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2CAN071602

July 18, 2016

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

SUBJECT: Nickel-Based Alloy Aging Management Program Plan
Arkansas Nuclear One – Unit 2
Docket No. 50-368
License No. NPF-6

REFERENCES: 1. Entergy letter to NRC, "License Renewal Application", dated
October 14, 2003 (2CAN100302) (ML032890492)
2. Entergy letter to NRC, "License Renewal Application Clarifications,"
dated September 10, 2004 (2CAN090402) (ML042660110)

Dear Sir or Madam:

By Reference 1, Entergy Operations, Inc. (Entergy) submitted a License Renewal Application (LRA) for Arkansas Nuclear One, Unit 2 (ANO-2). During the review of Reference 1, the NRC Staff issued a request for additional information (RAI). The Staff requested clarifications to some previously docketed RAI responses for the LRA. Reference 2 provided the requested clarifications for one set of the RAI responses.

In Reference 2, Entergy made a commitment to submit to the NRC for review and approval a description of the Nickel-Based Alloy Aging Management Program. Nickel-based alloys are also referred to as Alloy 600. As noted in Reference 2 primary water stress corrosion cracking (PWSCC) of nickel-based alloys is a current license term issue. As such, issues that are relevant to current plant operation are addressed by the existing regulatory process within the present license term rather than deferred until the time of license renewal. The existing regulatory process provides assurance that aging effects caused by PWSCC of nickel-based alloys is adequately managed during the period of extended operations (PEO). Attached is a copy of the Alloy 600 Aging Management Program Plan for ANO-2 which fulfills this commitment.

The commitments listed in Reference 2 stated the submittal date would be at least 24 months prior to the PEO. ANO-2 enters the PEO on July 17, 2018.

This letter contains no new regulatory commitments.

If you have any questions or require additional information, please contact me.

Sincerely,

ORIGINAL SIGNED BY STEPHENIE L. PYLE

SLP/rwc

Attachment: Alloy 600 Aging Management Program Plan

cc: Mr. Kriss Kennedy
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U. S. Nuclear Regulatory Commission
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ATTACHMENT TO

2CAN071602

ALLOY 600 AGING MANAGEMENT PROGRAM PLAN

ALLOY 600 AGING MANAGEMENT PROGRAM PLAN

1.0 BACKGROUND

At the time of submittal and review of the Arkansas Nuclear One, Unit 2 (ANO-2) License Renewal Application (LRA), NUREG-1801, "Generic Aging Lessons Learned (GALL) Report, Revision 0 was the current guidance. Revision 0 of the GALL report was the standard to which the ANO-2 aging management programs (AMPs) were compared for technical adequacy. The results of this review were documented in NRC letter dated June 30, 2005, "Issuance of Renewed Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit 2" (ML051800757 and ML051890339) and provides the technical basis for the ANO-2 renewed license.

The GALL, Revision 0 report contains a nickel-based alloys aging management program, XI.M11, Nickel-Alloy Nozzles and Penetrations (Nickel-based alloy is also referred to as Alloy 600). The Alloy 600 Aging Management Program manages aging effects of Alloy 600/690 items and Alloy 52/152 and Alloy 82/182 welds in the reactor coolant system that are not addressed by the Reactor Vessel Head Penetration Inspection Program and the Steam Generator Integrity Program. This program detects primary water stress corrosion cracking (PWSCC) by using the examination and inspection requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI.

2.0 DISCUSSION

PWSCC in Alloy 600 materials is a current license term issue. As such, interaction between the NRC and the industry has been ongoing to develop a program to manage the effects of aging due to this mechanism. Issues that are relevant to current plan operation are addressed by the existing regulatory process within the present license term rather than deferred until the period of extended operations (PEO). The existing regulatory process provides assurance that aging effects caused by PWSCC of Alloy 600 materials is adequately managed during the PEO.

The nickel-based alloy items listed in Section B.1.1 of the LRA are included in the ANO-2 In-service Inspection (ISI) program with the exception of the thermal sleeves, the cladding on the pressurizer lower head, the reactor vessel lower shell and head, the steam generator tube sheet, the steam generator channel head divider plate and primary nozzle rings, and the pressurizer heater support plates and heater support plate brackets. It should be noted that ANO-2 has not replaced its upper reactor vessel closure head at this time. The items that are inspected as part of the ANO-2 ISI Program have a greater susceptibility to PWSCC due to physical configuration or operational conditions (e.g., temperature) than those listed above, and the items listed above that are not volumetrically or visually inspected are bounded by the items that receive examination in accordance with the ASME Code, Section XI.

Specific component scheduling and examinations are managed through the ANO-2 ISI Database contained within the IDDEAL Software Suite. The ANO-2 Fourth 10-Year

Interval ISI Program Plan meets the requirements contained in the 2001 Edition with through the 2003 Addenda with the limits and conditions contained in 10 CFR 50.55a. The program outlines performance of bare-metal visual, liquid penetrant, eddy current, and ultrasonic examinations to detect cracking of the in-scope components.

The program implementing procedures define the requirements and scope of the program. The procedures identify the specific base metal and dissimilar metal weld locations included in the program and the susceptibility of each location to PWSCC. The ISI program includes the procedures for performing the inspections, the acceptance criteria for each examination technique, and the requirements for review and disposition of inspection results. This program is in accordance with current applicable industry requirements including ASME Code Case N-722-1, N-729-1, and N-770-1 subject to the conditions stipulated in 10 CFR 50.55a.

