NRC MEETING WITH STARS-IRAG

ON RISK INFORMED ISI

February 7, 2001

1:00 PM TO 3:00 PM

AGENDA

Introductions

Status of IRAG submittals

- Content of IRAG submittal
- Projected submittal dates

Discussion

Adjourn

STARS / IRAG

STARS – Strategic Teaming And Resource Sharing

Diablo Canyon

Comanche Peak

STP

Wolf Creek

Callaway

IRAG – Integrated Regulatory Affairs Group

Content of IRAG submittal

- Format consistent with NEI / Industry template and approved STP submittal

- Based on EPRI TR-112657-B-A Methodology

- Scope includes Class 1 and 2 welds (except for STP whose scope is reduces because STP already has an approved RI-ISI program for certain Class 1 welds)

- Analyses and evaluations done by STARS plants with contractor assistance

- Plant specific differences discussed in Attachment 2 to submittals

    - Tables are plant specific

    - Plant specific text in square brackets, "[ ]".

Projected submittal dates

- All plants intend to submit on or about February 15, 2001

- STARS point of contact

  - Ben Mays – Technical point of contact

  - Tom Grozan – Licensing point of contact

- Requested Approval Date, August 2001, to support outage for lead STARS plant

DRAFT

Ref: 10 CFR 50.55a

CPSES-2000nnnnnn
Log # TXX-01026
File # 10010

February 15, 2001

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RELIEF REQUEST FOR APPLICATION OF AN ALTERNATIVE TO THE ASME BOILER AND PRESSURE VESSEL CODE SECTION XI EXAMINATION REQUIREMENTS FOR CLASS 1 AND 2 PIPING WELDS

Gentlemen:

In accordance with the provisions of 10 CFR 50.55a(a)(3)(i), TXU Electric requests relief from the ASME Section XI code examination requirements for inservice inspection of Class 1 and 2 piping welds (Categories B-F, B-J, C-F-1, and C-F-2) for Comanche Peak Steam Electric Station (CPSES) Units 1 and 2. The proposed alternative, as described in Attachment 1, "Risk-Informed Inservice Inspection Program Plan – Comanche Peak Steam Electric Station Units 1 and 2," provides an acceptable level of quality and safety as required by 10 CFR 50.55 a(a)(3)(i).

The CPSES risk-informed inservice inspection (RI-ISI) program plan has been developed in accordance with the methodology provided in Electric Power Research Institute (EPRI) Topical Report (TR) 112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Revision B-A. EPRI TR-112657, Revision B, has been reviewed and accepted by the Nuclear Regulatory Commission (NRC). The NRC staff has found TR-112657, Revision B, is acceptable for referencing in licensing applications to the extent specified and under the limitations delineated in the report and the NRC Safety Evaluation Report, dated October 28, 1999.

The format of the CPSES RI-ISI program plan is consistent with the Nuclear Energy Institute (NEI)/industry template developed for applications of the EPRI RI-ISI methodology. Additional supporting documentation is available at the CPSES site for your review.

The CPSES RI-ISI program plan was developed in conjunction with RI-ISI program plans for the plants operated by Pacific Gas and Electric Company, AmerenUE, Wolf Creek Nuclear Operating Corporation, and STP Nuclear Operating Company. CPSES and these other plants make up an industry consortium of five plants as a result of a mutual agreement known as Strategic Teaming and Resource Sharing (STARS). The other members of the STARS group can also be expected to submit similar plant-specific relief requests. These additional relief requests will be submitted in parallel with this application, in order to reduce the amount of NRC resources required to review and approve the STARS applications. Attachment 2 describes the methodology for identifying differences in the STARS RI-ISI applications to assist in the review of the applications.

The recent event at the V.C. Summer facility in which through-wall cracking was discovered in a 34-inch main loop hot leg reactor pressure vessel nozzle has led to an extensive industry effort to determine generic implications and appropriate corrective actions. As discussed in the NEI letter from David Modeen to Dr. Brian Sheron dated December 14, 2000, the EPRI Materials Reliability Project will lead the industry effort to address the generic implications of the V.C. Summer event. TXU Electric will closely monitor the progress of and will assess the recommendations for applicability.

This communication contains the following commitment which will be completed as noted:

Commitment Number	Commitment
XXXX	Assess the industry recommendations resulting from the EPRI-MRP evaluation of the V.C. Summer event.

TXU Electric requests NRC approval of this relief request by August [OAB1]2001 to support the CPSES Unit 2 refueling outage 2RF06, which is currently scheduled to begin March 2002. TXU Electric intends to incorporate this risk-informed approach for Class 1 and 2 piping weld inspection into the Ten Year Inservice Inspection Plan for the second inspection interval for Unit 1, which began August 2000, and for the first interval for Unit 2 which began August1993.

Should you have any questions, please contact Mr. Ben Mays at (254) 897- 6816 or Mr. Obaid Bhatty at (254) 897- 5839.

