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**Otto W Gustafson**
Licensing Manager

PNP 2012-024

May 31, 2012

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

SUBJECT: Response to Request for Additional Information Regarding License Renewal Commitment for Alloy 600 Program

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

References:
1. Entergy Nuclear Operations, Inc. letter, "License Renewal Commitment to Submit Alloy 600 Program," dated March 13, 2008 (ADAMS Accession Number ML080770454)
2. NRC letter, "Palisades Nuclear Plant: Request for Additional Information Regarding License Renewal Commitment to Submit Alloy 600 Program (TAC No. ME7125)," dated April 2, 2012 (ADAMS Accession Number ML12068A388)

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. (ENO) submitted the Palisades Nuclear Plant (PNP) Nickel Alloy Program procedure EM-09-22 (Reference 1) to satisfy a commitment in the license renewal program. In Reference 2, the Nuclear Regulatory Commission issued a request for additional information (RAI). Conference calls were held on February 2, 2012 and March 7, 2012, to clarify the RAI issues.

Attached is the ENO response to the RAI.

This letter identifies no new commitments and no revisions to existing commitments.

Sincerely,

BE Watson for

owg/jlk

Attachments: 1. Response to Request for Additional Information – Alloy 600 Program
2. Nickel-Alloy Program, No. SEP-A600-PLP-001, Revision No. 0

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC
Project Manager, Division of License Renewal/NRR, USNRC

**ATTACHMENT 1**
**Response to Request for Additional Information – Alloy 600 Program**

## Nuclear Regulatory Commission (NRC) Request

1. Title 10, Code of Federal Regulations, Part 50, 50.55a (10 CFR 50.55a) requires the use of three American Society of Mechanical Engineers (ASME) Code Cases that are related to the examination of nickel alloy components. (a) Code Case N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds, Section XI, Division 1," is incorporated with conditions in 10 CFR 50.55a (g)(6)(ii)(D). (b) Code Case N-722, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated with Alloy 600/82/182 Materials, Section XI, Division 1," is incorporated with conditions in 10 CFR 50.55a(g)(6)(ii)(E). (c) Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," is incorporated with conditions in 10 CFR 50.55a(g)(6)(ii)(F).

   The proposed Nickel Alloy Program does not reference these three code cases or corresponding conditions in 10 CFR 50.55a. Discuss whether the proposed Nickel Alloy Program will be revised to incorporate these three code cases with associated conditions set forth in 10 CFR 50.55a. If yes, discuss how these code cases and corresponding paragraphs in 10 CFR 50.55a will be implemented in the proposed Nickel Alloy Program. If not, provide justification.

## Entergy Nuclear Operations, Inc. (ENO) Response

1. The Palisades Nuclear Plant (PNP) nickel alloy program procedure has been revised and incorporates the three referenced code cases and 10 CFR 50.55a. The current procedure for the nickel alloy program is SEP-A600-PLP-001, "Nickel-Alloy Program" (Attachment 2). SEP-A600-PLP-001 replaces the previous nickel alloy program procedure, EM-09-22, submitted in the Entergy Nuclear Operations, Inc. (ENO) letter dated March 13, 2008.

   The three referenced code cases required by 10 CFR 50.55a have been incorporated into SEP-A600-PLP-001,Section 5.3, "Examination Requirements," Subsection 5.3.1, "Examination Methods and Frequency," which states: "The type and frequency of examinations will be dependent upon the component being examined. The examination methods and frequencies for the 251 nickel-alloy components within the scope of the program are maintained in the Palisades Inservice Inspection (ISI) Master Plan. Examination methods and frequencies are

prescribed in the following mandatory ASME Code Cases, with conditions prescribed in 10 CFR 50.55a:

- N-722-1 (visual examinations)
- N-729-1 (reactor head examinations)
- N-770-1 (butt weld examinations)."

Implementation of the Code Cases as required by 10 CFR 50.55a will be in accordance with the nickel alloy program procedure No. SEP-A600-PLP-001, Section 5.3, "Examination Requirements," which further describes the examination procedures that will be in accordance with the site's inservice inspection program, the inspection activities, assessments, evaluation of indications, and disposition of reportable indications.

**NRC Request**

2. Section 2.1.3 of the Nickel Alloy Program identifies many components in the Palisades Nuclear Plant that are made of nickel alloy. Clarify whether the weld joining the safe end and the safety injection, shutdown cooling outlet and surge line nozzles in the primary coolant piping is made of Alloy 82/182 material and if the safe end is made of Alloy 600 material. Also, clarify whether the weld joining the safe end and the pressurizer spray, surge line, and relief valve nozzles is made of Alloy 82/182 and if the safe end is made of Alloy 600 material.

**ENO Response**

2. The welds joining the safe ends to the safety injection, shutdown cooling outlet and surge line nozzles in the primary coolant piping are made of Alloy 82/182 material.

