

AUDIT WORKSHEET
GALL REPORT AMP

PLANT: _____

LRA AMP: _____

REVIEWER: _____

GALL AMP: XI.M11A, Nickel Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors

DATE: _____

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
Program Description	<p>A. This program is established to ensure that augmented inservice inspections (ISI) of all nickel-alloy vessel head penetration (VHP) nozzles welded to the upper reactor vessel (RV) head of a PWR-designed light-water reactor will continue to be performed as mandated by the interim requirements in Order EA-03-009, "Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (PWRs)," as amended by the First Revision of the Order, or by any subsequent NRC requirements that may be established to supersede the requirements of Order EA-03-009. Since 1997, the Nuclear Regulatory Commission (NRC) has issued a number of generic communications on the topic of primary water stress corrosion cracking (PWSCC) in upper VHP nozzles. These generic communications included issuance of NRC Generic Letter (GL) 97-01, Bulletin 2001-01, Bulletin 2002-01, and Bulletin 2002-02. In response to its reviews of the industry's responses to these generic communications, the staff determined that PWSCC-induced cracking of upper VHP nozzles was a significant safety issue for operating PWRs that warranted issuance of an NRC Order for augmented inspection of PWR upper VHP nozzles and upper RV heads. On February 11, 2003, the Commission issued Order EA-03-009 to all holders of PWR operating licenses. Order EA-03-009 was issued in accordance with the regulatory bases and</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	<p>requirements of 10 CFR 2.202 and the adequate protection backfit provisions of 10 CFR 50.109. In this Order, the NRC required specific augmented inspections of reactor vessel closure heads and the associated nickel-alloy penetration nozzles in U.S. PWRs. The NRC issued the First Revised Order EA-03-009 on February 20, 2004, to clarify which locations of the PWR vessel head penetration nozzles were applicable to the requirements of the Order. All PWR licensees in the U.S. were required to submit 20-day and 60-day responses to Order EA-03-009 and to First Revised Order EA-03-009 (henceforth referred to in this document collectively as “the Order, as amended”). The Order, as amended, established a mandated augmented inspection process for upper VHP nozzles and upper RV heads that supplements the leakage tests and visual VT-2 examinations requirements established in Section XI of the ASME Boiler and Pressure Vessel Code, Table IWB-2500-1, Examination Category B-P. The interim requirements of the Order, as amended, also established the NRC’s required technical method for calculating the susceptibility ranking of a plant’s upper VHP nozzles to PWSCC and a required process for establishing the inspection methods and inspection frequencies for a plant’s VHP nozzles in accordance with its susceptibility ranking.</p>	
1. Scope of Program	<p>A. The program is focused on managing the effects of cracking due to PWSCC of the nickel-alloy used in the fabrication of the upper VHP nozzles at PWR-designed nuclear facilities. The scope of this AMP is limited to upper VHP nozzles, including control rod drive mechanism (CRDM) nozzles, control element drive mechanism (CEDM) nozzles, thermocouples (TC) nozzles, in-core instrumentation (ICI) nozzles, and vent line nozzles; associated J-groove welds; and the adjoining upper RV closure head.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment</p>

