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PNP 2014-022

March 04, 2014

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

SUBJECT: Response to Second Request for Additional Information dated February 27, 2014, for Relief Request Number RR 4-18 – Proposed Alternative, Use of Alternate ASME Code Case N-770-1 Baseline Examination

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

References:
1. Entergy Nuclear Operations, Inc. letter PNP 2014-015, *Relief Request Number RR 4-18 - Proposed Alternative, Use of Alternate ASME Code Case N-770-1 Baseline Examination*, dated February 25, 2014
2. NRC Electronic Mail, *Request for Additional Information - Palisades - RR 4-18 - Proposed Alternative, Use of Alternate ASME Code Case N-770-1 Baseline Examination - MF3508*, dated February 26, 2014
3. Entergy Nuclear Operations, Inc. letter PNP 2014-021, *Response to Request for Additional Information dated February 26, 2014, for Relief Request Number RR 4-18 – Proposed Alternative, Use of Alternate ASME Code Case N-770-1 Baseline Examination,* dated March 01, 2014
4. NRC Electronic Mail, *Palisades - RR 4-18 - 2nd Set of RAI's TAC No. MF3508*, dated February 27, 2014

Sir or Madam:

In Reference 1, Entergy Nuclear Operations, Inc. (ENO) requested Nuclear Regulatory Commission (NRC) approval of the Request for Relief for a Proposed Alternative for the Palisades Nuclear Plant (PNP). NRC approval was requested by March 8, 2014.

Reference 1 is associated with the use of an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Code Case N-770-1, as conditioned by 10 CFR 50.55a(g)(6)(ii)(F)(1) and 10 CFR 50.55a(g)(6)(ii)(F)(3), dated June 21, 2011.

In Reference 2, the NRC issued a request for additional information (RAI). ENO responded to the RAI in Reference 3.

In Reference 4, the NRC issued a second RAI. The response to the second RAI is provided in Attachment 1.

This submittal contains no proprietary information.

Summary of Commitments

This letter contains no new commitments and one revision to an existing commitment.

Commitment made by letter of February 25, 2014 (Reference 1):

ENO will perform appropriate actions to meet ASME Section XI Code Case N-770-1 examination requirements, as required, for those dissimilar metal welds identified in Attachment 1, Enclosure Table 1, of this request during the first refueling outage after a viable technology is developed to perform these examinations.

Revised commitment:

ENO will comply with 10 CFR 50.55a(g)(6)(ii)(F) for the welds identified in Attachment 1, Enclosure Table 1, of Relief Request Number RR 4-18 by the end of the next scheduled refueling outage (1R24).

Sincerely,

ajv/jse

Attachment:
1. Response to Second Request for Additional Information dated February 27, 2014, for Relief Request Number RR 4-18 – Proposed Alternative, Use of Alternate ASME Code Case N-770-1 Baseline Examination
2. Radiological Dose Estimates

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ATTACHMENT 1

Response to Second Request for Additional Information dated February 27, 2014, for Relief Request Number RR 4-18 – Proposed Alternative, Use of Alternate ASME Code Case N-770-1 Baseline Examination

By letter dated February 25, 2014, Entergy Nuclear Operations (ENO) requested Nuclear Regulatory Commission (NRC) approval of the Request for Relief for a Proposed Alternative for the Palisades Nuclear Plant (PNP). By electronic mail, dated February 27, 2014, the Nuclear Regulatory Commission (NRC) submitted a second request for additional information. The requested information is provided below.

1. **NRC Information Request – Response to Question RAI-2.1**

As part of the hardship associated with performing volumetric inspections this outage, a radiological total dose estimate of 37 REM was provided. However, as volumetric examinations would have been required this outage, the staff requests what portion of that dose is above the exposure to perform the examination, as required by 10 CFR 50.55(a) with appropriate planning and foresight. Please provide the basis for the dose estimates, e.g. a breakdown of doses for each weld for erecting scaffolding, conducting surveys, removing insulation, conducting examinations, re-installing insulation, removing scaffolding, etc. Include the times required for each activity along with the estimates for general area dose rates and dose rates at 12 inches from the nozzles.

