SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

AND THE OFFICE OF NEW REACTORS FOR

THE ELECTRIC POWER RESEARCH INSTITUTE TOPICAL REPORT 1021467

"NONDESTRUCTIVE EVALUATION: PROBABILISTIC RISK ASSESSMENT

TECHNICAL ADEQUACY GUIDANCE FOR

RISK-INFORMED IN-SERVICE INSPECTION PROGRAMS"

PROJECT NO. 669

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

The objective of the topical report (TR) process is, in part, to add value by improving the efficiency of other licensing processes, for example, the process for reviewing license amendment requests (LARs) from commercial operating reactor licensees. The purpose of the U.S. Nuclear Regulatory Commission (NRC) TR program is to minimize industry and NRC time and effort by providing for a streamlined review and approval of a safety-related subject with subsequent referencing in licensing actions, rather than repeated reviews of the same subject.

A TR is a stand-alone report containing technical information about a nuclear power plant safety topic, which meets the criteria of a TR. A TR improves the efficiency of the licensing process by allowing the NRC staff to review a proposed methodology, design, operational requirements, or other safety-related subjects that will be used by multiple licensees, following approval, by referencing the approved TR. The TR provides the technical basis for a licensing action.

During the review of the Electric Power Research Institute's (EPRI's) TR 1021467, the NRC staff found that, in general, the TR meets the objectives of a TR and reinforces previously established NRC regulations and guidelines as noted within this safety evaluation (SE). The NRC has evaluated this TR against the criteria of 10 CFR Section 50, and has determined that it does not represent a backfit. Specifically, NRC Staff technical positions outlined in this SE are consistent with the aforementioned regulations and established staff positions, while providing more detailed discussion concerning the methodology and data required supporting risk-informed in-service inspection programs. This SE endorses staff positions previously established through licensing actions and interactions with industry.

1.2 Background

By letter dated February 18, 2009 (Reference 1), supplemented by letters dated December 15, 2009 (Reference 2), May 12, 2010 (Reference 3), July 8, 2010 (Reference 4), October 12, 2010 (Reference 5), January 19, 2011 (Reference 6), and June 2, 2011 (Reference 7), EPRI submitted for NRC staff review and potential endorsement TR 1018427, *Nondestructive*

Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs. Under the letter dated July 8, 2010 (Reference 4), EPRI submitted TR 1021467, *Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs*. Reference 4, numbered 1021467, (the TR), replaces the initial EPRI TR (Reference 1) that was numbered 1018427.

On September 30, 2011 (Reference 9), the NRC issued a draft SE for a 30-day comment period. No comments were received.

1.3 Purpose

The NRC staff reviewed TR 1021467 to determine whether its guidance will provide reasonable assurance that the described alternative in-service inspections are risk-informed and provide probabilistic risk assessment (PRA) technical adequacy. The review also considered compliance with license amendment and license renewal (LR) requirements in order to allow licensees or applicants the option of incorporating the TR guidelines by reference in plant-specific licensing actions.

The TR states that the primary objective of the submittal is to provide guidance on determining the technical adequacy of PRAs used to develop a risk-informed in-service inspection (RI-ISI) program. EPRI has previously supported the development of two related but substantively different RI-ISI methodologies; referred to in the TR as “Traditional” and “Streamlined.” These methodologies are summarized in Appendix B of the TR. The TR describes the technical adequacy requirements for both methods and requests NRC endorsement of these requirements. This SE provides conclusions, findings, or endorsement of the PRA technical adequacy requirements that can be referenced by a licensee to support the technical adequacy of the PRA used to develop its proposed RI-ISI program.

The Traditional methodology is described in EPRI TR-112657, Revision B-A, *Revised Risk-Informed In-service Inspection Evaluation Procedure*, December 1999 (Reference 8). The NRC endorsed this methodology as described in Reference 8. Licensees may implement the Traditional methodology by requesting relief to implement the RI-ISI as an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Code Section XI for in-service inspection (ISI) pursuant to Section 50.55a(a)(3)(i) of Title 10 of the Code of Federal Regulations (10 CFR) on the basis that the alternative provides an acceptable level of quality and safety.

The Streamlined methodology is described in ASME Code Case N-716 *Alternative Piping Classification and Examination Requirements, Section XI Division 1* (N-716). The NRC staff has not endorsed N-716 but has approved several relief requests based, in part, on the methodology described in N-716. Licensees may implement the Streamlined method by requesting relief to implement the RI-ISI as an alternative to the requirements of the ASME Code Section XI for ISI pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety. New build licensees developing an RI-ISI program using the Streamlined method may have to request relief by providing justification to the NRC of sufficiently similar characteristics that the generic high-safety-significant (HSS) piping segments developed for the operating fleet are applicable. If endorsed by the NRC in

Regulatory Guide (RG) 1.147, *In-service Inspection Code Case Acceptability, ASME Section XI, Division 1,* licensees may implement this alternative ISI program without prior NRC staff review and approval.

1.4 Organization of the Safety Evaluation

Section 2.0 of this SE provides the NRC staff's regulatory evaluation of the TR, including the necessary references for use during licensing actions. Section 3.0 provides the technical evaluation, including NRC staff concerns with the TR as written. Section 4.0 summarizes the limitations and conditions and the applicant/licensee action items. Section 5.0 provides the conclusions resulting from this SE. Section 6.0 provides the references utilized in this SE.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements set forth in the Code to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulation in 10 CFR 50.55a(g), "In-service Inspection Requirements," requires, in part, that Classes 1, 2, 3, MC, and CC components and their supports meet the requirements of Section XI, "Rules for In-service Inspection of Nuclear Power Plant Components," of the ASME Boiler and Pressure Vessel Code (BPVC) or equivalent quality standards. Every 3 years the ASME publishes a new edition of the BPVC, including Section XI, and new addenda are published every year. The latest editions and addenda of Section XI that the NRC has approved for use are referenced in 10 CFR 50.55a(b). The ASME also publishes Code Cases quarterly. Code Cases provide alternatives to existing Code requirements that the ASME developed and approved. RG 1.147 identifies the Code Cases that the NRC has determined to be acceptable alternatives to applicable parts of Section XI.