   The safe ends at the safety injection, shutdown cooling outlet and surge line nozzles are made of Alloy 600 material. The pressurizer spray safe end is also made of Alloy 600 material.

   The welds joining the safe ends to the pressurizer spray and surge line piping are made of Alloy 82/182 material. The welds joining the relief valve flanges to the pressurizer vessel nozzles are made of Alloy 82/182 material

   The relief valve flanges are made of Alloy 600 material.

**NRC Request**

3. Section 5.2.3 of the proposed Nickel Alloy Program states that the mechanical stress improvement process has been applied at several nickel alloy locations. Section 5.2.3 further states that the details of the mitigation are contained in the Palisades 10-year Interval Master Inservice Inspection Plan for Class 1, 2, 3, Risk-Informed Defense-In-Depth and Augmented Examinations. (a) If this report has been submitted to the NRC, provide the date. If not, submit the report or provide a list of components that have been applied with the mechanical stress improvement process. (b) Discuss whether other mitigation methods such as weld overlay, onlay, or inlay have been applied to nickel alloy components. (c) Discuss any other repairs on nickel alloy components that have been completed.

**ENO Response**

3.(a) The three components that have mechanical stress improvement process (MSIP) applied at PNP are as follows:

- PCS-12-PSL-1H1-2, Alloy 82/182 weld attaching the pressurizer surge outlet Alloy 600 safe end to stainless steel surge line upper elbow;
- PCS-12-PSL-1H1-7, Alloy 82/182 weld attaching the stainless steel surge line lower elbow to hot leg nozzle Alloy 600 safe end;
- PCS-12-SDC-2H1-2, Alloy 82/182 weld attaching the hot leg shutdown cooling outlet nozzle Alloy 600 safe end to stainless steel piping elbow.

These three locations were described briefly in a June 27, 1995, NRC letter entitled, "Palisades Plant – Safety Evaluation of the Cracking of Inconel 600 Components (TAC No. M91739)," in Section 2.1.1.6, "Mitigation Methods."

3.(b) In 1995, the Power Operated Relief Valve (PORV) Alloy 600 safe end was eliminated and replaced by a stainless steel safe end attached with Alloy 52/152 material. A small amount of original Alloy 82/182 butter and weld were left on the end of the carbon steel pressurizer nozzle, but that material was encapsulated by an onlay on the inside diameter by Alloy 52/152 prior to safe end attachment, isolating it from the primary water environment. This weld is included, for inspection, in the Code Case N-770-1 population.

Other mitigation methods such as weld overlay or inlay have not been applied at PNP.

3.(c) In 1993, the original PORV Alloy 600 safe end to stainless pipe weld leaked due to primary water stress corrosion cracking (PWSCC). The leaking segment was removed and temporarily replaced by a stainless steel pup piece, until the entire safe end was replaced in 1995 as described in item (b) above. Also, in 1993, two J-welded Alloy 600 pressurizer temperature element nozzles leaked and were repaired with pad welds.

In 2004, two reactor head CRDM nozzles were found to have volumetric indications, but not leakage. They were temper bead weld repaired.

There have been no other repairs on nickel alloy components.

**NRC Request**

4. Section 4.5 of the proposed Nickel Alloy Program discusses briefly how operating experience is identified. (a) Discuss any industry and plant-specific operating experience that has occurred in nickel alloy components since the issuance of NUREG-1871, "Safety Evaluation Report Related to the License Renewal of Palisades Nuclear Plant" (ADAMS Accession Number ML070600578) that would require changes to the Operating Experience section of the original Nickel Alloy program. (b) Discuss in details whether a record of operating experience has been maintained and how industry and plant-specific operating experience will be addressed under the proposed Nickel Alloy Program.

**ENO Response**

4.(a) At time of the issuance of the NUREG-1871 Safety Evaluation Report in January 2007, the NRC and the industry nickel alloy programs were in flux. Rules had not yet been issued, and licensees prepared their programs on a combination of available data, projections from that data, and interim instructions from the NRC. Since the time of the issuance of NUREG-1871, industry operating experience has led to the development of ASME Code Cases N-722-1, N-729-1, and N-770-1. This industry experience has been applied in the PNP nickel alloy program. The NRC has required use of these Code Cases through 10 CFR 50.55a. By incorporation of the mandatory Code Cases and 10 CFR 50.55a conditions, the PNP Alloy 600 program has been revised to satisfy the latest NRC requirements.

Plant inspections since 2007 have not identified any further evidence of PWSCC. ENO did not identify any evidence of PWSCC at Alloy 600 locations during any refueling outage since January 2007 (2007, 2009, 2010, and 2012). The only evidence of PWSCC prior to 2007 was identified in 1993 and 2004. Examination results are retained in inservice inspection reports. Adverse findings are captured in the corrective action system.