ENO Response

Attachment 2, "Radiological Dose Estimates," provides detailed radiological dose estimates for performing unplanned volumetric inspections this outage (Table 1) and dose estimates for performing the volumetric inspections with appropriate planning and foresight (Table 2). The total dose for performing unplanned volumetric inspections this outage is estimated to be approximately 37 Rem. The total dose with appropriate planning and foresight is estimated to be 14.5 Rem. Attachment 2 provides a breakdown of dose for each weld, which includes erecting and removing scaffolding, conducting surveys, removing insulation, etc. The duration for each activity along with the general area dose rates and dose rates at 12 inches from the welds are also provided.

2. **NRC Information Request – Response to Question RAI-2.2**

10 CFR 50.55a(g)(6)(ii)(F) requires a volumetric inspection be performed this outage of the subject butt welds that meets the requirements of Appendix VIII of ASME Code. The proposed alternative would manage the potential for PWSCC cracking by monitoring for reactor coolant pressure boundary unisolable though

wall leakage. This is unacceptable without significant hardship or compensating basis for ensuring leaktightness. Provide the basis for why the following nondestructive examinations could not be performed in this outage for each weld:

A. *The use of an ASME Code Section XI Appendix VIII Supplement 10 qualified procedure using a manual phased array ultrasonic search unit with a large number of angles to examine the welds. The use of many angles could overcome the difficulties posed by the geometry of the weld. Additionally, if the manual phased array inspection procedure is validated by a later site-specific mockup demonstration, the inspection could be counted as a fully-qualified inspection.*

B. *Perform an eddy current or ultrasonic inspection from the inner diameter of the component to search for surface-breaking cracks.*

C. *Use a high-angle ultrasonic inspection method (e.g. a 70 degree refracted longitudinal search unit) to determine if any crack tips are in the outer 25% of the weld metal.*

For A through C above, identify the estimated dose to complete the examination at each of the affected welds.

ENO Response

A. To ensure reliable results of a manual phased array ultrasonic search unit with a large number of angles for examination of the subject welds, a Performance Demonstration Initiative (PDI) examination qualified to ASME Code, Section XI, Appendix VIII, Supplement 10 would be required. The complex geometry of the PNP subject welds will require mock-ups to be built in accordance with the industry standard Performance Demonstration Initiative (PDI), "Site Specific Configuration Mockup Requirements for Dissimilar Metal Welds." The use of an existing ASME Code, Section XI, Appendix VIII, Supplement 10 qualified examination that is not PDI-qualified for the PNP weld complex geometry is not in accordance with industry guidance (i.e., NDE Implementation Focus Group) and would most likely result in the identification of indications that could not be evaluated, resulting in unnecessary repairs. Further, attempting to examine first, and then qualify the procedure later, would most likely result in the use of a technique that could not be qualified, in addition to the identification of indications that could not be evaluated and require potentially unnecessary repairs. The hardships associated with the above options are discussed below:

   Use Currently Qualified Manual Phased Array Examination

   Performing an inspection using a PDI-qualified manual ultrasonic phased array search unit with many angles, that is not qualified to the PNP weld geometry, would be a "best effort" informational exam producing inspection results that

could not be further characterized. ENO's current mock-up for the subject weld locations was designed before ASME Section XI, Appendix VIII requirements were established. That is, this mock-up does not meet the "Site Specific Configuration Mockup Requirements for Dissimilar Metal Welds," Revision C, that was developed by the PDI. Still, the mockup was used in conjunction with a current PDI-qualified manual phased array procedure, equipment, and personnel to determine if a qualified examination on this complex configuration could be produced. During the testing, known flaws within the mockup specimen could not be reliably detected. After the testing, it was determined, with EPRI, that in order to produce reliable results, the NDE Implementation Focus Group (NIFG) recommendations would have to be followed, which includes building samples and procedures that meet the approved PDI site specific configuration mockup requirements, and meet the current ASME Section XI, Appendix VIII, Code and Code Case N-770-1 requirements.

