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RESEARCH INSTITUTE

**CHRISTIAN B. LARSEN**
Vice President and
Chief Nuclear Officer

February 18, 2009

Tanya Mensah
Document Control Desk
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Subject: Report Transmittal; "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed Inservice Inspection Programs," EPRI, Palo Alto, CA: 2008. 1018427

Ref. EPRI Project Number 669

Dear Ms. Mensah:

Enclosed is the EPRI Report "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed Inservice Inspection Programs," EPRI, Palo Alto, CA: 2008. 1018427. This report is being transmitted as a means of exchanging information with the NRC for the purposes of supporting generic regulatory improvements with respect to application of risk-informed technology to inservice inspection (RI-ISI) programs. EPRI is requesting that the NRC issue a safety evaluation report (SER) on 1018427.

The USNRC has issued revision 1 to Regulatory Guide 1.200 (RG1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessments Results for Risk-informed Activities." This regulatory guide describes NRC's approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making (e.g. RI-ISI applications). In particular, the regulatory guide defines the quality of a PRA analysis used to support a particular application in terms of its appropriateness with respect to scope, level of detail, and technical acceptability.

EPRI report 1018427 has been develop to provide guidance in defining which technical elements and supporting requirements of the plant PRA are applicable to RI-ISI programs. Also, for those supporting requirements that are applicable to RI-ISI programs, this report provides guidance on the appropriate capability category. This guidance is provided for both EPRI's traditional RI-ISI methodology (EPRI TR-112657) and our streamlined RI-ISI methodology (N716).

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NRR



3420 Hillview Avenue, Palo Alto, CA 94304-1338 USA • 650.855.2329 • Fax 650.855.8759 • cblarsen@epri.com

Two copies of the report are enclosed.

If you have any questions on this subject, please contact Anne Demma (ademma@epri.com, 650-850-2026)

Sincerely,

Enclosures

c: Stephen Dinsmore (NRC)
Art Smith (Entergy)
Sam Volk (Progress)
R. Bradley (NEI)
Patrick O'Regan (EPRI)
John Lindberg (EPRI)

ELECTRIC POWER
RESEARCH INSTITUTE

**CHRISTIAN B. LARSEN**
Vice President and
Chief Nuclear Officer

February 18, 2009

Chief Financial Officer
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Subject: Request for Exemption of NRC Review Fees for "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed Inservice Inspection Program," EPRI, Palo Alto, CA: 2008. 1018427
Ref. EPRI Project Number 669

Reference:
(1) Report Transmittal; "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed Inservice Inspection Programs," EPRI, Palo Alto, CA: 2008. 1018427 Ref. EPRI Project Number 669, Christian B. Larsen (EPRI) to Document Control Desk, U.S. Nuclear Regulatory Commission, Dated February 09, 2009, Report Transmittal

(2) ASME C&S Connect #09-22 - Section XI - Code Case N-716-1, "Alternative Piping Classification and Examination Requirements Based Upon Risk-Informed and Safety-Based Insights," dated January 23, 2009

The purpose of this letter is to request that the document entitled "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed Inservice Inspection Programs," EPRI, Palo Alto, CA: 2008. 1018427, be exempt for NRC review fees in accordance with 10CFR170.11 (a) (1)(iii)(A)*(1)*.

EPRI Report 1018427 was submitted to the NRC by the referenced letter, which indicates that the document is provided for exchanging information with the NRC for the purposes of supporting generic regulatory improvements with respect to application of risk-informed technology to inservice inspection (RI-ISI) programs.

The USNRC has issued revision 1 to Regulatory Guide 1.200 (RG1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessments Results for Risk-informed Activities." This regulatory guide describes NRC's approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making (e.g. RI-ISI applications). In particular, the regulatory guide defines the quality of a PRA



3420 Hillview Avenue, Palo Alto, CA 94304-1338 USA • 650.855.2329 • Fax 650.855.8759 • cblarsen@epri.com

analysis used to support a particular application in terms of its appropriateness with respect to scope, level of detail, and technical acceptability. All future RI-ISI submittals (and re-submittals) are required to address Regulatory Guide 1.2000 as part of their RI-ISI application.

EPRI report 1018427 has been develop to provide guidance in defining which technical elements and supporting requirements of the plant PRA are applicable to RI-ISI programs. Also, for those supporting requirements that are applicable to RI-ISI programs, this report provides guidance on the appropriate capability category. This guidance is provided for both EPRI's traditional RI-ISI methodology (EPRI TR-112657) and our streamlined RI-ISI methodology (N716).

EPRI report 1018427 serves as an effective means to address PRA Technical Adequacy Requirements for RI-ISI programs. It is our understanding through a number of meetings between industry and NRC staff that this report is expected to be an important document for NRC staff to support agency reviews of RI-ISI submittals. NRC review and acceptance of EPRI report 1018427 is the most efficient use of NRC and industry resources to support generic regulatory improvements in an area which is not fully addressed by current NRC regulations.

As this report is applicable to the vast majority of the operating fleet and will also be applicable to existing and future COL applicants, NRC review and acceptance of EPRI 1018427 is the most efficient use of industry and NRC resources. Since each licensee is required to make a plant-specific submittal for their RI-ISI program, NRC review and acceptance of the document should increase the efficiency and reduce the man-hours required for individual licensee reviews. Finally, NRC staff has asked for a copy of this report for its use in interactions between NRC and ASME (see Reference 2).

Sincerely,

Enclosures

c: Stephen Dinsmore (NRC)
Art Smith (Entergy)
Sam Volk (Progress)
R. Bradley (NEI)
Patrick O'Regan (EPRI)
John Lindberg (EPRI)

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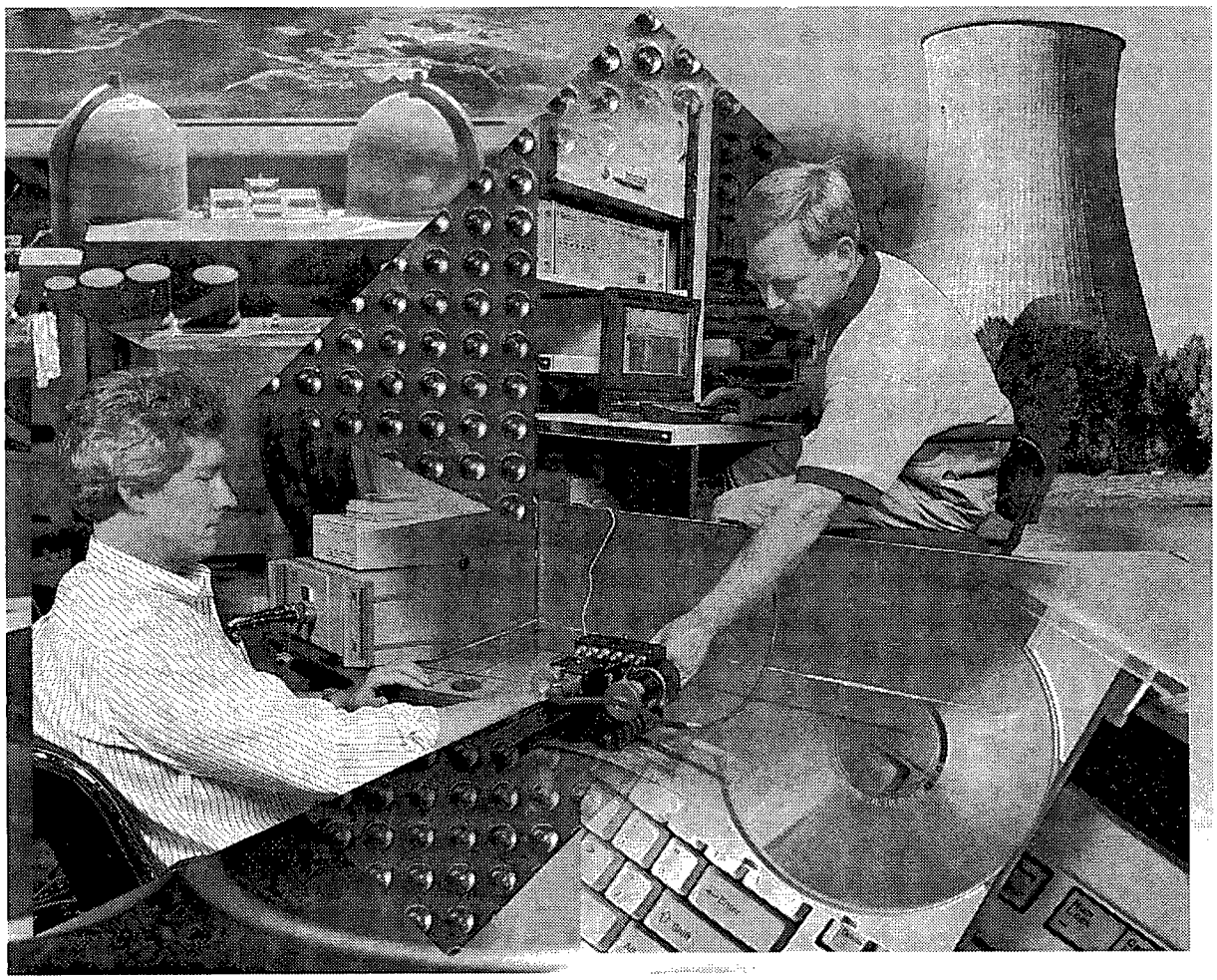
# Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs

1018427



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

1018427

Technical Update, December 2008

EPRI Project Manager

P. O'Regan

ELECTRIC POWER RESEARCH INSTITUTE
3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 • USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

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# CITATIONS

This report was prepared by

AREVA NP, Inc.
400 Donald Lynch Blvd.
Marlborough, MA 01752

Principal Investigator
V. Dimitrijevic

Electric Power Research Institute (EPRI)
Nondestructive Evaluation (NDE) Program
1300 W.T. Harris Blvd.
Charlotte, NC 28262

Principal Investigator
P. O'Regan

JH Moody Consulting
30 Kooaukee Court
Strafford, NH 03884

Principal Investigator
J. Moody

Scientech, LLC
Curtiss-Wright Flow Control
Commercial Power & Services
1740 Mass Avenue
Boxboro, MA 01719

Principal Investigator
J. Chapman

This report describes research sponsored by EPRI.

The report is a corporate document that should be cited in the literature in the following manner:

*Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-Service Inspection Programs.* EPRI, Palo Alto, CA: 2008. 1018427.

# PRODUCT DESCRIPTION

Risk-informed methodologies have been developed in order to establish alternative in-service inspection requirements that are defined as risk-informed in-service inspection (RI-ISI) programs. Plant-specific probabilistic risk assessments (PRAs) are typically used during the RI-ISI development process. The ASME PRA Standard (ASME RA-Sb-2005) and the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.200 R1 have been issued and provide guidance in determining PRA technical adequacy. Thus, a need was identified to determine which attributes in these documents pertain to RI-ISI programs.

## Results and Findings

This report provides guidance on determining the technical adequacy of PRAs used to develop RI-ISI programs. The technical adequacy of the PRA is determined by demonstrating that the PRA meets technical elements and associated supporting requirements (SRs) of NRC RG 1.200. Most but not all of these technical elements and supporting requirements relate to the technical aspects of the plant PRA, and so peer-review findings and/or gaps related to documentation that do not impact the results would still allow the PRA to support development of an RI-ISI program.

## Challenges and Objectives

Risk-informed methodologies have been developed in order to establish alternative in-service inspection requirements. Plant-specific PRAs are typically used during RI-ISI development to support the consequence assessment that will also impact the risk ranking, element selection, and delta risk evaluation steps.

With respect to PRA technical adequacy, the ASME PRA Standard has been developed (ASME RA-Sb-2005), and the NRC RG 1.200 R1 was issued, providing a review and an endorsement (with positions) of the PRA Standard.

This report will be useful to personnel responsible for developing and maintaining an RI-ISI program. It will also be useful to personnel who support RI-ISI program development. In particular, it can be used by plant PRA staff to assess the technical adequacy of the plant's PRA as needed to support RI-ISI development.

## Applications, Value, and Use

The information contained in this report can be used by plant operators who wish to implement and maintain RI-ISI programs. As future revisions to RG 1.200 occur, this work will be updated to support future RI-ISI application and maintenance.

## EPRI Perspective

The vast majority of U.S. plants that implement RI-ISI programs have used tools and products developed by the Electric Power Research Institute (EPRI). This report reviews these tools and products against the ASME PRA Standard and the NRC RG 1.200. This report will support industry implementation and maintenance of these tools and products.

## Approach

Each of the supporting requirements in the ASME Standard was reviewed for applicability to RI-ISI programs. For supporting requirements applicable to RI-ISI programs, an assessment was made in order to define the capability category necessary to support the development of an RI-ISI program. Positions in RG 1.200 R1 were also addressed in this assessment.


## Keywords

Risk-informed
In-service inspection
Risk-informed in-service inspection (RI-ISI)
Probabilistic risk assessment (PRA)
Probabilistic safety assessment (PSA)

# ACKNOWLEDGMENTS

EPRI wishes to acknowledge the support and guidance provided by the NDE Program Steering Committee (APWG #4). Their continued support provides the foundation for the development and application of this technology to the vast majority of U.S. plants and a number of international members. Additionally, Art Smith of Entergy and Sam Volk of Progress Energy were key sponsors for this effort and provided invaluable insight and direction.

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# 1
# INTRODUCTION

The Electric Power Research Institute (EPRI) has developed alternative piping selection methodologies based on risk-informed insights, operating experience, and an inspection for cause philosophy. These methodologies have been validated in several NRC-approved pilot applications, by numerous additional plant applications, and subsequently embodied in ASME Standards (for example, Code Cases, non-mandatory Appendix). Figure 1-1 provides a status of RI-ISI applications in the United States. When the risk-informed methods are used, changes to the number and locations for inspection required are accompanied with increases in plant safety or a negligible change in plant risk.

These risk-informed methodologies use plant-specific PRAs as a key input into the development of the RI-ISI program. Use of the plant-specific PRA includes the following:

- Success criteria are used to define safety functions and backup trains.
- Conditional core damage probabilities (CCDP) are used for initiating events.
- The PRA system and/or train unavailabilities are used to determine the equivalent train worth for each backup train.
- PRA results are used to determine conditional LERF, given core damage, and to identify event sequences that provide the dominant contribution to LERF.
- Plant-specific failure data are used for isolation valves.
- Internal flood results, when used, help define spatial effects associated with postulate piping failure.

The NRC has issued a revision 1 to Regulatory Guide 1.200 (RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessments Results for Risk-informed Activities"). This regulatory guide describes NRC's approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results so that the PRA can be used in regulatory decision making (for example, RI-ISI applications). In particular, the regulatory guide defines the quality of a PRA analysis used to support a particular application in terms of its appropriateness with respect to scope, level of detail, and technical acceptability.

As discussed in RG 1.200 and other related documents (for example, Regulatory Guide 1.174), the confidence in the information derived from the PRA is an important issue in that the accuracy of the technical content must be sufficient to justify the specific results and insights that are used to support the decision under consideration—in this case, the development of the RI-ISI program. It is also recognized that necessary sophistication of the evaluation, including the use of the PRA, depends on the contribution that the risk assessment makes to the integrated decision making, which depends to some extent on the magnitude of the potential risk impact of the application. That is, for applications that may have a more substantial impact, an in-depth and comprehensive PRA analysis would be required. Whereas in other applications, bounding estimates, simplified analyses, and/or qualitative assessments are sufficient.

This report provides guidance in defining which technical elements and supporting requirements of the plant PRA are applicable to RI-ISI programs. Also, for those supporting requirements that are applicable to RI-ISI programs, this report provides guidance on the appropriate capability category.