Sincerely,

C. L. Terry

By: ______________________
Roger D. Walker
Regulatory Affairs Manager

OAB/ob
Enclosures

Cc: E. W. Merschoff, Region IV
J. I. Tapia, Region IV
D. H. Jaffe, NRR
Resident Inspectors, CPSES

RISK-INFORMED INSERVICE INSPECTION PROGRAM PLAN

COMANCHE PEAK STEAM ELECTRIC STATION,

UNITS 1 AND 2 (REV. 0)

Table of Contents

1. INTRODUCTION

[Comanche Peak Steam Electric Station (CPSES) Unit 1 is currently in the second inservice inspection (ISI) interval as defined by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Section XI Code for Program B, while Unit 2 is in the first inspection interval. The second ISI interval for CPSES Unit 1 commenced on August 14, 2000, while the first ISI interval for Unit 2 commenced on August 3, 1993. In order to keep both units on the same edition of ASME Section XI, CPSES requested that the Code update for Unit 1be delayed until such time that it could be performed concurrently with Unit 2. As a result, the edition of ASME Section XI utilized during the first interval is currently still applicable for both units. Pursuant to 10 CFR 50.55a(g)(4)(ii), the applicable ASME Section XI Code for both units is the 1986 Edition, no Addenda.]

The objective of this submittal is to request a change to the ISI Program for Class [1 and] 2 piping through the use of a risk-informed inservice inspection (RI-ISI) program. The RI-ISI process used in this submittal is described in Electric Power Research Institute (EPRI) Topical Report (TR) 112657, Rev. B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure." The RI-ISI application was also conducted in a manner consistent with ASME Code Case N-578, "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B."

1.1 Relation to NRC Regulatory Guides 1.174 and 1.178

As a risk-informed application, this submittal meets the intent and principles of Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," and Regulatory Guide 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking Inservice Inspection of Piping." Further information is provided in Section 3.6.2 relative to defense-in-depth.

1.2 PSA Quality

[The evaluation of the consequences of pipe rupture for the RI-ISI assessment for Comanche Peak Steam Electric Station was based on Revision 1 of the CPSES Safety Monitor.]

[The Safety Monitor model was used to perform the various calculations for this submittal. The base core damage frequency (CDF) and base large early release frequency (LERF) from that model are 1.83E-05 per year and 1.97E-06 per year, respectively.]

[With specific regards to PRA quality, the CPSES PRA models have undergone multiple reviews. The CPSES full power Level 1 and Level 2, Probabilistic Risk Assessment and Individual Plant Examination, from August 1992, received multiple reviews before and after the submittal, including an internal review by TXU staff, external review by outside PSA experts, independent industry review after the completion, and a review versus "EPRI PSA Application Guide".]

[It should also be noted that CPSES received a safety evaluation report (SER) on the Risk Informed In-Service Testing Application in 1998. NRC acceptance of this program was based largely on their review of the then current PRA/IPE model (1992) and the programs in place to control the PRA.]

[The NRC's review can be summarized with the following comment, "In general, the IPE study for CPSES fully satisfies the requirements of a full-scope Level-I and Level-II PRA." The NRC's review of the IPE also identified areas for improvement, but these areas were addressed in the latest PSA update.]

[The CPSES 2000 update to the Comanche Peak PSA included an updated version of the Latent Human Reliability Analysis (HRA), which had previously received comments from the NRC during their review. Other items receiving comment (e.g., recovery/repair of failed components and Loss of Offsite Power Initiating Event Frequency) were also addressed in the update.]

[The CPSES 2000 update to the Comanche Peak PSA, used in the RI-ISI evaluation, is a complete update, which includes:

- updates to the system notebooks and data (initiating event frequencies, plant-specific hardware failure rates and unavailabilities, human error probabilities, and common cause parameters),
- success criteria (more realistic thermal hydraulic (T/H) results), and
- re-quantification of the overall model.
- The CPSES containment analysis was not revisited as part of the CPSES 2000 update. The CTs identified in the CPSES IPE were used for the PDS binning and to develop the LERF split fractions for the update.]

[In addition, the current PSA is scheduled to undergo the Westinghouse certification process in 2001. PSA model updates are performed on a periodic basis in order to satisfy the requirements of the maintenance rule and other risk informed applications. Additionally, changes to the plant's design and operation are evaluated on a real time basis to assess impact on the PSA model and results.]

2. PROPOSED ALTERNATIVE TO CURRENT ISI PROGRAM REQUIREMENTS

2.1 ASME Section XI

ASME Section XI Examination Categories B-F, B-J, C-F-1 and C-F-2 currently contain the requirements for the nondestructive examination (NDE) of Class 1 and 2 piping components. The alternative RI-ISI program for piping is described in EPRI TR-112657. The RI-ISI program will be substituted for the currently approved program for Class 1 and 2 piping (Examination Categories B-F, B-J, C-F-1 and C-F-2) in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected. EPRI TR-112657 provides the requirements for defining the relationship between the RI-ISI program and the remaining unaffected portions of ASME Section XI.