The hardship associated with creation of a qualified examination for using manual phased array with a large number of angles is that industry precedence for the PNP weld geometry has not been demonstrated to date. As such, conceptual designs would require industry vetting prior to fabricating mock-ups and procedures. Significant input from the industry, including the NIFG, is required because current ASME codes do not adequately address the complex geometry of the subject welds. The addition of more angles adds to the complexity of an already complex exam, without an equivalent increase in exam fidelity because each search unit will require that its focus be maintained, proper inside diameter (ID) impingement angles be maintained over the entire scan, mis-orientation of angles be minimized, required examination coverage be obtained, and a sufficient sound path for calibration be available. Procedure instructions to evaluate examination results require development, such as detailed profile and plotting instructions, and flaw placement and length / depth sizing. Further, NIFG recommendations would need to be incorporated, such as the performance of in-field walkdowns, evaluation of the applicability of encoded and non-encoded techniques, and performance of computer modeling to ensure an effective probe selection and scan plan. In addition, EPRI review of the proposed technique, fabrication of mock-ups, purchase of ultrasonic testing probes, and delivery device (scanner) design and fabrication would also be required.

Examine Welds Now and Qualify Later

Examining the subject welds in the current PNP refueling outage (1R23), with an unqualified procedure and then attempting to qualify the procedure after the refueling outage, has a low probability of success. The low probability of success is based on the fact that an ASME, Section XI, Appendix VIII weld configuration for this complex geometry does not exist and, as such, PDI demonstrating these configurations using the current PDI-qualified method is highly unlikely. ENO has explored the use of a currently qualified procedure by

using an existing mock-up. The mock-up contained known flaws that could not consistently be identified using currently available manual phased array techniques, and the addition of angles would not change this result. Performing such an examination prior to qualification would result in a "best effort" informational exam which would most likely result in additional hardships associated with evaluation and disposition of results. Performance of a "best effort" NDE exam, without a PDI-qualified examination demonstrated to be effective for the applicable complex weld geometry, has a high probability of producing erroneous results, such as detecting indications that cannot be further interrogated to determine validity or size. Adding to the already high probability of erroneous results is the fact that the post-fabrication radiographs of the subject welds include acceptable indications that would be detected by a manual phased array examination without a process to further characterize and evaluate them. Since the indications could not be accurately characterized and evaluated, mitigation actions could likely be required.

Mitigation actions include development of a repair design(s) which has not been approved for these weld configurations. In order to support implementation, tooling fabrication, mock-up testing, and qualification of procedures and personnel would have to be completed. For example, the hot leg drain line design includes removal of the line and installation of a weld overlay, which, based on weld geometry, would be a pad welded over the outside diameter of the pipe. Installation of such a pad would require an NRC-approved relief request. Depending on the design of the overlay, ultrasonic test procedures, personnel, and equipment may need to be qualified for the design. Finally, in order to implement this design, the reactor would have to be defueled, the hot leg would have to be drained, and hot leg plugs would have to be designed and installed. Implementation of this emergent weld overlay would have an outage schedule impact of greater than 30 days duration given the current configuration of PNP.

Dose Estimate

The estimated dose to plant personnel to complete these examinations is 37 Rem. For mitigation, a dose of at least 27 Rem would be incurred for repair work plus another 68 Rem to remove and reinstall the reactor head, defuel and refuel the reactor, and remove and the reinstall the core support barrel. The examination dose is essentially the same dose as that incurred for the unplanned volumetric exam in the RAI-2.1 response. The repair dose is based on dose measured during the mitigation of Alloy 600 branch connection welds during the current refueling outage. The reactor disassembly and reassembly is based on dose measured during the current outage.

B. A PDI-qualified ultrasonic examination technique on this complex dissimilar metal weld configuration from the ID is not available. The tooling to perform an eddy current or ultrasonic inspection from the inner diameter of the components

that contain the subject welds is not currently available. Access to the inner surface is limited. Creating a qualified examination and providing physical access to the inner surface of the subject welds would be a significant hardship to ENO. Further details on the hardships associate with just the hot leg drain nozzle weld follow. Similar hardships exist with the cold leg nozzle welds.

