SAFETY EVALUATION REPORT
Related to "Revised Risk-Informed Inservice Inspection Evaluation Procedure"
(EPRI TR-112657, Rev. B, July 1999)

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

October 28, 1999

TABLE OF CONTENTS

ABBREVIATIONS

ASME	American Society of Mechanical Engineers
CCDF	Conditional core damage frequency
CCDP	Conditional core damage probability
CLERP	Conditional large early release probability
FAC	Flow Accelerated Corrosion
IGSCC	Intergranular stress corrosion cracking
IPE	Individual plant examination
ISI	Inservice inspection
HSS	High Safety Significant
LERF	Large early release frequency
LERP	Large early release probability
LOCA	Loss of coolant accident
PRA	Probabilistic risk assessment
PSA	Probabilistic safety assessment
RI-ISI	Risk-informed inservice inspection
SRP	Standard review plan

SAFETY EVALUATION REPORT RELATED TO "REVISED RISK-INFORMED INSERVICE INSPECTION EVALUATION PROCEDURE" (EPRI TR-112657, Rev. B, JULY 1999)

1.0 INTRODUCTION

On April 14, 1999, Electric Power Research Institute (EPRI) submitted its topical report (TR), EPRI TR-112657, "Revised Risk-Informed Inservice Inspection [RI-ISI] Procedure," (Ref. 1) for review and approval by the staff of the U. S. Nuclear Regulatory Commission (NRC). On July 29, 1999, EPRI submitted the revised TR, EPRI TR-112657, Revision B, "Revised Risk-Informed Inservice Inspection [RI-ISI] Procedure," (Ref. 2). EPRI TR-112657, Rev. B, provides technical guidance on an alternative for selecting and categorizing piping components based on their risk significance to develop an RI-ISI program as an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI ISI requirements for piping.

Current inspection requirements for commercial nuclear power plants are contained in the 1989 Edition of Section XI, Division 1, of the ASME Code entitled "Rules for Inservice Inspection of Nuclear Power Plant Components." The RI-ISI programs enhance overall safety (1) by focusing inspections of piping at highly risk significant locations and locations at which failure mechanisms are likely to be present and (2) by improving the effectiveness of inspection of components because the examination methods are based on the postulated failure mode and the configuration of the piping structural element. EPRI TR-112657, Rev. B, provides details required to incorporate risk insights when identifying locations for ISI of piping, in accordance with the general guidance provided in Regulatory Guide (RG) 1.174 (Ref. 3) and RG 1.178 (Ref. 4).

EPRI has asserted that the EPRI methodology for RI-ISI is a detailed implementation document for ASME Code Cases N-560 (Ref. 5) and N-578 (Ref. 6). However, the staff has not evaluated ASME Code Cases N-560 and N-578 to determine their acceptability. Also, the staff has not evaluated EPRI TR-112657, Rev. B, to determine if it is an acceptable document for meeting the intent of ASME Code Cases N-560 and N-578.

In developing the methods described in EPRI TR-112657, Rev. B, the industry incorporated insights gained from two pilot plant studies, Arkansas Nuclear One, Unit 2 (ANO-2) and Vermont Yankee. The staff's review of EPRI TR-112657, Rev. B, incorporates information obtained through technical discussions at public meetings and through formal requests for additional information (Ref. 7) to address the issues related to the analytical methods, observation of the application of the methods to the ANO-2 and Vermont Yankee pilot plants, review of the ANO-2 and Vermont Yankee RI-ISI applications, independent audit calculations, and peer reviews of selected technical issues.

The methodology and procedures in EPRI TR-112657, Rev. B, will be used by licensees to define the scope of a risk-informed piping ISI program. This scope is defined by establishing piping segments, inspection element locations, inspection methods, examination volumes, and acceptance and evaluation criteria. A licensee using this methodology will be expected to incorporate the results of its RI-ISI evaluation into plant-specific program procedures that are consistent with the performance-based implementation and monitoring strategies specified in RG 1.178 and ASME Code Section XI.

2.0 SUMMARY OF PROPOSED APPROACH

The proposed risk-informed methodology would replace the current ASME Code examination requirements for Class 1, 2, and 3 piping. The resulting changes include the number of piping welds examined, their locations, and methods of inspection. ASME Code requirements regarding inspection intervals, acceptance criteria for evaluation of flaws, expansion criteria for flaws discovered, and qualification of inspection techniques and personnel are essentially unchanged, except as identified in EPRI TR-112657, Rev. B, Section 3.6.7, for examinations for localized corrosion. As noted in Section 1.1 of EPRI TR-112657, Rev. B, the proposed methodology is an alternative method of selecting locations for nondestructive examination (NDE). The EPRI RI-ISI methodology is designed to be integrated with existing augmented examination programs for degradation mechanisms such as flow-accelerated corrosion (FAC) (Ref. 8) and intergranular stress-corrosion cracking (IGSCC) (Ref. 9).

In accordance with 10 CFR 50.55a(a)(3)(i), proposed alternatives to regulatory requirements may be used when authorized by the NRC if the applicant demonstrates that the alternative provides an acceptable level of quality and safety. The EPRI RI-ISI method is proposed as an alternative that will (1) identify degradation mechanism(s) that are potentially active, (2) select inspection locations in which the impact of each degradation mechanism is most severe, and (3) implement appropriate inspection methods with qualified inspectors.

The proposed approach is specifically for the NDE of Class 1 and 2 piping welds but also includes Class 3 piping and non-ASME Code class piping found to be highly risk significant in the risk evaluation. As stated by EPRI, all other portions of the ASME Code (i.e., not related to piping) will not be affected by the implementation of the EPRI TR-112657, Rev. B, approach.

The EPRI RI-ISI process includes the following steps:

- scope definition
- consequence evaluation
- degradation mechanism evaluation
- piping segment definition
- risk categorization
- inspection/NDE selection
- risk impact assessment
- implementation, monitoring, and feedback

3.0 EVALUATION

For this safety evaluation, the NRC staff reviewed the EPRI RI-ISI methodology, as defined by EPRI TR-112657, Rev. B, with respect to the guidance contained in RG 1.178 and Standard Review Plan (SRP) Chapter 3.9.8 (Ref. 10), which describe the acceptable methodology, acceptance guidelines, and review process for proposed plant-specific, risk-informed changes to ISI programs for piping components. Further guidance is provided in RG 1.174 and SRP Chapter 19.0 (Ref. 11) which contain general guidance for using probabilistic risk assessments (PRAs) in risk-informed decisionmaking..

3.1 Proposed Changes to ISI Programs

A general description of the changes to ISI programs that would result from the proposed methodology is provided in Section 6.2.1 of EPRI TR-112657, Rev. B, which specifies conformance with Section 3 of RG 1.178. Specific pipe systems, segments, and welds, as well as revisions to inspection scope, schedule, locations, and techniques, are plant-specific and, therefore, are not directly included in this evaluation.

Pursuant to 10 CFR 50.55a(g), ASME Code Category B-J and C-F piping welds and Examination Category B-F dissimilar metal welds must receive ISI during successive 120-month (ten-year) intervals. Currently, 25 percent of all Category B-J piping welds of more than 1-inch nominal diameter are selected for volumetric or surface examination, or both, on the basis of existing stress analyses. For Category C-F piping welds, 7.5 percent of non-exempt welds are selected for surface or volumetric examination, or both. Examination Category B-F requires volumetric or surface examination, or both, of all dissimilar metal nozzle-to-piping welds. B-F welds have been included in the scope of the proposed risk-informed analysis at certain plants and may be categorized as being low risk significant if appropriate. The staff concludes that the inclusion of B-F welds in a RI-ISI program is a plant-specific issue and that individual licensees should determine the safety significance of B-F welds and perform examinations commensurate with the associated risk.

Pursuant to 10 CFR 50.55a(a)(3)(i), a licensee planning to use the EPRI methodology will propose an alternative to the ASME Code's examination requirements for piping systems at its plant. As stated in Section 2.2 of EPRI TR-112657, Rev. B, the objectives of the RI-ISI program are to identify risk-significant piping segments, define the locations to be inspected within these segments, and identify appropriate inspection methods. EPRI TR-112657, Rev. B, Section 6.1, states that the EPRI approach is formulated such that no significant risk increases should be expected. For most applications, EPRI expects that strict compliance with its procedure for pipe segment classification, inspection sample selection, and implementation of an inspection-for-cause approach will result in reduction in pipe leak and rupture frequencies. Consequently, EPRI expects reductions in core damage frequency (CDF) and large early release frequency (LERF) if licensees adopt the methodology in EPRI TR-112657, Rev. B.

As stated in EPRI TR-112657, Rev. B, Section 6.5, and discussed in the public meeting with EPRI on March 2, 1999 (Ref. 12), no changes to the augmented inspection programs for FAC or for IGSCC Category B through G welds for boiling-water reactors (BWRs) are being made in the proposed RI-ISI program. The EPRI RI-ISI program would supersede augmented inspection programs for Category A welds for IGSCC for BWRs, IGSCC in pressurized water reactors (PWRs) (Ref. 13), microbiologically influenced corrosion (MIC) (Ref. 14), and thermal fatigue (Ref. 15).