The regulation at 10 CFR 50.55a(g) also states that ISI of the ASME Code, Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific written relief has been granted by the NRC. According to 10 CFR 50.55a(a)(3), the NRC may authorize alternatives to the requirements of 10 CFR 50.55a(g), if an applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety, or that the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. AN RI-ISI program replaces the number and locations of non-destructive examination (NDE) inspections based on ASME Code Section XI requirements by the number and locations of these inspections based on the RI-ISI guidelines. PRA results are used to develop the RI-ISI program and to demonstrate that the proposed alternative provides an acceptable level of safety. Consequently, confidence in the information derived from a 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 develop the RI-ISI program.

General guidance in defining acceptable methods for implementing an RI-ISI program is provided in RG 1.174, *An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis*. One of the requirements for an acceptable RI-ISI program is that the program is developed using a PRA where the scope, level of detail, and technical acceptability of the PRA are commensurate with the application for which it is intended and the role the PRA results play in the integrated decision process. Although the TR's title includes only "technical adequacy," the TR also identifies the adequate scope and level of detail of the PRA analysis.

Revision 2 of RG 1.200, *An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,* issued in March 2009, describes one acceptable approach for determining whether the technical adequacy 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 for light-water reactors. RG 1.200 endorses the PRA quality descriptions contained in ASME/American Nuclear Standard (ANS) RA-Sa-2009, *Addenda to ASME/ANS RA-S–2008 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications* (ASME/ANS Standard).

For reactors licensed under 10 CFR Part 52, 10 CFR 50.71(h)(1) states that no later than the scheduled date for initial loading of fuel, each holder of a combined operating licensee (COL) shall develop a level 1 and a level 2 PRA. The PRA must cover those initiating events and modes for which NRC-endorsed consensus standards on PRA exist 1-year prior to the scheduled date for initial loading of fuel. PRAs should be developed consistent with NRC-endorsed consensus standards and other external events prior to the RI-ISI implementation.

The regulation at 10 CFR 50.71(h)(2) states that each COL holder must maintain and upgrade the PRA required by 10 CFR 50.71(h)(1). The upgraded PRA must cover initiating events and modes of operation contained in NRC-endorsed consensus standards on PRA in effect 1 year prior to each required upgrade. The PRA must be upgraded every 4 years until the permanent cessation of operations under 10 CFR 52.110(a). The PRA models must be updated and upgraded as necessary during both pre-operation and post-operation phases to maintain quality requirements needed for an RI-ISI program.

When the NRC approved TR appears as a reference in an RI-ISI program, the licensee should have made all changes to the PRA models, methods, and documentation such that the PRA meets, at a minimum, all the supporting requirements at the capability category identified in the endorsed version of the TR. If referenced as part of an RI-ISI program, the NRC staff is not required to perform a review of the PRA technical adequacy.

3.0 TECHNICAL EVALUATION

The ASME/ANS Standard describes the technical requirements for a PRA in a series of tables that list hundreds of detailed Supporting Requirements (SRs). SRs identify basic features of PRA analyses and describe an activity or the process required to support each feature. Some SRs describe a single variation of an activity or process that a PRA has included or not included (i.e., Met or Not-Met). Some SRs provide three variations designated Categories I, II, and III that differ in level of detail, degree of plant-specificity, or degree of realism. The remaining SRs provide two variations by grouping either Categories I and II, or II and III together.

In general, RG 1.200 clarifies that the current good practice, i.e., Capability Category II of the

ASME/ANS Standard, is the level of detail that is adequate for the majority of applications. However, for some applications, Capability Category I may be sufficient for some SRs. In other applications, Capability Category III may be required. For SRs that do not differentiate between capability categories, a "Met" is generally acceptable.

The TR proposes Capability Categories for each SR in Parts 2 (internal events) and 3 (flooding events) of ASME/ANS RA-Sa-2009[1]. Parts 4 through 9 in the ASME/ANS Standard describe the PRA analyses for fires (Part 4); seismic events (Part 5); high winds, external floods, and other external hazards (Parts 6 through 9).

Implementation of RG 1.200 is achieved through a peer review where a team of experienced industry analysts determine if the methodology and the implementation of the methodology meet the attributes described in the ASME/ANS SRs. Findings or "facts and observations" (F&Os) are usually developed when an SR is Not-Met or when Capability Category II, if differentiated, is not achieved. F&Os may also be developed if individual errors are identified or if inconclusive or inconsistent documentation prevents the peer review team from determining what methodology the licensee used. F&Os associated with differences between the licensee PRA and the capability categories identified in the TR should be resolved. To resolve a weakness in an SR caused by missing or inadequate technical evaluation, that evaluation must be performed and documented; compared to the SR attributes; and the capability category identified. To resolve a weakness in an SR caused by an inability to determine the capability category because of inconclusive or inconsistent documentation, the method or activity used by the licensee to address the SR must be clarified and documented, compared to the SR attributes, and the capability category identified.

In addition to peer reviews, operating experience is important to understanding mechanisms that may affect ISI at nuclear power plants. The nature of operating experience is such that it can come from a variety of sources and may affect any number of areas of plant operation. Thus, potentially relevant operating experience must be screened and, if necessary, further reviewed to determine whether any subsequent actions should be taken. The NRC staff recognizes that the capture and review of operating experience may best be accomplished through generic plant operating experience review activities, such as those implemented to address Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff," of NUREG-0737, "Clarification of TMI Action Plan Requirements." In this regard, the staff believes that guidance on the ongoing review of operating experience for RI-ISI should be addressed as a generic process that is used to inform and, when necessary, to develop new RI-ISI guidance. This process would be used for the operating experience element of all RI-ISI, similar to how the 10 CFR Part 50, Appendix B, quality assurance program may be applied to the elements of corrective actions, confirmation process, and administrative controls. Therefore, the staff believes that the TR should address the ongoing review of operating experience in the same fashion as the quality assurance program.

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[1] The labels in the ASME/ANS Standard endorsed by RG 1.200 that are assigned to many of the individual supporting requirements have been changed during the reorganization between RA-Sb-2005 and RA-Sa-2009. The Topical uses the labels from RA-Sb-2005. This SE uses the same labels as the Topical, but also provides the new labels in RA-Sa-2009 in parentheses throughout the safety evaluation.