Examination Possibilities

If access to the inside diameter was possible, and limited stay times could be achieved, a surface examination using either an eddy current probe or dye penetrant would be used. Currently, remote eddy current equipment for this type of examination is not readily available and would need to be developed and demonstrated. This would take several months or more to accomplish. Another option, if remote capabilities were developed, would be to perform a dye penetrant examination. Industry operating experience shows that dye penetrant testing has not provided reliable results for detecting primary water stress corrosion cracking (PWSCC) due to the tightness of the crack openings on the surface. If indications were found, depth sizing would not be possible and external ultrasonic examination, as discussed in the response to RAI-2.2, subsection A, above, would still be required. This would most likely result in the performance of an unnecessary repair and associated hardships discussed in the RAI-2.2, subsection A, response above.

Physical Limitations

Personnel access to the inside diameter of the "A" hot leg to perform internal examinations is extremely limited. Access would only be possible after defueling, and then inserting a line plug into the hot leg from the reactor vessel side, draining of the hot leg and then removal of the nozzle dam from the steam generator nozzle after draining. The internal piping would be a high radiation and high contamination entry for the examination personnel. PNP does not have a line plug for the 42-inch hot leg or the examination delivery system at the current time to support examinations of the inside surface of the weld.

Dose Estimate

The complexity and options in performing this examination make an estimation of dose highly variable, but the dose incurred would exceed the dose (27 Rem) incurred during mitigation of Alloy 600 branch connection welds during the current refueling outage, due to limited inside surface access.

C. The use of a high-angle ultrasonic inspection method (e.g., a 70 degree refracted longitudinal search unit) to determine whether any crack tips are in the outer 25% of the weld metal would involve the same hardships as the use of a qualified technique that is not qualified for the PNP complex weld geometry (see RAI-2.2, subsection A, response above). Similar to the RAI-2.2, subsection A,

response, the same issues would arise when performing an examination without qualified procedure guidance, equipment and personnel. Recent industry operating experience and guidance cautions sites about performing examinations without demonstrated procedures, equipment and personnel. Use of only a high-angle 70 degree refracted longitudinal search unit would not confirm the presence or absence of a flaw, and would likely result in an unnecessary repair.

Dose Estimate

The estimated dose to plant personnel to complete these examinations is 37 Rem. For mitigation, a dose of at least 27 Rem would be incurred for repair work plus another 68 Rem to remove and reinstall the reactor head, defuel and refuel the reactor, and remove and the reinstall the core support barrel. The examination dose is essentially the same dose as that incurred for the unplanned volumetric exam in the RAI-2.1 response. The repair dose is based on dose measured during the mitigation of Alloy 600 branch connection welds during the current refueling outage. The reactor disassembly and reassembly is based on dose measured during the current outage.

It should be noted that a primary basis for the proposed alternative in the relief request are the benefits of the post weld heat treatment (PWHT) that was performed during fabrication of the subject welds. Testing and extensive industry experience demonstrate that Alloy 600 weldments that have been exposed to PWHT after welding have greatly reduced susceptibility to the occurrence of PWSCC. Additionally, calculations performed show that should a flaw of engineering size, crack growth rates are acceptably low due to PWHT. Therefore, the benefits of PWHT provide reasonable assurance of structural integrity and leak tightness which supports deferral of the required volumetric examinations to the next refueling outage (1R24).

3. NRC Information Request – Response to Question RAI-3.1

The NRC staff's understanding is that the licensee's current proposed alternative is as follows;

"1) Perform periodic system leakage tests in accordance with ASME Section XI Examination Category B-P, Table IWB-2500-1 (Reference 10).

2) Perform visual and dye penetrant surface examinations of the welds in accordance with ASME requirements. During the 2012 (1R22) and 2014 (1R23) refueling outages, visual and external surface examinations of certain welds for which relief is requested identified no evidence of through-wall cracking or leakage for these components, as identified in Enclosure Table 1.

Pursuant to 10 CFR 50.55a(a)(3)(ii), ENO proposes to perform appropriate actions to meet ASME Section XI Code Case N-770-1 examination requirements, as required, for those dissimilar metal welds identified in Enclosure Table 1 of this request during the first refueling outage after a viable technology is developed to perform these examinations."