3.2 Engineering Analysis

According to the guidelines in RGs 1.174 and 1.178, licensees proposing an RI-ISI program should perform an analysis of the proposed changes using a combination of engineering analysis with supporting insights from a PRA. For the RI-ISI program, engineering analysis includes determining the scope of piping systems included in the RI-ISI program, establishing the methodology for defining piping segments, evaluating the failure potential of each segment, and determining the consequences of failure of piping segments. The deterministic and probabilistic analyses that are performed to evaluate the proposed changes to the ISI program are summarized in Section 6.2.2 of EPRI TR-112657, Rev. B.

The process to ensure that the RI-ISI program does not deviate from the licensing bases pertaining to piping structural integrity are addressed in Section 5.3 of EPRI TR-112657, Rev. B. The EPRI TR states that the only codes and standards that will be affected by implementation of the EPRI RI-ISI method will be the ISI requirements of ASME Code Section XI. Existing safety analyses are not expected to be affected by implementation of RI-ISI.

In Section 6.1 of EPRI TR-112657, Rev. B, EPRI describes the basis for conformance with the key principles of RG 1.174 to ensure that the proposed change meets the current regulations, is consistent with defense-in-depth philosophy, maintains sufficient safety margins, provides reasonable assurance that risk increases (if any) resulting from the proposed change should be small and consistent with the intent of the Commission's Safety Goal Policy Statement, and is monitored using performance-based strategies. Details of the engineering analysis of the risk-based evaluations are discussed in the following sections.

3.2.1 Scope of Program

In accordance with the guidelines in Section 1.3 of RG 1.178, the staff has determined, as set forth below, that full-scope and partial-scope options are acceptable for RI-ISI programs for piping. The full-scope option includes ASME Code Class 1, 2, and 3 piping, piping whose failure could prevent safety-related structures, systems, or components (SSCs) from fulfilling their safety functions, and non-safety-related piping that is relied upon to mitigate accidents or whose failure could cause a reactor scram or actuation of a safety-related system.

As described in Sections 1.3, 3.1, and 3.2 of the EPRI TR, the EPRI methodology should be applicable whether the scope of piping to be evaluated in the RI-ISI program includes a single system, selected systems, or all plant systems. The methodology refers to ASME Code Case N-560 for a scope covering B-J welds in Class 1 piping systems, and to ASME Code Case N-578 for alternative scopes (other piping classes or individual piping systems) up to, and including, full plant evaluations. Therefore, both "partial-scope" or "full-scope" applications of the methodology are anticipated. Section 3.7.2 of the EPRI TR provides system-level decision guidelines for change in CDF of 1E-7/yr and for change in LERF of 1E-8/yr. These changes in frequency are an order of magnitude less than those regarded as "very small" in RG 1.174. The EPRI TR states that system-level decision guidelines should be applied to each system regardless of the scope of the application. If a Class 1 only evaluation is being performed, the

EPRI Topical states that, for the purpose of the risk impact assessment only, the Class 1 piping may be treated as a single system.

Treatment of the RI-ISI inspection strategy for existing augmented and other inspection program activities is described in Sections 2.4, 3.6.4.1, 3.6.4.2, 3.6.5, and 6.5 of the EPRI TR. In these discussions, EPRI describes the role of inspection programs outside the scope of Section XI that will be integrated with the RI-ISI program as noted by the following statements:

- The RI-ISI program would include Category A welds that were formerly a part of the IGSCC program for BWRs; all others welds (category B-G) will still be inspected in accordance with the plant program under Generic Letter (GL) 88-01 and NUREG-0313 guidance.

- The RI-ISI program would replace augmented programs for thermal fatigue (NRC Bulletins 88-08 and 88-11, Information Notice 93-020), and for IGSCC concerns for PWRs (NRC Bulletin 79-17).

- The plant's existing FAC program in response to GL 89-08 would not be affected by the RI-ISI.

- Section 3.6.7 of the EPRI TR provides utilities with an alternative for localized corrosion (MIC, pitting) examinations currently performed as specified in GL 89-13.

The staff finds acceptable the discussion of scope since it is consistent with guidance provided in RG 1.178 and SRP Chapter 3.9.8. The staff finds that conformance to the system-level guidelines provides reasonable assurance that the risk from individual system failures will be kept small and dominant risk contributors will not be created. Conformance with the system-level guidelines also provides assurance that the aggregate impact of possible further application of RI-ISI at any plant would not be expected to exceed the aggregate risk change guidelines in RG 1.174. Class 1 piping is composed of parts of a variety of systems. The staff finds that applications including all reactor coolant pressure boundary (RCPB) piping may treat this Class 1 piping as one system because the RCPB is defined in 10 CFR 50.2 and is equivalent to a "system" insofar as it performs a well-defined function and is composed of a fixed set of equipment.

3.2.2 Piping Segments

Section 3.5.1 of EPRI TR-112657, Rev. B, provides the definition for pipe segments. Pipe segments are defined as lengths of pipe that are exposed to the same degradation mechanism and whose failure leads to the same consequence. That is, some lengths of pipe whose failure would lead to the same consequences are split into two or more segments when two or more regions are exposed to different degradation mechanisms. Similarly, lengths of pipe exposed to the same degradation mechanism whose failure would lead to different consequences are split into two or more segments. The EPRI TR also states that segments must be located in the same area of the plant. EPRI stated that the area criteria are used to simplify recordkeeping and review and do not affect the consequence and risk-ranking results.

Section 3.3.1 of EPRI TR-112657, Rev. B, discusses the possibility of isolating a break. In defining pipe segment boundaries and associated consequences for the segments, check valves and automatic isolation valves are generally assumed to close if the pipe failure creates the signal or demand for the valve to close. The staff notes that this assumption will not have a significant impact on the results since the probability of a valve's failing to close is small and the consequences from failure will not change appreciably in most instances. In some cases, however, the equipment and functions lost as a result of a pipe rupture can vary greatly if an automatic isolation succeeds or fails. Failure of containment isolation valves, in particular, can create an unisolable loss-of-coolant accident (LOCA) outside containment and require special consideration. Containment isolation valve failures are discussed further in Section 3.2.5.3 of this safety evaluation report (SER).

The staff finds that the consequence-related definition of piping segments in EPRI TR-112657, Rev. B, is acceptable because the definition is consistent with the expectations expressed in Section 4.1.4 of RG 1.178, which states that one acceptable approach to dividing piping systems into segments is to identify segments as portions of piping having the same consequences of failure in terms of an initiating event, loss of a particular train, loss of a system, or a combination thereof. The staff finds that the EPRI TR's further differentiation of segments according to degradation mechanisms is appropriate, and necessary, because the methodology combines separate consequence categories with degradation mechanism categories in the risk matrix and, therefore, the two characteristics should not be mixed within a segment.

3.2.3 Piping Failure Potential

The purpose of the piping failure potential estimation is to differentiate among the piping segments on the basis of the potential failure mechanism and the postulated consequences. The relative failure potential of piping segments provides insights for defining the scope of inspection for the RI-ISI program. Determination of piping failure potential is discussed in Section 3.4 of EPRI TR-112657, Rev. B. The basis for this assessment includes evaluating the degradation mechanisms for each pipe segment using the attributes and evaluation criteria presented in that section of the TR, followed by categorizing the potential for a large pipe failure according to the degradation category. Table 3-14 of EPRI TR-112657, Rev. B, provides guidance and criteria for assessing the degradation mechanism. In the EPRI methodology, although the consequences of piping failures are evaluated assuming a large break, the pipe break failure potential rankings are based upon specific degradation mechanisms to which the pipe segment is postulated to be susceptible. Only a pipe segment that is susceptible to FAC receives a high pipe failure potential, unless that segment is susceptible to a degradation mechanism other than FAC and also has the potential for water hammer.

EPRI TR-112657, Rev. B, describes how insights from service experience formed the technical basis for the pipe failure degradation categories. EPRI analyses of piping service experience have been performed relating to recent developments in the area of piping service data and reliability assessment techniques, and further insights from those studies have been documented in Section 2.2.2 of the EPRI TR. As noted in Section 3.4.2.2 of EPRI TR-112657, Rev. B, plant service history as well as industry experience (Ref. 16) are important considerations in the EPRI methodology for evaluating degradation mechanisms to ensure completeness and to validate the existence of any identified mechanisms. Actual operating experience at the plant performing the evaluation is used to define the portion of the pipe segments (elements) in which the potential degradation mechanism has been identified. The ultimate determination of the potential degradation mechanism for a specific piping segment is primarily based on actual operating conditions at the plant.

The EPRI risk matrix is based on the premise that, in light of uncertainties associated with any attempt to quantify risk levels associated with passive components, it is appropriate to place pipe segments into broad categories of pipe rupture potential and consequence. That is, the method should lead to consistent rankings of pipe segments since these categories include conservative, broad ranges that should ensure reproducible results between various analysts.

The staff expects that an in-depth review of plant and industry databases and plant documents will be required to characterize each plant's operating experience with respect to piping degradation. Plant service experience provides confirmation of appropriate assignment of damage mechanisms to piping segments. This information is also utilized in the element selection process.

The EPRI methodology does not advocate using an "Expert Panel" for final element selection. Instead, the final element selection is subject to a detailed multidiscipline plant review, in accordance with the criteria discussed in EPRI TR-112657, Rev. B, Sections 3.6.5.1 and 3.6.5.2.

In view of the foregoing, the staff finds that the EPRI methodology meets the RG 1.178 guidance for ensuring that a systematic process is used to identify pipe segments susceptible to common degradation mechanisms and for categorizing these mechanisms into the appropriate degradation categories with respect to their potential to result in a postulated large pipe break.