2.2 Augmented Programs

The following augmented inspection programs were considered during the RI-ISI application:

- The augmented inspection program for flow accelerated corrosion (FAC) per Generic Letter 89-08, "Erosion/Corrosion – Induced Pipe Wall Thinning," is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RI-ISI program.

[• The augmented inspection program for high energy break exclusion piping is not affected by the RI-ISI program.]

[• Portions of the Unit 1 containment spray and residual heat removal systems contain piping that is less than 0.375 in. thick. ASME Section XI does not require surface or volumetric examinations on this piping, based on the wall thickness. However, in response to NRC SSER-26, CPSES committed to performing volumetric examinations on 7.5% of the welds in this "thin wall" piping during each ten year interval. This piping was included in the scope of the RI-ISI application, and therefore is addressed by the RI-ISI program. Consequently, the RI-ISI program subsumes this augmented inspection program.]

3. RISK-INFORMED ISI PROCESS

The process used to develop the RI-ISI program conformed to the methodology described in EPRI TR-112657 and consisted of the following steps:

- Scope Definition
- Consequence Evaluation
- Failure Potential Assessment
- Risk Characterization
- Element and NDE Selection
- Risk Impact Assessment
- Implementation Program
- Feedback Loop

A deviation to the EPRI RI-ISI methodology has been implemented in the failure potential assessment for CPSES. Table 3-16 of EPRI TR-112657 contains criteria for assessing the potential for thermal stratification, cycling and striping (TASCS). Key attributes for horizontal or slightly sloped piping greater than 1" nominal pipe size (NPS) include:

1. Potential exists for low flow in a pipe section connected to a component allowing mixing of hot and cold fluids, or
2. Potential exists for leakage flow past a valve, including in-leakage, out-leakage and cross-leakage allowing mixing of hot and cold fluids, or
3. Potential exists for convective heating in dead-ended pipe sections connected to a source of hot fluid, or
4. Potential exists for two phase (steam/water) flow, or
5. Potential exists for turbulent penetration into a relatively colder branch pipe connected to header piping containing hot fluid with turbulent flow,

AND

$\Delta T > 50°F$,

AND

Richardson Number > 4 (This value predicts the potential buoyancy of stratified flow.)

These criteria, based on meeting a high cycle fatigue endurance limit with the actual ΔT assumed equal to the greatest potential ΔT for the transient, will identify all locations where stratification is likely to occur, but allows for no assessment of severity. As such, many locations will be identified as subject to TASCS where no significant potential for thermal fatigue exists. The critical attribute missing from the existing methodology that would allow consideration of fatigue severity is a criterion that addresses the potential for fluid cycling. The impact of this additional consideration on the existing TASCS criteria is presented below.

- **Turbulent penetration TASCS**

  Turbulent penetration typically occurs in lines connected to piping containing hot flowing fluid. In the case of downward facing lines, significant top-to-bottomΔTs can develop in horizontal sections within about 25 pipe diameters, and the conditions can potentially be cyclic. For an upward or horizontal facing branch line connected to the hot fluid source, natural convective effects will fill the line with hot water. In the absence of in-leakage towards the hot fluid source, this will result in a well-mixed fluid condition where significant top-to-bottom ΔTs will not occur. Even in fairly long lines, where some heat loss from the outside of the piping will tend to occur and some fluid stratification may be present, there is no significant potential for cycling. The effect of TASCS will not be significant under these conditions and can be neglected.

- **Low flow TASCS**

  In some situations, the transient startup of a system (e.g., Residual Heat Removal suction piping) creates the potential for fluid stratification as flow is established. In cases where no cold fluid source exists, the hot flowing fluid will fairly rapidly displace the cold fluid in stagnant lines, while fluid mixing will occur in the piping further removed from the hot source and stratified conditions will exist only briefly as the line fills with hot fluid. As such, since the situation is transient in nature, it can be assumed that the criteria for thermal transients (TT) will govern.

➤ **Valve leakage TASCS**

Sometimes a very small leakage flow can occur outward past a valve into a line with a significant temperature difference. However, since this is a generally a "steady-state" phenomenon with no potential for cyclic temperature changes, the effect of TASCS is not significant and can be neglected.

➤ **Convection heating TASCS**

Similarly, there sometimes exists the potential for heat transfer across a valve to an isolated section beyond the valve, resulting in fluid stratification due to natural convection. However, since there is no potential for cyclic temperature changes in this case, the effect of TASCS is not significant and can be neglected.

These additional considerations for determining the potential for thermal fatigue as a result of the effects of TASCS were applied in the failure potential assessment for CPSES. This constitutes a deviation to the requirements of EPRI TR-112657 since the methodology does not presently provide any allowance for the consideration of cycle severity in assessing the potential for TASCS effects. For the reasons discussed above, this approach is considered technically justifiable. Furthermore, EPRI concurs with this position and intends to address this issue in a future revision to the methodology.