During the recent 2012 refueling outage, nine Alloy 600 locations were inspected for the first time, due to their inclusion under Code Case N-770-1. Seven locations could not be fully examined to N-770-1 requirements, and verbal relief request approval by the NRC has been granted to defer inspection until the fall 2013 refueling outage. Dye penetrant examinations at all nine locations and

limited UT examinations at the seven locations did not reveal any evidence of PWSCC.

4.(b) Industry and plant-specific operating experience related to the nickel alloy program are described in the program procedure (Attachment 2), as follows:

The nickel alloy program procedure, SEP-A600-PLP-001, Section 4.1, "Program Engineering," describes the responsibilities for the Program Engineering department, which include (among other responsibilities):

- "Serving as the Palisades contact for outside technical communications (NEI, INPO, NRC, EPRI/IMRP, ASME, PWR Owners Group, etc.)
- Participating in industry owners groups
- Providing analysis and response to significant industry events."

SEP-A600-PLP-001, Section 4.5, "Plant and Industry Experience," delineates that "The ISI Technical Lead shall identify any additional nickel-alloy components based upon industry experience that may be applicable to Palisades. These components shall be included as required in the examination scope."

Alloy 600 examination results records are retained in inservice inspection reports prepared after every refueling outage. Adverse findings are also documented and maintained as records in the corrective action process. Such records are maintained in accordance with the Entergy Quality Assurance Program Manual and ENO procedures.

**NRC Request**

5. The licensee stated in its commitment as part of license renewal application that "...NMC will revise the Alloy 600 Program to update the PWSCC [primary water stress corrosion cracking] corrosion rate assessments and inspection program consistent with the latest NRC requirements and industry commitments (e.g., EPRI [Electric Power Research Institute] Report 1010087 "Materials Reliability Program [MRP]: Primary System Piping System Butt Weld Inspection and Evaluation Guidelines [MRP-139]" (August 2005)). The updated program will be submitted for NRC review and approval by March 24, 2008... ." Please identify the revised portion of the updated Alloy 600 Program as compared to the original Alloy 600 program in the license renewal application and demonstrate that the updated Alloy 600 program satisfies the latest NRC requirements.

**ENO Response**

5. The updated nickel alloy program procedure, SEP-A600-PLP-001, Subsection 5.3.1, "Examination Methods and Frequency," references the latest NRC

requirements in 10 CFR 50.55a and ASME Code Cases N-722-1, N-729-1 and N-770-1. The procedure states:

> "The type and frequency of examinations will be dependent upon the component being examined. The examination methods and frequencies for the 251 nickel-alloy components within the scope of the program are maintained in the Palisades ISI Master Plan. Examination methods and frequencies are prescribed in the following mandatory ASME Code Cases, with conditions prescribed in 10 CFR 50.55a:
>
> • N-722-1 (visual examinations)
> • N-729-1 (reactor head examinations)
> • N-770-1 (butt weld examinations)."

Examination of Alloy 600 components in the recently completed 2012 refueling met the requirements of 10 CFR 50.55a, except that seven Code Case N-770-1 baseline volumetric inspections could not be performed due to piping configuration. A relief request was verbally approved by the NRC, to defer those inspections until the 2013 refueling outage (documented in ADAMS Accession Number ML12122A260).

Examination frequencies within these Code Cases, and within the additional conditions imposed by 10 CFR 50.55a, are based in large part upon corrosion rate assessments, in order to detect PWSCC in time to safely correct adverse conditions. Therefore, these Code Cases largely supersede component-by-component corrosion rate assessments that had been needed prior to establishment of common standards.

However, specific corrosion rate assessments may still be employed within the structure of ASME Section XI to evaluate acceptability of specific conditions. For example, ENO recently performed a corrosion rate assessment in the preparation of a Relief Request related to Code Case N-770-1 baseline inspection requirements. Refer to ENO letter of April 26, 2012, entitled "Relief Request - Proposed Alternative - Use of Alternate ASME Code Case N-770-1 Baseline Examination" (ADAMS Accession Number ML12118A144).

**NRC Request**

6. Since the time the proposed Nickel Alloy Program was submitted on March 13, 2008, the NRC has required examinations as discussed in Question No. 1 above. Depending on industry operating experience on nickel-based alloy components, the NRC may impose requirements in the future, if needed. Please explain how the proposed Nickel Alloy Program will be maintained current from present to the end of the extended period of operation.

**ENO Response**

6. The Nickel Alloy Program requirements will continue to meet the 10 CFR 50.55a requirements and conditions for the Code Cases described in item 1 above. ENO procedure SEP-A600-PLP-001, "Nickel Alloy Program," responsibilities and requirements will be the basis for maintaining the nickel alloy program current. The procedure delineates the Program Engineering responsibilities, in Section 4.0, as briefly described in response to item 4 above, and the program requirements that will ensure program maintenance and updates to the ISI Master Plan occur as described below.