3.2.4 Consequence of Failure

The consequences of the postulated pipe segment failures are considered primarily in Section 3.3 of the EPRI TR, and include direct and indirect effects of the failure. Direct effects include the loss of a train or system and associated possible diversion of flow or an initiating event such as a LOCA, or both. Indirect effects include the spatial effects of flood, spray, pipe whip, or jet impingement that may affect adjacent SSCs or depletion of a water source and loss of associated systems. The piping failure break sizes considered range from a small leak to a full rupture, as discussed in Section 3.3.1 of EPRI TR-112657, Rev. B. The most limiting consequence from the spectrum of break sizes considered is used to assign a consequence rank to that pipe segment.

Several plant level consequences can result from the postulated pipe rupture. EPRI TR-112657, Rev. B, identifies the following effects of pipe rupture on the operation of the plant.

1. Initiating events: Segment failures that cause only an initiating event and no mitigating system failures.

2. Loss of mitigating ability: Segment failures that only cause failure of mitigating functions but do not cause a plant trip, thereby increasing the likelihood that following an unrelated initiating event, the sequence of events will lead to a core damage event. In some cases (for example, normally isolated segments), the segment failure may occur before the event but only become manifested upon demand. In other cases, the failure may be detected and repair initiated (up to the allowed outage time limits of the equipment), and the initiating event may occur during the repair.

3. Combinations: Segment failures that cause both an initiating event and a failure of mitigating systems.

The staff finds that the EPRI TR properly identifies equipment consequences and the plant-level consequences because it covers the range of possible consequences and is consistent with the guidelines in SRP 3.9.8 and RG 1.178.

EPRI TR-112657, Rev. B, does not include a detailed discussion of the specific assumptions to be used to guide the assessment of the direct and indirect effects of segment failures. For example, although diversion of flow is included as a direct effect, there is no guidance for determining whether a flow diversion would be sufficiently large to cause a system to fail to perform its function. Similarly, EPRI TR-112657, Rev. B, does not provide clear guidance for calculating flooding effects with regard to the required modeling of flood propagation pathways, modeling of flood growth and mitigation, and assumptions for the failure of critical equipment within a flood zone (e.g., if electro-mechanical components must be submerged before failure, etc.). The staff finds that specific assumptions regarding the direct and indirect effects of pipe segment failure should be developed by the individual licensees and should form part of the onsite documentation. Chapter 5 of the EPRI TR requires that details from the consequence evaluation be maintained on site for potential audit.

3.2.5 Consequence Categorization

The methodology requires that the consequence of each piping segment failure be placed into one of four categories: High, Medium, Low, and None. The None category would cause none of the effects discussed in Section 3.2.4 of this SER. The other categories are based on a set of decision criteria discussed in Section 3.2.5.1 of this SER.

EPRI TR-112657, Rev. B, uses the terminology "conditional" core damage probability (CCDP) and "conditional" large early release probability (CLERP) to describe the quantities used to characterize the risk due to segment ruptures that do not cause an initiating event but only cause the failure of mitigating systems. The staff believes that for this type of plant level consequence the desired quantity is not the conditional core damage probability given the segment ruptures, but rather the increase or change in probability of core damage that would be caused by the segment rupture. As illustrated by Equation 3-3 and by the equations in Sections 3.3.3.5.2 and 3.3.3.5.3 of EPRI TR-112657, Rev. B, to calculate CCDP, the baseline CDF estimate (e.g., the result of the PRA which does not include the effect of the segment rupture in the model) is subtracted from the CDF estimate that includes the effect of the segment rupture. The result is multiplied by the exposure time (e.g., a period of time in which an unrelated transient could occur) to characterize the increase in probability of core damage or large early release associated with the rupture of the segment. Although the terminology would be more descriptive if "change" was used instead of "conditional," the staff finds that the quantitative measure described by Equation 3-3 of EPRI TR-112657, Rev. B, is an acceptable measure because it appropriately isolates the contribution of the rupture of the segment on plant risk from scenarios that are not affected by the rupture. Segment ruptures which cause a reactor trip do contribute to all scenarios initiated by the trip and therefore no baseline contribution needs to be subtracted.

The CCDP and the CLERP for each segment's failure can be estimated and compared directly to the decision criteria. The methodology provides an alternative methodology based on bounding evaluations as discussed in Sections 3.2.5.2 and 3.2.5.3 of this SER. Estimating the CCDP and CLERP and comparing the results to the criteria are straightforward, and most of the EPRI TR-112657, Rev. B, consequence evaluation discussions describe how to apply the bounding methodology.

The consequence evaluation is defined assuming at-power operation since this plant configuration is considered more critical in evaluating the risk from pressure boundary failures. The EPRI methodology also provides guidance for evaluating the risk from pressure boundary failures for other modes of operation and external events in EPRI TR-112657, Rev. B, Sections 3.3.4 and 3.3.5 respectively. In the EPRI TR, pipe segment failures classified as Medium and Low consequence are evaluated to determine their potential impact during shutdown operation and while responding to external events. This evaluation is performed considering the potential of the segment to fail and cause an initiating event and its potential to fail while responding to another initiating event. The staff finds that the EPRI methodology provides for evaluating plant configurations to ensure that pipe segment failures (that are not already classified in the High consequence category) do not have a more limiting consequence impact for modes other than at power and for external events, and is, therefore, acceptable..

3.2.5.1 Consequence Categorization Criteria

The methodology to assign segment failures to consequence categories is based on the number of unaffected trains available to mitigate an event. The specific decision criteria used to determine the consequence category depends on the type of impact the segment failure has on the plant and the reliability[1] of the unaffected trains. In general, however, the criteria are derived from guidelines applied to the CCDP and the CLERP, given the segment failure. That is, given a segment failure and all the associated spatial effects, the CCDP is the probability that the resulting scenario will lead to core damage. If the failure of a segment is estimated to lead to a core damage event with a probability greater than 1E-4, the segment is categorized as High consequence. An estimated CCDP within the range of 1E-6 to 1E-4 is categorized as Medium consequence. CCDPs less than 1E-6 are categorized as Low consequence. Similarly, if the failure of a segment is estimated to lead to a large early release event with a probability greater

---

[1] The reliability of a train is the probability that it will perform its required function in the desired manner under all relevant conditions and on the occasions or during the time intervals when it is required to so perform.

than 1E-5, the segment is categorized as High consequence. An estimated CLERP within the range of 1E-7 to 1E-5 is categorized as Medium consequence. CLERP less than 1E-7 is categorized as Low consequence. If the CCDP and CLERP categories are different, the segment is assigned the higher of the two categories.

As discussed in Section 3.3.2 of TR-112657, Rev. B, the above consequence guidelines were developed together with the bounding pipe failure frequencies, which are related to estimated weld failure frequencies. The consequence and the frequency together represent the risk of each segment and is an appropriate metric to use to characterize guidelines used in a risk-informed application. EPRI estimates that the total frequency of a pipe break at a plant is on the order of 1E-2/yr. The EPRI TR states that the boundaries between the High and Medium consequence categories, at CCDP and CLERP values of 1E-4 and 1E-5 respectively, are set to correspond with the definitions of small CDF and LERF values of 1E-6/yr (e.g., 1E-2/yr times 1E-4 CCDP) and 1E-7/yr (e.g., 1E-2/yr times 1E-5 CLERP). The EPRI TR states that the assumption that 1E-6 and 1E-7 per year represent suitable small CDF and LERF values is consistent with the decision criteria for acceptable changes in CDF and LERF found in RG 1.174. Experience in the pilot plant applications indicate that, in practice, events normally considered highly risk significant (insofar as extensive regulatory attention is given to preventing the scenario and ensuring that mitigating functions are available), such as LOCAs and loss of multiple equipment trains, are placed in the High consequence category with these guidelines. The staff finds the CCDP criteria for the High consequence category acceptable because they provide reasonable assurance that the methodology will systematically and successfully identify the population of the highly risk significant welds within the scope of the analysis.

The CCDP criteria selected to guide placing of piping failures in the Low consequence category were selected in order to ensure that the aggregate risk from welds in these piping is so low as to be considered risk insignificant. The maximum CDF allowed to be placed in the Low consequence category can be calculated from the highest bounding weld failure frequency (1E-4/yr) and the highest allowable Low CCDP (1E-6) as 1E-10/yr. That is, only welds for which CDF is less than 1E-10/yr will be placed in the Low consequence category. The EPRI TR states that the Low CCDP guideline is reasonable because the low category represents negligible contributions to CDF. The staff notes that even if hundreds of welds are placed in Low risk categories, the aggregate impact of around 1E-8/yr can indeed be characterized as low risk and, consequently, finds this guideline acceptable. The use of the Medium risk category to capture all welds that are not High or Low, and the consequent application of an intermediate number of inspection locations to these welds can adequately address the uncertainty in the evaluations and is also acceptable. The None category is only used for welds whose failure has no impact on either the operation of the plant or the operability of mitigating systems.