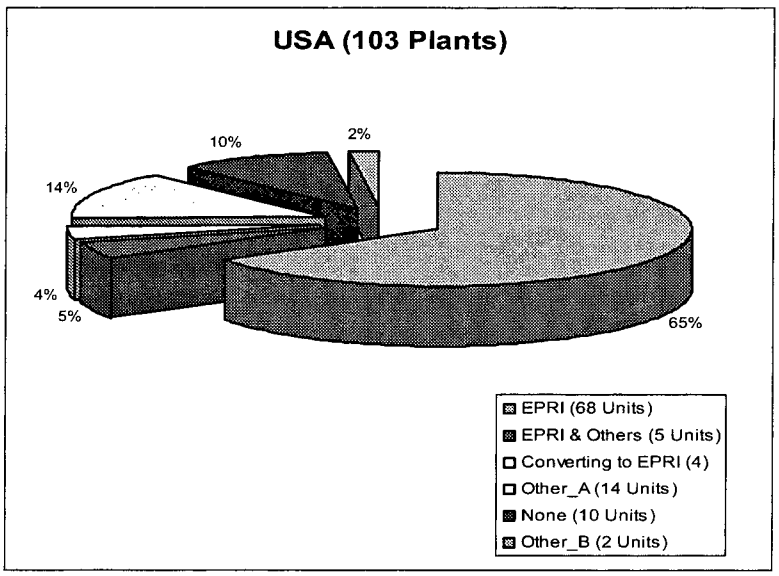


**Figure 1-1**
**Status of RI-ISI applications in the United States**

# 2
# PRA TECHNICAL ADEQUACY GUIDANCE FOR RI-ISI APPLICATIONS

Risk-informed methodologies have been developed in order to establish alternative in-service inspection requirements. Plant-specific PRAs are typically used during the RI-ISI development to support the consequence assessment, risk ranking, element selection, and delta risk evaluation steps.

With respect to PRA technical adequacy, the ASME PRA Standard has been developed (ASME RA-Sb-2005), and the NRC Regulatory Guide (RG) 1.200 R1 was issued, providing a review and endorsement (with positions) of the PRA Standard.

A PRA meeting Capability Category II of the PRA Standard is a major step forward in the PRA maturation process and is an acceptable starting point for almost all risk assessment applications. This viewpoint is supported by the general trend that Capability Category I supporting requirements (SRs) have a conservative bias, whereas Capability Category III SRs represent more realism in the analysis. In addition, an increasing capability category tends to increase the completeness as well as documentation requirements of the PRA.

There are some SRs in which this trend is not observed, and the bias can be in either direction (conservative or nonconservative). For example, the supporting requirement SC-B1 is an example of the general trend in that the higher capability categories are less conservative and provide more realism. The supporting requirement IF-C3 is one of the few supporting requirements that exhibits the opposite trend in that the higher capability categories are more complete and realistic, but the lower capability categories are not conservative.

For IF-C3, in particular, the NRC in RG 1.200 R1 has taken the position that for Capability Category II, conservative assumptions are to be used to preserve the general trend, although only between Capability Categories II and III.

With respect to risk-informed applications, Section 3 of the PRA Standard provides a roadmap for determining the capability of a PRA needed to support a particular risk-informed application. Key aspects of this roadmap include the following:

- Role of the PRA in the application and extent of reliance of the decision on the PRA results
- Risk metrics to be used to support the application and associated decision criteria
- Significance of the risk contribution from the hazard group to the decision
- Degree to which bounding or conservative methods for the PRA or in a given portion of the PRA would lead to inappropriately influencing the decisions made in the application and approach(es) for accounting for this in the decision-making process
- Degree of accuracy and evaluation of uncertainties and sensitivities required of the PRA results
- Degree of confidence in the results that are required to support the decision
- Extent to which the decisions made in the application will impact the plant design basis

Each of these aspects is discussed in detail in EPRI TR-112657, which provides the foundation for the EPRI traditional RI-ISI approach and the EPRI streamlined RI-ISI approach codified in ASME Code Case N716.

This report provides guidance as to the capability categories for each supporting requirement that is applicable to RI-ISI applications. Some RI-ISI applications have made use of the plant's existing internal flooding study, whereas some have not. If the internal flooding was used during the development of the RI-ISI program, the IF SRs are applicable. If the internal flooding study was not used to support the development of the RI-ISI program, the IF SRs are not applicable.

For the purposes of RI-ISI, the capability category relates to the technical aspects of the plant PRA and so peer review findings and/or gaps related to documentation that do not impact the results would allow the capability category to still be considered met.

Tables 2-1 and 2-2 summarize the results of this review. As can be seen in the tables, for many of the supporting requirements, there is no differentiation between capability categories. That is, the requirements of the Standard have the same wording for all three capability categories. Additionally, 23 supporting requirements were identified as not applicable to RI-ISI applications (that is, need not be met). Of the remaining supporting requirements, Capability Category I has been determined to be sufficient for RI-ISI applications.

Tables 2-1 and 2-2 provide only a summary of the review documented in this report. Appendix A provides the detailed breakdown of each supporting requirement and provides the basis for the capability category assignments. Thus, Appendix A should be used when comparing an existing plant PRA to the guidelines contained in this report.

For ease of reference, a summary description of the EPRI traditional and streamlined RI-ISI methodologies are presented in Appendix B.

**Table 2-1**
**Summary of Capability Category Guidance**

| Capability Category | EPRI Traditional RI-ISI[1, 2] | EPRI Streamlined RI-ISI[2, 3] |
|---|---|---|
| III and II | 1 IF SR | 1 IF SR |
| II and I | 11 non-IF SRs + 2 IF SRs = 13 SRs | 11 non-IF SRs + 2 IF SRs = 13 SRs |
| II | 3 IF SRs | 1 non-IF SR + 3 IF SRs = 4 SRs |
| I | 70 SRs (non-IF and IF) | 69 SRs (non-IF and IF) |
| Need not be met | 23 SRs (non-IF and IF) | 23 SRs (non-IF and IF) |
| Spans all three categories and needs to be met | 197 SRs (non-IF and IF) | 197 SRs (non-IF and IF) |

**Notes:**

1. The internal flooding SRs are applicable only to the traditional RI-ISI approach if the internal flooding study is used to directly support the development of the RI-ISI program.
2. For purposes of RI-ISI, the capability category relates to technical aspects of the plant PRA and so peer review findings and/or gaps related to documentation that do not impact the results would allow the capability category to still be considered met.
3. The EPRI streamlined RI-ISI methodology has been codified in ASME Code Case N716.

**Table 2-2**
**Supporting Requirement by Capability Category**

| Capability Category | EPRI Traditional RI-ISI[1, 2] | EPRI Streamlined RI-ISI[2, 3] |
|---|---|---|
| III and II | IF-D5A | IF-D5A |
| | | |
| II and I | IE-A3a, IE-C11, IE-C12, AS-A7, SY-A7, SY-A15, SY-B2, HR-D7, HR-F1, DA-B2, DA-C9, IF-D3a, IF-E3a | IE-A3a, IE-C11, IE-C12, AS-A7, SY-A7, SY-A15, SY-B2, HR-D7, HR-F1, DA-B2, DA-C9, IF-D3a, IF-E3a |
| | | |
| II | IF-C3, IF-C6, IF-C8 | IE-A4, IF-C3, IF-C6, IF-C8 |
| | | |
| I | IE-A4, IE-E4a, IE-A6, IE-A7, IE-B3, AS-A9, AS-A10, SC-A2, SC-A5, SC-B1, SC-B2, SY-A4, SY-A20, SY-B1, SY-B7, SY-B11, HR-B1, HR-C2, HR-D2, HR-D3, HR-E3, HR-E4, HR-F2, HR-G1, HR-G3, HR-G4, HR-G5, HR-H1, DA-B1, DA-C7, DA-C8, DA-C10, DA-C12, DA-D1, DA-D3, DA-D4, DA-D5, DA-D6, DA-D7, IF-A1a, IF-C3b, IF-D3, QU-A2b, QU-D3, QU-D5a, QU-E3, QU-F3, LE-B1, LE-B2, LE-C1, LE-C2a, LE-C2b, LE-C3, LE-C4, LE-C8a, LE-C8b, LE-C9a, LE-C9b, LE-C10, LE-D1a, LE-D1b, LE-D2, LE-D3, LE-D4, LE-D5, LE-D6, LE-E2, LE-E3, LE-F1a, LE-G3 | IE-E4a, IE-A6, IE-A7, IE-B3, AS-A9, AS-A10, SC-A2, SC-A5, SC-B1, SC-B2, SY-A4, SY-A20, SY-B1, SY-B7, SY-B11, HR-B1, HR-C2, HR-D2, HR-D3, HR-E3, HR-E4, HR-F2, HR-G1, HR-G3, HR-G4, HR-G5, HR-H1, DA-B1, DA-C7, DA-C8, DA-C10, DA-C12, DA-D1, DA-D3, DA-D4, DA-D5, DA-D6, DA-D7, IF-A1a, IF-C3b, IF-D3, QU-A2b, QU-D3, QU-D5a, QU-E3, QU-F3, LE-B1, LE-B2, LE-C1, LE-C2a, LE-C2b, LE-C3, LE-C4, LE-C8a, LE-C8b, LE-C9a, LE-C9b, LE-C10, LE-D1a, LE-D1b, LE-D2, LE-D3, LE-D4, LE-D5, LE-D6, LE-E2, LE-E3, LE-F1a, LE-G3 |
| | | |
| Need not be met | IE-A10, IE-B5, IE-C1, IE-C1a, IE-C2, IE-C3, IE-C4, IE-C5, IE-C13, IE-D3, AS-C3, SC-C3, SY-C3, HR-I3, DA-E3, IF-D6, QU-E1, QU-E2, QU-E4, QU-F4, LE-F2, LE-F3, LE-G4 | IE-A10, IE-B5, IE-C1, IE-C1a, IE-C2, IE-C3, IE-C4, IE-C5, IE-C13, IE-D3, AS-C3, SC-C3, SY-C3, HR-I3, DA-E3, IF-D6, QU-E1, QU-E2, QU-E4, QU-F4, LE-F2, LE-F3, LE-G4 |
| | | |