3.1 ASME/ANS Standard Parts 2 and 3

Appendix A in the TR lists all the SRs in Parts 2 and 3 of the ASME/ANS Standard. For each SR in Part 2 (Internal events), two justifications for the proposed acceptable capability categories are proposed, one for the Traditional and one for the Streamlined analysis. In most SRs, the proposed acceptable category and justifications are identical. In some SRs, the proposed acceptable categories are the same but the justification varies between the Traditional versus the Streamlined methods. Only one SR, IE-A4, proposes a different acceptable SR category for the Traditional versus the Streamlined analysis.

For each SR in Part 3 (flooding), an acceptable capability is only proposed for the Streamlined analysis. The TR clarifies that RI-ISI applications using the Traditional analysis must perform an analysis as described in the EPRI TR-112657 instead of the flooding analysis described in Part 3 of the ASME/ANS Standard. The Traditional method requires a flooding analysis for each pipe segment in the scope of the proposed RI-ISI program and therefore does not need to be reviewed against the flooding requirements in the ASME/ANS Standard. Conversely, the Streamlined method relies on an appropriate screening flooding analysis which is described in Part 3 of the ASME/ANS Standard. Therefore the information contained in Appendix A in the TR provides the required guidance.

Each SR in Appendix A of the TR provides a column “assessment for RI-ISI Purposes.” The proposed capability category that should be acceptable for the SR is both identified and justified in this column. Although the specific wording in the “assessment” column sometimes varies, inspection of the TR yields five general justifications for accepting the use of PRAs with SRs for which CCI or “Not-Met” (i.e., lower than general good practices) have been assigned.

1. The TR states a lower capability category should be acceptable for some SRs because, “applying conservatisms for this SR will at worst only add inspection.” Lower capability categories in general are more conservative than high categories. Both the Streamlined and the Traditional methods’ safety-significance ranking process rely on the absolute risk values and that excessive conservatism in one scenario will not mask any other scenario. Therefore, the staff finds that a capability category less than “II” is acceptable for SRs to which this assessment applies.

2. The TR states, using several different phrases, that the RI-ISI assessment of flood scenarios will correct or render unimportant any impact on the RI-ISI program associated with accepting the lower capability category for some internal event SRs. In general, the flooding analysis assumes a flood, then identifies all Structures, Systems and Components (SSCs) that fail because of the flood, and quantifies the scenarios caused by or made worse by these failures. For example, weaknesses in identifying all sources of internal initiating events (IE-A4 (IE-A5)) are unimportant for RI-ISI because the flooding analysis must identify every scenario arising from SSC failure following each flooding event. The NRC staff concurs that the focused flooding evaluation can correct or render unimportant weaknesses in some internal events SRs. Therefore, the staff finds that a capability category less than “II” is acceptable for SRs to which this assessment applies.

3. The TR states that analyses or plant features addressed by some SRs are “not relevant” because, however it is modeled, it will not impact the results used to support the RI-ISI program evaluation. Not all analyses or plant features will affect the results used to support RI-ISI and changes to features that don’t affect the results are unnecessary. Therefore, the staff finds that a capability category less than “II” is acceptable for SRs to which this assessment applies.

4. The TR states that the impact of using the lower capability category (or departure from realism) is not expected to substantively affect the risk-significance due to the “order of magnitude absolute ranking and grouping approach” used. Sometimes this assessment is modified for the “Streamlined” method to refer to the small Core Damage Frequency (CDF) / Large Early Release Frequency (LERF) threshold used for identifying plant specific HSS piping which is also an order of magnitude guideline. The NRC staff concurs that the methods are order of magnitude ranking and grouping which are relatively insensitive to small quantitative changes. Small changes in the input values that could result when a higher capability category is met for an SR are not expected to cause significant changes to the PRA results which would be needed to change the proposed RI-ISI program. Therefore, the staff finds that a capability category less than “II” is acceptable for SRs to which this assessment applies.

5. The TR states that the lower capability category “provides resolution and specificity sufficient to identify the importance of the contributors at the system or train level.” Both the Traditional and Streamlined methods are based on absolute risk results which are directly compared to a guideline value and used in a change in risk analysis. The staff finds that “resolution and specificity” is a vague term that is more related to precision than accuracy and does not address the potential impact that meeting the higher capability category could have on the PRA results. Therefore, the NRC staff finds that this assessment category cannot be used to justify a CCI or “Not-met” assignment.

In most SRs, the NRC staff has identified one of the four above justifications as applicable to the proposed capability category. In two SRs, the NRC did not identify any other applicable justifications and the general requirement in RG 1.200 for a capability category II or Met is retained. These changes are described in Table 1.

Table 1 attached to this SE includes the NRC staff position on specific items in the TR to reflect the staff positions described above. These positions are:

- **No objection**. The NRC staff has no objection to the requirement or to the basis.
- **Qualification**. The NRC staff has a technical concern with the requirement and has provided a qualification to resolve the concern.

In the qualification, stricken text does not comport with the NRC staff position while bolded text should be added to comport with the staff position. Italicized text, when included, clarifies the staff position.

3.2 ASME/ANS Standard Parts 4 through 9

RG 1.174 states that the assessment of the risk implications in light of the acceptance guidelines requires that all plant operating modes and initiating events be addressed. However, RG 1.174 further clarifies that it is not necessary to have a PRA that quantitatively treats all initiating events if a qualitative treatment demonstrates the acceptability of the proposed change would not be affected by the unmodeled initiators. The TR proposes a qualitative treatment of the risk from fire events and from events that impose extreme loads on piping systems.

Fire events

ISI examines welds in order to identify and, if necessary, initiate the repair of flaws. The TR states that fire events may challenge piping integrity by causing transients that must be mitigated, but such challenges are expected to be less frequent and not significantly different than challenges caused by the random occurrence of internal initiating events. The NRC staff concurs with this assessment.