3.1 Scope of Program

The systems included in the RI-ISI program are provided in Table[s] 3.1-1 [and 3.1-2 for Units 1 and 2, respectively]. The piping and instrumentation diagrams and additional plant information including the existing plant ISI program were used to define the Class [1 and] 2 piping system boundaries.

3.2 Consequence Evaluation

The consequence(s) of pressure boundary failures were evaluated and ranked based on their impact on core damage and containment performance (isolation, bypass and large, early release). The impact on these measures due to both direct and indirect effects was considered using the guidance provided in EPRI TR-112657.

3.3 Failure Potential Assessment

Failure potential estimates were generated utilizing industry failure history, plant specific failure history and other relevant information. These failure estimates were determined using the guidance provided in EPRI TR-112657.

Table[s] 3.3-1 [and 3.3-2] summarize[s] the failure potential assessment by system for each degradation mechanism that was identified as potentially operative for [Units 1 and 2, respectively.]

3.4 Risk Characterization

In the preceding steps, each run of piping within the scope of the program was evaluated to determine its impact on core damage and containment performance (isolation, bypass and large, early release) as well as its potential for failure. Given the results of these steps, piping segments are then defined as continuous runs of piping potentially susceptible to the same type(s) of degradation and whose failure will result in similar consequence(s). Segments are then ranked based upon their risk significance as defined in EPRI TR-112657.

The results of these calculations are presented in Table[s] 3.4-1 [and 3.4-2 for Units 1 and 2, respectively.]

3.5 Element and NDE Selection

In general, EPRI TR-112657 requires that 25% of the locations in the high risk region and 10% of the locations in the medium risk region be selected for inspection using appropriate NDE methods tailored to the applicable degradation mechanism. In addition, per Section 3.6.4.2 of EPRI TR-112657, if the percentage of Class 1 piping locations selected for examination falls substantially below 10%, then the basis for selection needs to be investigated. [The initial results of the RI-ISI application were that 5.8% of the Class 1 piping welds in both units were selected for RI-ISI examination. In accordance with Section 3.6.4.2 of EPRI TR-112657, the bases for selection were investigated further, and the following conclusions were reached:]

[• The 5.8% figure for the examination of Class 1 piping locations was a direct result of having a lower than usual population of locations ranked in the "High" consequence category (e.g., 40% versus 60% or higher that is typically seen). There are two primary reasons that substantiate the lower percentage of "High" consequence locations in Class 1 piping at CPSES:]

[1) Small break loss of coolant accidents (SLOCA) and very small break loss of coolant accidents (VSLOCA) are typically assigned a "High" consequence ranking. However, at CPSES, SLOCA and VSLOCA events only need to be assigned a "Medium" consequence ranking due to the diversity of the plant make-up systems.]

[2) CPSES has a larger than usual population of Class 1 welds that are located between the first and second isolation valves. Postulated pipe breaks between isolation valves only lead to potential loss of coolant accidents (PLOCAs), and as such result in a lower consequence ranking than pipe breaks that are postulated to occur in unisolable piping prior to the first isolation valve.]

[These plant unique factors result in safer than usual Class 1 piping where a smaller distribution of locations ranked as having a "High" consequence is warranted. In turn, a lower consequence ranking results in a lower overall risk ranking, and therefore a smaller percentage of Class 1 welds that require examination per the RI-ISI process.]

[• Even though the evaluation described above provides justification for selecting less than 10% of the Class 1 piping welds, CPSES decided to add twenty selections per unit in order to increase the overall percentage of Class 1 selections. These additional selections also support the defense-in-depth philosophy. The additional twenty welds increased the percentage of Class 1 selections to 8.3% for Unit 1, and 8.2% for Unit 2.]

[• One additional factor that was considered during the evaluation was that the overall percentage of Class 1 selections included both socket and non-socket welds. The percentage of initial Class 1 selections was 9.9% for Unit 1 and 9.5% for Unit 2 when considering only those Class 1 non-socket welds that are 3" NPS and greater. With the addition of twenty welds per unit, the percentage of Class 1 non-socket weld selections increased to 14.2% for Unit 1, and 13.9% for Unit 2.]

A brief summary is provided below, and the results of the selection process are presented in Table[s] 3.5-1 [and 3.5-2 for Units 1 and 2, respectively.] It should be noted that no credit was taken for any FAC or existing high energy break exclusion piping augmented inspection program locations in meeting the sampling percentage requirements. Section 4 of EPRI TR-112657 was used as guidance in determining the examination requirements for these locations.

Unit	Class 1 Piping Welds(1)		Class 2 Piping Welds(2)		All Piping Welds(3)	
	Total	Selected	Total	Selected	Total	Selected
1	821	68(4)	2315	37	3136	105
2	816	67(4)	2310	39	3126	106

Notes

1. Includes all Category B-F and B-J locations.
2. Includes all Category C-F-1 and C-F-2 locations.
3. All in-scope piping components, regardless of risk classification, will continue to receive Code required pressure testing, as part of the current ASME Section XI program. VT-2 visual examinations are scheduled in accordance with the station's pressure test program that remains unaffected by the RI-ISI program.
4. The initial RI-ISI application yielded 48 weld selections in Unit 1 and 47 weld selections in Unit 2. Twenty welds per unit were subsequently added to the initial selections to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657.