**Table 2-2 (continued)**
**Supporting Requirement by Capability Category**

| Capability Category | EPRI Traditional RI-ISI[1, 2] | EPRI Streamlined RI-ISI[2, 3] |
|---|---|---|
| Spans all three categories and needs to met | IE-A1, IE-A2, IE-A3, IE-A5, IE-B1, IE-B2, IE-B4, IE-C1b, IE-C6, IE-C7, IE-C8, IE-C9, IE-C10, IE-D1, IE-D2, AS-A1, AS-A2, AS-A3, AS-A4, AS-A5, AS-A6, AS-A8, AS-A11, AS-B1, AS-B2, AS-B3, AS-B4, AS-B5, AS-B5a, AS-B6, AS-C1, AS-C2, SC-A1, SC-A4, SC-A4a, SC-A6, SC-B3, SC-B4, SC-B5, SC-C1, SC-C2, SY-A1, SY-A2, SY-A3, SY-A5, SY-A6, SY-A8, SY-A10, SY-A11, SY-A12, SY-A12a, SY-A12b, SY-A13, SY-A14, SY-A16, SY-A17, SY-A18, SY-A18a, SY-A19, SY-A21, SY-A22, SY-B3, SY-B4, SY-B5, SY-B6, SY-B8, SY-B10, SY-B12, SY-B13, SY-B14, SY-B15, SY-B16, SY-C1, SY-C2, HR-A1, HR-A2, HR-A3, HR-B2, HR-C1, HR-C3, HR-D1, HR-D4, HR-D5, HR-D6, HR-E1, HR-E2, HR-G2, HR-G6, HR-G7, HR-G9, HR-H2, HR-H3, HR-I1, HR-I2, DA-A1, DA-A1a, DA-A2, DA-A3, DA-C1, DA-C2, DA-C3, DA-C4, DA-C5, DA-C6, DA-C11, DA-C11a, DA-C13, DA-C14, DA-C15, DA-D2, DA-D6a, DA-D8, DA-E1, DA-E2, IF-A1, IF-A1b, IF-A3, IF-A4, IF-B1, IF-B1a, IF-B1b, IF-B2, IF-B3, IF-B3a, IF-C1, IF-C2, IF-C2a, IF-C2b, IF-C2c, IF-C3A, IF-C3c, IF-C4, IF-C4a, IF-C5, IF-C5a, IF-C7, IF-C9, IF-D1, IF-D4, IF-D5, IF-D7, IF-E1, IF-E3, IF-E4, IF-E5, IF-E5a, IF-E6, IF-E6a, IF-E6b, IF-E7, IF-E8, IF-F1, IF-F2, IF-F3, QU-A1, QU-A2a, QU-A3, QU-A4, QU-B1, QU-B2, QU-B3, QU-B4, QU-B5, QU-B6, QU-B7a, QU-B7b, QU-B8, QU-B9, QU-C1, QU-C2, QU-C3, QU-D1a, QU-D1B, QU-D1C, QU-D4, QU-D5b, QU-F1, QU-F2, QU-F5, QU-F6, LE-A1, LE-A2, LE-A3, LE-A4, LE-A5, LE-B3, LE-C5, LE-C6, LE-C7, LE-E1, LE-E4, LE-F1b, LE-G1, LE-G2, LE-G5, LE-G6 | IE-A1, IE-A2, IE-A3, IE-A5, IE-B1, IE-B2, IE-B4, IE-C1b, IE-C6, IE-C7, IE-C8, IE-C9, IE-C10, IE-D1, IE-D2, AS-A1, AS-A2, AS-A3, AS-A4, AS-A5, AS-A6, AS-A8, AS-A11, AS-B1, AS-B2, AS-B3, AS-B4, AS-B5, AS-B5a, AS-B6, AS-C1, AS-C2, SC-A1, SC-A4, SC-A4a, SC-A6, SC-B3, SC-B4, SC-B5, SC-C1, SC-C2, SY-A1, SY-A2, SY-A3, SY-A5, SY-A6, SY-A8, SY-A10, SY-A11, SY-A12, SY-A12a, SY-A12b, SY-A13, SY-A14, SY-A16, SY-A17, SY-A18, SY-A18a, SY-A19, SY-A21, SY-A22, SY-B3, SY-B4, SY-B5, SY-B6, SY-B8, SY-B10, SY-B12, SY-B13, SY-B14, SY-B15, SY-B16, SY-C1, SY-C2, HR-A1, HR-A2, HR-A3, HR-B2, HR-C1, HR-C3, HR-D1, HR-D4, HR-D5, HR-D6, HR-E1, HR-E2, HR-G2, HR-G6, HR-G7, HR-G9, HR-H2, HR-H3, HR-I1, HR-I2, DA-A1, DA-A1a, DA-A2, DA-A3, DA-C1, DA-C2, DA-C3, DA-C4, DA-C5, DA-C6, DA-C11, DA-C11a, DA-C13, DA-C14, DA-C15, DA-D2, DA-D6a, DA-D8, DA-E1, DA-E2, IF-A1, IF-A1b, IF-A3, IF-A4, IF-B1, IF-B1a, IF-B1b, IF-B2, IF-B3, IF-B3a, IF-C1, IF-C2, IF-C2a, IF-C2b, IF-C2c, IF-C3A, IF-C3c, IF-C4, IF-C4a, IF-C5, IF-C5a, IF-C7, IF-C9, IF-D1, IF-D4, IF-D5, IF-D7, IF-E1, IF-E3, IF-E4, IF-E5, IF-E5a, IF-E6, IF-E6a, IF-E6b, IF-E7, IF-E8, IF-F1, IF-F2, IF-F3, QU-A1, QU-A2a, QU-A3, QU-A4, QU-B1, QU-B2, QU-B3, QU-B4, QU-B5, QU-B6, QU-B7a, QU-B7b, QU-B8, QU-B9, QU-C1, QU-C2, QU-C3, QU-D1a, QU-D1B, QU-D1C, QU-D4, QU-D5b, QU-F1, QU-F2, QU-F5, QU-F6, LE-A1, LE-A2, LE-A3, LE-A4, LE-A5, LE-B3, LE-C5, LE-C6, LE-C7, LE-E1, LE-E4, LE-F1b, LE-G1, LE-G2, LE-G5,LE-G6 |

**Notes:**

1. The internal flooding SRs are applicable only to the traditional RI-ISI approach if the internal flooding study is used to directly support the development of the RI-ISI program.
2. For purposes of RI-ISI, the capability category relates to technical aspects of the plant PRA and so peer review findings and/or gaps related to documentation that do not impact the results would allow the capability category to still be considered met.

The EPRI streamlined RI-ISI methodology has been codified in ASME Code Case N716.

