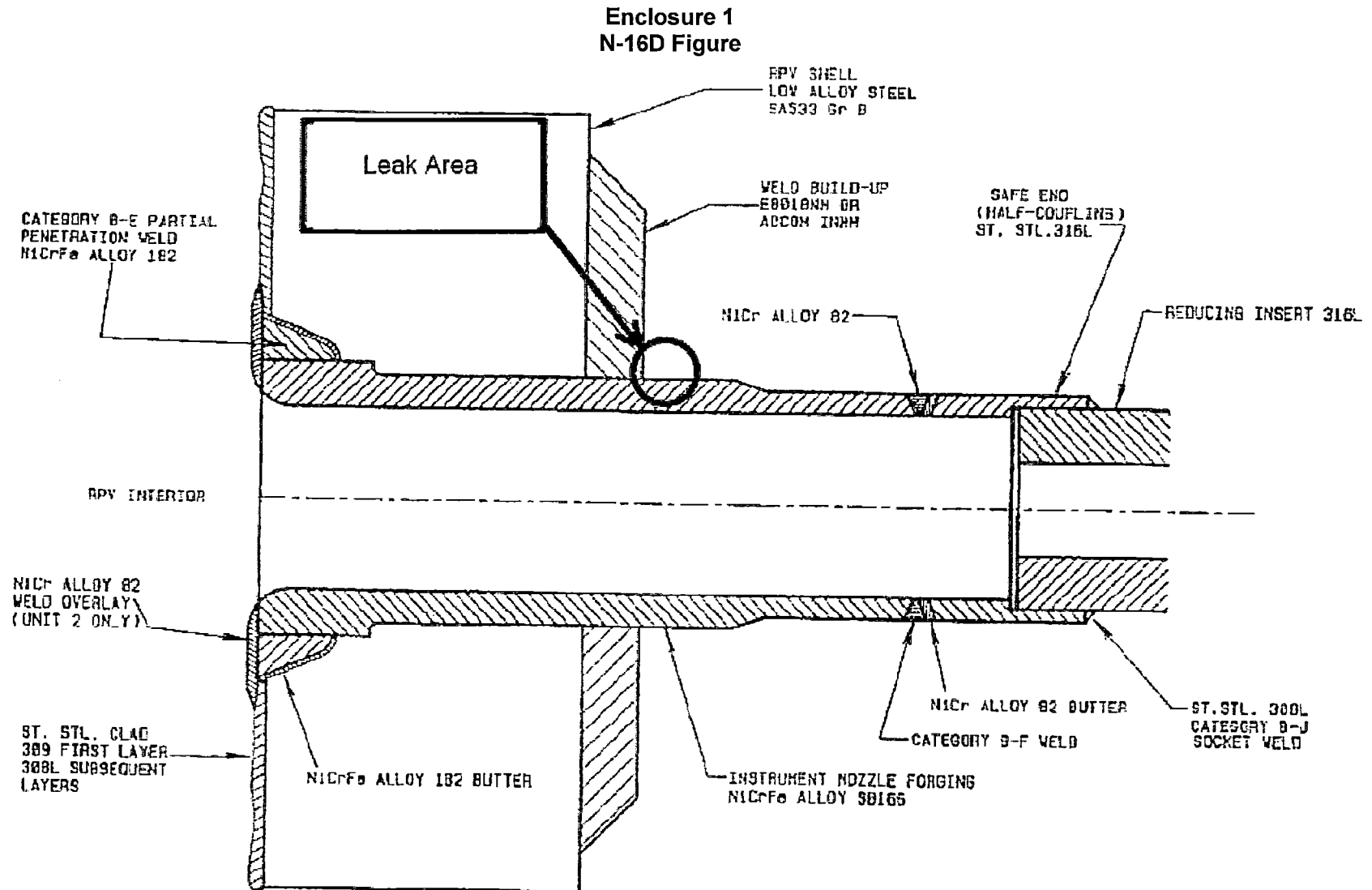
6. DURATION OF PROPOSED ALTERNATIVE

The attached relief request applies to the remainder of the fourth 10-year ISI interval and the remainder of the plant life, which is currently scheduled to conclude on June 22, 2049.