The NRC staff does not find the proposed alternative for future inspections by the licensee to be acceptable. At a minimum, the NRC staff would expect the licensee to clearly identify the regulatory requirements and how those regulatory requirements will be met. The NRC staff expects the licensee to comply with 10 CFR 50.55a(G)(6)(ii)(F) during the next scheduled refueling outage.

ENO Response

Regulation 10 CFR 50.55a(g)(6)(ii)(F)(1) states "Licensees of existing, operating pressurized water reactors as of July 21, 2011 shall implement the requirements of ASME Code Case N-770-1, subject to the conditions specified in paragraphs (g)(6)(ii)(F)(2) through (g)(6)(ii)(F)(10) of this section, by the first refueling outage after August 22, 2011."

Regulation 10 CFR 50.55a(g)(6)(ii)(F)(3) states that baseline examinations for welds in Code Case N-770-1, Table 1, Inspection Items A-1, A-2, and B, shall be completed by the end of the next refueling outage after January 20, 2012.

As discussed in the cover letter, ENO is revising the commitment made in Relief Request Number RR 4-18, dated February 25, 2014, as described below.

Commitment made by letter of February 25, 2014 (Reference 1):

ENO will perform appropriate actions to meet ASME Section XI Code Case N-770-1 examination requirements, as required, for those dissimilar metal welds identified in Attachment 1, Enclosure Table 1, of this request during the first refueling outage after a viable technology is developed to perform these examinations.

Revised commitment:

ENO will comply with 10 CFR 50.55a(g)(6)(ii)(F) for the welds identified in Attachment 1, Enclosure Table 1, of Relief Request Number RR 4-18, by the end of the next scheduled refueling outage (1R24).

ATTACHMENT 2

RADIOLOGICAL DOSE ESTIMATES

3 Pages Follow

Table 1

Dose Estimate for Unplanned Weld Prep and Examinations of ALLOY 600 Welds

	DESCRIPTION	Area	ISI WELD ID	DOSE RATES (mrem/hr)				Profile		Dectection		TWS		Scaffold		Insulation		TOTAL
				CONTACT	12 inch	G/A	LDWA	HOURS	DOSE	HOURS	DOSE	HOURS	DOSE	HOURS	DOSE	HOURS	DOSE	DOSE
1	2" Cold Leg Charging Nozzle	P-50A	PCS-30-RCL-1A-11/2	120	70	50	14	1	184	0.75	105	1	140	11	650	6	200	1279
2	2" Cold Leg Drain Nozzle	P-50A	PCS-30-RCL-1A-5/2	400	80	25	14	1	439	0.75	120	1	160	0	0	6	150	869
3	3" Cold Leg PZR Spray Nozzle	P-50B	PCS-30-RCL-1B-10/3	1800	320	150	20	1	1970	0.75	480	1	640	6	700	6	450	4240
4	2" Cold Leg Drain Nozzle	P-50B	PCS-30-RCL-1B-5/2	700	120	60	20	1	780	0.75	180	1	240	0	0	6	250	1450
5	2" Cold Leg Charging Nozzle	P-50C	PCS-30-RCL-2A-11/2	120	80	25	23	1	168	0.75	120	1	160	6	420	6	150	1018
6	3" Cold Leg PZR Spray Nozzle	P-50C	PCS-30-RCL-2A-11/3	1800	330	150	23	1	1973	0.75	495	1	660	6	700	6	250	4078
7	2" Cold Leg Drain Nozzle	P-50C	PCS-30-RCL-2A-5/2	780	130	50	23	1	853	0.75	195	1	260	0	0	6	250	1558
8	2" Cold Leg Drain / Letdown Nozzle	P-50D	PCS-30-RCL-2B-5/2	15000	300	200	35	1	15235	0.75	450	1	600	0	0	6	450	16735
9	2" Hot Leg Drain Nozzle	A S/G	PCS-42-RCL-1H-3/2	280	100	80	50	1	410	0.75	150	1	200	0	0	7	350	1110
									22012		2295		3060		2470		2500	32337