Extreme loading events

Seismic and other external events such as high winds, tornados, and floods may subject piping systems to increased and, for severe events, catastrophic loads. The TR notes that well engineered systems and structures such as piping systems are mechanically rugged. The staff evaluated the affect of seismic loads on piping in NUREG 1903, *Seismic Considerations For the Transition Break Size.* The NUREG concludes that, for most sites, only large flaws (e.g., greater than 30 percent of the piping wall thickness for a flaw approximately 145 degrees around the piping circumference) could cause piping to fail after seismic events that may be more frequent than about 10^{-5}/year. Seismic and other increased load events are too infrequent to cause flaw growth and therefore some other degradation mechanism is needed to grow flaws to such large sizes. The RI-ISI process already re-directs inspections to piping with degradation mechanisms that could cause flaw growth and with the greatest impact on risk. Conversely, catastrophic loads will fail piping with or without flaws that might have been removed as a result of inspections and therefore including these catastrophic loads could misdirect the selection of locations. In its letter dated June 2, 2011 (Reference 7), EPRI noted that plant-specific service experience (e.g., accepted or repaired flaws/indications) is included in the RI-ISI element selection process. The staff concludes that additional analyses of extreme loading events are not needed because the relevant information (pipe rupture safety-significant and plant-specific service experience) is addressed and additional evaluation will not change the conclusions derived from the RI-ISI program.

3.3 New Build Fleet (Part 50 & Part 52)

When proposing an alternative RI-ISI program under 10 CFR 50.55a(a)(3)(i) to a conventional ISI program, licensees will use a plant-specific PRA as an input. New plants licensed under part 50 must have a PRA capable of satisfying the quality requirements in the TR. New plants licensed under Part 52 must have a PRA that meets the requirements of 10 CFR 50.71(h). These plant-specific PRAs should reflect the as-built, as-operated plant, in that they represent the current plant design, configuration, and operating practices to the extent required to support the RI-ISI program. Since the plant-specific PRA cannot be completed until the plant is constructed, it is anticipated that the RI-ISI program could be implemented during the operational phase after initial fuel load.

The RI-ISI RGs and the RI-ISI SRP are written based on the premise that a conventional ISI Program exists and is modified in part to an RI-ISI program. The Part 52 design certification (DC) and combined license (COL) application submittals have been based on generating a conventional ISI Program, and the acceptance review has been predicated on the development of a conventional ISI Program. Similarly, the licensing process under Part 50 has been based on generating a conventional ISI program. The current RI-ISI process is based, in part, on comparison to a conventional ISI program. New build licensees may propose alternative RI-ISI methods that are not compared to a conventional program but that would still provide an acceptable level of quality and safety.

For individual new build licensees developing RI-ISI programs after sufficient plant-specific data and operating experience become available, the licensees should address the technical adequacy of PRAs used to develop an RI-ISI program by complying with the guidance of Section 3.1, Section 3.2, and Table 1 of this SE.

The staff finds that the PRA when used in support of a Traditional RI-ISI program for the new build fleet should be of sufficient technical adequacy 1) consistent with the requirements for currently operating reactors specified in Section 3.0 of this SE and 2) as modified in the following discussion. Use of the Streamlined methodology requires that the new build reactor has sufficiently similar characteristics of the operating fleet and that the generic HSS piping segments developed for the operating fleet are applicable. For some plant designs, the NRC staff may have insufficient information to reach this conclusion for new build reactors and therefore only approves referencing the TR requirements as demonstration of PRA technical adequacy for proposed RI-ISI programs developed using the Traditional method. Individual new build licensees developing RI-ISI programs using the Streamlined method may request to reference the TR by providing justification of sufficiently similar characteristics in the submittal to the NRC.

The ASME/ANS-PRA Standard referenced in the TR, as endorsed by RG 1.200, has been developed to support risk-informed activities at operating reactors. As such, many SRs do not specify the variable degree of achievability by a plant-specific PRA at initial fuel load as compared to a PRA for a plant with operational experience. Specifically, some SRs in the PRA standard may not be fully achieved until after plant operation due to the lack of industry or plant-specific operating data. The staff finds that it is necessary to identify those SRs that have a variable degree of achievability and to clarify their acceptability for use in demonstrating PRA technical adequacy to support the development of an RI-ISI program for new build reactors.

Table 2-3 “Assessment for New Build” of the TR identifies 75 SRs that have some variable degree of achievability before a plant acquires operating experience. Of the SRs listed in the table, 6 SRs are identified as “need not be met” for operating plants implementing an RI-ISI program and therefore are also similar for new build. Of the remaining SRs listed in Table 2-3, 17 require no plant specific input for the capability category required by the TR and may be met before initial fuel load, 28 can be fully met at initial fuel load, and 24 can be fully met by the first inspection period.

The staff has reviewed Table 2-3 of the TR and EPRI's responses dated January 19, 2011 (Reference 6) and June 2, 2011 (Reference 7) to the RAIs and reached the following conclusions.

Since the RI-ISI program is an alternative to the ASME Section XI ISI requirements which would be requested under 10 CFR 50.55a(a)(3), the ASME Section XI ISI program should have been developed prior to the RI-ISI implementation. Therefore, all important plant-specific operating procedures should be developed in support of the conventional ISI program and will be completed prior to initial fuel load. Other than normal plant changes reflecting lessons learned, these procedures and systems information are not expected to change as the plant transitions to full operation. Therefore, the SRs relevant to the use of assumptions about the "as anticipated" to be operated plant versus plant-specific procedures/systems should all meet the assigned capability category at initial fuel load.

Regarding the issue of plant-specific versus generic experience/data, it is acceptable for new plants to initially use only generic experience/data in some areas in support of the RI-ISI program, because the EPRI methodologies have been developed such that only large changes in a large amount of data would be expected to have a significant impact on the results. Furthermore, the RI-ISI program is a living program, so that new information (e.g., plant-specific data) is incorporated into the program on a periodic basis. This new information may result in an increase or decrease in the inspection population. From a practical perspective, the inspections themselves are allocated over a 10-year interval. As such, if incorporating plant-specific experience/data into the program results in additional inspections at the end of the first inspection period, then there would still be two inspection periods available to incorporate this impact into the program prior to closing out the inspection interval.