# 3
# SUMMARY/CONCLUSIONS

Risk-informed methodologies have been developed to establish alternative in-service inspection requirements. Plant-specific PRAs are typically used during the RI-ISI development to support the consequence assessment, risk ranking, element selection, and delta risk evaluation steps.

With respect to PRA technical adequacy, the ASME PRA Standard has been developed (ASME RA-Sb-2005), and the USNRC Regulatory Guide 1.200 R1 was issued, providing a review and an endorsement (with positions) of the PRA Standard.

This report provides guidance in determining which supporting requirements are applicable to RI-ISI programs. Also, for those supporting requirements that are applicable to RI-ISI programs, this report provides guidance on the appropriate capability category.

# A
# CAPABILITY CATEGORY ASSESSMENT AND ASSIGNMENT

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| IE-A1 | Spans all three capability categories. |
| IE-A2 | Spans all three capability categories. |
| IE-A3 | Spans all three capability categories. |
| IE-A3a | EPRI traditional CCI/II because the assessment will review the impact of system failures either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined CCI/II because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-A4 | EPRI traditional CCI because the assessment will review the impact of system failures either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined CCII because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-A4a | EPRI traditional CCI because the assessment will review the impact of system failures either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined CCI because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-A5 | Spans all three capability categories. |
| IE-A6 | EPRI traditional CCI because the assessment will review the impact of system failures, including plant interviews as needed, either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined CCI because this is captured by the internal flooding study, including plant interviews as needed, for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-A7 | EPRI traditional CCI because the assessment will review the impact of system failures either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined CCI because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-A8 | Deleted. |
| IE-A9 | Deleted. |
| IE-A10 | Need not be met:<br>EPRI traditional because the assessment will review these impacts either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-B1 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| IE-B2 | Spans all three capability categories. |
| IE-B3 | EPRI traditional CCI because the EPRI approach is an absolute risk ranking and so applying conservatisms for this SR would potentially increase, but not reduce, inspections.<br><br>EPRI streamlined CCI because applying conservatisms for this SR would increase the scope of HSS segments per Section 2(a)(5) of case. |
| IE-B4 | Spans all three capability categories. |
| IE-B5 | Need not be met:<br><br>EPRI traditional because the assessment will review these impacts either through a specific consequence assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br><br>EPRI streamlined because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-C1 | Need not be met:<br><br>EPRI traditional because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. For plants that directly used the PRA results and did not benchmark the results against the methodology look-up tables, this SR is required.<br><br>EPRI streamlined because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. |
| IE-C1a | Need not be met:<br><br>EPRI traditional because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. For plants that directly used the PRA results and did not benchmark the results against the methodology look-up tables, this SR is required.<br><br>EPRI streamlined because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. |
| IE-C1b | Spans all three capability categories. |
| IE-C2 | Need not be met:<br><br>EPRI traditional because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. For plants that directly used the PRA results and did not benchmark the results against the methodology look-up tables, this SR is required.<br><br>EPRI streamlined because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. |
| IE-C3 | Need not be met:<br><br>EPRI traditional because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. For plants that directly used the PRA results and did not benchmark the results against the methodology look-up tables, CCI/II is required.<br><br>EPRI streamlined because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| IE-C4 | Need not be met:<br>EPRI traditional because the assessment will review these impacts either through a specific assessment of flood-induced events or use of the internal flooding study (see IF-A, IF-B, IF-C, and IF-E).<br>EPRI streamlined because this is captured by the internal flooding study for flood-induced events (see IF-A, IF-B, IF-C, and IF-E). |
| IE-C5 | Need not be met:<br>EPRI traditional because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. Also, the living component of an RI-ISI program will capture the impact of future performance, if any.<br>EPRI streamlined because initiating event frequency for non-pressure boundary failures is not relevant to RI-ISI applications. Also, the living component of an RI-ISI program will capture the impact of future performance, if any. |
| IE-C6 | Spans all three capability categories. |
| IE-C7 | Spans all three capability categories. |
| IE-C8 | Spans all three capability categories. |
| IE-C9 | Spans all three capability categories. |
| IE-C10 | Spans all three capability categories. |
| IE-C11 | EPRI traditional CCI/II because rare initiating events are not very relevant to RI-ISI applications, which model application-specific pressure-boundary failure-related initiating events.<br>EPRI streamlined CCI/II because rare initiating events are not very relevant to RI-ISI applications, which model application-specific pressure-boundary failure-related initiating events. |
| IE-C12 | EPRI traditional CCI/II—Only bounding estimates of multiple valve failures are needed to support RI-ISI, the pipe is assumed to break with probability of 1, and if credit for ISLOCA mitigation is used, the consequences of the break must be confirmed.<br>EPRI streamlined CCI/II bounding analyses can be used because it would at most require pipe segments to be classified as HSS. |
| IE-C13 | Need not be met:<br>EPRI traditional mean values are sufficient due to the order of magnitude ranking and grouping approach used.<br>EPRI streamlined mean values are sufficient due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| IE-D1 | Spans all three capability categories. |
| IE-D2 | Spans all three capability categories. |
| IE-D3 | Need not be met because RI-ISI is interested only in initiating events caused by pressure boundary failures. |
| AS-A1 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1,2] |
|---|---|
| AS-A2 | Spans all three capability categories. |
| AS-A3 | Spans all three capability categories. |
| AS-A4 | Spans all three capability categories. |
| AS-A5 | Spans all three capability categories. |
| AS-A6 | Spans all three capability categories. |
| AS-A7 | CCI/II is sufficient due to the order of magnitude ranking and grouping approach used in the EPRI methodology. Also, it is generally acknowledged that CCII is adequate for all but the most challenging of PRA applications. |
| AS-A8 | Spans all three capability categories. |
| AS-A9 | EPRI traditional CCI because the EPRI approach uses an order of magnitude absolute risk ranking and grouping approach. Substantial differences between the generic analyses and realistic plant-specific analyses would be required to impact the RI-ISI results.<br><br>EPRI streamlined CCI because substantial differences between the generic analyses and realistic plant-specific analyses would be required to have a significant enough impact to increase the scope of HSS segments, per Section 2(a)(5) of case. |
| AS-A10 | EPRI traditional CCI—The EPRI approach is an absolute risk-ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| AS-A11 | Spans all three capability categories. |
| AS-B1 | Spans all three capability categories. |
| AS-B2 | Spans all three capability categories. |
| AS-B3 | Spans all three capability categories. |
| AS-B4 | Spans all three capability categories. |
| AS-B5 | Spans all three capability categories. |
| AS-B5a | Spans all three capability categories. |
| AS-B6 | Spans all three capability categories. |
| AS-C1 | Spans all three capability categories. |
| AS-C2 | Spans all three capability categories. |
| AS-C3 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| AS-C4 | Deleted. |
| SC-A1 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| SC-A2 | EPRI traditional—Per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because applying conservatism for this SR would increase the scope of HSS segments, per Section 2(a)(5) of case. |
| SC-A3 | Deleted. |
| SC-A4 | Spans all three capability categories. |
| SC-A4a | Spans all three capability categories. |
| SC-A5 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| SC-A6 | Spans all three capability categories. |
| SC-B1 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| SC-B2 | EPRI traditional CCI—Per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI—per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| SC-B3 | Spans all three capability categories. |
| SC-B4 | Spans all three capability categories. |
| SC-B5 | Spans all three capability categories. |
| SC-C1 | Spans all three capability categories. |
| SC-C2 | Spans all three capability categories. |
| SC-C3 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| SY-A1 | Spans all three capability categories. |
| SY-A2 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| SY-A3 | Spans all three capability categories. |
| SY-A4 | EPRI traditional CCI because this SR will be supplemented by the RI-ISI consequence assessment or IF analyses.<br>EPRI streamlined CCI because this SR will be supplemented by SRs in Section IF. |
| SY-A5 | Spans all three capability categories. |
| SY-A6 | Spans all three capability categories. |
| SY-A7 | EPRI traditional CCI/II because per Table 1.3-1 of the RA-2005, by meeting CCII, any departure from realism will have a small impact on the conclusions and risk insights. Thus, any impact on the RI-ISI results would be minimal.<br>EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, by meeting CCII, any departure from realism will have a small impact on the conclusions and risk insights. Thus, any impact on the RI-ISI results would be minimal. |
| SY-A8 | Spans all three capability categories. |
| SY-A9 | Deleted. |
| SY-A10 | Spans all three capability categories. |
| SY-A11 | Spans all three capability categories. |
| SY-A12 | Spans all three capability categories. |
| SY-A12a | Spans all three capability categories. |
| SY-A12b | Spans all three capability categories. |
| SY-A13 | Spans all three capability categories. |
| SY-A14 | Spans all three capability categories. |