3.0 EVALUATION USING NUREG-1801, GENERIC AGING LESSONS LEARNED (GALL) REPORT EVALUATION

3.1 SCOPE

The scope of the Alloy 600 program includes the following components:

- Upper Reactor Vessel Closure Head;
- Nozzles and Partial-Penetration Welds in the Upper Reactor Vessel Closure Head;
- Twelve Cold Leg Instrument Connections;
- Twenty-one Cold Leg Full Penetration Welds;
- Class 1 Piping and Vessel Nozzle Welds Fabricated with UNSN060802 or UNS W86182 material with or without mitigation (These are piping butt welds); and,
- Full Structural Weld Overlays on one Hot Leg Drain Nozzle to Safe End. One Hot Leg Surge Nozzle to Safe End and one Hot Leg Shutdown Cooling Nozzle to Safe End Dissimilar Metal Welds.

Based on the susceptibility of materials, the upper Reactor Vessel Closure Head is visually examined every refueling outage. The nozzles and partial-penetration welds in the head are volumetrically examined every refueling outage. ANO-2 is committed to perform the volumetric examination of the reactor vessel head every outage until the reactor vessel head is replace. (ASME Code Case N-729-1)

The twelve Cold Leg Instrument Connections and the twenty-one Cold Leg Full Penetration Welds have a bare metal visual examination performed in accordance with ASME Code Case N-722-1. Additionally, twelve of the twenty-one Cold Leg Full Penetration Welds have an ultrasonic examination performed in accordance with the

ANO-2 Risk-Informed ISI Program. These examinations are performed once per interval. The selection of these welds for examination meets the requirements of ASME Code Case N-722-1, Table 1, Item No. B15.205 and B15.215.

The Class 1 Alloy 600/82/182 Piping and Vessel Nozzle Butt Welds in the Alloy 600 program are visually examined once per interval and volumetrically examined every second inspection period not to exceed seven years. The selection of these welds for examination meets the requirements of ASME Code Case N-770-1, Table 1, Inspection Item B.

The three Full Structural Weld Overlays are examined in accordance with ANO-2 relief request ANO2-R&R-005. (Refer to NRC letter dated March 17, 2008, (ML080660082) for the Safety Evaluation for this relief request). The ANO-2 relief request provided the weld overlay examination area. This area is ultrasonically examined during the first or second refueling outage following application. Twenty-five percent of the full structural weld overlay population (non-Cast Stainless Steel (CSS)) is examined once every ten years. These welds are scheduled to meet these augmented requirements. ISI of these welds with CSS safe ends are performed at a higher frequency than those without CSS safe ends. These weld overlays are to be examined once every ten years from the date of installation until such time when a technique is qualified to examine CSS in accordance with the Performance Demonstration Initiative program.

3.2 PREVENTIVE ACTIONS

The Alloy 600 program is an inspection program and is designated condition monitoring. The Alloy 600 program does not include preventive actions.

ANO-2 has taken preventive measures to mitigate degradation of Alloy 600 components. These actions; however, are not part of the Alloy 600 program.

3.3 PARAMETERS MONITORED / INSPECTED

The Alloy 600 program detects degradation by using the examination and inspection requirements of ASME Section XI. The parameters monitored will be the presence and extent of cracking.

3.4 DETECTION OF AGING EFFECTS

The Alloy 600 program directs visual, surface, and volumetric examinations to detect cracking of the components due to PWSCC. The inspection plans for the Alloy 600 components are based on the guidance of ASME Section XI Code Cases N-722-1, N-729-1, and N-770-1 and the NRC approved relief request.

3.5 MONITORING AND TRENDING

Records of the inspection program, examination and test procedures, examination / test data, and corrective actions taken are maintained in accordance with the requirements of the ASME Code, Section XI.

3.6 ACCEPTANCE CRITERIA

The acceptance criteria for each inspection of the Alloy 600 components are in accordance with the appropriate section of the ASME Code, Section XI.

3.7 CORRECTIVE ACTION

For each component that does not meet the acceptance criteria, a condition report is issued in accordance with the Corrective Action Program.

If evaluations determine that the component requires repair or replacement then such repairs / replacements are performed in accordance with the ANO-2 repair / replacement program.

3.8 CONFIRMATION PROCESS

Quality Assurance procedures, review and approval processes, and administrative controls are implemented in accordance with 10 CFR 50, Appendix B.

The ANO-2 Alloy 600 and IS Programs are implemented in accordance with the requirements of the Entergy Quality Assurance Program Manual.

3.9 ADMINISTRATIVE CONTROLS

Administrative and implementation procedures are reviewed, approved, and maintained as controlled documents in accordance with the procedure control process and the Quality Assurance Program.

3.10 OPERATING EXPERIENCE

At the time the ANO-2 renewed license was issued, Entergy committed to follow industry efforts investigating the aging effects applicable to nickel-based alloys, identify the appropriate aging management activities, and implement the appropriate recommendations resulting from the guidance. Based on operating experience, Entergy has taken action to replace some ANO-2 Alloy 600 components, perform full structural weld overlays, and perform other mitigating activities. Internal and industry operating experience subsequent to the mitigation activities indicates that the inspection methodologies employed by the Alloy 600 inspection program have been effective in identifying cracking due to PWSCC.

4.0 SUMMARY

The ANO-2 license renewal commitment in correspondence dated September 10, 2004 (2CAN090402) (ML042660110) states:

Submit a description and inspection plans of the Alloy 600 program to the NRC for review and approval at least 24 months prior to the period of extended operations.

This submittal provides a description and an inspection plan for the ANO-2 Alloy 600 program and therefore fulfills this commitment.

The ANO-2 Alloy Aging Management Program, as summarized above, ensures that the effects of aging associated with the Alloy 600 components is adequately managed so that there is a reasonable assurance that their intended functions are maintained consistent with the current licensing basis throughout the PEO.