SEP-A600-PLP-001, Subsection 4.4.1, "Program Development and Maintenance," states:

> "Nickel-Alloy Program scope, examination methods, examination frequencies, and other inspection requirements shall be contained in the ISI Master Plan. The ISI Technical Lead provides the necessary code expertise, drawings, and examination tables as required by SEP-ISI-PLP-001, "Inservice Inspection."

SEP-A600-PLP-001, Subsection 4.4.3, "Master Plan Updates," states:

> "When required, the ISI Technical Lead shall prepare and submit applicable ISI Master Plan updates for nickel-alloy components in accordance with SEP-ISI-PLP-001."

SEP-A600-PLP-001, Subsection 4.4.4, "Program Revision," states:

> "The ISI Technical Lead shall maintain the Nickel-Alloy Program through periodic review and correction consistent with the directions provided in SEP-ISI-PLP-001. Revision of this program shall require the same reviews and approvals as the original document."

**ATTACHMENT 2**

**Nickel-Alloy Program, No. SEP-A600-PLP-001, Revision No. 0**

19 pages follow

**NICKEL-ALLOY PROGRAM**

**ENTERGY NUCLEAR ENGINEERING PROGRAMS**

**PALISADES NUCLEAR PLANT**

All Sites: ☐

Specific Sites: ANO ☐ GGNS ☐ IPEC ☐ JAF ☐ PLP ☒ PNPS ☐ RBS ☐ VY ☐ W3 ☐ HQN ☐

**Safety Related:** ☒ **Yes**

☐ **No**

**Not Applicable to Dry Fuel Storage (72.48 Review)**

| **Program Section Revision Summary** | |
|---|---|
| **Current Revision** | **Description of Change** |
| **0** | Converted EM-09-22, Revision 1, to SEP-A600-PLP-001, Revision 0.<br>Added references to site leak detection and boric acid corrosion control programs.<br>Updated procedure to make current with 10 CFR 50.55a and Code Cases N-722-1, N-729-1, and N-770-1.<br>Added clarification about program applicability to reactor flange leakoff detection nozzles.<br>Added clarification regarding multiple component ID numbers at some nickel-alloy locations<br>Updated document reference numbers.<br>Moved responsibility for program continuity to Supervisor, Code Programs.<br>Performed editorial cleanup.<br>Incorporated outstanding EM-09-22 Document Revision Notice (DRN).<br>(DRN-11-01140) Revised record retention requirements. |

**Continuous Use** ☐ **Reference Use** ☒ **Informational Use** ☐

**REVIEW AND CONCURRENCE SHEET**

Program Section Title: NICKEL-ALLOY PROGRAM

Prepared By: Donald A Bemis Date 01/18/2012

Checked By: Paul E Deeds Jr Date 01/19/2012

Reviewed By: (Optional) n/a Date n/a

ANII: Patrick M McCarthy Date 2/8/2012
Reviewed By (or N/A)

Concurred: George E. Schrader Date 2/8/2012
Responsible Supervisor
George E. Schrader

## REVISION STATUS SHEET

### SEP-A600-PLP-001 R0, PAGE REVISION STATUS

| SECTION | PAGE NO. | REV. |
|---|---|---|
| ALL | ALL | 0 |

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**Table of Contents**

| REFERENCE USE |
| --- |
| • **Procedure and Procedure Precautions and Limitations are at the work location for reference.**<br>• **Review and understand segments before performing any steps.**<br>• **Signoff steps are completed, when included, before starting the next step.**<br>• **Place keep in accordance with EN-HU-102, "Human Performance Tools."**<br>• **Review the Procedure to verify segments have been completed.** |

## 1.0 PURPOSE

This procedure provides the overall programmatic requirements for management of primary water stress corrosion cracking (PWSCC) in nickel-alloy reactor vessel head penetration (RVHP) locations, Pressurizer locations, and other locations exposed to the reactor coolant environment.

Alloy 600 management is identified as a sub-program of the Reactor Coolant System Materials Degradation Management Program (RCS MDMP) within Entergy Procedure EN-DC-202, "NEI 03-08 Materials Initiative".

This document contains one or more steps or sections that implement a Nuclear Regulatory Commission requirement or commitment to manage the effects of aging on systems, structures, and components within the scope of license renewal as described in Palisades Administrative Procedure 3.26, "Implementation of Palisades Renewed License Requirements," and Site Engineering Program SEP-RLP-PLP-001, "Renewed License Program." Renewed License Requirements and Renewed License Commitments are designated "[RLR]" and "[RLC]" respectively.

This procedure does not contain specifics which already exist elsewhere; rather, it is intended to point the user to locations where those specifics are captured.