| SY-A15 | EPRI traditional CCI/II—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br>EPRI streamlined CCI/II—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| SY-A16 | Spans all three capability categories. |
| SY-A17 | Spans all three capability categories. |
| SY-A18 | Spans all three capability categories. |
| SY-A18a | Spans all three capability categories. |
| SY-A19 | Spans all three capability categories. |
| SY-A20 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| SY-A21 | Spans all three capability categories. |
| SY-A22 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1,2] |
|---|---|
| SY-B1 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| SY-B2 | EPRI traditional CC I/II is acknowledged to be adequate for most PRA applications; this includes RI-ISI applications.<br><br>EPRI streamlined CC I/II is acknowledged to be adequate for most PRA applications; this includes RI-ISI applications. |
| SY-B3 | Spans all three capability categories. |
| SY-B4 | Spans all three capability categories. |
| SY-B5 | Spans all three capability categories. |
| SY-B6 | Spans all three capability categories. |
| SY-B7 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| SY-B8 | Spans all three capability categories. |
| SY-B9 | Deleted. |
| SY-B10 | Spans all three capability categories. |
| SY-B11 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| SY-B12 | Spans all three capability categories. |
| SY-B13 | Spans all three capability categories. |
| SY-B14 | Spans all three capability categories. |
| SY-B15 | Spans all three capability categories. |
| SY-B16 | Spans all three capability categories. |
| SY-C1 | Spans all three capability categories. |
| SY-C2 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| SY-C3 | Need not be met:<br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| HR-A1 | Spans all three capability categories. |
| HR-A2 | Spans all three capability categories. |
| HR-A3 | Spans all three capability categories. |
| HR-B1 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| HR-B2 | Spans all three capability categories. |
| HR-C1 | Spans all three capability categories. |
| HR-C2 | EPRI traditional CCI because this level of detail in the system models is not expected to impact the RI-ISI results, given that this SR requires that any unique design or operational features of the plant need to be accounted for.<br>EPRI streamlined CCI because this level of detail in the system models is not expected to impact the RI-ISI results, given that this SR requires that any unique design or operational features of the plant need to be accounted for. |
| HR-C3 | Spans all three capability categories. |
| HR-D1 | Spans all three capability categories. |
| HR-D2 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| HR-D3 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| HR-D4 | Spans all three capability categories. |
| HR-D5 | Spans all three capability categories. |
| HR-D6 | Spans all three capability categories. |
| HR-D7 | EPRI traditional CCI/II because per Table 1.3-1 of the RA-2005, by meeting CCII, any departure from realism will have a small impact on the conclusions and risk insights. Thus, any impact on the RI-ISI results would be minimal.<br><br>EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, by meeting CCII, any departure from realism will have a small impact on the conclusions and risk insights. Thus, any impact on the RI-ISI results would be minimal. |
| HR-E1 | Spans all three capability categories. |
| HR-E2 | Spans all three capability categories. |
| HR-E3 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| HR-E4 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| HR-F1 | EPRI traditional CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the relative importance of significant contributors at the component level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the relative importance of significant contributors at the component level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| HR-F2 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| HR-G1 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| HR-G2 | Spans all three capability categories. |
| HR-G3 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments per section 2[a][5] of case). |
| HR-G4 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments per section 2[a][5] of case). |
| HR-G5 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level, including associated human actions. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| HR-G6 | Spans all three capability categories. |
| HR-G7 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1,2] |
|---|---|
| HR-G8 | Deleted. |
| HR-G9 | Spans all three capability categories. |
| HR-H1 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| HR-H2 | Spans all three capability categories. |
| HR-H3 | Spans all three capability categories. |
| HR-I1 | Spans all three capability categories. |
| HR-I2 | Spans all three capability categories. |
| HR-I3 | Need not be met:<br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| DA-A1 | Spans all three capability categories. |
| DA-A1a | Spans all three capability categories. |
| DA-A2 | Spans all three capability categories. |
| DA-A3 | Spans all three capability categories. |
| DA-B1 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-B2 | EPRI traditional CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the relative importance of significant contributors at the component level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br>EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the relative importance of significant contributors at the component level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-C1 | Spans all three capability categories. |
| DA-C2 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| DA-C3 | Spans all three capability categories. |
| DA-C4 | Spans all three capability categories. |
| DA-C5 | Spans all three capability categories. |
| DA-C6 | Spans all three capability categories. |
| DA-C7 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-C8 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-C9 | EPRI traditional CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the relative importance of significant contributors at the component level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the relative importance of significant contributors at the component level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-C10 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-C11 | Spans all three capability categories. |
| DA-C11a | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| DA-C12 | EPRI traditional CCI because the EPRI approach uses an absolute risk ranking approach, so applying conservatism for this SR would only add inspections.<br><br>EPRI streamlined CCI because applying conservatism for this SR would increase the scope of HSS segments, per Section 2(a)(5) of case. |
| DA-C13 | Spans all three capability categories. |
| DA-C14 | Spans all three capability categories. |
| DA-C15 | Spans all three capability categories. |
| DA-D1 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-D2 | Spans all three capability categories. |
| DA-D3 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-D4 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| DA-D5 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-D6 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking.<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-D6a | Spans all three capability categories. |
| DA-D7 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| DA-D8 | Spans all three capability categories. |
| DA-E1 | Spans all three capability categories. |
| DA-E2 | Spans all three capability categories. |
| DA-E3 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| IF-A1 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| IF-A1a | EPRI traditional CCI—The higher capability categories require further resolution of plant areas/rooms. CCI does not allow propagation outside of the defined area, including through drain lines or other paths. By not requiring higher resolution per CCII/III, a conservative CCDP would be developed which would result in an increase in HSS scope only (per Section 2[a][5] or conservative CCDP/CLERPs for the delta risk evaluation).<br><br>EPRI streamlined CCI—The higher capability categories require further resolution of plants areas/rooms. CCI does not allow propagation outside of the defined area, including through drain lines or other paths. By not requiring higher resolution per CCII/III, a conservative CCDP would be developed which would result in an increase in HSS scope only (per Section 2[a][5] or conservative CCDP/CLERPs for the delta risk evaluation). |
| IF-A1b | Spans all three capability categories. |
| IF-A2 | Deleted: Moved to IF-C2c. |
| IF-A3 | Spans all three capability categories. |
| IF-A4 | Spans all three capability categories. |
| IF-B1 | Spans all three capability categories. |
| IF-B1a | Spans all three capability categories. |
| IF-B1b | Spans all three capability categories. |
| IF-B2 | Spans all three capability categories.<br><br>**Note:** RI-ISI applies to piping and NDE requirements only; therefore, this SR is only partially applicable (that is, human-induced mechanisms for overfilling tanks are not applicable). |
| IF-B3 | Spans all three capability categories. |
| IF-B3a | Spans all three capability categories. |
| IF-B4 | Relocated to IF-C2. |
| IF-C1 | Spans all three capability categories. |
| IF-C2 | Spans all three capability categories. |
| IF-C2a | Spans all three capability categories. |
| IF-C2b | Spans all three capability categories. |
| IF-C2c | Spans all three capability categories. |
| IF-C3 | EPRI traditional CCII—RG 1.200 R1 comment requires that CCII assess CCIII mechanisms **by using conservative assumptions**. Thus, CCII is conservative, and EPRI uses an absolute risk ranking and grouping approach that will possibly increase the inspection population.<br><br>EPRI streamlined CCII—RG 1.200 R1 comment requires that CCII assess CCIII mechanisms **by using conservative assumptions**. Thus, CCII is conservative and could increase the scope of HSS piping and inspection population. |
| IF-C3a | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1,2] |
|---|---|
| IF-C3b | EPRI traditional CCI—Higher capability categories are not required because the flood areas are defined as independent per SR IF-A1a. For CCI, SF IF-A1a does not allow propagation outside of the defined area, including through drain lines or other paths. If areas are not independent (that is, individual rooms are defined), CCII is required. It is noted that N716 applies to piping and RI-ISI applications. ISI has limited or negligible ability to impact maintenance-induced unavailability of barriers and vice versa.<br><br>EPRI streamlined CCI—Higher capability categories are not required because the flood areas are defined as independent per SR IF-A1a. For CCI, SF IF-A1a does not allow propagation outside of the defined area, including through drain lines or other paths. If areas are not independent (that is, individual rooms are defined), CCII is required. It is noted that N716 applies to piping and RI-ISI applications. ISI has limited or negligible ability to impact maintenance-induced unavailability of barriers and vice versa. |