7. PRECEDENTS

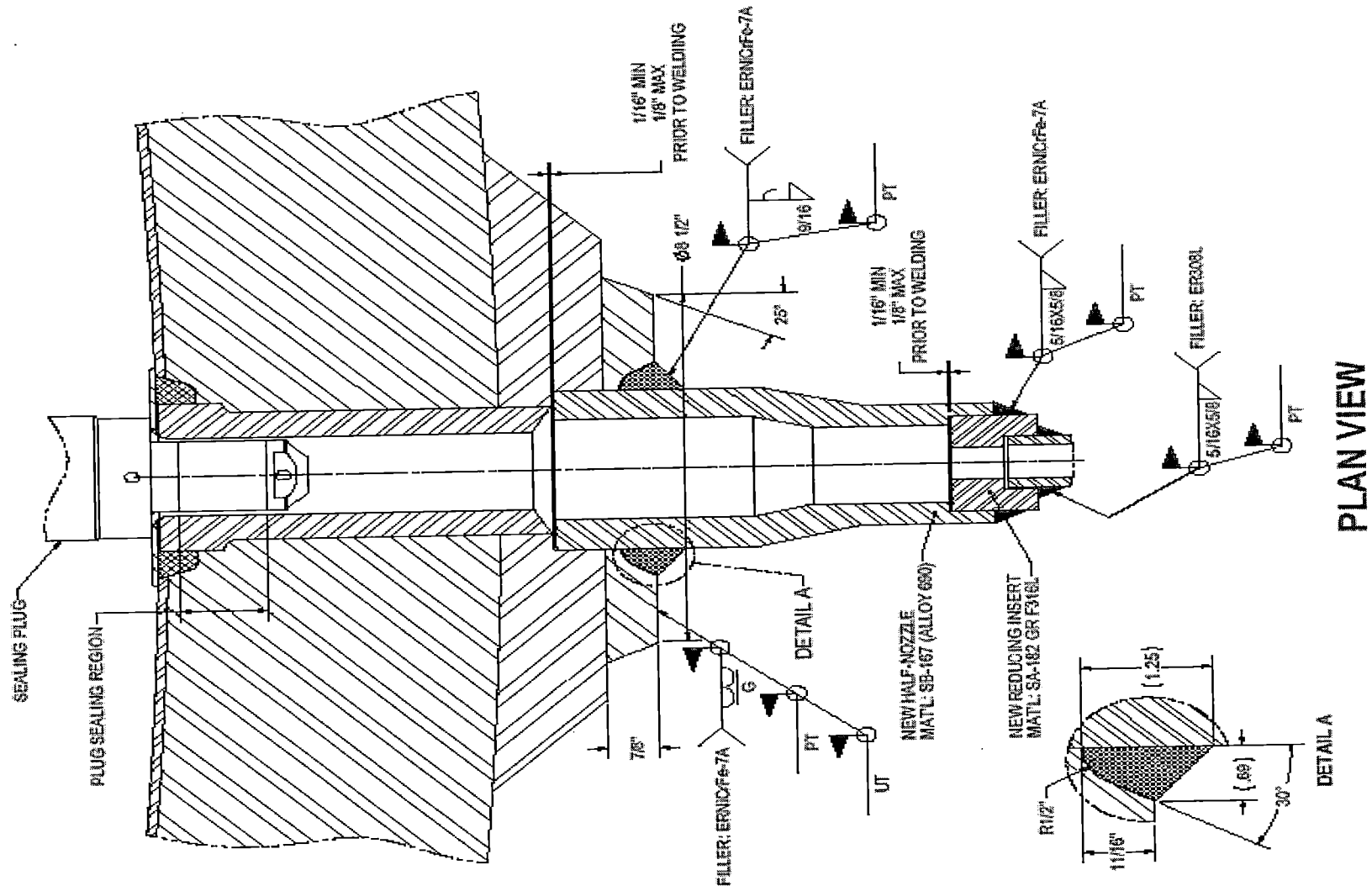
A similar relief request was previously approved via a verbal authorization on April 15, 2012 for Quad Cities, Unit 2 (ML12107A472). The NRC Safety Evaluation was subsequently issued on January 30, 2013.

10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 8 of 9)



10 CFR 50.55a Request Number I4R-17, Revision 1
Proposed Alternatives
In accordance with 10 CFR 50.55a(z)(2)
--Hardship without Compensating Increase in Quality and Safety--
(Page 9 of 9)

Enclosure 2
Repaired N-16D



Attachment 9

Affidavit Associated with AREVA Document No. 32-9277252-000

accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by Framatome Inc. to determine whether information should be classified as proprietary:

- (a) The information reveals details of Framatome Inc.'s research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.
- (c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for Framatome Inc.
- (d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for Framatome Inc. in product optimization or marketability.
- (e) The information is vital to a competitive advantage held by Framatome Inc., would be helpful to competitors to Framatome Inc., and would likely cause substantial harm to the competitive position of Framatome Inc.

The information in this Document is considered proprietary for the reasons set forth in paragraphs 6(b), 6(c) and 6(d) above.