## 2.0 SCOPE [RLR]

The Nickel-Alloy Program is used to manage primary water stress corrosion cracking in 251 specific nickel-alloy components within the reactor coolant pressure boundary, including the reactor pressure vessel head. The program follows the guidelines provided by the Materials Reliability Program (MRP) to:

a. Minimize the impact of PWSCC on plant safety and operation

b. Ensure that regulatory requirements are met

c. Develop and execute long-term strategies for managing primary water stress corrosion cracking in Alloy 600 base metal and Alloy 82/182 weld metal

The Nickel-Alloy Program does not include any nickel-alloy components other than the 251 specific locations identified in Palisades Site Engineering Program SEP-ISI-PLP-003, "Palisades Inservice Inspection Master Plan, Fourth Interval, ASME Section XI, Division 1" (also called the ISI Master Plan).

## 2.1 DEFINITIONS

### 2.1.1 Nickel-Alloys

The term nickel-alloy refers to alloys that are variously called Alloy 600, Alloy 82, Alloy 182, Alloy 690, Alloy 52, Alloy 152, Grade 688 (X-750), Inconel 182, Inconel 82, NiCrFe, SB-166, SB-167, SB-168, and X-750. The terms nickel-alloy and nickel-base alloy are used interchangeably.

### 2.1.2 Primary Water Stress Corrosion Cracking (PWSCC)

PWSCC is an intergranular cracking mechanism that is known to occur in the presence of high applied and/or residual stress, susceptible microstructures, and high temperature.

2.1.3 Component

Within the context of this procedure, the term component means one or more of the following 251 nickel-alloy locations described in detail in the Palisades ISI Master Plan. A location may have more than one component, as in the case of two welds on one nickel-alloy safe end. These are assigned separate component ID numbers in the ISI Master Plan.

- 45 reactor vessel upper head control rod drive (CRD) penetration nozzles (2 ID numbers each)
- 8 reactor vessel upper head incore instrument penetration nozzles (2 ID numbers each)
- 1 reactor vent line penetration nozzle
- 2 reactor flange leak detector taps (Not subject to examination per ASME Code Case N-722-1)
- 1 Pressurizer power-operated relief valve (PORV) nozzle safe end weld
- 1 Pressurizer spray nozzle safe end (2 ID numbers)
- 1 Pressurizer surge line nozzle safe end (2 ID numbers)
- 3 Pressurizer safety and relief valve nozzle flanges
- 8 Pressurizer level nozzles (2 ID numbers each)
- 2 Pressurizer temperature element nozzle penetrations
- 120 Pressurizer heater sleeves
- 4 primary coolant piping safety injection nozzle safe ends (2 ID numbers each)
- 1 primary coolant piping shutdown cooling outlet nozzle safe end (2 ID numbers)
- 1 primary coolant piping surge line nozzle safe end (2 ID numbers)
- 22 temperature measurement nozzles
- 1 hot leg drain nozzle (2 ID numbers)
- 3 cold leg drain nozzles (2 ID numbers each)
- 1 cold leg letdown/drain nozzle (2 ID numbers)
- 18 pressure measurement and sampling nozzles (2 ID numbers each)
- 2 primary coolant piping spray supply nozzles (2 ID numbers each)
- 2 primary coolant piping charging inlet nozzles (2 ID numbers each)
- 4 steam generator (SG) primary bowl plugs

## 3.0 REFERENCES

## 3.1 SOURCE DOCUMENTS

3.1.1 NEI 03-08, "Guideline for the Management of Materials Issues"

3.1.2 EPRI 1009561,"Materials Reliability Program: Generic Guidance for Alloy 600 Management (MRP-126)", Final Report, November 2004

3.1.3 NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Revision 0

3.1.4 NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Revision 1

3.1.5 Palisades Application for Renewed Operating License, March 22, 2005

3.1.6 NUREG-1871, NRC Letter to Paul Harden dated September 28, 2006, "Safety Evaluation Report Related to the License Renewal of Palisades Nuclear Plant"

3.1.7 Order EA 03-009, Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors, February 11, 2003

3.1.8 First Revised Order EA-03-009, Issuance of Revised Order EA-03-009 Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors, February 20, 2004

3.1.9 Palisades Plant Response to Revised NRC Order EA-03-009, "Issuance of First Revised NRC Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors" (dated 3/8/04)

3.1.10 Palisades Plant "60-Day Report Per First Revised Order EA-03-009" – fall 2004 refueling outage reactor pressure vessel head visual inspection and NDE of head penetrations (dated 1/13/2005)

3.1.11 Letter from Dan J. Malone to the USNRC dated July 26, 2004, 60-Day Response to Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors"