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
2. Preventive Actions	A. Preventive measures to mitigate PWSCC are in accordance with PWR water chemistry guidelines for primary coolant systems, as established in EPRI Topical Report TR-105714 (applicants for license renewal may credit the version of the report on record at the facility at the time of submittal of its application). The program description and the evaluation and technical basis of monitoring and maintaining reactor coolant water chemistry are presented in Chapter XI.M2, "Water Chemistry."	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
3. Parameters Monitored/ Inspected	A. The program monitors for cracking/PWSCC and loss of material/wastage in the upper VHP nozzles to ensure the structural integrity of the VHP nozzles prior to a loss of their intended safety function.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	B. The program also monitors for evidence of reactor coolant leakage as a result of through-wall cracks that may exist in the upper VHP nozzles or their associated partial penetration J-groove welds. Evidence of reactor coolant leakage may manifest itself in the form of boric acid residues on the upper RV head or adjacent components or in the form of corrosion products that result from rusting of the low-alloy steel materials used to fabricate the RVs.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
4. Detection of Aging Effects	A. Implementation of inspections required by the Order, as amended, or any subsequent NRC requirements, as applicable, assures detection of cracks in the upper VHP nozzles and any loss of material/wastage of the upper RV head prior to a loss of intended function of the components. Detection of cracking (including those induced by PWSCC) is accomplished through implementation of a combination of bare-metal visual examination and/or non-visual examination techniques, as discussed in the Order, as amended. Bare-metal visual examinations required by the Order, as amended, are used to detect reactor coolant leakage from the VHP nozzles or their	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	associated J-groove welds and for any loss of material that may be induced as a result of boric-acid wastage.	
“	B. Non-visual examination techniques required by the Order, as amended, are also used to detect these aging effects and are performed using either surface examination techniques (eddy current or penetrant testing) or volumetric examination techniques (ultrasonic testing).	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Document(s) used to confirm Criteria:</p> <p>Comment:</p>
“	C. The specific types of examinations to be implemented are dependent on a plant’s susceptibility ranking for its VHP nozzles. Inspection methods selected for examination are implemented in accordance with appropriate inspection requirements of Section IV.C of the Order, as amended, as applicable for a plant’s susceptibility ranking (i.e., in accordance with the appropriate inspection methods mandated for “Low,” “Moderate,” “High,” or “Replaced” susceptibility category plants). Any deviations from implementing the appropriate required inspection methods of the Order, as amended, will be submitted for NRC review and approval in accordance with the Order, as amended.	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Document(s) used to confirm Criteria:</p> <p>Comment:</p>
5. Monitoring and Trending	A. As required by the Order, as amended, inspection schedules and frequencies for the applicant’s VHP nozzles are implemented in accordance with required frequencies for the plant’s susceptibility category (i.e., in accordance with the specific inspection frequencies required for “Low,” “Moderate,” “High,” or “Replaced” susceptibility categories, as based on the “total effective degradation years”). Any deviations from implementing the required inspection frequencies mandated by	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Document(s) used to confirm Criteria:</p> <p>Comment:</p>

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	<p>the Order, as amended, will be submitted for NRC review and approval in accordance with the Order, as amended. Disposition of flaw indications detected during required examinations is implemented in accordance with the Acceptance Criteria and Corrective Actions Program attributes of this AMP.</p>	
6. Acceptance Criteria	<p>A. Relevant flaw indications detected as a result of the augmented inspections of the upper VHP nozzles are to be evaluated in accordance with acceptable law evaluation criteria provided in a letter from Mr. Richard Barrett, NRC, Office of Nuclear Reactor Regulation (NRR), Division of Engineering to Alex Marion, Nuclear Energy Institute (NEI), dated April 11, 2003, or in accordance with NRC-approved Code Cases that incorporate the flaw evaluation procedures and criteria of the NRC's April 11, 2003, letter to NEI.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
7. Corrective Actions	<p>A. Relevant flaw indications in the upper VHP nozzles or their associated nickel-alloy J-groove weld materials are unacceptable for further service and are corrected through implementation of appropriate repair or replacement activities.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
“	<p>B. In addition, detection of leakage or evidence of cracking in the VHP nozzles (including associated J-groove welds) of plants ranked in the “Low,” “Moderate,” or “Replaced” susceptibility categories requires that the plant's VHP nozzles be immediately reclassified to the “High” susceptibility category and that the required augmented inspections for “High” susceptibility VHP nozzles be implemented, commencing from the same outage in which the leakage or cracking was detected. Repair and replacement procedures and activities either must comply with ASME Section XI, as invoked by the requirements of 10 CFR 50.55a, or conform with 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</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	repair/replacement activities suggested instead of those endorsed by the NRC in either Section XI or NRC-approved Code Cases must be requested for NRC approval in accordance with either the acceptable alternative provisions of 10 CFR 50.55a(a)(3)(i) or hardship provisions of 10 CFR 50.55a(a)(3)(ii).	
8. Confirmation Process	A. Site quality assurance (QA) procedures, review and approval processes are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," acceptable to address confirmation process and administrative controls.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
9. Administrative Controls	A. See Item 8, above.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
10. Operating Experience	A. PWSCC is occurring in the VHP nozzles of U.S. PWRs, as described in the program description above. In addition, applicants for license renewal should reference plant-specific operating experience that is applicable to PWSCC of its VHP nozzles.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

EXCEPTIONS

Item Number	Program Elements	LRA Exception Description	Basis for Accepting Exception	Documents Reviewed (Identifier, Para.# and/or Page #)
1.				
2.				
...				

ENHANCEMENTS

Item Number	Program Elements	LRA Enhancement Description	Basis for Accepting Enhancement	Documents Reviewed (Identifier, Para.# and/or Page #)
1.				
2.				
...				

DOCUMENT REVIEWED DURING AUDIT

Document Number	Identifier (number)	Title	Revision and/or Date
1.			
2.			
3.			
4.			
....			