Accumulating operating experience in all SRs that require as-built, as-operated data would only have a significant impact on the RI-ISI program, if the as-built, as-operated plant experience is radically different than that assumed in the PRA. Although the as-built, as-operated data, when incorporated, may increase the inspection population, since the inspections are allocated over a ten year interval, there should be time available to incorporate this impact into the program, thereby completing 100 percent of the inspection population prior to closing out the inspection interval.

Table 2 attached to this SE provides the NRC staff position on specific items in Table 2-3 of the proposed TR. Similar to Table 1 of this SE, Table 2 reflects the staff positions including "No objection" and "Qualification." In the qualification, stricken text does not comport with the NRC staff position while bolded text should be added to comport with the staff position. Since the SRs stated in the TR are established for the Level 1 and Level 2 internal events PRA, it is important to note that, for new reactors, if the fire, seismic, and other external events PRAs are to be used to support the RI-ISI program, the licensees must demonstrate compliance with the PRA technical adequacy requirements, and that these PRAs are of sufficient technical adequacy to support the application.

Regarding the risk-informed pre-service inspection (RI-PSI) program proposed in the TR, currently, RI-PSI is not programmatically acceptable for new reactors. Therefore, the staff concludes that, at this point, it is premature to discuss specific PRA technical adequacy guidance relevant to the RI-PSI program. The staff does not endorse any of the discussions in the TR related to the RI-PSI program.

4.0 CONDITIONS AND LIMITATIONS AND APPLICANT/LICENSEE PLANT-SPECIFIC ACTION ITEMS

Based on its review, the NRC staff identified some issues and concerns in Section 3.0 of this SE that were not adequately resolved regarding the implementation of EPRI TR 1021467. Some of the staff's issues that are not adequately resolved and remaining concerns are related to conditions and limitations on the use of the tables contained within the TR. These conditions and limitations address deficiencies in the TR and are identified in this Section. In addition, some of the staff's issues and concerns that were not adequately resolved are related to applicant/licensee action items related to the use of EPRI TR 1021467. These plant-specific action items address topics related to the implementation of EPRI TR 1021467 that could not be effectively addressed on a generic basis. Although Section 4.1 and 4.2 describe the conditions and limitations and the plant-specific action items identified by the NRC staff, Section 3 more fully describes all concerns and shall be considered during any update to EPRI TR 1021467 to comport with this SE.

4.1 Limitations and Conditions

1. The justification that a lower capability category "provides resolution and specificity sufficient to identify the importance of the contributors at the system or train level" cannot be used to justify a CCI or "Not-met" assignment. The final TR shall be modified to clearly reflect this limitation. **This is Topical Report Condition 1.**

2. The NRC staff does not find the methods and results in the July 2010 version of the TR acceptable but, instead, would endorse the methods and results that would be described after modifying the TR by incorporating the specific changes identified in Tables 1 and 2 of this SE, and by appropriately reflecting the other limitations and conditions in this SE. The final TR shall be modified to clearly reflect this condition and limitation. **This is Topical Report Condition 2.**

3. For new build nuclear power plants, the NRC staff only approves referencing the TR requirements as demonstration of PRA technical adequacy for proposed RI-ISI programs developed using the Traditional method. The final TR shall be modified to clearly reflect this limitation. **This is Topical Report Condition 3.**

4. RI-PSI for new reactors is not programmatically acceptable. The final TR shall be modified to clearly reflect this limitation. **This is Topical Report Condition 4.**

4.2 Plant-Specific Action Items

1. For a supporting requirement to be considered met at the capability category required in the TR, all relevant peer and other independent review findings shall have been

addressed and, as necessary, applicable changes made to PRA models, methods, and documentation. **This is Applicant/Licensee Action Item 1.**

2. An approved, conventional ISI program should be in place before the NRC will consider an alternative to the requirements of 10 CFR 50.55a to use RI-ISI. **This is Applicant/Licensee Action Item 2.**

3. Any new build licensee developing an RI-ISI program using the Streamlined method must provide to the NRC, in a request for relief, justification of sufficiently similar characteristics in the submittal. **This is Applicant/Licensee Action Item 3.**

4. Plant specific operating experience and data should be incorporated into the RI-ISI program consistent with the schedule laid out in the TR. **This is Applicant/Licensee Action Item 4.**

5.0 CONCLUSIONS

The NRC staff has reviewed EPRI TR 1021467 and concludes that the TR, as modified by the conditions and limitations and applicant/licensee action items summarized in Section 4.0 of this SE and further described in Section 3, provides reasonable assurance that the PRA has sufficient quality to support the development of an RI-ISI program.

The NRC staff finds that the methodology in the TR identifying what capability categories are needed for all SRs is acceptable because it is capable of justifying differences between current good practice (i.e., Capability Category II or "Met") and the capability category required to support an RI-ISI program developed according to the Traditional or the Streamlined methods. As described in Section 3 of this SE, the staff concurs with 4 of the 5 justifications for accepting a lower than the current good practice Capability Category II (or "Met") identified in RG 1.200. The staff finds that the proposed justifications, as endorsed in Table 1 of this SE (Attachment 1), appropriately reflect the potential impact of each "less than current" good practice SR on RI-ISI programs. Therefore, a PRA that meets or exceeds the guidelines in the NRC approved version of the TR has sufficient quality to support a proposed RI-ISI program.

The NRC staff finds that the TR appropriately identifies the SRs that have variable degree of achievability during the transition from a plant-specific PRA before initial fuel load to a PRA for a plant with operational experience. For these SRs, the level and timing of achievability to support an RI-ISI program is appropriately identified and characterized in the TR with the modifications identified in Table 2 (Attachment 2) of this SE. For individual new build licensees developing RI-ISI programs after sufficient plant-specific data and operating experience become available, the licensees should address the technical adequacy of PRAs used to develop an RI-ISI program by complying with the guidance of Section 3.1, Section 3.2, and Table 1 of this SE.