## 3.2 REFERENCE DOCUMENTS

3.2.1 Palisades Administrative Procedure 3.26, "Implementation of Palisades Renewed License Requirements"

3.2.2 Site Engineering Program SEP-ISI-PLP-001, "Inservice Inspection"

3.2.3 Site Engineering Program SEP-ISI-PLP-003, "Palisades Inservice Inspection Master Plan, Fourth Interval, ASME Section XI, Division 1"

3.2.4 Site Engineering Program SEP-RLP-PLP-001, "Renewed License Program"

3.2.5 Site Engineering Program SEP-BAC-PLP-001, "Boric Acid Corrosion Control Program"

3.2.6 Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP-139), EPRI, Palo Alto, CA: 2005. 1010087

3.2.7 NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity"

3.2.8 Palisades Plant 60-Day Response to Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity" Request for Additional Information (TAC No MB4562) (dated 1/20/03)

3.2.9 Letter from R. Barrett, NRC Office of Nuclear Reactor Regulation (NRR), Division of Engineering to Alex Marion, Nuclear Energy Institute, Flaw Evaluation Guidelines, April 11, 2003 (ADAMS Accession Nos ML030980322 and ML030980333)

3.2.10 Entergy Procedure EN-AD-103, "Document Control and Records Management Programs"

3.2.11 Entergy Procedure EN-DC-126, "Engineering Calculation Process"

3.2.12 Entergy Procedure EN-DC-202, "NEI 03-08 Materials Initiative"

3.2.13 Entergy Procedure EN-LI-102, "Corrective Action Process"

3.2.14 Entergy Procedure EN-DC-319, "Inspection and Evaluation of Boric Acid Leaks"

3.2.15 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI Nuclear Code Case N-722

3.2.16 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI Nuclear Code Case N-729-1

3.2.17 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI Nuclear Code Case N-770-1

3.2.18 Code of Federal Regulations 10 CFR 50.55a, "Codes and Standards"

3.2.19 Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division I"

3.2.20 Entergy Procedure EN-HU-102, "Human Performance Tools"

3.3 COMMITMENTS

3.3.1 LO-LAR-2009-244-6, "Update Alloy 600 Program"

3.3.2 LO-LAR-2009-244-49, "Implement a Nickel Alloy Program as described in FSAR Section 1.9.1.1"

4.0 RESPONSIBILITIES AND ADMINISTRATION

The overall responsibility for development, revision, and implementation of the Nickel-Alloy Program resides in the Program Engineering Department. Responsibilities of various groups are described below.

4.1 PROGRAM ENGINEERING

- Preparation, maintenance and ownership of the Nickel-Alloy Program
- Development of refueling outage examination plans
- Development of a recommended strategy for the management of Alloy 600/82/182 materials
- Ensuring compliance with regulatory requirements
- Serving as the Palisades contact for outside technical communications (NEI, INPO, NRC, EPRI/MRP, ASME, PWR Owners Group, etc)
- Participating in industry owners groups
- Providing analysis and response to significant industry events

- Preparing periodic program health reports
- Conducting periodic self-assessments of the Nickel-Alloy Program

## 4.2 DESIGN ENGINEERING

- Preparation of Design Change Packages (DCP) for repairs or modifications that would result in a configuration change to existing Alloy 600/82/182 components
- Disposition of Condition Reports associated with examination results

## 4.3 SITE MAINTENANCE AND PROJECTS

- Performance of work orders for the implementation of examination, evaluation, mitigation, and repair/replacement activities

## 4.4 ADMINISTRATIVE CONTROLS

### 4.4.1 Program Development and Maintenance

Nickel-Alloy Program scope, examination methods, examination frequencies, and other inspection requirements shall be contained in the ISI Master Plan. The ISI Technical Lead provides the necessary code expertise, drawings, and examination tables as required by SEP-ISI-PLP-001, "Inservice Inspection".

### 4.4.2 Requests for Relief from the Provisions of Section XI

If necessary, the ISI Technical Lead shall prepare and submit relief requests, alternative positions, or hardship requests related to nickel-alloy components in accordance with SEP-ISI-PLP-001.

### 4.4.3 ISI Master Plan Updates

When required, the ISI Technical Lead shall prepare and submit applicable ISI Master Plan updates for nickel-alloy components in accordance with SEP-ISI-PLP-001.

### 4.4.4 Program Revision

The ISI Technical Lead shall maintain the Nickel-Alloy Program through periodic review and correction consistent with the directions provided in SEP-ISI-PLP-001. Revision of this program shall require the same reviews and approvals as the original document.

4.4.5 Program Engineering

The ISI Technical Lead shall provide engineering expertise as delineated in SEP-ISI-PLP-001.

4.4.6 Program Continuity

The Supervisor, Engineering Code Programs, shall ensure that at least one other additional person in addition to the ISI Technical Lead is familiar with the Palisades Nickel-Alloy Program and that individuals involved are adequately trained.