| IF-C3c | Spans all three capability categories. |
| IF-C4 | Spans all three capability categories. |
| IF-C4a | Spans all three capability categories. |
| IF-C5 | Spans all three capability categories. |
| IF-C5a | Spans all three capability categories. |
| IF-C6 | EPRI traditional CCII—Higher capability category is not required because the CCII requirements assure high reliability for these actions. EPRI TR-112657, Rev B-A provides additional guidance.<br><br>EPRI streamlined CCII—Higher capability category is not required because the CCII requirements assure high reliability for these actions. EPRI TR-112657, Rev B-A provides additional guidance. |
| IF-C7 | Spans all three capability categories. |
| IF-C8 | EPRI traditional CCII—Higher capability category is not required because the CCII requirements assure high reliability for these actions. EPRI TR-112657, Rev B-A provides additional guidance.<br><br>EPRI streamlined CCII—Higher capability category is not required because the CCII requirements assure high reliability for these actions. EPRI TR-112657, Rev B-A provides additional guidance. |
| IF-C9 | Spans all three capability categories. |
| IF-D1 | Spans all three capability categories. |
| IF-D2 | Deleted. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| IF-D3 | EPRI traditional CCI—The higher capability categories require further resolution. By not requiring a higher resolution, a conservative CCDP would be developed which would result in an increase in HSS scope only, per Section 2(a)(5) or conservative CCDP/CLERPs for the delta risk evaluation. It is noted that, in these groupings, the sum of their frequencies will be retained for use in the quantification step.<br><br>EPRI streamlined CCI—The higher capability categories require further resolution. By not requiring higher resolution, a conservative CCDP would be developed which would result in an increase in HSS scope only, per Section 2(a)(5) or conservative CCDP/CLERPs for the delta risk evaluation. It is noted that, in these groupings, the sum of their frequencies will be retained for use in the quantification step. |
| IF-D3a | EPRI traditional CCI/II because subsuming these scenarios into existing plant initiating events will not impact the application or results. This information needs to be retrievable to support the application (for example, CCDP, HSS determination).<br><br>EPRI streamlined C I/II because subsuming these scenarios into existing plant initiating events will not impact the application or results. This information needs to be retrievable to support the application (for example, CCDP, HSS determination). |
| IF-D4 | Spans all three capability categories. |
| IF-D5 | Spans all capability categories. This requirement includes the retention (that is, total frequency of the group versus dominant frequency) of all summed frequencies for all scenarios addressed by the flood scenario group. |
| IF-D5a | EPRI traditional CCII/III—EPRI TR-112657, EPRI TR-102266, and EPRI TR-1012302 provide acceptable ways of meeting this requirement. In lieu of these, conservative/bounding values may be used.<br><br>EPRI streamlined CCII/III—EPRI TR-112657, EPRI TR-102266, and EPRI TR-1012302 provide acceptable ways of meeting this requirement. In lieu of these, conservative/bounding values may be used. |
| IF-D6 | Need not be met:<br><br>EPRI traditional—The purpose of RI-ISI is to develop an alternative ISI program (that is, periodic NDE on piping). Implementation of a periodic NDE will not impact maintenance activities.<br><br>EPRI streamlined—The purpose of RI-ISI is to develop an alternative ISI program (that is, periodic NDE on piping). Implementation of a periodic NDE will not impact maintenance activities. |
| IF-D7 | Spans all capability categories.<br><br>When option (b) is used, it must also be shown to result in total scenario frequencies less than 1E-06 per year (CDF) and 1E-07 per year (LERF). |
| IF-E1 | Spans all three capability categories. |
| IF-E2 | Moved to IF-C3c. |
| IF-E3 | Spans all three capability categories. |
| IF-E3a | EPRI traditional because CCI/II is sufficient to capture all important contributors.<br><br>EPRI streamlined because CCI/II is sufficient to capture all important contributors. |
| IF-E4 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| IF-E5 | Spans all three capability categories. |
| IF-E5a | Spans all three capability categories. |
| IF-E6 | Spans all three capability categories. |
| IF-E6a | Spans all three capability categories. |
| IF-E6b | Spans all three capability categories. |
| IF-E7 | Spans all three capability categories. |
| IF-E8 | Spans all three capability categories. |
| IF-F1 | Spans all three capability categories. |
| IF-F2 | Spans all three capability categories. |
| IF-F3 | Spans all three capability categories as needed to support the RI-ISI application. |
| QU-A1 | Spans all three capability categories. |
| QU-A2a | Spans all three capability categories. |
| QU-A2b | EPRI traditional CCI because the order of magnitude ranking and grouping approach used and higher capability categories are not expected to have a significant impact on the ranking results.<br>EPRI streamlined CCI because the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping and higher capability categories are not expected to have a significant impact on the ranking results. |
| QU-A3 | Spans all three capability categories. |
| QU-A4 | Spans all three capability categories. |
| QU-B1 | Spans all three capability categories. |
| QU-B2 | Spans all three capability categories. |
| QU-B3 | Spans all three capability categories. |
| QU-B4 | Spans all three capability categories. |
| QU-B5 | Spans all three capability categories. |
| QU-B6 | Spans all three capability categories. |
| QU-B7a | Spans all three capability categories. |
| QU-B7b | Spans all three capability categories. |
| QU-B8 | Spans all three capability categories. |
| QU-B9 | Spans all three capability categories. |
| QU-C1 | Spans all three capability categories. |
| QU-C2 | Spans all three capability categories. |
| QU-C3 | Spans all three capability categories. |
| QU-D1a | Spans all three capability categories. |
| QU-D1b | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1,2] |
|---|---|
| QU-D1c | Spans all three capability categories. |
| QU-D2 | Deleted. |
| QU-D3 | EPRI traditional CCI because methodology look-up tables serve to benchmark the PRA inputs. For plants that directly used the PRA results and did not benchmark these results against the methodology look-up tables, CCII/III is applicable.<br><br>EPRI streamlined CCI because this level of detail has no impact on classification. |
| QU-D4 | Spans all three capability categories. |
| QU-D5a | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| QU-D5b | Spans all three capability categories. |
| QU-E1 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| QU-E2 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| QU-E3 | EPRI traditional CCI because the order of magnitude ranking and grouping approach used and higher capability categories are not expected to have a significant impact on the ranking results.<br><br>EPRI streamlined CCI because the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping and higher capability categories are not expected to have a significant impact on the ranking results. |
| QU-E4 | Need not be met:<br><br>EPRI traditional—Analyzing the impact from uncertainties on the PRA results is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Analyzing the impact from uncertainties on the PRA results is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| QU-F1 | Spans all three capability categories. |
| QU-F2 | Spans all three capability categories. |
| QU-F3 | EPRI traditional CCI—Although potentially helpful, further level of detail is not required to support the RI-ISI applications.<br><br>EPRI streamlined CCI—Although potentially helpful, further level of detail is not required to support the RI-ISI applications. |
| QU-F4 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| QU-F5 | Spans all three capability categories. |
| QU-F6 | Spans all three capability categories. |
| LE-A1 | Spans all three capability categories. |
| LE-A2 | Spans all three capability categories. |
| LE-A3 | Spans all three capability categories. |
| LE-A4 | Spans all three capability categories. |
| LE-A5 | Spans all three capability categories. |
| LE-B1 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| LE-B2 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| LE-B3 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1,2] |
|---|---|
| LE-C1 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| LE-C2a | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-C2b | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| LE-C3 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| LE-C4 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-C5 | Spans all three capability categories. |
| LE-C6 | Spans all three capability categories. |
| LE-C7 | Spans all three capability categories. |
| LE-C8a | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| LE-C8b | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-C9a | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-C9b | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-C10 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-D1a | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-D1b | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per section 2[a][5] of case). |
| LE-D2 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-D3 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-D4 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| LE-D5 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-D6 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-E1 | Spans all three capability categories. |
| LE-E2 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-E3 | EPRI traditional CCI—The EPRI approach is an absolute risk ranking approach, so applying conservatisms for this SR will at worst only add inspections.<br><br>EPRI streamlined CCI—Applying conservatisms for this SR will at worst increase the scope of HSS segments, per Section 2(a)(5) of case. |
| LE-E4 | Spans all three capability categories. |
| LE-F1a | EPRI traditional CCI because it is consistent with conservatives bias in supportive requirements; additional detail is not required.<br><br>EPRI streamlined CCI because it is consistent with conservatives bias in supportive requirements; additional detail is not required. |
| LE-F1b | Spans all three capability categories. |
| LE-F2 | Need not be met:<br><br>EPRI traditional—Analyzing the impact from uncertainties is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Analyzing the impact from uncertainties is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| LE-F3 | Need not be met:<br><br>EPRI traditional—Analyzing the impact from uncertainties is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Analyzing the impact from uncertainties is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| LE-G1 | Spans all three capability categories. |
| LE-G2 | Spans all three capability categories. |