When a licensee references the NRC approved version of the TR in an RI-ISI program, the licensee should have resolved all peer review findings and made all changes to the PRA models, methods, and documentation such that the PRA meets the supporting requirements at or greater than the capability category identified in the TR. The NRC staff is not required to repeat its review of the matters described in the TR conditioned upon the changes described in this SE (Sections 3 and 4) to be incorporated when the report appears as a reference which was complied within a request for relief to implement an RI-ISI program, or as part of the adoption of a code case approved for use as endorsed in RG 1.146, or other related licensing actions.

A conventional ISI program should be in place before the licensee submits a request for relief to implement an RI-ISI program. For operating power reactors licensed after January 1, 2011, the RI-ISI program can evolve after operation which infers that submittal/approval prior to initial fuel load is not schedule critical.

Concerning RI-PSI, the staff does not endorse any risk-informed pre-service inspection programs for new reactors.

Before endorsement by the NRC, the TR must be updated to reflect the correction of the issues described in Sections 3 and 4, including incorporation of the additions and strikeout provided by the NRC staff in Tables 1 and 2 into the body of the TR. The updated or final TR shall be identified by a "-A" following the TR identification. The NRC expects the "-A" version to be issued by EPRI within three months of receipt of this final SE. The "-A" version of the TR should incorporate the transmittal letter, the final SE, and all RAIs with responses after the title page of the TR. Upon receipt of the "-A" version, the NRC staff will review the updated TR and, if accepted, will respond with an endorsement letter.

6.0 <u>REFERENCES</u>

1. Christian B. Larsen (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission Report Transmittal; "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs," EPRI, Palo Alto, CA: 2008. 1018427, February 18, 2009. Agencywide Documents Access and Management System (ADAMS) Accession No. ML090700594)

2. Tuan Nguyen, (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, Transmittal of RAI Responses on Report; Nondestructive Evaluation.- Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs. EPRI, Palo Alto, CA: 2008. 1018427, December 15, 2009. (ADAMS Accession No. ML093520080)

3. Neil Wilmshurst (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, Transmittal of RAI Responses on Report; Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs. EPRI, Palo Alto, CA: 2008.1018427 (Ref. EPRI Project Number 669), May 12, 2010. (ADAMS Accession No. ML11229A675)

4. Neil Wilmshurst (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, Transmittal of Report; Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs. EPRI, Palo Alto, CA: 2010. 1021467 (Ref. EPRI Project Number 669), July 8, 2010. (ADAMS Accession No. ML101930535)

5. Neil Wilmshurst (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, Additional Clarification with Respect to EPRI Report; Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs. EPRI, Palo Alto, CA: 2010. 1021467, October 12, 2010. (ADAMS Accession No. ML102920275)

6. Neil Wilmshurst (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, Transmittal of RAI Response on Report; Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs. EPRI, Palo Alto, CA: 1021467, January 19, 2011. (ADAMS Accession No. ML110250354)

7. Neil Wilmshurst (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, Additional clarification with respect to EPRI report: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-informed In-service Inspection Programs. EPRI, Palo Alto, CA: 1021467, June 2, 2011. (ADAMS Accession No. ML11158A014)

8. Jeffrey Mitman (Electric Power Research Institute) to U. S. Nuclear Regulatory Commission, EPRI Topical Report TR-112657 Revision B-A, Revised Risk Informed Inservice Inspection Procedure. EPRI, Palo Alto, CA: 1021467, February 10, 2000. (ADAMS Accession No. ML013470102)

9. U. S. Nuclear Regulatory Commission to Neil Wilmshurst (Electric Power Research Institute), draft NRC safety evaluation for 30-day comment period, September 30, 2011. (ADAMS ADAMS Accession No. ML11262A206)

Attachments: 1. Table 1
2. Table 2

Principal Contributor: Stephen Dinsmore

Date: January 18, 2012

Attachment 1:
Table 1

Note 1, Table 2-1 as modified by letter dated June 2, 2011.	For a supporting requirement to be considered met, all relevant peer **and other independent** review findings shall have been addressed and as necessary applicable changes made to PRA models, ~~and~~ methods**, and documentation**. ~~As the capability category assignment for each supporting requirement relates to the technical aspects of the plant PRA, peer *review* findings and/or gaps related to documentation that do not impact the RI-PSI / RI-ISI results would allow the capability category to still be considered met. A documented basis for this conclusion should be prepared and available. This documented basis could, for example, include the use of supplemental analyses, comparison to similar plants and/or *review* of the impact of similar *review* findings on RI-PSI / RI-ISI results to confirm the RI-PSI / RI-ISI results would not be significantly impacted.~~ *Referencing this Topical Report is intended to clearly define the minimal quality of the PRA. The evaluation of possible impacts of deviations from the TR permitted by the stricken text may be acceptable but requires a prior submittal to the NRC for review and therefore is not acceptable as part of the TR.*
Supporting Requirement: 2005 Version (2009 Version)	
IE-A1 (IE-A1) through AS-A8 (AS-A8)	*No objection*
AS-A9 (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.~~ ~~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.~~ **CCII because difference in success criteria caused by more use of applicable (instead of generic) thermal hydraulic analysis could result in significant differences in the PRA results in some scenarios.** *See Note 1*

AS-A10 (AS-A10) through SC-A1 (SC-A1)	*No objection*
SC-A2 (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). EPRI streamlined CCI because applying conservatism for this SR would increase the scope of HSS segments, per Section 2(a)(5) of case.~~ **CCI because CCI definition of core damage is generally conservative and both the Streamlined and the Traditional methods rely on the absolute risk values so conservatism in one scenario will not mask any other scenario.**
SC-A3 (SC-A3) through SC-B1 (SC-B1)	*No objection*
SC-B2 (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).~~ ~~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).~~ **CCII because the difference in PRA results caused by using expert panels instead of available information could result in significant differences in the PRA results in some scenarios..** *See Note 1*
SC-B3 (SC-B3) through SY-B1 (SY-B1)	*No objection*

SY-B1 (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).~~ ~~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).~~ **CCI because the probabilities from missing CCFs would have been screened out at the system level and therefore are expected to be small and would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
SY-B2 (SY-B2) through SY-B10 (SY-B9)	*No objection*
SY-B11 (SY-B10)	~~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).~~ ~~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).~~ **CCI because the probabilities of missing actuation or lockout events would have been screened out at the system level and therefore are expected to be small and would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
SY-B12 (SY-B11) through HR-A3 (HR-A3)	*No objection*