3.5.1 Additional Examinations

The RI-ISI program in all cases will determine through an engineering evaluation the root cause of any unacceptable flaw or relevant condition found during examination. The evaluation will include the applicable service conditions and degradation mechanisms to establish that the element(s) will still perform their intended safety function during subsequent operation. Elements not meeting this requirement will be repaired or replaced.

The evaluation will include whether other elements in the segment or segments are subject to the same root cause conditions. Additional examinations will be performed on these elements up to a number equivalent to the number of elements required to be inspected on the segment or segments initially. If unacceptable flaws or relevant conditions are again found similar to the initial problem, the remaining elements identified as susceptible will be examined. No additional examinations will be performed if there are no additional elements identified as being susceptible to the same root cause conditions.

3.5.2 Program Relief Requests

An attempt has been made to select RI-ISI locations for examination such that a minimum of >90% coverage (i.e., Code Case N-460 criteria) is attainable. However, some limitations will not be known until the examination is performed, since some locations may be examined for the first time by the specified techniques.

At this time, all the RI-ISI examination locations that have been selected provide >90% coverage. In instances where locations may be found at the time of the examination that do not meet the >90% coverage requirement, the process outlined in EPRI TR-112657 will be followed.

[The following relief requests can be withdrawn for the reasons provided below with all other relief requests remaining in place.]

ISI Program Relief Requests

Relief Request	Unit	Brief Description
B-2[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4103-4.
B-3[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4503-30.
B-5[(1)]	1	Limited coverage examinations. Less than 90% examination coverage achieved on Weld Nos. TBX-1-4103-1 and TBX-1-4202-1.
B-8[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4200-5.
B-10[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4101-1.
B-11[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4201-7.
B-13[(1)]	1	Limited coverage examinations. Less than 90% examination coverage achieved on Weld Nos. TBX-1-4102-7, TBX-4301-7 and TBX-1-4402-7.
B-14[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4404-1.
C-3[(1)]	1	Limited coverage examinations. Less than 90% examination coverage achieved on Weld Nos. TBX-2-2570-32 and TBX-2-2570-33.
C-6[(1)]	1	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-2-2580-3.
C-8[(1)]	1	Limited coverage examinations. Less than 90% examination coverage achieved on Weld Nos. TBX-2-2530-29 and TBX-2-2530-30.

ISI Program Relief Requests (con't)

Relief Request	Unit	Brief Description
B-2(1)	2	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4103-1.
B-3(1)	2	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4104-1.
B-6(1)	2	Limited coverage examination. Less than 90% examination coverage achieved on Weld No. TBX-1-4201-7.

Notes

1. None of the welds listed above with known examination coverage limitations were selected for examination per the RI-ISI process. As such, the associated relief requests are being withdrawn.

3.6 Risk Impact Assessment

The RI-ISI program has been conducted in accordance with Regulatory Guide 1.174 and the requirements of EPRI TR-112657, and the risk from implementation of this program is expected to remain neutral or decrease when compared to that estimated from current requirements.

This evaluation identified the allocation of segments into High, Medium, and Low risk regions of the EPRI TR-112657 and ASME Code Case N-578 risk ranking matrix, and then determined for each of these risk classes what inspection changes are proposed for each of the locations in each segment. The changes include changing the number and location of inspections within the segment and in many cases improving the effectiveness of the inspection to account for the findings of the RI-ISI degradation mechanism assessment. For example, for locations subject to thermal fatigue, examinations will be conducted on an expanded volume and will be focused to enhance the probability of detection (POD) during the inspection process.

3.6.1 Quantitative Analysis

Limits are imposed by the EPRI methodology to ensure that the change in risk of implementing the RI-ISI program meets the requirements of Regulatory Guides 1.174 and 1.178. The EPRI criterion requires that the cumulative change in CDF and LERF be less than 1E-07 and 1E-08 per year per system, respectively.

CPSES conducted a risk impact analysis per the requirements of Section 3.7 of EPRI TR-112657. The analysis estimates the net change in risk due to the positive and negative influence of adding and removing locations from the inspection program. A risk quantification was performed using the "Simplified Risk Quantification Method" described in Section 3.7 of EPRI TR-112657. The conditional core damage probability (CCDP) and conditional large early release probability (CLERP) used for high consequence category segments was based on the highest evaluated CCDP [(1.16E-02)] and CLERP [(4.70E-03)], whereas, for medium consequence category segments, bounding estimates of CCDP (1E-04) and CLERP (1E-05) were used. The likelihood of pressure boundary failure (PBF) is determined by the presence of different degradation mechanisms and the rank is based on the relative failure probability. The basic likelihood of PBF for a piping location with no degradation mechanism present is given as x_o and is expected to have a value less than 1E-08. Piping locations identified as medium failure potential have a likelihood of $20x_o$. These PBF likelihoods are consistent with References 9 and 14 of EPRI TR-112657. In addition, the analysis was performed both with and without taking credit for enhanced inspection effectiveness due to an increased POD from application of the RI-ISI approach.