The evaluation of changes in CDF and LERF in the final phase of the methodology provides additional assurance that aggregate change in risk for changes in the ISI program will be acceptable. In view of the above, the staff finds that these guidelines are consistent with the intent of RG 1.174 and, when used in the methodology as described in EPRI TR-112657, Rev. B, provide reasonable assurance that risk increases (if any) resulting from a proposed change should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

3.2.5.2 Core Damage Consequence Categorization Process

EPRI TR-112657, Rev. B, provides guidance on assigning CCDP consequence categories to segment failures on the basis of the number of available (i.e., unaffected by the rupture) mitigating trains remaining, broad categories of initiating event frequencies, and exposure times. These trains may be parallel system trains or other systems that provide a backup function to the unavailable system and that are unaffected by the direct and indirect consequences of the segment rupture. The identification and development of the systems and backup systems available to respond to different initiating events are described in Section 3.3.3.2.2 of EPRI TR-112657, Rev. B.

After the EPRI TR identifies all the systems available to perform each function, it provides two tables which relate the number of backup trains to the CCDP and CLERP guidelines, respectively. The selection of the table to be used depends on the plant-level impact of the failure. The tables are based on the assumption that each unaffected backup train left to mitigate an event has an unreliability of 0.01. Assuming that each backup train provides a reliability of at least 0.99, then if the CCDP associated with a table element is greater than 1E-4 the consequence category is high; if CCDP is between 1E-4 and 1E-6, the consequence category is Medium; and if CCDP is less than or equal to 1E-6, the category is Low. Because of potential interactions between the system trains and between different systems, a physical train cannot always be credited as a full backup train. That is, two parallel pump trains may have an estimated unreliability to provide flow from at least one pump of 8E-4. Two trains with an unreliability of 0.01 each, would have, at most, an unreliability of 1E-4. Therefore, these two physical trains would then represent 1.5 backup trains (i.e., with an unreliability of about 1E-3).

The following decision criteria are used to support the CCDP related categorization of each type of segment failure consequence defined above in Section 3.2.4.

1. Initiating Event: EPRI TR-112657, Rev. B, states that "consequence categories for pressure boundaries failures leading [only] to an initiating event are explicitly determined from the plant PSA/IPE [probabilistic safety analysis/individual plant examination] results, based on the numerical guidelines . . ." for the CCDP.

2. Loss of Mitigating Ability: EPRI TR-112657, Rev. B, Table 3-5, specifies consequence categories based on categories of initiating events which, in turn, are based on expected frequencies, the number of equivalent backup trains left to mitigate the event, and exposure time. The consequence category for each table entry was developed by estimating a CCDP and comparing that value to the CCDP guidelines. Table 3-6A in EPRI TR-112657, Rev. B, provides estimates of the CCDP for each table entry on the basis of the upper bound exposure time, the lower bound train reliability, and a best estimate challenge frequency. The CCDPs in this table are compared to the guideline values, and the appropriate consequence category is assigned as shown in Table 3-5. Table 3.6B is similar to Table 3.6A except the upper bound challenge frequency is used instead of the best estimate challenge frequency. The staff recognizes that elements in Table 3.6B with upper bound CCDPs up to 3E-4 are categorized as Medium (not High) and others as high as 3E-6 are categorized as Low (not Medium). The staff finds that the product of two bounding values

and a best estimate is sufficiently conservative and, therefore, the categories, as determined by Table 3.6A, are reasonable.

3. Combinations: EPRI TR-112657, Rev. B, Table 3-11, specifies consequence categories on the basis of the number of equivalent unaffected trains available for mitigation. The consequence category for these matrix entries was developed by estimating a CCDP assuming the bounding unreliability of 0.01 for each backup train and comparing the result to the CCDP guidelines.

The staff finds the definition and use of the methodology and the tables acceptable because the table elements are derived from bounding values, and because the methodology directs each licensee to perform confirmatory calculations to provide reasonable assurance that each assigned backup train corresponds to at least the reliability of 0.99 or to adjust the credit for each "train" accordingly. If a licensee believes that the table elements derived from bounding values are too conservative for one or more pipe segments, the licensee may perform plant- and sequence-specific calculations and use the CCDP guidelines directly.

3.2.5.3 Large Early Release Consequence Categorization Process

EPRI TR-112657, Rev. B, provides guidance for the consequence categorization of pipe segment failures by determining if the CCDP, coupled with the conditional containment failure probability (CCFP), indicates that the consequence category based on the LERP guidelines is higher than that based on CCDP guidelines. The CLERP guidelines are a factor of 10 smaller than the CCDP guidelines. If the CCFP is less than 0.1 (given a core damage event) the CLERP consequence category would be less than or equal to the CCDP consequence category. Three types of containment failure are considered:

1. Some segment ruptures may cause failure of the containment isolation function. Tables 3-5 and 3-11 in EPRI TR-112657, Rev. B, identify the specific table entries that should be placed in the next higher consequence category when containment isolation also fails. These table entries would have a higher CLERP consequence category than the CCDP category because the CLERP guidelines are a factor of 10 lower than the CCDP guidelines.

2. Some segment ruptures may lead to core damage sequences that create conditions in the containment that increase the CCFP above 0.1, given a core damage event. EPRI TR-112657, Rev. B, specifies that sequences that have CCDPs between 1E-4 and 1E-5 be evaluated to determine if a CCFP of greater than 0.1 is expected. If so, the CLERP category should be determined and the segment placed in the higher of the two categories. Similarly, sequences that have CCDPs between 1E-6 and 1E-7 should be evaluated to determine if the segment has a higher CLERP category than the CCDP category. Experience with the pilot applications indicates that only a few specific types of core damage sequences (for example, those involving a total loss of service water and thus loss of all containment cooling) lead to CCFPs greater than 0.1.

3. Some segment ruptures may directly, or in combination with isolation valve failures, create a LOCA outside containment. The entries in Table 3-12 in EPRI TR-112657, Rev. B, identify the consequence category, given the number of passive and active isolation valves that have

to fail in combination with a segment rupture in order to create a LOCA outside containment. Experience with the pilot plant applications indicates that common-cause failures among series isolation valves that must close on demand can yield double valve failure probabilities greater than 1E-5 so that the consequence category should be High instead of Medium as indicated in the table. The EPRI TR directs the licensee to evaluate the plant specific isolation valve unavailabilities (and the probability of core damage given a LOCA outside containment, if the unavailabilities alone are not sufficiently small) to confirm that the categories in Table 3-12 are appropriate.

The staff finds the definition and use of the methodology and tables acceptable because the evaluation includes the dominant containment failure modes contributing to LERF and can identify those segments that would exceed the CLERP criteria.

3.2.5.4 Human Actions To Isolate Breaks

In some cases, the operators can isolate a break and regain a system train or function(usually by closing a diversionary flow path). In order to use the supplied tables on the basis of the number of available "trains," it is necessary to represent the potential for the operators to isolate a break and recover mitigating capability within the backup train framework. In general, if successful operator action to isolate the break would recover one or more mitigating trains, the potential for isolation is credited as one backup train. If isolation is possible, the consequences should be analyzed by determining the number of backup trains that would be available without successful isolation, and adding one more train of mitigating capacity. Crediting one more mitigating train than is available reduces the CCDP by a factor of 0.01, and is equivalent to incorporating the probability of the failure of the operator to perform the isolation into the determination of the consequence category. The consequences are next analyzed by determining the number of backup trains that would be available assuming that the isolation was successfully performed (e.g., crediting all mitigating capability that would be available after a successful isolation of the break). The worst of the two consequence categories should be selected.

This methodology requires that the recovered train can be used to mitigate the sequence (recovery of one train of emergency feedwater following a large LOCA in a PWR would not provide useful mitigating capacity) and that the recovered train is "worth" about a train (recovery of a reactor core isolation cooling system with an unreliability of 0.1 should not be credited as a full mitigating train or 0.01). When crediting the recovered train of mitigating capacity as available, the recovered backup train might fail to operate, so isolation and backup failures should be added. That is, failure to isolate or failure of the mitigating train given successful isolation should, for example, be 0.02, but this difference is negligible within the bounding values used in this methodology.

In support of the 0.01 probability of failure for the human actions, EPRI TR-112657, Rev. B, recommends that human actions only be credited when (1) there is an alarm or clear indication, to which the operator will respond; (2) the response is directed by a procedure; (3) the isolation equipment (e.g., the valves) is not affected by the break; and (4) there is enough time to perform isolation and reduce consequences. In some specific scenarios, credit for fewer or more trains may be taken, corresponding to the evaluated magnitude of the human error probabilities.

The staff finds that crediting isolation potential as described in the submittal is acceptable because it provides for including isolation (which has a substantial impact on the consequences of pipe rupture), and the impact of not adding the recovered train's failure probability to the operator error probability is negligible when compared to the order of magnitude analyses upon which the methodology is based.

3.2.6 Probabilistic Risk Assessment

This section deals with determining the overall quality of a PRA that supports the RI-ISI evaluation process, and the use of a PRA to investigate the impact on change in risk because of a change from the ASME Code to the RI-ISI program. The scope, level of detail, and quality of a PRA and the general methodology for using PRA in regulatory applications is discussed in RG 1.174. RG 1.178 provides guidance that is more specific to ISI. The EPRI methodology does not prescribe the incorporation of pipe segment failure events into the PRA model. Specific uses of plant-specific PRA results are discussed throughout the EPRI report and this SER. Section 3.3.6 of EPRI TR-112657, Rev. B, summarizes the use of the plant-specific PRA.