HR-B1 (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).~~ ~~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).~~ **CCI because the probabilities from any maintenance related failure modes that may have been screened out are expected to be small compared to random failures and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
HR-B2 (HR-B2) through HR-D2 (HR-D2)	*No objection*
HR-D3 (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).~~ ~~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).~~ **CCI because changes to the probabilities of HEPs due to the process specified in CCII of this SR are expected to be small compared to the basic HEP values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
HR-D4 (HR-D4) through HR-E2 (HR-E2)	*No objection*

HR-E3 (HR-E3) and HR-E4 (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).~~ ~~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).~~ **CCI because changes to the probabilities of HEPs due to the process specified in CCII of this SR are expected to be small compared to the basic HEP values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
HR-F1 (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 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).~~ ~~EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the 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).~~ **CC I/II because it is generally acknowledged that CCII is adequate for all but the most challenging of PRA applications.**

HR-F2 (HR-F2)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because changes to the probabilities of HEPs due to the process specified in CCII of this SR are expected to be small compared to the basic HEP values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
HR-G1 (HR-G1) and HR-G2 (HR-H2)	*No objection*
HR-G3 (HR-G3) through HR-G5 (HR-G5)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because changes to the probabilities of HEPs due to the process specified in CCII of this SR are expected to be small compared to the basic HEP values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
HR-G6 (HR-G6) through DA-A3 (DA-A4)	*No objection*

DA-B1 (DA-B1)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because changes to the component failure probabilities due to the process specified in CCII of this SR are expected to be small compared to the basic probability values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
DA-B2 (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 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).~~ ~~EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, CII provides resolution and specificity sufficient to identify the 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).~~ **CC I/II because it is generally acknowledged that CCII is adequate for all but the most challenging of PRA applications.**
DA-C1 (DA-C1) through DA-C6 (DA-C6)	*No objection*

DA-C7 (DA-C7) and DA-C8 (DA-C8)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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 [a][5] of case).~~ **CCI because changes to the component failure probabilities due to the process specified in CCII of this SR are expected to be small compared to the basic probability values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
DA-C9 (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 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).~~ ~~EPRI streamlined CCI/II because per Table 1.3-1 of the RA-2005, CCII provides resolution and specificity sufficient to identify the 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).~~ **CC I/II because it is generally acknowledged that CCII is adequate for all but the most challenging of PRA applications.**

DA-C10 (DA-C10)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because changes to the component failure probabilities due to the process specified in CCII of this SR are expected to be small compared to the basic probability values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
DA-C11 (DA-C11) through DA-C15 (DA-C16)	*No objection*
DA-D1 (DA-D1)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because changes to the component failure probabilities due to the process specified in CCII of this SR are expected to be small compared to the basic probability values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
DA-D2 (DA-D2)	*No objection*

DA-D3 (DA-D3) through DA-D6 (DA-D6)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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 [a][5] of case).~~ **CCI because changes to the component failure probabilities due to the process specified in CCII of this SR are expected to be small compared to the basic probability values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
DA-D6a (DA-D7)	*No objection*
DA-D7 (DA-D8)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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 [a][5] of case).~~ **CCI because changes to the component failure probabilities due to the process specified in CCII of this SR are expected to be small compared to the basic probability values and therefore would not affect the RI-ISI program due to the order of magnitude ranking and grouping approach used.**
DA-E1 (DA-E1) through QU-D4 (QU-D5)	*No objection*

QU-D5a (QU-D6)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because application specific flooding assessment will review (or supplement) any impact associated with accepting the lower capability category.**
QU-D5b (QU-D7) through LE-A5 (LE-A5)	*No objection*
LE-B1 (LE-B1) and LE-B2 (LE-B2)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ ~~EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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 [a][5] of case).~~ **CCI because the analysis in NUREG/CR-6595 is generally conservative and both the Streamlined and the Traditional methods rely on the absolute risk values so conservatism in one scenario will not mask any other scenario.**
LE-B3 (LE-B3)	*No objection*

LE-C1 (LE-C1) through LE-C2a (LE- C2)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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). EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because the analysis in NUREG/CR-6595 is generally conservative and both the Streamlined and the Traditional methods rely on the absolute risk values so conservatism in one scenario will not mask any other scenario.**
LE-C2b (LE-C3)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, **CCI** provides resolution and specificity sufficient to identify the 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). EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because not crediting repair is conservative and both the Streamlined and the Traditional methods rely on the absolute risk values so conservatism in one scenario will not mask any other scenario.**

LE-C3 (LE-C4)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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). EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because the analysis in NUREG/CR-6595 is generally conservative and both the Streamlined and the Traditional methods rely on the absolute risk values so conservatism in one scenario will not mask any other scenario.**
LE-C4 (LE-C5) through LE-D1a (LE-D1)	*No objection*
LE-D1b (LE-D2)	~~EPRI traditional CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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). EPRI streamlined CCI because per Table 1.3-1 of the RA-2005, CCI provides resolution and specificity sufficient to identify the 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).~~ **CCI because the analysis in NUREG/CR-6595 is generally conservative and both the Streamlined and the Traditional methods rely on the absolute risk values so conservatism in one scenario will not mask any other scenario.**
LE-D2 (LE-D3) through LE-G6 (LE-G6)	*No objection*

Notes to Table 1

In its October 12, 2010, submittal, EPRI proposed changing the assessment to become an assertion that non-conservative result will be identified or not produced if the lower capability category was accepted because of interactions between these SRs and others. In its June 2, 2011, submittal, EPRI further argued that a Capability Category I should be sufficient for this SR. The NRC staff has not identified guidance on success criteria or expert judgment or plant comparison process that can systematically identify non-conservative results, and finds no support for arguing that interactions between SRs will provide this identification. Therefore the

NRC staff retains the requirement that these be Capability Category II in order to claim compliance with the Topical Report.