Table[s] 3.6-1 [and 3.6-2] present summaries of the RI-ISI program versus [1986] ASME Section XI Code Edition program requirements and identifies on a per system basis each applicable risk category [for Units 1 and 2, respectively]. The presence of FAC was adjusted for in the performance of the quantitative analysis by excluding its impact on the risk ranking. However, in an effort to be as informative as possible, for those systems where FAC is present, the information in Table[s] 3.6-1 [and 3.6-2] is presented in such a manner as to depict what the resultant risk categorization is both with and without consideration of FAC. This is accomplished by enclosing the FAC damage mechanism, as well as all other resultant corresponding changes (failure potential rank, risk category and risk rank), in parenthesis. Again, this has only been done for information purposes, and has no impact on the assessment itself. The use of this approach to depict the impact of degradation mechanisms managed by augmented inspection programs on the risk categorization is consistent with that used in the delta risk assessment for the Arkansas Nuclear One, Unit 2 (ANO-2) pilot application. An example is provided below.

System	Risk		Consequence Rank	Failure Potential	
	Category	Rank[(1)]		DMs	Rank
FWS	5 (3)	Medium (High)	Medium	TASCS, TT, (FAC)	Medium (High)

In this example if FAC is not considered, the failure potential rank is "medium" instead of "high" based on the TASCS and TT damage mechanisms. When a "medium" failure potential rank is combined with a "medium" consequence rank, it results in risk category 5 ("medium" risk) being assigned instead of risk category 3 ("high" risk).

In this example if FAC were considered, the failure potential rank would be "high" instead of "medium". If a "high" failure potential rank were combined with a "medium" consequence rank, it would result in risk category 3 ("high" risk) being assigned instead of risk category 5 ("medium" risk).

Note

1. The risk rank is not included in Tables 3.6-1 or 3.6-2 but it is included in Tables 5-2-1 and 5-2-2.

As indicated below, this evaluation has demonstrated that unacceptable risk impacts will not occur from implementation of the RI-ISI program, and satisfies the acceptance criteria of Regulatory Guide 1.174 and EPRI TR-112657.

Unit 1 Risk Impact Results

System[1]	$\Delta Risk_{CDF}$		$\Delta Risk_{LERF}$	
	w/ POD	w/o POD	w/ POD	w/o POD
RCS	-6.48E-09	5.20E-09	-2.59E-09	2.11E-09
CVCS	Negligible	negligible	negligible	negligible
SIS	-7.92E-10	-7.92E-10	-3.27E-10	-3.27E-10
RHRS	-5.80E-11	-5.80E-11	-2.35E-11	-2.35E-11
CSS	1.16E-10	1.16E-10	4.70E-11	4.70E-11
FWS	3.00E-11	7.00E-11	3.00E-12	7.00E-12
MSS	Negligible	negligible	negligible	negligible
Total	**-7.18E-09**	**4.54E-09**	**-2.90E-09**	**1.82E-09**

Note
1. Systems are described in Table 3.1-1.

Unit 2 Risk Impact Results

System[1]	$\Delta Risk_{CDF}$		$\Delta Risk_{LERF}$	
	w/ POD	w/o POD	w/ POD	w/o POD
RCS	-8.61E-09	5.86E-09	-3.46E-09	2.37E-09
CVCS	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
SIS	-4.44E-10	-4.44E-10	-1.86E-10	-1.86E-10
RHRS	-5.22E-10	-5.22E-10	-2.12E-10	-2.12E-10
CSS	-1.16E-10	-1.16E-10	-4.70E-11	-4.70E-11
FWS	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
MSS	no change	no change	no change	no change
Total	**-9.73E-09**	**4.76E-09**	**-3.91E-09**	**1.93E-09**

Note
1. Systems are described in Table 3.1-2.

3.6.2 Defense-in-Depth

The intent of the inspections mandated by ASME Section XI for piping welds is to identify conditions such as flaws or indications that may be precursors to leaks or ruptures in a system's pressure boundary. Currently, the process for picking inspection locations is based upon structural discontinuity and stress analysis results. As depicted in ASME White Paper 92-01-01, Rev. 1, "Evaluation of

Inservice Inspection Requirements for Class 1, Category B-J Pressure Retaining Welds," this method has been ineffective in identifying leaks or failures. EPRI TR-112657 and Code Case N-578 provide a more robust selection process founded on actual service experience with nuclear plant piping failure data.