The staff finds that the use of PRA results as described in EPRI TR-112657, Rev. B, is acceptable to support the EPRI ISI methodology based on the following reasons: (1) The PRA results characterize the specific attributes at the plant in a manner that can support and confirm the basic assumptions of the general methodology; and (2) the methodology includes systematic consideration of initiating events and operating states outside the scope of the licensee's PRA such as external events and refueling operation. The staff recognizes that plant-specific PRA results are used to support placing pipe segments into broad risk-significant categories and to support risk evaluations in order to investigate the potential change in risk as a result of the proposed change in the ISI program. The staff notes that in support of all risk-informed applications, the licensee is responsible for developing, and retaining on site for potential NRC audit, justification that the PRA is of sufficient quality and that there is reasonable assurance that the general results and conclusions of the proposed program change are valid.

3.2.7 Safety-Significance Determination

The EPRI TR uses "risk-significance" as opposed to the term "safety-significance" generally used by the NRC staff. The safety significance of pipe segments is addressed in Section 3.5 of EPRI TR-112657, Rev. B, entitled "Risk Characterization." The safety significance of an individual pipe segment is based on categorizing the consequence of segment failure as High, Medium, Low, or None; and categorizing the failure potential of the piping as High, Medium, or Low. As described in Section 3.5.2, once the individual elements of risk (consequence and failure potential) have been defined for each pipe segment, they are compared to a risk matrix in which the 12 elements are grouped into 7 risk categories corresponding to all of the various combinations of failure potential and consequence rankings.

In EPRI TR-112657, Rev. B, Section 3.5.3, these combinations define the basis for categorizing the pipe segments into Risk Categories 1 through 7. Risk Categories 1, 2, and 3 are designated as belonging to the High-risk group, Risk Categories 4 and 5 belong to the Medium-risk group, and Risk Categories 6 and 7 belong to the Low-risk group. The Medium-risk group ensures that segments that are not clearly High- or Low-risk will receive an intermediate level of inspection.

The staff finds that the assignment of the safety significance to the 12 matrix elements as detailed in EPRI TR-112657, Rev. B, is internally consistent and logically compelling. The staff finds that the process of categorization of pipe segments meets the intent of the integrated decisionmaking process guidelines discussed in RGs 1.174 and 1.178, in that engineering and risk insights (both qualitative and quantitative) are taken into consideration in identifying safety-significant piping segments. The staff finds that the use of the reported categories, along with other evaluation and confirmation steps set forth in this SER provides reasonable assurance that the safety significance of each segment is appropriately assigned.

3.2.8 Change in Risk Resulting From the Change in ISI Programs

RG 1.178 provides that any risk increases that might result from the proposed RI-ISI program and their cumulative effects be small and not exceed NRC safety goals. The EPRI method does not develop the number of locations to be inspected on the basis of quantitative risk results. Instead, the method categorizes the risk significance of the piping segments and then specifies the percentage of the welds to be inspected in each of the various categories as discussed in Section 3.3.1 of this SER. The change in risk evaluation in the EPRI method is a final screening to ensure that a licensee wishing to replace a Section XI inspection program with a risk-informed inspection program investigates the potential change in risk resulting from that change and implements it only upon determining with reasonable confidence that it is acceptable.

EPRI TR-112657, Rev. B, discusses four screening evaluations that are, in order of increasing resource requirements, as follows: qualitative, bounding without credit for any increase in probability of detection (POD), bounding with credit for increase in POD, and a Markov model based calculation. Each licensee may select any of the screening evaluations, although it is anticipated that each licensee will start with the qualitative evaluation and move to more resource-intensive estimation techniques until the results indicate that the risk impact of the proposed change is acceptable, or until additional inspections are added to make the impact acceptable.

The screening evaluations investigate the change in risk because of the change in the number and location of ISI inspections. All four screening evaluations include the assumption that there is a negligible risk increase because of the discontinuation of inspections of piping segments in the Low-risk categories (Categories 6 and 7). Section 3.7.1 of EPRI TR-112657, Rev. B, provides a bounding evaluation indicating that with weld rupture frequencies and CCDPs all at their maximum values for Low-risk categories, CDF increases on the order of 1E-10/yr to 1E-12/yr per weld are calculated (LERF 1E-11/yr to 1E-13/yr). A similar bounding estimate for the Medium-risk categories yields change in risk estimates two orders of magnitude greater (corresponding to a maximum CCDP/LERP that is two orders of magnitude greater than the Low consequence bounding estimate). Changes to High-risk categories use a plant-specific bounding value that experience from the pilot plants indicates will normally be another order of magnitude greater than the Medium bounding estimates. The staff finds that changes in the Low category need not be evaluated because the change in risk from changes in the High- and Medium-risk welds will dominate the results.

In general, application of the methodology tends to increase the number of inspection locations in higher risk pipe segments and decrease the number of inspections in lower risk pipe segments. In some cases, each High- or Medium-risk category has an increased number of locations selected for inspection, or a comparable number of locations are redirected to locations that are more likely to identify failure precursors on the basis of characteristics of the identified damage mechanisms. The staff finds that for some proposed inspection program changes, such as the change discussed above, a clear and straightforward qualitative risk evaluation is sufficient.

For more extensive changes in the number of inspections in the High- and Medium-risk category welds, a quantitative estimate of the change in risk should be developed. The EPRI TR includes a flowchart in Figure 3-6 that outlines the decision criteria for evaluating RI-ISI impacts on CDF and LERF. The staff finds that this flowchart contains the appropriate steps in the correct sequence to guide the estimation of risk process and to determine what level of effort is required on the basis of the specific results of each licensee's evaluation. The bounding calculation methodology using both no POD increase and a POD increase was reviewed by the staff during the pilot applications and found to be acceptable for investigating the change in risk associated with changing the number and the locations of welds to be inspected as part of an RI-ISI application that uses the EPRI methodology.

EPRI TR-112657, Rev. B, also discusses a Markov process model for the weld rupture and inspection process and a Bayesian estimation (updating) process for use in estimating the required occurrence rates corresponding to the failure states in the Markov model. Technical reviews of the Markov model have been performed by the staff, a staff contractor (Ref. 17), and by independent peer reviewers for EPRI. These efforts provided a detailed review of the model and its ability to support the proposed licensing application. The conclusion of the reviews is that the proposed four-state Markov model as described in EPRI-TR-110161 is both sound and appropriate as a first-order model of pipe rupture. The staff adopts the analysis of the Markov model and the Bayesian updating set forth in the contractor report (Ref. 17). The contractor report is available in the Commission's Public Document Room, which is located in the Gelman Building at 212 L St, N.W., Washington, D.C., 20003, under accession number 9909300045. Based on that analysis, the staff finds that the model can be used as a basis for the estimation of pipe rupture frequencies to be used instead of the bounding pipe failure frequencies in support of the change in risk estimates as part of an application that uses the EPRI RI-ISI methodology.

The Bayesian estimation (updating) process updates "state of knowledge" prior distributions with industry-wide experience data and does not further use plant-specific experience to develop plant-specific posteriors. The staff finds this approach acceptable because very little plant-specific pipe failure experience is available. Individual applicants are, however, responsible for ensuring that the operating and design characteristics assumed for estimating the state transition rates for their reactor type and system types are appropriate and that the applicable industry operating experience failures were appropriately evaluated and categorized. The staff may review these calculations or the results of the licensee's review to determine the acceptability of the data analysis and the data used on a case-by-case basis.

The delta CDF/LERF calculations illustrate the potential change in risk rather than precisely estimating the magnitude of the change. It is expected that implementation of the RI-ISI program should be risk neutral, a decrease in risk, or, at most, an insignificant increase in risk. EPRI TR-112657, Rev. B, provides guidance on an acceptable risk change of 1E-7/yr for CDF and 1E-8/yr for LERF for each system included in the application (regardless of the number of systems) and a total change less than the "very small" guidelines of 1E-6/yr for CDF and 1E-7/yr for LERF in RG 1.174. As discussed in Section 3.2.1 of this SER, when the scope of the application encompasses all ASME Code Class 1 welds, the system-level criteria may be applied to the total change instead of to each system and system part included in the analysis. The values are intended to ensure that after applying these values to multiple systems, the total plant-level changes in CDF and LERF remains below the guidelines in RG 1.174. The staff finds that this use of system-level guidelines in addition to the plant level guidelines is acceptable, as their use will ensure that the risk from individual system failures will be kept small and dominant risk contributors will not be created. Furthermore, the staff finds that these system-level guidelines are necessary in order to provide reasonable assurance that partial-scope applications will, individually and cumulatively, remain below the guidelines in RG 1.174.

EPRI's process for evaluating and bounding the potential change in risk is reasonable since it accounts for the change in the number and location of elements inspected, recognizes the difference in degradation mechanisms related to failure likelihood and the consequence of failure, and considers the effects of enhanced inspection. The improved inspection techniques that are designed to be effective for specific degradation mechanisms and examination locations should substantially increase the fraction of potential weld ruptures that would be identified by inspection before the flaw develops into an actual rupture. Redistributing the welds to be inspected by consideration of the safety significance of the segments provides assurance that segments whose failures have a significant impact on plant risk receive an acceptable and often improved level of inspection. It is, therefore, concluded that implementation of the RI-ISI program as described in the application will reduce or negligibly increase the risk and thus will not cause the NRC Safety Goals to be exceeded.

3.3 Integrated Decisionmaking

RG 1.178 and SRP Chapter 3.9.8 guidelines describe an integrated approach that should be utilized to determine the acceptability of the proposed RI-ISI program by considering in concert the traditional engineering analysis, risk evaluation, and the implementation and performance monitoring of piping under the program.