Table 2

Staff Position on Table 2-3 of ERPI TR 1021467

Sec ID 2008 (2009)	**TR1018427 Assessment**
IE-A3 (IE-A3)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
IE-A3a (IE-A4)	~~CCI/II can be met partially as some components may be unique~~ CCI/II will be met partially at initial fuel load if some components are unique **CCI/II** will be completely met **at 1st inspection period** via the RI-ISI living program component
IE-A4a (IE-A6)	~~CC I can be met~~ **CCI will be met before initial fuel load**
IE-A6 (IE-A8)	~~CCI can be met~~ **CCI will be met before initial fuel load**
IE-A7 (IE-A9)	~~CCI can be met~~ **CCI will be met before initial fuel load**
IE-C1 (IE-C1)	*No objection*
IE-C1a (IE-C2)	*No objection*
IE-C1b (IE-C3)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
IE-C2 (IE-C4)	*No objection*
IE-C3 (IE-C5)	*No objection*

IE-C5 (IE-C7)	*No objection*
IE-C9 (IE-C11)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
IE-C12 (IE-C14)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **CCI/II will be met at initial fuel load**
AS-A5 (AS-5)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
AS-B5a (AS-B6)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
SC-A6	~~Procedures may not be available.~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
SY-A2 (SY-A2)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
SY-A3 (SY-A3)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
SY-A4 (SY-A4)	~~Plant staff /~~ Operating data may not be available ~~Can be mostly met at Fuel Load and completely met at 1st Period~~ **CCI will be completely met at 1st inspection period**
SY-A5 (SY-A5)	~~Procedures may not be available~~

	~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
SY-A7 (SY-A7)	~~Detailed design information may not be available~~ ~~Can be met at Fuel Load~~ **CCI/II will be met at initial fuel load**
SY-A18 (SY-A19)	Operating experience may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
SY-A18a (SY-A20)	Operating experience ~~and Procedures~~ may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
HR-A1 (HR-A1)	Operating experience ~~and procedures~~ may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
HR-A2 (HR-A2)	Operating experience ~~and procedures~~ may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
HR-A3 (HR-A3)	Operating experience ~~and procedures~~ may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
HR-C3 (HR-D3)	Operating experience ~~and procedures~~ may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
HR-D3 (HR-D3)	~~CCI can be met~~ **CCI will be met before initial fuel load**

HR-D4 (HR-D4)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load** Note: SR is only relevant if applicable
HR-D7 (HR-D7)	~~CCI/II can be met~~ **CCI/II will be met before initial fuel load**
HR-E1 (HR-E1)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
HR-E2 (HR-E2)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
HR-E3 (HE-E3)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **CCI will be met at initial fuel load**
HR-E4 (HR-E4)	~~CCI can be met~~ **CCI will be met before initial fuel load**
HR-F2 (HR-F2)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **CCI will be met at initial fuel load**
HR-G3 (HR-G3)	~~CCI can be met~~ **CCI will be met before initial fuel load**
HR-G5 (HR-G5)	~~CCI can be met~~ **CCI will be met before initial fuel load**
HR-G6 (HR-G6)	~~Procedures and~~ Operating experience may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**

HR-G7 (HR-G7)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
HR-H2 (HR-H2)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
DA-B2 (DA-B2)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **CCI/II will be met at initial fuel load**
DA-C2 (DA-C2)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C3 (DA-C3)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C4 (DA-C4)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C5 (DA-C5)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C6 (DA-C6)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C7 (DA-C7)	~~CCI can be met~~ **CCI will be met before initial fuel load**
DA-C8 (DA-C8)	~~CCI can be met~~ **CCI will be met before initial fuel load**

DA-C9 (DA-C9)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **CCI/II will be met at 1st inspection period**
DA-C10 (DA-C10)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **CCI will be met at 1st inspection period**
DA-C11 (DA-C11)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C12 (DA-C13)	Plant-specific data may not be available. ~~Can be met at 1st Period~~ **CCI will be met at 1st inspection period**
DA-C13 (DA-C14)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-C14 (DA-C15)	Plant-specific data may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
DA-D1 (DA-D1)	~~CCI can be met~~ **CCI will be met before initial fuel load**
DA-D2 (DA-D2)	~~Can be met.~~ **Will be met before initial fuel load** This SR also shows that other Data SRs may be supplemented by this approach
DA-D4 (DA-D4)	~~CCI can be met~~ **CCI will be met before initial fuel load**

IF-A3 (IFPP-A4)	~~As-built and as-operated sources may not be available~~ ~~As-built can be met at Fuel Load~~ ~~As-operated can be met at 1st Period~~ **Will be met at 1st inspection period**
IF-A4 (IFPP-A5)	**Final** walkdowns may not be possible ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
IF-B3a (IFSO-A6)	**Final** walkdowns may not be possible ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
IF-C6 (IFSN-A14)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **CCII will be met at initial fuel load**
IF-C8 (IFSN-A16)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **CCII will be met at initial fuel load**
IF-C9 (IFSN-A17)	**Final** walkdowns may not be possible ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
IF-D5a (IFEV-A6)	~~Noted information may not be fully available~~ ~~Most can be met at Fuel Load, Operating data can be met at 1st Period~~ **CCII/III will be met at 1st inspection period**
IF-D6 (IFEV-A7)	*No objection*
IF-E5a (IFQU-A6)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**

IF-E8 (IFQU-A11)	**Final** walkdowns may not be possible ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
QU-D1b (QU-D2)	~~Procedures and~~ Operating experience may not be available ~~Can be met at 1st Period~~ **Will be met at 1st inspection period**
QU-D3 (QU-D4)	~~CCI can be met~~ **CCI will be met before fuel load**
LE-C2a (LE-C2)	~~CCI can be met~~ **CCI will be met before fuel load**
LE-C2b (LE-C3)	~~CCI can be met~~ **CCI will be met before fuel load**
LE-C3 (LE-C4)	~~CCI can be met~~ **CCI will be met before fuel load**
LE-C6 (LE-C7)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**
LE-D5 (LE-D6)	~~Procedures may not be available~~ BWR – Not applicable PWR – ~~Can be met at Fuel Load~~ **CCI will be met at initial fuel load**
LE-E1 (LE-E1)	~~Procedures may not be available~~ ~~Can be met at Fuel Load~~ **Will be met at initial fuel load**