

# ASME Section XI NONMANDATORY APPENDIX R

# Risk-informed Inspection Requirements for Piping



April 17th, 2018

### **RI-ISI Timeline**

2006-Present 1996-1997 1998-1999 1999-2006 U.S. & Worldwide Industry Implementation ASME Section XI **USNRC** Approves **Industry Reports** 25-30 US Reactors + ~5 US Reactors + Code Case N577 **WOG Topical** Several Countries in Several Countries in RI-ISI Method A #14572-A Europe / Asia Europe / Asia "RI-ISI Method A" Code Case N-578 60 US Reactors + ~50 US Reactors, RI-ISI Method B Several countries in Canada, Mexico, S. **EPRI Topical** Africa & Several Europe #112657, Rev B-A Countries in Europe "RI-ISI Method B" Code Case N-716 EPRI Report #30020030291 ~45 US Reactors "Streamlined RI-ISI"



# **Initial Approval Process**

- Pilot Plant Process
  - Topical Reports
  - Plant-specific evaluations provided to NRC
  - Substantial interactions

- Follow-on Process
  - Plant-specific relief request following industry/NRC agreed upon Template



# **Initial Approval Process**

- Significant industry / NRC interactions
  - 50 plant-specific approvals
  - Updates to code cases and creation of Appendix R

Nondestructive Evaluation: Probabilistic Risk
ssessment Technical Adequacy Guidance for Risk
Informed In-Service Inspection Programs

- PRA Technical Adequacy identified as generic issue
  - Regulatory Guide 1.200, rev 2 03/2009
    - An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessments Results for Risk-Informed Activities
  - EPRI Topical Report #1021467-A approved by NRC
    - Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs
    - Applies to both the EPRI Traditional (ASME Appendix R) and EPRI Streamlined RI-ISI (Code Case N716) Methodologies



### **Current Status**

- EPRI Streamlined RI-ISI Methodology
  - ASME Code Case N716-1
  - Endorsed in Regulatory Guide 1.1467, revision
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  - Relief request / Request for alternative no longer required
  - Focuses limited NRC / industry resources on more important issues / components
- EPRI Traditional RI-ISI Methodology
  - Latest version of 10CFR50.55a still requires plant-specific submittals as well as NRC review and approval

Code Case Number	Table 1 Acceptable Section XI Code Cases	Date		
N-666	Weld Overlay of Class 1, 2, and 3 Socket Welded Connections, Section XI, Division 1	4/18/06		
N-683	Method for Determining Maximum Allowable False Calls When Performing Single-Sided Access Performance Demonstration in Accordance with Appendix VIII, Supplements 4 and 6, Section XI, Division 1			
N-685	Lighting Requirements for Surface Examination, Section XI, Division 1	2/28/03		
N-686-1	Alternative Requirements for Visual Examinations, VT-1, VT-2, and VT-3, Section XI, Division			
N-695	Qualification Requirements for Dissimilar Metal Piping Welds, Section XI Division 1			
N-696	Qualification Requirements for Appendix VIII Piping Examinations Conducted from the Inside Surface, Section XI, Division I	5/21/03		
N-697	Pressurized Water Reactor (PWR) Examination and Alternative Examination Requirements for Pressure Retaining Welds in Control Rod Drive and Instrument Nozzle Housings, Section XI, Division 1	11/18/03		
N-700	Alternative Rules for Selection of Classes 1, 2, and 3 Vessel Welded Attachments for Examination, Section XI, Division 1			
N-705	Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks, Section XI, Division 1			
N-706-1	Alternative Examination Requirements of Table IWB-2500-1 and Table IWC-2500-1 for PWR Stainless Steel Residual and Regenerative Heat Exchangers, Section XI, Division 1			
N-712	Class 1 Socket Weld Examinations, Section XI, Division 1	5/12/04		
N-716-1	Alternative Piping Classification and Examination Requirements, Section XI, Division 1	1/27/13		
N-730	Roll Expansion of Class 1 Control Rod Drive Bottom Head Penetrations in BWRs, Section XI, Division 1	10/04/06		
N-731	Alternative Class 1 System Leakage Test Pressure Requirements, Section XI, Division 1	2/22/05		
N-733	Mitigation of Flavs: in NPS 2 (DN 50) and Smaller Nozzles and Nozzle Partial Peneration Welds in Vessels and Piping by Use of a Mechanical Connection Modification, Section XI, Division I			
N-735	Successive Inspection of Class 1 and 2 Piping Welds, Section XI, Division 1	10/12/06		

Revision 17 of RG 1.147, Page 7



## **ASME Section XI - Appendix R**

- What steps are needed to get Appendix R endorsed in 10CFR50.55a?
  - Reflect guidance in EPRI Topical Report #1021467-A as approved by NRC?
  - And?