The EPRI RI-ISI methodology is a process-driven approach, that is, the process identifies risk-significant pipe segment locations to be inspected without reliance on an expert panel. However, the element selection results will be subjected to a multidiscipline plant review to verify the final risk results and element selections as discussed in Section 3.6.5 of the EPRI TR. The multidiscipline plant review team should possess expertise in the following areas:

- ISI
- System engineering
- Plant operations
- PRA
- Piping and materials engineering with degradation mechanism experience
- Nondestructive examination
- Health physics
- Plant maintenance

Sections 6.1 and 6.2 are provided to demonstrate conformance with RG 1.174 in addressing the key principles of risk-informed decisionmaking, and with RG 1.178 to ensure proper application, on a plant-specific basis, of the four-basic-element approach in making a risk-informed analysis (see Section 3.5 of this SER for a discussion of the four elements).

3.3.1 Selection of Examination Locations

Evaluation of the selection of piping segment elements to be examined as part of the RI-ISI program is addressed in Section 3.6 of EPRI TR-112657, Rev. B. The specific guidelines for ASME Code Cases N-560 and N-578 are contained in Sections 3.6.4.1 and 3.6.4.2, respectively.

ASME Code Case N-560 guidelines state that the number of elements to be examined as part of the RI-ISI program should be 10 percent of the total piping weld population. All elements are to be subjected to pressure-/leak-testing requirements. Locations that are in the High risk categories and are susceptible to FAC or IGSCC, and are included in the existing plant FAC or IGSCC inspection programs, are credited as part of the required sample size.

Augmented inspection programs being conducted for N-560 scope may also be credited toward the 10 percent sampling requirement of N-560 provided the following requirements are met:

- Augmented inspections for locations identified that are in the Low or Medium risk categories may not be used to replace or supplant inspections of High risk locations.

- The 10 percent inspection sample shall include a reasonable representation of different material, such as stainless steel and carbon steel.

- Each degradation mechanism type existing in High risk locations shall be inspected.

- In the absence of specific justification, no more than one half of the N-560 inspections may be taken from the augmented inspection program.

ASME Code Case N-578 guidelines specify that for those segments not included in the existing plant FAC and IGSCC inspection programs, the number of locations to be volumetrically examined as part of the RI-ISI program is as follows: For piping segments that are in Risk Category 1, 2, or 3 (High risk), the number of inspection locations in each risk category should be 25 percent of the total number of elements in each risk category. For Risk Categories 4 and 5 (Medium risk), the number of inspection locations in each category should be 10 percent of the total number of elements in each risk category. Volumetric examinations are not required for those segments determined to be in Risk Category 6 or 7 (Low risk). However, all elements, regardless of risk category, are to be subjected to pressure-/leak-testing requirements under the ASME XI Code. For ASME Code Case N-578 applications that include Class 1 piping, the EPRI methodology recommends reviewing any resulting Class 1 inspection populations that are less than 10 percent of the Class 1 piping population.

For welds and elements that are included in the existing plant FAC or IGSCC inspection programs, the EPRI TR Section 3.6.4.2 provides the following guidance: For elements in Risk Category 1, 3, or 5, or 7 that are included in a plant's existing FAC inspection program, the elements and frequency are to be the same as in the existing plant FAC inspection program. The existing FAC program is to remain unchanged and is not subsumed under the EPRI RI-ISI program. For those IGSCC Category B through G welds that are in Risk Category 1, 2, 3, 5, 6, or 7, the number, location, and frequency of inspections are to be the same as in the existing plant IGSCC inspection program. Only IGSCC Category A welds are subsumed under the EPRI RI-ISI program.

For the locations not included in the FAC or IGSCC augmented inspection programs, other factors need to be considered in the selection of the final inspection locations. As discussed in Section 3.6.5 of EPRI TR-112657, Rev. B, actual operating and design conditions for each element within the segment are to be compared to the attribute criteria contained in EPRI TR Table 3-14. Those elements determined to be the most susceptible to the damage mechanism(s) present are selected for inspection. The selection of individual inspection locations also depends upon several other factors, including the degradation mechanism present, physical access constraints, and radiation exposure. Accordingly, the staff finds that the overall risk-ranking process will result in the systematic identification of risk-significant welds and that the EPRI methodology provides adequate justification for the locations to be examined.

For systems that are subject to localized corrosion, for example, service water systems, the degradation mechanisms for MIC, pitting, and flow-induced erosion-cavitation are expected to dominate. For such systems, the examination selection guidance is not practical in that localized corrosive attack can occur within substantially large portions of the piping and is not necessarily associated with a discontinuity such as a weld. Section 3.6.7 of EPRI TR-112657, Rev. B, includes a detailed process description and guidance for licensees to conduct "finer screening" evaluations for these systems. The method recognizes that there is variation in the severity of these degradation mechanisms (e.g., areas close to biocide injection may experience degradation greater than predicted from nominal biocide concentrations) and variation due to geometrical properties (e.g., enhanced deposition at the bottom of long vertical runs). A preliminary element selection is based on the identification of worst case areas and a selection of typical areas. The final element selection includes a sampling of High consequence segments not captured by the preliminary selection and the substitution of higher consequence elements for lower consequence elements of the same or similar susceptibility.

The staff finds that this degradation susceptibility review process, augmented by the selection of higher risk locations, is a systematic and reasonable method for considering engineering and risk insights in establishing a program to assess service-induced degradation due to variable, localized corrosion.

3.3.2 Examination Methods

Licensees that wish to apply the EPRI TR-112657, Rev. B, methodology to an RI-ISI program must conform to the guidelines of RG 1.178 for examination and pressure testing or justify alternatives to these provisions. Examination methods and personnel qualification must be in accordance with the ASME Code Section XI Edition and Addenda endorsed by the NRC through 10 CFR 50.55a. For inspections outside the scope of Section XI (e.g., FAC, IGSCC), the acceptance criteria should meet existing regulatory guidance applicable to those programs.

The objective of ISI and ASME Code Section XI is to identify conditions (i.e., flaw indications) that are precursors to leaks and ruptures in the pressure boundary that may affect plant safety. Therefore, the RI-ISI program must meet this objective to be found acceptable for use. Further, since the risk-informed program is based on inspection for cause, element selection should target specific degradation mechanisms.

Evaluation of degradation mechanisms to determine the potential for piping failure is provided in Section 3.4 of EPRI TR-112657, Rev. B. The associated mechanism-specific examination volumes and methods for the selected piping structural elements are provided in Section 4 of EPRI TR-112657, Rev. B. Table 3-14 of EPRI TR-112657, Rev. B, provides a summary of the degradation mechanism-specific NDE methods and the associated acceptance standards, evaluation standards, and inspection frequencies. As set forth in RG 1.178, all ASME Code Class 1, 2, and 3 piping systems included in the scope of an RI-ISI program will continue to receive visual examination for leakage in accordance with the pressure test requirements of ASME Code Section XI. Because the examination methods specified in EPRI TR-112657, Rev. B, are designed for specific degradation mechanisms and examination locations, the staff concludes that the examination methods selected are appropriate for the degradation mechanisms, pipe sizes, and materials of concern.

3.4 Implementation and Monitoring

The objective of this element of RGs 1.174 and 1.178 is to assess performance of the affected piping systems under the proposed RI-ISI program by implementing monitoring strategies that confirm the assumptions and analysis used in developing the RI-ISI program. To satisfy 10 CFR 50.55a(a)(3)(i), implementation of the RI-ISI program (including inspection scope, examination methods, and methods of evaluation of examination results) must provide an adequate level of quality and safety. The methodology and procedures in EPRI TR-112657, Rev. B, will be used by licensees to define the scope of a risk-informed piping ISI program. This scope is defined by establishing piping segments, inspection element locations, inspection methods, examination volumes, and acceptance and evaluation criteria. A licensee using this methodology will be expected to incorporate the results of its RI-ISI evaluation into plant-specific program procedures that are consistent with the performance-based implementation and monitoring strategies specified in RG 1.178 and ASME Code Section XI.

Implementing the proposed RI-ISI program will reduce the number of examinations but will also likely result in the selection of locations that have not been previously examined. When examination is not practical or is limited because of physical constraints or radiation hazards, RG 1.178 states that alternative inspection intervals, scope, and methods should be developed to ensure that piping degradation is detected and structural integrity is maintained. It is anticipated that the licensees will address alternatives on a case-by-case basis and that limited examinations will be identified and submitted to the NRC staff for review and approval in plant-specific applications. Sections 6.1 and 6.2 of EPRI TR-112657, Rev. B, provide further discussion of performance-based implementation and monitoring strategies to confirm that existing monitoring and feedback mechanisms provided in Section XI will be maintained. The inspection results from implementation of the RI-ISI program will be compared to preservice inspection and prior ISI (IWX-3130[c]), and the process for expanded sampling will be followed if flaws are found to exceed the acceptance criteria (IWX- 3500).