7. In accordance with Framatome Inc.'s policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside Framatome Inc. only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. Framatome Inc.'s policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

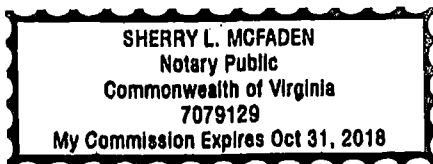
9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

Sherry L. McFaden

SUBSCRIBED before me this 29th
day of January, 2018.

SMVRO

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/18
Reg. # 7079129



Attachment 10

Affidavit Associated with AREVA Document No. 32-9274303-001

requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by AREVA to determine whether information should be classified as proprietary:

- (a) The information reveals details of AREVA's research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.
- (c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA.
- (d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA in product optimization or marketability.
- (e) The information is vital to a competitive advantage held by AREVA, would be helpful to competitors to AREVA, and would likely cause substantial harm to the competitive position of AREVA.

The information in this Document is considered proprietary for the reasons set forth in paragraphs 6(b), 6(c) and 6(d) above.

7. In accordance with AREVA's policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside AREVA only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

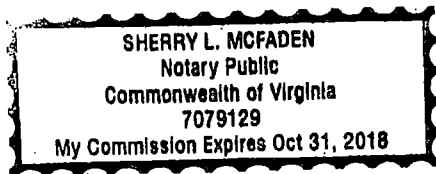
9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

Philip A. Paul

SUBSCRIBED before me this 5th
day of October, 2017.

Sherry L. McFaden

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/18
Reg. # 7079129





Limerick Unit 2 Instrument Nozzle N-16D Repair Weld Residual Stress Analysis

Verification Problem VM38MOD
Plastic loading of a Thick-Walled Cylinder

Two-Dimensional Analysis

File: vm38mod2D.vrt

----- VM38MOD2D RESULTS COMPARISON -----

		TARGET	ANSYS	RATIO
PLANE182 FULLY ELASTIC ANALYSIS (psi):				
SIGR	LEFT END	-9984.	-10103.	1.012
SIGT	LEFT END	18645.	18763.	1.006
SIGR	RIGHT END	-468.	-481.	1.028
SIGT	RIGHT END	9128.	9141.	1.001

PLANE182 FULLY PLASTIC ANALYSIS (psi):				
SIGEFF	LEFT END	30000.	30000.	1.000
SIGEFF	RIGHT END	30000.	30000.	1.000
Pult		24011.	23350.	0.972

Three-Dimensional Analysis

File: vm38mod3D.vrt

----- VM38MOD3D RESULTS COMPARISON -----

		TARGET	ANSYS	RATIO
SOLID185 FULLY ELASTIC ANALYSIS (psi):				
SIGR	LEFT END	-9984.	-10066.	1.008
SIGT	LEFT END	18645.	18776.	1.007
SIGR	RIGHT END	-468.	-475.	1.014
SIGT	RIGHT END	9128.	9128.	1.000

SOLID185 FULLY PLASTIC ANALYSIS (psi):				
SIGEFF	LEFT END	30000.	30000.	1.000
SIGEFF	RIGHT END	30000.	30000.	1.000
Pult		24011.	23360.	0.973

Attachment 11

Affidavit Associated with Framatome Document No. 51-9271544-003

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is Philip A. Opsal. I am Manager, Product Licensing, for Framatome Inc., (formally known as AREVA Inc.), and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by Framatome Inc., to determine whether certain Framatome Inc. information is proprietary. I am familiar with the policies established by Framatome Inc. to ensure the proper application of these criteria.

3. I am familiar with the Framatome Inc. information contained in the following document: Framatome Inc. Engineering Information Record, 51-9271544-003, "Corrosion Evaluation of the Limerick Unit 2 N16-D Reactor Vessel Nozzle Modification," referred to herein as "Document." Information contained in this Document has been classified by Framatome Inc. as proprietary in accordance with the policies established by Framatome Inc. for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by Framatome Inc. and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in

accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by Framatome Inc. to determine whether information should be classified as proprietary:

- (a) The information reveals details of Framatome Inc.'s research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.
- (c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for Framatome Inc.
- (d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for Framatome Inc. in product optimization or marketability.
- (e) The information is vital to a competitive advantage held by Framatome Inc., would be helpful to competitors to Framatome Inc., and would likely cause substantial harm to the competitive position of Framatome Inc.

The information in this Document is considered proprietary for the reasons set forth in paragraphs 6(b), 6(c) and 6(d) above.

7. In accordance with Framatome Inc.'s policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside Framatome Inc. only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. Framatome Inc.'s policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

Regis A. Ouel

SUBSCRIBED before me this 29th
day of January, 2018.

Sherry L. McFaden

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/18
Reg. # 7079129