Profile - 1 person at the weld, 1 person in the G/A, 1 firewatch in the LDWA

Detection - Requires 2 people at the weld or within arms length of the weld

TWS - Requires 2 people at the weld or within arms length of the weld

Superviser Oversite - 1 person at all times in G/A to LDWA 2000

RP Technician (8% of prep and inspection dose) 2587

Scaffold and Insulation dose taken from work performed in 1R23 as tracked by work order

Dose Rate data extracted from surveys PLP-1401-0291, PLP-1401-0459, PLP-1401-0275, PLP-1402-0500 and from dose reduction planning data

Grand Total 36924

(all dose stated in mrem)

Table 2

Dose Estimate for Weld Prep and Examinations of ALLOY 600 Welds With Additional Dose Reduction Planning Implemented

	DESCRIPTION	Area	ISI WELD ID	DOSE RATES (mrem/hr)				Profile		Detection		TWS		Scaffold		Insulation		TOTAL DOSE
				CONTACT	12 inch	G/A	LDWA	HOURS	DOSE	HOURS	DOSE	HOURS	DOSE	HOURS	DOSE	HOURS	DOSE	
1	2" Cold Leg Charging Nozzle	P-50A	PCS-30-RCL-1A-11/2	120	70	30	5	1	155	0.75	105	1	140	11	495	6	180	1075
2	2" Cold Leg Drain Nozzle	P-50A	PCS-30-RCL-1A-5/2	400	50	20	5	1	425	0.75	75	1	100	0	0	6	120	720
3	3" Cold Leg PZR Spray Nozzle	P-50B	PCS-30-RCL-1B-10/3	900	150	80	20	1	1000	0.75	225	1	300	6	700	6	450	2675
4	2" Cold Leg Drain Nozzle	P-50B	PCS-30-RCL-1B-5/2	500	60	40	20	1	560	0.75	90	1	120	0	0	6	250	1020
5	2" Cold Leg Charging Nozzle	P-50C	PCS-30-RCL-2A-11/2	80	50	20	20	1	120	0.75	75	1	100	6	420	6	150	865
6	3" Cold Leg PZR Spray Nozzle	P-50C	PCS-30-RCL-2A-11/3	900	155	80	23	1	1003	0.75	233	1	310	6	700	6	250	2496
7	2" Cold Leg Drain Nozzle	P-50C	PCS-30-RCL-2A-5/2	400	65	30	23	1	453	0.75	98	1	130	0	0	6	250	931
8	2" Cold Leg Drain / Letdown Nozzle	P-50D	PCS-30-RCL-2B-5/2	500	100	100	35	1	635	0.75	150	1	200	0	0	6	450	1435
9	2" Hot Leg Drain Nozzle	A S/G	PCS-42-RCL-1H-3/2	140	80	60	50	1	250	0.75	120	1	160	0	0	7	350	880
									4601		1170		1560		2315		2450	12096

Profile - 1 person at the weld, 1 person in the G/A, 1 firewatch in the LDWA
Detection - Requires 2 people at the weld or within arms length of the weld
TWS - Requires 2 people at the weld or within arms length of the weld
Superviser Oversite - 1 person at all times in G/A to LDWA 1500
RP Technician (8% of prep and inspection dose) 968
Scaffold and Insulation dose taken from work performed in 1R23 as tracked by work order
Dose Rate data extracted from surveys PLP-1401-0291, PLP-1401-0459, PLP-1401-0275, PLP-14-2-0500 and from dose reduction planning data.

Grand Total 14564

(all dose stated in mrem)

Acronyms and Component Identification Numbers

PZR – Pressurizer

P-50A – Primary Coolant Pump P-50A

P-50B – Primary Coolant Pump P-50B

P-50C – Primary Coolant Pump P-50C

P-50D – Primary Coolant Pump P-50D

A S/G – Steam Generator E-50A

G/A – General Area

LDWA – Low Dose Waiting Area

Profile – Examination Preparation Activities

TWS – Through Wall Sizing

RP – Radiation Protection

1R23 – Refueling Outage Number 23