| SR | Assessment For RI-ISI Purposes[1, 2] |
|---|---|
| LE-G3 | EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, absolute risk ranking versus relative risk ranking).<br><br>EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the relative importance of the contributors at the system or train level. Thus, this level of detail is sufficient to support implementation of the EPRI RI-ISI methodology (for example, scope of HSS segments, per Section 2[a][5] of case). |
| LE-G4 | Need not be met:<br><br>EPRI traditional—Although helpful from a living program perspective, this is not necessary due to the order of magnitude ranking and grouping approach used.<br><br>EPRI streamlined—Although helpful from a living program perspective, this is not necessary due to the conservative identification of pre-defined HHS piping and the small CDF/LERF threshold used for plant-specific HSS piping. |
| LE-G5 | Spans all three capability categories. |
| LE-G6 | Spans all three capability categories. |

**Notes:**

1. The internal flooding SRs are applicable only to the traditional RI-ISI approach if the internal flooding study is used to directly support the development of the RI-ISI program.

2. The EPRI streamlined RI-ISI methodology has been codified in ASME Code Case N716.

# B
# SUMMARY DESCRIPTION OF RI-ISI METHODOLOGIES

## Traditional RI-ISI Methodology

The EPRI methodology was developed to be implemented on a system-by-system basis. In order to conduct and document the analysis, the piping systems are divided into segments based on the pipe rupture potential and its consequences. Although the analysis is conducted on a segment basis, it is for ease of use rather than being a technical component of the analyses. Thus, differences in segment definition or segment boundary definition will have no impact on the final results for applications using the EPRI RI-ISI methodology. Each segment, which includes all of the elements within the segment, is placed onto the appropriate place on the EPRI Risk Characterization Matrix, as shown in Table B-1.

The failure potential category is determined on the basis of identified degradation mechanism.

The consequence evaluation focuses on the impact of a pipe-section failure (loss of pressure boundary integrity) on plant operation. This impact can be direct, indirect, or a combination of both, as follows:

- Direct impacts—A failure results in a diversion of flow and a loss of the train and/or system or an initiating event (such as a LOCA).
- Indirect impacts—A failure results in a flood, spray, or pipe whip, spatially affecting neighboring structures, systems, and components; a failure may also result in the depletion of a tank and loss of the systems supplied by the tank.

The possibility of isolating a break is also identified and accounted for as part of the consequence analysis. A break could be isolated by a protective check valve, a closed isolation valve, or it could be automatically isolated by an isolation valve that closes on a given signal. If not automatically isolated, a break can be isolated by an operator action, given a successful diagnosis. The likelihood of isolating a break depends on the availability of isolation equipment, a means of detecting the break, the amount of time available to prevent specific consequences (for example, flooding of the room or draining of the tank), and human performance. If isolation is possible, the consequence assessment should be conducted for both cases, that is, successful and unsuccessful isolations. Operator recovery actions are further discussed in EPRI TR-112657, Section 3.3.3.2.

For each run of piping under evaluation, a spectrum of break sizes is evaluated. The break size ranges from a small leak to a rupture. Larger leaks and breaks have the potential to disable systems or trains and to cause initiating events, flooding, or diversions of water sources. Typically, small breaks (minor leakage) would not render a train inoperable. They may, however, depending on the energy level of the system, spray onto adjacent equipment and cause equipment malfunction.

The consequence category is determined from the plant-specific PRA by calculating the conditional core damage probability (CCDP) and the conditional large early release probability (CLERP), as follows:

High = CCDP > 1E-4

Medium = 1E-6 < CCDP < 1E-4

Low = CCDP < 1E-6

For CLERP, the boundary values are one order of magnitude smaller.

**Table B-1**
**EPRI Risk Matrix**

| POTENTIAL FOR PIPE RUPTURE<br>PER DEGRADATION MECHANISM SCREENING CRITERIA | CONSEQUENCES OF PIPE RUPTURE<br>IMPACTS ON CONDITIONAL CORE DAMAGE PROBABILITY AND LARGE EARLY RELEASE PROBABILITY | | | |
|---|---|---|---|---|
| | NONE | LOW | MEDIUM | HIGH |
| HIGH<br>FLOW ACCELERATED CORROSION | LOW<br>Category 7 | MEDIUM<br>Category 5 | HIGH<br>Category 3 | HIGH<br>Category 1 |
| MEDIUM<br>OTHER DEGRADATION MECHANISMS | LOW<br>Category 7 | LOW<br>Category 6 | MEDIUM<br>Category 5 | HIGH<br>Category 2 |
| LOW<br>NO DEGRADATION MECHANISMS | LOW<br>Category 7 | LOW<br>Category 7 | LOW<br>Category 6 | MEDIUM<br>Category 4 |

The risk categories shown are combined into three risk regions for more robust and more efficient utilization. For risk Category 1, 2, or 3, the minimum number of inspection elements in each category should be 25% of the total number of elements in each risk category (rounded up to the next higher whole number). For risk Category 4 or 5, the number of inspection elements in each category should be 10% of the total number of elements in each risk category (rounded up to the higher whole number). Pressure/leakage testing requirements remain in effect regardless of the risk category (that is, risk Categories 1 through 7).

## Streamlined RI-ISI Methodology

This approach is a streamlined process for implementing and maintaining RI-ISI, based upon lessons learned from numerous approved RI-ISI applications and has been codified by ASME in Code Case N716. The N716 approach differs from the traditional RI-ISI approaches in two respects. First, the consequence assessment is not required. The consequence assessment has been replaced with a predetermined set of high safety significant locations (for example, reactor coolant system, break exclusion area) and a plant-specific assessment of the impact of pressure

boundary failure by directly using the plant PRA. That is, any other safety or non-safety-related piping whose pressure boundary failure contributions to CDF is greater than 1E-06 (or LERF greater than 1E-07) based upon a plant-specific PRA is required to be within the scope of the Code Case N-716 application. The second departure is that partial scope application, which is allowed by previous RI-ISI approaches, is not allowed by N716.

According to the process, the inspection selection should equal to 10% of the high safety significant (HSS) welds, plus augmented programs for flow accelerated corrosion, localized corrosion (for example, MIC), and IGSCC in BWRs. HSS welds are selected as follows:

1. A minimum of 25% of the population is identified as susceptible to each degradation mechanism and degradation mechanism combination.
2. For the RCPB, at least two-thirds of the examinations shall be located between the first isolation valve (that is, isolation valve closest to the RPV) and the reactor pressure vessel.
3. A minimum of 10% of the welds in the portion of the RCPB that lies outside containment (for example, portions of the main feedwater system in BWRs) shall be selected.
4. A minimum of 10% of the welds within the break exclusion region (for example, high energy piping penetrating containment) shall be selected. Pressure/leakage testing requirements remain in effect regardless of the safety significance category.

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**Electric Power Research Institute**
3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 • USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com