This process has two key independent ingredients, that is, a determination of each location's susceptibility to degradation and secondly, an independent assessment of the consequence of the piping failure. These two ingredients assure defense in depth is maintained. First, by evaluating a location's susceptibility to degradation, the likelihood of finding flaws or indications that may be precursors to leak or ruptures is increased. Secondly, the consequence assessment effort has a single failure criterion. As such, no matter how unlikely a failure scenario is, it is ranked High in the consequence assessment, and at worst Medium in the risk assessment (i.e., Risk Category 4), if as a result of the failure there is no mitigative equipment available to respond to the event. In addition, the consequence assessment takes into account equipment reliability, and less credit is given to less reliable equipment.

All locations within the reactor coolant pressure boundary will continue to receive a system pressure test and visual VT-2 examination as currently required by the Code regardless of its risk classification.

4. IMPLEMENTATION AND MONITORING PROGRAM

Upon approval of the RI-ISI program, procedures that comply with the guidelines described in EPRI TR-112657 will be prepared to implement and monitor the program. The new program will be integrated into [the second inservice inspection interval for Unit 1, and the first inservice inspection interval for Unit 2]. No changes to the [Final Safety Analysis Report] are necessary for program implementation.

The applicable aspects of the ASME Code not affected by this change would be retained, such as inspection methods, acceptance guidelines, pressure testing, corrective measures, documentation requirements, and quality control requirements. Existing ASME Section XI program implementing procedures will be retained and modified to address the RI-ISI process, as appropriate.

The monitoring and corrective action program will contain the following elements:

A. Identify

B. Characterize

C. (1) Evaluate, determine the cause and extent of the condition identified

(2) Evaluate, develop a corrective action plan or plans

D. Decide

E. Implement

F. Monitor

G. Trend

The RI-ISI program is a living program requiring feedback of new relevant information to ensure the appropriate identification of high safety significant piping locations. As a minimum, risk ranking of piping segments will be reviewed and adjusted on an ASME period basis. In addition, significant changes may require more frequent adjustment as directed by NRC Bulletin or Generic Letter requirements, or by industry and plant specific feedback.

5. PROPOSED ISI PROGRAM PLAN CHANGE

A comparison between the RI-ISI program and ASME Section XI Code program requirements for in-scope piping is provided in Tables [5-1-1 and 5-2-1 for Unit 1 and Tables 5-1-2 and 5-2-2 for Unit 2]. Table[s 5-1-1 and 5-1-2] provide[ ] summary comparisons by risk region. Table[s 5-2-1 and 5-2-2] provide[ ] the same comparison information, but in a more detailed manner by risk category, similar to the format used in Table[s] 3.6-1 [and 3.6-2].

[Unit 1 is currently at the start of the first period of its second inservice inspection interval. As such, 100% of the required RI-ISI program inspections will be completed in the second interval. Examinations shall be performed during the interval such that the period examination percentage requirements of ASME Section XI, paragraphs IWB-2412 and IWC-2412 are met.]

[Unit 2 is currently at the start of the third period of its first inspection interval. Up until this point, 53% of the examinations required by ASME Section XI have been completed for Examination Category B-F, B-J, C-F-1 and C-F-2 piping welds. Beginning in the third period of the first interval, the examinations determined by the RI-ISI process will replace those formerly selected per ASME Section XI criteria. Since 53% of the examinations have been completed during the first two periods of the first interval, 47% of the RI-ISI examinations will be performed during the third period so that 100% of the selected examinations are performed during the course of the interval.]

Subsequent ISI intervals will implement 100% of the examination locations selected per the RI-ISI program. These examinations will be distributed between periods such that the period percentage requirements of ASME Section XI, paragraphs IWB-2412 and IWC-2412 are met.

6. REFERENCES/DOCUMENTATION

EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Rev. B-A.

ASME Code Case N-578, "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1."

Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis."

Regulatory Guide 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking Inservice Inspection of Piping."

Supporting Onsite Documentation

[Letter from Mr. C. L. Terry (TXU) to NRC Document Control Desk, dated February 24, 2000, "Request to Delay the Code of Record (1989 Edition of ASME Code, Section XI, No Addenda; Unit 1 Interval Dates: August 13, 1990 – August 2, 2003, First Interval; Unit 2 Interval Dates: August 3, 1993 – August 2, 2003, First Interval)."]

[Engineering Report ER-EA-012, "Consequence Evaluation of Class 1 and 2 Piping in Support of ASME Code Case N-578," Comanche Peak Steam Electric Station (CPSES), Units 1 and 2, Rev. 0.]

[Engineering Report ER-ME-107, "Degradation Mechanism Evaluation of Class 1 and 2 Piping in Support of ASME Code Case N-578," Rev. 0.]

["CPSES Units 1 and 2 Risk Ranking Summary, Matrix and Report," Rev. 1, dated December 21, 2000.]

[Record of Conversation No. ROC-004, "Minutes of the Element Selection Meeting for the Risk-Informed ISI Project at the Comanche Peak Steam Electric Station," dated August 22, 2000.]

["Risk Impact Analysis for CPSES Units 1 and 2," Rev. 0.

