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10 CFR 50.55a

October 24, 2016
Serial: HNP-16-097

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

Shearon Harris Nuclear Power Plant, Unit 1
Docket No. 50-400/Renewed License No. NPF-63

Subject: Relief Request I3R-16, Reactor Vessel Closure Head Nozzle Repair Technique, Inservice Inspection Program, Third Ten-Year Interval, Response to Request for Additional Information

Ladies and Gentlemen:

Duke Energy Progress, LLC (Duke Energy), requested NRC approval of relief request (RR) I3R-16 for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP), Inservice Inspection (ISI) program by letter dated October 19, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML16294A218), which was supplemented by a letter dated October 21, 2016 (ADAMS Accession No. ML16295A159). The RR I3R-16 requests to use an alternate method in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, to repair flaw indications detected during the ISI program ultrasonic examination of the Reactor Vessel Closure Head (RVCH) Penetration Nozzles. The RR I3R-16 is applicable to RVCH Nozzle Numbers 30, 40, and 51. The NRC transmitted a request for additional information (RAI) to Duke Energy on October 21, 2016, regarding RR I3R-16. The Duke Energy response to this RAI is provided in the Enclosure to this letter.

This letter does not contain any regulatory commitments.

Please refer any questions regarding this submittal to John Caves, HNP Regulatory Affairs Manager, at (919) 362-2406.

Sincerely,

Ben C Waldrep

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Enclosure: Response to Request for Additional Information

cc: Mr. M. Riches, NRC Resident Inspector, HNP
Ms. M. Barillas, NRC Project Manager, HNP
NRC Regional Administrator, Region II

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Enclosure
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Request 1
Section 1 of the letter referenced above identified the affected components as "Reactor Vessel Closure Head (RVCH) Penetration Nozzles" without identifying specific nozzles. Section 4 of the letter referenced above identified nozzle numbers 30, 40 and 51 that need to be repaired. Clarify whether the relief request is applicable to only RVCH nozzle numbers 30, 40 and 51 or to all RVCH nozzles that have not been repaired.

Response 1
RR I3R-16 is only applicable to the following ASME Code Components: RVCH Penetration Nozzle Numbers 30, 40, and 51.

Request 2
In a letter dated April 29, 2015, the licensee notified the NRC that its evaluation of the impact of a residual flaw in the J-groove weld contained an error as documented in Calculation 32-9176350-001, Shearon Harris Unit 1 CRDM/CET [Control Rod Drive Mechanism/ Core Exit Thermocouple] Nozzle As-Left J-groove Weld Analysis. The licensee submitted calculation 32-9176350-001 to support relief request I3R-13 (ADAMS Accession No. ML13330A996). The licensee referenced calculation 32-9176350-001 in the original RR I3R-15 submittal dated April 2, 2015. Subsequently, the licensee corrected the original calculation and submitted the revised Calculation 32-9176350-002 as documented in enclosure 3 of the submittal dated April 29, 2015 (ADAMS Accession No. 15120A406). Confirm that the error in Calculation 32-9176350-001 in Relief Request I3R-13 has been removed and is not contained in Calculation 32-9176350-003 that is a part of the current Relief Request I3R-16.

Response 2
Calculation 32-9176350-002, included as enclosure 3 of the submittal dated April 29, 2015 (ADAMS Accession No. ML15120A406), was revised to resolve the primary stress limit analysis (PSLA) error contained in Calculation 32-9176350-001, Shearon Harris Unit 1 CRDM/CET Nozzle As-Left J-groove Weld Analysis. The error was rectified by performing a PSLA contained in a new Appendix C to Calculation 32-9176350-002. The PSLA methodology performed in

Calculation 32-9176350-002 is used in Calculation 32-9176350-003 to address nozzles 30, 40, and 51 in the current RR I3R-16.

Request 3

Discuss how the roll expansion joint will be applied and measures will be taken in the repair of the three RVCH nozzles in the Fall 2016 refueling outage to minimize stresses in the region above the roll expansion so as to prevent primary stress corrosion cracking in that region.

Response 3

The roll expansion process is carefully controlled to ensure stresses introduced do not have unintended consequences. Stresses introduced during the roll expansion process implemented per design and fabrication controls will not create regions that would be more susceptible to primary water stress corrosion cracking (PWSCC) than other regions that have been previously evaluated and found acceptable. Two fabrication parameters are controlled to ensure the nozzle roll expansion is effective in performing its design function of mechanical support for the nozzle prior to the application of the inside diameter temper bead weld, and does not introduce stresses sufficient to initiate PWSCC in the region above the roll expansion zone. The parameters of interest are tool insertion depth and torque on the assembly tool.