• What is the best process for assuring timely changes are made to Appendix R to allow efficient endorsement by NRC in 10CFR50.55a? NONMANDATORY APPENDIX R

DATE CECTION VI

#### NONMANDATORY APPENDIX R RISK-INFORMED INSPECTION REQUIREMENTS FOR PIPING

#### ARTICLE R-1000 INTRODUCTION

#### R-1100 SCOP

(a) When an Owner chooses to use this Appendix, the requirements of Section XI, Division 1 shall apply, except for the alternatives and exemptions provided by this Appendix. In addition, all of the provisions of this Appendix are mandatory for the piping within the boundaries of the piping for which this Appendix will be used to satisfy the requirements of IWHE-2500, IWC-2500, or IWD-2550.

the requirements of the 200, the received in Supplements 1 and 2 may be applied to all Classes 1, 2, and 3 piping systems, an individual Class of piping (e.g., Class 1 piping), to all piping in Examination Category BF, B-I, C-F-I, or C-F-I, or to one or more individual piping systems (e.g., Reactor Coolant System). Boundaries for the scope of all piping systems, or portions thereof, (i.e., portions of piping a pieded to include a complete Examination Category of piping a piping system, or a Class of piping) to be considered for evaluation in accordance with either risk-informed selection process shall be clearly defined. When not applying either process to all systems in a Class of piping, piping, a piping systems that are not evaluated shall be examined in accordance with Examination Category B-R B\_J-C-F-I, or C-F-Z, as applicable.

(c) Application of this Appendix for plants that do not have an existing deterministic inservice inspection program is in the course of preparation.

#### R-1200 PIPING SUBJECT TO EXAMINATION

#### R-1210 BOUNDARY REQUIREMENTS

As an alternative to the examination requirements of IWB-1210, IWC-1210, or IWD-1210, as applicable, the examination requirements of this Appendix shall be used for Class 1, 2, and 3 piping evaluated by a risk-informed process. Piping in systems evaluated as part of the plant Probabilistic Risk Assessment (PRA), but outside the current Section XI examination boundaries: may be included.

#### R-1220 PIPING EXEMPT FROM EXAMINATION

In lieu of the exemptions of IWB-1220, IWC-1220, or IWD-1220, as applicable, piping segments and their structural elements shall be evaluated in accordance with the requirements of Supplement 1 or 2 to determine if any exemptions may be applied.

#### R-1230 RISK-INFORMED SELECTION PROCESS

(a) High Safety Significant (HSS) piping structural elements shall be examined in accordance with R-2500.

(b) The risk-informed selection processes in this Appen-

dix are specified in Supplements 1 and 2. Each process identifies how to classify piping segments and their piping structural elements, based on their safety significance, as HSS or Low Safety Significant (LSS). (c) If using Supplement 1, HSS or LSS is determined by

the process described in 4.2.4 through 4.2.8 of Supplement 1, and if using Supplement 2, HSS is determined to be Risk Category 1, 2, 3, 4, or 5, and LSS is Risk Category 6 or 7 as defined in 3.3.2 of Supplement 2.

#### R-1300 OWNER'S RESPONSIBILITY

#### R-1310 ADEQUACY OF THE PRA

The PRA shall meet the requirements of ASME RASwith the RAS-a addenda and the RAS-b addenda to the extent required to support the development and application of a risk-informed inservice inspection program. All PRAweaknesses or deficiencies identified by regulatory or peer review shall be explicitly accounted for during the analysis used to support the risk-informed inspection program. The resolution of all PRA issues shall be documented.

#### R-1320 PROGRAM INTENT AND PRINCIPLES

The development or update of a risk-informed inspection program in accordance with this Appendix shall meet the intent and principles outlined in USNRC Regulatory Guide 1.174, Revision 1, November 2002, and Regulatory Guide 1.178, Revision 1, September 2008.

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