4.5 PLANT AND INDUSTRY OPERATING EXPERIENCE

The ISI Technical Lead shall identify any additional nickel-alloy components based upon industry experience that may be applicable to Palisades. These components shall be included as required in the examination scope.

5.0 PROGRAM REQUIREMENTS

| REFERENCE USE |
| --- |
| • **Procedure and Procedure Precautions and Limitations are at the work location for reference.**<br>• **Review and understand segments before performing any steps.**<br>• **Signoff steps are completed, when included, before starting the next step.**<br>• **Place keep in accordance with EN-HU-102, "Human Performance Tools."**<br>• **Review the Procedure to verify segments have been completed.** |

The NRC considers various regulatory options to address this issue. The industry continues to work through the ERPI MRP to develop a nickel-alloy program acceptable to the NRC.

The ISI Technical Lead shall continue to follow nickel-base alloy issues and requirements as they evolve, and will update the program accordingly. For example, the program scope will change with the installation of the new head because the RVHP will be Alloy 690. In the interim, the program will be based on the latest regulatory requirements, operating experience, ISI results, and the latest body of industry knowledge.

## 5.1 PROGRAM COMMITMENTS

### 5.1.1 Renewed License Commitment

A commitment to revise our program to be consistent with latest NRC requirements and industry commitments was required by the NRC as part of obtaining the renewed Operating License (OL). The specific commitment for the renewed OL is provided below.

*Palisades will revise the Alloy 600 Program to update the PWSCC growth rate assessments and inspection program consistent with the latest NRC requirements and industry commitments (e.g., EPRI Report 1010087 "Materials Reliability Program: Primary System Piping System Butt Weld Inspection and Evaluation Guidelines [MRP-139]," (August 2005)). The updated program will be submitted for NRC review and approval by March 24, 2008.* ***LO-LAR-2009-244-6 [RLC]***

### 5.1.2 Other Commitments

Commitments which were made prior to the renewed operating license may be found in the ISI Master Plan.

## 5.2 KEY PROGRAM ELEMENTS

The key elements of the Palisades Nickel-Alloy Program are 1) identification of susceptible component locations, 2) prioritization of those locations for examination/inspection (component ranking), and 3) mitigation, detection, and repair of PWSCC in nickel-alloy components.

### 5.2.1 Identification of Susceptible Locations [RLR]

The 251 specific nickel-alloy locations are described in the Palisades ISI Master Plan. This list of Alloy 600/82/182 locations was provided to the NRC as part of the 60-day response to NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity."

5.2.2 Component Ranking

As a result of Alloy 600 cracking issues associated with the PORV nozzle, a project was initiated in 1993 to identify and rank all nickel-alloy locations contained within the PCS. This project ranked all 251 locations based on four main criteria: PWSCC susceptibility, failure consequence, leakage detection margin, and radiation dose rates.

The ISI Technical Lead will provide category definitions based on several factors, which include, but may not be limited to:

a. whether the material is resistant to PWSCC

b. whether inspection has already been performed

c. whether the weld is cracked or not

d. whether a weld has undergone a mitigation process

e. pipe size

f. temperature at the location

5.2.3 Mitigation

Plant design provides some reduced susceptibility. PWSCC is highly dependent on elevated temperature, and the Palisades pressurizer operates about 10°F below the industry average for PWRs. Palisades follows EPRI guidelines for primary water chemistry, which further reduces PWSCC susceptibility. Finally, the mechanical stress improvement process (MSIP) has been applied to three nickel alloy welds. Details are contained in the Palisades ISI Master Plan.

The ISI Technical Lead will assist in development, evaluation and implementation of new mitigation options which may be identified through future research, be recommended by the MRP, or other avenues.

5.2.4 Detection [RLR]

Detection of cracking (including PWSCC) will be accomplished in accordance with EN-DC-319, through a combination of bare-metal visual examination and/or non-visual examination techniques as identified in the Palisades ISI Master Plan. Bare-metal visual examinations may be used to detect reactor coolant leakage from RVHP nozzles or their associated J-groove welds, and for loss of material that may be induced as a result of boric-acid wastage. Non-visual examination techniques, including surface examination (eddy current or penetrant testing) or volumetric examination (ultrasonic testing), may also be used to detect aging effects and may be performed using.

Potential leakage resulting from PWSCC can be monitored during operation by the Palisades RCS leakage measurement program. Boric acid evidence of potential leakage is evaluated and documented by the Palisades Boric Acid Corrosion Control Program.

5.2.5 Repair or Replacement [RLR]

Repair and replacement procedures and activities will be accomplished in accordance with EN-DC-319 and comply with ASME Section XI, as invoked by the requirements of 10 CFR 50.55a, or applicable ASME Code Cases that have been endorsed in 10 CFR 50.55a by reference in the latest version of NRC Regulatory Guide 1.147.