Tool insertion depth, based on tooling setup height, was controlled so that the rolled region was contained within the RVCH penetration bore. Tool insertion depth was adjusted based on the as-found head thickness. The tool is set up for the longest insertion distance and spacer plates are added to adjust (lower) the roll expander for the inboard nozzles. The adjustment of the thrust collar and selection of spacer plates is independently verified before tool use. The insertion depths calculated for nozzles 30, 40, and 51 were 8.102 inches (in.), 8.652 in., and 9.282 in., respectively. The actual insertion depths recorded in the installation procedure for nozzles 30, 40, and 51 were 8.079 in., 8.673 in., and 9.281 in., respectively. The difference between the target and actual depths is well within the allowable tolerance.

The torque applied to the roll expander is controlled so that the desired amount of plastic deformation occurs. The torque limiter assembly was set and independently verified with a calibrated torque wrench prior to use. The roll expansion procedure requires the torque limiter assembly to be set between 210 foot-pounds (ft-lb) and 240 ft-lb. The actual torque setting recorded in the installation procedure for nozzles 30, 40, and 51 was 225 ft-lb.

As noted above, the roll expansion process has been completed for nozzles 30, 40, and 51, and the two parameters of interest that could impact the susceptibility to PWSCC have been validated to be within process specifications. As a result, there is high confidence that adequate measures have been applied in nozzles 30, 40, and 51 repairs such that PWSCC in the region above the roll expansion zone is not expected to initiate.

Request 4

During the current Fall 2016 refueling outage, the licensee discovered an indication in repaired RVCH nozzle number 23 as discussed in Event Notification (EN) 52297. Discuss the measures and/or procedures that the proposed repair in Relief Request I3R-16 will implement or were implemented to minimize the occurrence of the indication that was discovered in nozzle number 23. If no measures have been implemented, provide justification.

Response 4

Nozzle 23 was initially repaired in May 2015. During the post-repair preservice examinations, a rounded indication of 0.149 inches was identified in the mid-section of the weld taper,

approximately 0.2 inches from the toe of the weld. This indication was acceptable under ASME code and therefore did not require repair. Previously repaired locations are examined each refueling outage. The examination of nozzle 23 in Fall 2016 revealed the indication now quantified as a 0.307 inch rounded indication, which will be repaired in accordance with ASME code requirements, for which no relief is required or requested.

Relief Request I3R-16 requires preservice and inservice examinations for acceptance of the inside diameter temper bead welds for RVCH Penetration Nozzle numbers 30, 40, and 51. The examination area is equivalent to that required by Figure 2 in ASME Code Case N-729-1. The inservice inspection discovery of this condition provides evidence that the required inservice inspections can identify flaws that would not be acceptable for continued service under the Code before they have a significant impact on the integrity of the repair.

The repair welds are subjected to multiple angle, multiple direction ultrasonic (UT) examination after installation. The repair welds are also subjected to surface examination. The repair weld integrity is verified by examination results, which satisfy the applicable ASME B&PV Code acceptance standards.

Precautions are in place to ensure first-time weld quality when executing weld repairs on Class 1 components. AREVA's record of achieving first time acceptable quality on RVCH CRDM Nozzle repairs consists of only 2 out of over 130 previous repairs requiring re-work. The two that required rework at other nuclear facilities were on penetrations that had active leaks and root welding contamination issues, neither of which are concerns for nozzles 30, 40, and 51 repairs at HNP. In the event an indication is found, whether in the preservice or subsequent inservice inspections, repairs would be completed in accordance with the ASME Code and the approval of relief request I3R-16 prior to any significant impact on the integrity of the weld repair on nozzles 30, 40, and 51.

Request 5

In Relief Request I3R-15, the licensee stated that the nozzle numbers 14, 18 and 23 that were repaired in 2015 have a design life of 2.2 effective full power years. Section 5, page 11, of current Relief Request I3R-16 discussed a limiting life of 5 years for the subject nozzle numbers 30, 40 and 51. Section 6 of I3R-16 states that "…The minimum life of 5 years is predicted based on the as-left J-groove flaw evaluation. The 2.2 EFPY [effective full power years] is based on a separate PWSCC evaluation in the exposed original Alloy 600 nozzle. The overall acceptable life of the repair design is based on the most limiting life predicted amongst the weld anomaly analysis, the as-left J-groove analysis and the PWSCC evaluation of the original Alloy 600 nozzle, which is 2.2 EFPY..." Clarify whether the design life for the subject nozzle numbers 30, 40 and 51 is 2.2 EFPY or 5 years.

Response 5

The overall acceptable life of the repair design is based on the most limiting life predicted amongst the weld anomaly analysis, the as-left J-groove analysis, and the PWSCC evaluation of the original Alloy 600 nozzle. For the weld anomaly and as-left J-groove weld analyses, the design life starts at the time of the repair.

For the most limiting PWSCC evaluation, the 2.2 EFPY predicted design life starts at the time of the repair; however, the design life is reset to an additional 2.2 EFPY upon demonstration of acceptable results from examinations performed during each subsequent outage. The design life of 2.2 EFPY for the RVCH Penetration Nozzle is based upon the PWSCC evaluation for nozzle numbers 30, 40, and 51.