An RI-ISI program for piping should be implemented at the start of a plant's next ISI interval, consistent with the requirements of the ASME Code Section XI Edition and Addenda committed to by a licensee in accordance with 10 CFR 50.55a, or any delays granted by the NRC staff pursuant to 10 CFR 50.55a(g)(6). As noted in EPRI TR-112657, Rev. B, Section 3.6.6, in general, updates and changes to the plant inspection program will occur at the start of each 10-year inspection interval according to the requirements specified in 10 CFR 50.55a and ASME Code Section XI. Thus, for many plants, the initial implementation of an RI-ISI program will coincide with the start of a new 10 year inspection interval. However, the RI-ISI program can be implemented at any time within an inspection interval as long as the examination schedules are consistent with the interval requirements contained in Article IWA-2000 of ASME Section XI as applied to Inspection Program B. Implementation of an RI-ISI program will continue to incorporate lessons learned from sources such as inspection and examination results, plant service experience, industry notices and bulletins, and NRC generic letters and bulletins, which may require modification of the RI-ISI program.

The proposed periodic reporting requirements meet existing ASME Code requirements and applicable regulations and, therefore, should be considered acceptable. The proposed process for RI-ISI program updates meets the guidelines of RG 1.174 that provide that risk-informed applications must include performance monitoring and feedback provisions; therefore, the process for program updates is considered acceptable.

3.5 Conformance to Regulatory Guide 1.174

RG 1.174 describes an acceptable method for assessing the nature and impact of licensing basis changes by a licensee when the licensee chooses to support these changes with risk information. RG 1.174 identifies a four-element approach, as discussed below, for evaluating such changes which are aimed at addressing the five principles of risk-informed regulation. RG 1.178 is consistent with RG 1.174 and focuses on the use of PRA in support of a risk-informed ISI program. Sections 6.1 and 6.2 of EPRI TR-112657, Rev. B, summarize how the proposed process conforms to the RG 1.174 approach. The staff finds that the EPRI TR-112657, Rev. B, approach is consistent with RG 1.174 as discussed below.

- In Element 1 of the RG 1.174 approach, the licensee is to define the proposed change. Sections 6.1 and 6.2.1 of EPRI TR-112657, Rev. B, discuss current regulatory requirements for the ISI program and the changes in regulatory compliance using the RI-ISI approach. The scope of the changes is also discussed, and this scope includes the addition of any non-ASME Code piping identified as highly risk significant. The staff finds the discussion in EPRI TR-112657, Rev. B, to be consistent with the guidance provided in Section 2.1 of RG 1.174.

- Element 2 is the performance of the engineering analysis. In this element, the licensee is to consider the appropriateness of qualitative and quantitative analyses, as well as analyses using traditional engineering approaches and those techniques associated with the use of PRA findings. Regardless of the analysis method chosen, the licensee needs to satisfy the principles set forth in Section 2 of RG 1.174, which include, for example, reasonable balance between prevention and mitigation and avoidance of over reliance on programmatic activities. Sections 1, 2, and 3 of EPRI TR-112657, Rev. B, describes the probabilistic and deterministic engineering analyses to be performed to categorize the risk significance of the piping segments. The results of these analyses are used to determine the number of locations to be inspected and to select the inspection locations and inspection methods. Accordingly, the staff finds that the evaluation process as summarized in Sections 6.1 and 6.2 of EPRI TR-112657, Rev. B, meets the criteria of this element.

- Element 3 is the definition of the implementation and monitoring program. The primary goal of this element is to ensure that no adverse safety degradation occurs because of changes to the ISI program, and the staff finds that the guidance provided in EPRI TR-112657, Rev. B, Section 3.6, provides feedback appropriate to alert the licensee of adverse safety degradation, and, therefore, is adequate to meet this goal. In addition, the monitoring, feedback, and corrective action programs discussed are consistent with guidelines provided in Section 2.3 of RG 1.174.

- Element 4 is the submittal of the proposed change. EPRI TR-112657, Rev. B, states that each licensee will submit its proposed change for prior approval before they implement an RI-ISI program.

RG 1.174 states that in implementing risk-informed decisionmaking, plant changes are expected to meet a set of key principles. The following paragraphs summarize these principles and the staff findings related to the conformance of EPRI TR-112657, Rev. B, methodology with these principles.

- Principle 1 states that the proposed change must meet current regulations unless it is explicitly related to a requested exemption or rule change. The proposed RI-ISI change is an alternative to the ASME Code Section XI as may be requested under 10 CFR 50.55a(a)(3). The proposed change is an alternative to piping ISI requirements with regard to the number of inspections, locations of inspections, and methods of inspections. Each licensee seeking to implement the alternative will request NRC approval pursuant to 10 CFR 50.55a(a)(3). Therefore, principle 1 is satisfied.

- Principle 2 states that the proposed change must be consistent with the defense-in-depth philosophy. ISI is an integral part of defense-in-depth. As part of the RI-ISI process, the risk significance categorization and the specification of the subsequent number and location of elements to inspect will maintain the basic intent of ISI (i.e., identifying and repairing flaws before pipe integrity is challenged). Therefore, although a reduction in the number of welds inspected is anticipated, if a licensee implements an RI-ISI program as described in the EPRI TR and subject to the conditions specified in this SER, there will be reasonable assurance that the program will provide a substantive ongoing assessment of piping condition.

- Principle 3 states that the proposed change shall maintain sufficient safety margins. No changes to the evaluation of design basis accidents in the final safety analysis report (FSAR) are being made by the RI-ISI process. Therefore, sufficient safety margins will be maintained.

- Principle 4 states that when proposed changes result in an increase in CDF or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement. Redirecting inspections to highly risk significant locations and adaption of inspection procedures to the identified degradation mechanisms at the specified locations is expected to contribute to a reduction of risk that will partially or fully offset any risk increase from discontinuing inspection at low risk significant locations. Section 3.7 of EPRI TR-112657, Rev. B, discusses a method to investigate the risk implications of the proposed change to support the finding that this principle is met. Staff findings with regard to principle 4 are found in Section 3.2.7 of this SER.

- Principle 5 states that the impact of the proposed change should be monitored using performance measurement strategies. EPRI TR's conformance to this principle is already discussed in the paragraph on Element 3 above.

4.0 CONCLUSIONS

As provided in 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (1) the proposed alternatives would provide an acceptable level of quality and safety or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Based on its evaluation of the EPRI TR, the staff has reached the following conclusions:

The methodology conforms to the guidance provided in RGs 1.174 and 1.178 in that no significant risk increase should be expected from the changes to the ISI program resulting from applying the methodology. According to this methodology, the licensees will identify those aspects of the plants' licensing bases that may be affected by the proposed change, including rules and regulations, the FSAR, technical specifications, and licensing conditions. In addition, the licensees will identify all changes to commitments that may be affected, as well as the particular piping systems, segments, and welds that are affected by the change in the ISI program. Specific revisions to inspection scope, schedules, locations, and techniques will also be identified, as will plant systems and functions that rely on the affected piping.

The EPRI procedure for subdividing piping systems into segments is predicated on identifying portions of piping having the same consequences of failure and the same potential degradation mechanisms. The impact on risk attributable to piping pressure boundary failure considers both direct and indirect effects. Consideration of direct effects includes failures that cause initiating events or disable single or multiple components, trains or systems, or a combination of these effects. The methodology also considers indirect effects of pressure boundary failures affecting other SSCs or piping segments, also referred to as spatial effects such as pipe whip, jet impingement, flooding, or failure of fire protection systems.

Each segment's relative potential for failure is consistent with systematic consideration of degradation mechanisms, segment and weld material characteristics, and environmental and operating stresses. The assessment of component failure potential attributable to aging and degradation takes into account uncertainties. Only a pipe segment that is susceptible to FAC receives a high failure potential, unless that segment is susceptible to a different degradation mechanism other than FAC and also has the potential for water hammer. Plant service history, as well as industry experience, is an important consideration in the EPRI methodology for evaluating degradation mechanisms to ensure completeness and to validate the existence of any identified mechanism. The licensee seeking to implement RI-ISI uses actual operating experience at the plant to define the potential degradation mechanism for specific piping segments. The staff finds that the EPRI methodology meets the SRP guidance for ensuring that a systematic process is used to identify pipe segments susceptible to common degradation mechanisms, and for categorizing these mechanisms into the appropriate degradation categories with respect to their potential to result in a postulated large pipe break.

The results of the different elements of the engineering analysis are considered in an integrated decisionmaking process. The impact of the proposed change in the ISI program is founded on the adequacy of the engineering analysis, acceptable change in plant risk, and the adequacy of the proposed implementation and performance monitoring plan in accordance with RG 1.174 guidelines.

The EPRI methodology also considers implementation and performance-monitoring strategies. Inspection strategies ensure that failure mechanisms of concern have been addressed and there is adequate assurance of detecting damage before structural integrity is affected. The risk significance of piping segments is taken into account in defining the inspection scope for the RI-ISI program.

System pressure tests and visual examination of piping structural elements will continue to be performed on all Class 1, 2, and 3 systems in accordance with the ASME Code Section XI program. The RI-ISI program applies the same performance measurement strategies as existing ASME Code requirements and, in addition, increases the inspection volumes at weld locations.

EPRI TR-112657, Rev. B, has provided the methodology for conducting an engineering analysis of the proposed changes using a combination of engineering analysis with supporting insights from a PRA. Defense-in-depth and quality is not degraded in that the methodology provides reasonable confidence that any reduction in existing inspections will not lead to degraded piping performance when compared to existing performance levels. Inspections are focused on locations with active degradation mechanisms as well as selected locations that monitor the performance of system piping.

Safety margins used in design calculations are not changed. Piping material integrity is monitored to ensure that aging and environmental influences do not significantly degrade the piping to unacceptable levels.