Alternative repair/replacement activities in lieu of those endorsed by the NRC in either Section XI or NRC-approved Code Cases will be sent to the NRC for approval in accordance with either the acceptable alternative provisions of 10 CFR 50.55a(a)(3)() or the hardship provisions of 10 CFR 50.55a(a)(3)(ii).

5.3 EXAMINATION REQUIREMENTS [RLR]

5.3.1 Examination Methods and Frequency

The type and frequency of examinations will be dependent upon the component being examined. The examination methods and frequencies for the 251 nickel-alloy components within the scope of the program are maintained in the Palisades ISI Master Plan. Examination methods and frequencies are prescribed in the following mandatory ASME Code Cases, with conditions prescribed in 10 CFR 50.55a:

- N-722-1 (visual examinations)
- N-729-1 (reactor head examinations
- N-770-1 (butt weld examinations.

5.3.2 Examination Agency Project Plan

The examination agencies may, with Palisades ISI approval, prepare and submit a project plan to monitor and implement their onsite activities. This will be done in accordance with SEP-ISI-PLP-001.

5.3.3 Examination Procedures

The ISI Technical Lead will determine the appropriate procedures to be used for examination. Reviews and approvals for these procedures shall be completed as identified in Attachment 1 to SEP-ISI-PLP-001.

5.3.4 Inspection Activities

The ISI Technical Lead shall administer the ISI Specification and coordinate examination agencies, the Authorized Nuclear Inservice Inspector, State and NRC activities. As work progresses, the ISI Technical Lead compiles and reviews data to provide engineering justifications and recommended dispositions of reportable indications. The ISI Technical Lead will initiate changes necessary to facilitate performing additional examinations or reexaminations.

5.3.5 Audits or Assessments

Findings that result from audits conducted by the Authorized Nuclear Inservice Inspector, NRC, or any designated audit or assessment group, shall be dispositioned in accordance with Entergy Procedure EN-LI-102, "Corrective Action Process."

5.3.6 Reportable Indications

Any indications that exceed acceptance criteria and cannot be resolved as non-relevant by the examination agency will be documented by the ISI Technical Lead in accordance with EN-LI-102; describing indication resolution, disposition instructions, action taken, and the results of any re-examination. Indications considered non-relevant will also be adequately documented by the examination agency on a data sheet or other document which becomes part of the ISI record.

5.3.7 Evaluation of Indications [RLR]

Relevant flaw indications, including those in reactor head penetrations, shall be evaluated in accordance with EN-DC-319, ASME Section XI Table IWB-2500-1, and applicable Code Cases. Acceptable flaw evaluation criteria were provided in an April 11, 2003 letter from Mr. Richard Barrett, NRC, Office of Nuclear Reactor Regulation (NRR), Division of Engineering, to Alex Marion, Nuclear Energy Institute (NEI). Since that time, Code Cases N-722-1, N-729-1, and N-770-1 have been issued. Note that flaw growth may be attributable to stress corrosion cracking, fatigue cracking, or a combination.

The ISI Technical Lead shall be responsible for coordinating characterization and evaluation of all surface and volumetric indications that exceed applicable acceptance standards, and documenting in a Condition Report in accordance with EN-LI-102. Engineering evaluations of indications may be performed by members of the Plant or Corporate staff, or outside contractor(s), in accordance with Entergy Procedure EN-DC-126, "Engineering Calculation Process." Evaluations shall be reviewed by the ISI Technical Lead for inclusion into the ISI Record.

5.3.8 Disposition of Indications

The ISI Technical Lead will disposition reportable indications by determining whether adequate engineering justification exists to return the Plant to service without repair, or if a repair must be made. Where conflicts arise in the evaluations or recommended disposition of indications, the ISI Technical Lead shall refer them to the Engineering Programs Manager for final review and determination of the course of action to be followed.

Relevant flaw indications in the RVHP nozzles or their associated nickel-alloy J-groove weld materials shall be considered unacceptable for further service and shall be corrected through implementation of appropriate repair or replacement activities directed by the ISI Technical Lead, and the component category will be changed appropriately.

Boric acid deposits, staining or scaling should be cleaned down to bare metal promptly in accordance with EN-DC-319, prior to reinstallation of insulation.

5.3.9 Administrative Anomalies

Deviations related to ISI activities other than indication evaluation are resolved and documented as required by the ISI Technical Lead.

## 6.0 ATTACHMENTS AND RECORDS

### 6.1 ATTACHMENTS

None

### 6.2 RECORDS

Program records shall be prepared, reviewed and approved in accordance with requirements set forth in Site Engineering Program SEP-ISI-PLP-001. Records shall be filed in accordance with Entergy Procedure EN-AD-103, "Document Control and Records Management Programs."

## 7.0 SPECIAL REVIEWS

None.