Augmented examination programs for degradation mechanisms, such as IGSCC, Category B through G welds, and FAC, would remain unaffected by the RI-ISI program.

Although the staff finds the general guidance provided in EPRI TR-112657, Rev. B, to be acceptable, application of this guidance will be plant specific. As such, individual applications in RI-ISI must address the various plant-specific issues. These include the following:

- The quality, scope, and level of detail of the PRA used, as described in RGs 1.174 and 1.178 (see Section 3.2.6 of this SER).
- The guidelines and assumptions used for determining direct and indirect effects of flooding, including assumptions on the failure of components affected by the pipe break (see Section 3.2.4 of this SER).
- The criteria, information sources, and results of the in-depth review of plant and industry operating experience to determine the type and location of degradation mechanisms when modifying existing thermal fatigue and localized corrosion augmented inspection programs (see Section 3.2.1 of this SER).
- The review and acceptance of the reactor operating characteristics, reactor design characteristics, and operating failure experience evaluation and categorization used for estimating the state transition rates for the licensee's reactor type and system types when the Markov method is used (see Section 3.2.8 of this SER).

In the public meeting on January 5, 1999 (Ref. 18), the staff and nuclear industry representatives discussed the information to be submitted to the NRC and the list of retrievable onsite documentation for potential NRC audits of licensees that seek to implement an RI-ISI methodology. Based on the analysis in this SER, the staff concludes that the RI-ISI program proposed in EPRI TR-112657, Rev. B, if supplemented by appropriate plant-specific information, can be an alternative to piping ISI requirements with regard to the number, locations, and methods of inspections that provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3). The staff concludes further that a licensee requesting to implement such an RI-ISI program pursuant to section 50.55a(a)(3) may incorporate into its application, by reference, the program described in EPRI TR-112657, Rev. B, and rely on that program, together with appropriate plant-specific information, to demonstrate that the licensee's plant-specific alternative RI-ISI program for piping satisfies section 50.55a(a)(3), provided that:

(A) The application includes the following information:

1. justification for statement that PRA is of sufficient quality;
2. summary of risk impact;
3. current inspection code;
4. impact on previous relief requests;

5. revised FSAR pages affected by the change, if any;
6. process followed (EPRI TR-112657, Rev. B, ASME Code Case, and exceptions to methodology, if any);
7. summary of results of each step (e.g., number of segments, number of segments in Risk Categories 1 one through 7, number of locations to be inspected, etc.);
8. a statement that RG principles have been met (or any exceptions);
9. summary of changes from the current ISI program; and
10. summary of any augmented inspections that would be affected; and

(B) the licensee maintains, in an auditable form at the plant site, the following information:

1. scope definition;
2. segment definition;
3. degradation mechanism assessment;
4. consequence evaluation;
5. confirmatory PRA model runs and results for the RI-ISI program;
6. risk evaluation;
7. structural element/NDE selection;
8. change in risk calculation;
9. PRA quality review; and
10. continual assessment forms as program changes in response to inspection results;
11. documentation required by ASME Code (including qualification of inspection personnel, inspection results, and flaw evaluations).

5.0 REFERENCES

1. EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*, April 1999.

2. EPRI TR-112657, Rev. B, Final Report, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*, July 1999.

3. U.S. Nuclear Regulatory Commission, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Regulatory Guide 1.174, July 1998.

4. NRC Regulatory Guide 1.178, *An Approach for Plant-Specific Risk-Informed Decision Making: Inservice Inspection of Piping*, September 1998.

5. ASME Code Case N560, *Alternative Examination Requirements for Class 1, Category B-J Piping Welds, Section XI, Division 1*, approved August 9, 1996.

6. ASME Code Case N-578, *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B*, Section XI, Division 1, approved September 2, 1997.

7. Letter, dated November 13, 1998, Jeff Mitman (EPRI Project Manager), to Dr. Brian W. Sheron (NRC), containing response to NRC request for additional information.

8. U.S. Nuclear Regulatory Commission Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning," May 2, 1989.

9. U.S. Nuclear Regulatory Commission Generic Letter 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," January 25, 1988.

10. Standard Review Plan (SRP) Chapter 3.9.8, *Standard Review Plan for Trail Use for the Review of Risk-Informed Inservice Inspection of Piping*, NUREG-0800, May 1998.

11. Standard Review Plan Chapter 19.0, "Use of Probabilistic Risk Assessment in Plant-Specific, Risk-Informed Decisionmaking: General Guidance," NUREG-0800, July 1998.

12. Letter dated March 9, 1999, Jeff Mitman (EPRI Project Manager) to Syed Ali (NRC), containing meeting minutes and response to second NRC request for information.

13. U.S. Nuclear Regulatory Commission IE Bulletin 79-17, "Pipe Cracks in Stagnant Borated Water Systems at PWR Plants," July 26, 1979.

14. U.S. Nuclear Regulatory Commission Generic Letter 89-13, Supplement 1, "Service Water System Problems Affecting Safety-Related Equipment," April 4, 1990.

15. U.S. Nuclear Regulatory Commission Generic Letter 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems," June 22, 1988.

16. EPRI TR-110161, *Piping System Reliability and Failure Rate Estimation Models for Use in Risk-Informed In-Service Inspection Applications*, December 1998, Proprietary.

17. TSA-1/99-164, "Final (Revised) Review of the EPRI-Proposed Markov Modeling/Bayesian Updating Methodology for Use in Risk-Informed Inservice Inspection of Piping in Commercial Nuclear Power Plants," H. Martz, Los Alamos National Laboratory, June 1999.

18. Minutes for NRC Meeting with the Nuclear Energy Institute (NEI) Regarding Issues Related to Risk-Informed Inservice Inspection Activities on January 5, 1999.

10 CFR 50.55a(a)(3) provides, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The staff concludes that the proposed RI-ISI program as described in EPRI TR-112657, Revision B, is a sound technical approach and will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a for the proposed alternative to the piping ISI requirements with regard to the number of locations, locations of inspections, and methods of inspection.

The staff will not repeat its review of the matters described in EPRI TR-112657, Rev. B, when the report appears as a reference in license application, except to ensure that the material presented applies to the specific plant involved. In accordance with procedure established in NUREG-0390, the NRC requests that EPRI publish the accepted version of the submittal, within 3 months of receipt of this letter. The accepted version shall incorporate this letter and the enclosed safety evaluation between the title page and the abstract and a "-A" (designating accepted) following the report identification symbol.

If the NRC's criteria or regulations change so that its conclusion that the submittal is acceptable are invalidated, EPRI and/or the applicant referencing the topical report will be expected to revise and resubmit its respective documentation, or submit justification for the continued applicability of the topical report without revision of the respective documentation.

Should you have any questions or wish further clarification, please call me at (301) 415-2795 or Syed Ali at (301) 415-2776.

Sincerely,

original signed by
William H. Bateman, Chief
Materials and Chemical Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

Enclosure: Safety Evaluation

cc w/enc: See next page

Distribution: PUBLIC File Center EMCB RF TSullivan LOlshan OGC
PGEB r/f ACRS SDinsmore

File:G:\EMCB\ALI\EPRI SER Letter Oct 28.wpd ***PREVIOUSLY CONCURRED**
To receive a copy of this document, indicate in the box: "C" = Copy w/o attachment; "E" = Copy w/attachment; "N" = No Copy

OFFICE	EMCB:DE		SC:LPD4-2		BC:EMCB:DE	
NAME	SAli*		SDembek*		WHBateman WHB	
DATE	10 / 28/99		10/ 28 /99		10/29/99	

99-189

OFFICIAL RECORD COPY

10 CFR 50.55a(a)(3) provides, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The staff concludes that the proposed RI-ISI program as described in EPRI TR-112657, Revision B, is a sound technical approach and will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a for the proposed alternative to the piping ISI requirements with regard to the number of locations, locations of inspections, and methods of inspection.

The staff will not repeat its review of the matters described in EPRI TR-112657, Rev. B, when the report appears as a reference in license application, except to ensure that the material presented applies to the specific plant involved. In accordance with procedure established in NUREG-0390, the NRC requests that EPRI publish the accepted version of the submittal, within 3 months of receipt of this letter. The accepted version shall incorporate this letter and the enclosed safety evaluation between the title page and the abstract and an -A(designating accepted) following the report identification symbol.

If the NRC's criteria or regulations change so that its conclusion that the submittal is acceptable are invalidated, EPRI and/or the applicant referencing the topical report will be expected to revise and resubmit its respective documentation, or submit justification for the continued applicability of the topical report without revision of the respective documentation.

Should you have any questions or wish further clarification, please call me at (301) 415-2795 or Syed Ali at (301) 415-2776.

Sincerely,

William H. Bateman, Chief
Materials and Chemical Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

Enclosure: Safety Evaluation
cc w/enc: See next page

Distribution: PUBLIC File Center EMCB RF TSullivan LOlshan OGC
PGEB r/f ACRS SDinsmore

File:G:\EMCB\ALI\EPRI SER Letter Oct 28.wpd
To receive a copy of this document, indicate in the box: "C" = Copy w/o attachment; "E" = Copy w/attachment; "N" = No Copy

OFFICE	EMCB:DE		SC:LPD4-2		BC:EMCB:DE	
NAME	SAli		SDembek with comment		WHBateman	
DATE	10 /28 /99		10/28/99		10/ /99	

10/28

OFFICIAL RECORD COPY