Table 3.1-1 Unit 1 - System Selection and Segment / Element Definition			
System Description	**ASME Code Class**	**Number of Segments**	**Number of Elements**
RCS – Reactor Coolant System	Class 1	96	397
CVCS – Chemical and Volume Control System	Class 1 and 2	30	316
SIS – Safety Injection System	Class 1 and 2	93	1127
RHRS – Residual Heat Removal System	Class 1 and 2	18	266
CSS – Containment Spray System	Class 2	29	422
FWS – Feedwater System	Class 2	28	443
MSS – Main Steam System	Class 2	16	165
Totals		**310**	**3136**

Table 3.1-2
Unit 2 - System Selection and Segment / Element Definition

System Description	ASME Code Class	Number of Segments	Number of Elements
RCS – Reactor Coolant System	Class 1	94	368
CVCS – Chemical and Volume Control System	Class 1 and 2	33	324
SIS – Safety Injection System	Class 1 and 2	109	1126
RHRS – Residual Heat Removal System	Class 1 and 2	20	263
CSS – Containment Spray System	Class 2	30	428
FWS – Feedwater System	Class 2	29	450
MSS – Main Steam System	Class 2	32	167
Totals		**347**	**3126**

Table 3.3-1

Unit 1 - Failure Potential Assessment Summary

System[1]	Thermal Fatigue		Stress Corrosion Cracking				Localized Corrosion			Flow Sensitive	
	TASCS	**TT**	**IGSCC**	**TGSCC**	**ECSCC**	**PWSCC**	**MIC**	**PIT**	**CC**	**E-C**	**FAC**
RCS	X	X									
CVCS		X									
SIS			X								
RHRS											
CSS											
FWS	X										X
MSS											

Note

1. Systems are described in Table 3.1-1.

Table 3.3-2 Unit 2 - Failure Potential Assessment Summary											
System[1]	Thermal Fatigue		Stress Corrosion Cracking				Localized Corrosion			Flow Sensitive	
	TASCS	TT	IGSCC	TGSCC	ECSCC	PWSCC	MIC	PIT	CC	E-C	FAC
RCS	X	X									
CVCS		X									
SIS			X								
RHRS											
CSS											
FWS	X										X
MSS											

Note

1. Systems are described in Table 3.1-2.

Table 3.4-1

Unit 1 - Number of Segments by Risk Category With and Without Impact of FAC

System[1]	High Risk Region						Medium Risk Region				Low Risk Region			
	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Category 7	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
RCS			12	12			35	35	24	24	21	21	4	4
CVCS											25	25	5	5
SIS							10	10	4	4	54	54	25	25
RHRS							17	17			1	1		
CSS							2	2			14	14	13	13
FWS					28[2]	0			0	4	0	24		
MSS											16	16		
Total			12	12	28	0	64	64	28	32	131	155	47	47

Notes

1. Systems are described in Table 3.1-1.
2. Of these 28 segments, 4 segments become Category 5 after FAC is removed from consideration due to the presence of other "medium" failure potential damage mechanisms, and 24 segments becomes Category 6 after FAC is removed from consideration due to no other damage mechanisms being present.

Table 3.4-2

Unit 2 - Number of Segments by Risk Category With and Without Impact of FAC

System[1]	High Risk Region						Medium Risk Region				Low Risk Region			
	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Category 7	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
RCS			12	12			37	37	22	22	18	18	5	5
CVCS									1	1	27	27	5	5
SIS							14	14	4	4	58	58	33	33
RHRS							19	19			1	1		
CSS							2	2			10	10	18	18
FWS					29[2]	0			0	4	0	25		
MSS											32	32		
Total			12	12	29	0	72	72	27	31	146	171	61	61

Notes

1. Systems are described in Table 3.1-2.
2. Of these 29 segments, 4 segments become Category 5 after FAC is removed from consideration due to the presence of other "medium" failure potential damage mechanisms, and 25 segments becomes Category 6 after FAC is removed from consideration due to no other damage mechanisms being present.

Table 3.5-1

Unit 1 - Number of Elements Selected for Inspection by Risk Category Excluding Impact of FAC

System[1]	High Risk Region						Medium Risk Region				Low Risk Region			
	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Category 7	
	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected
RCS			27	7			224	43[2]	70	7	61	0	15	0
CVCS											286	0	30	0
SIS							177	18	12	2	700	0	238	0
RHRS							258	26			8	0		
CSS							10	1			178	0	234	0
FWS									8	1	435	0		
MSS											165	0		
Total	0	0	27	7	0	0	669	88	90	10	1833	0	517	0

Notes

1. Systems are described in Table 3.1-1.
2. 20 of these 43 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 3.5-2

Unit 2 - Number of Elements Selected for Inspection by Risk Category Excluding Impact of FAC

System[(1)]	High Risk Region						Medium Risk Region				Low Risk Region			
	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Category 7	
	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected
RCS			26	9[(2)]			213	40[(3)]	64	7	50	0	15	0
CVCS									1	1	281	0	42	0
SIS							184	18	12	2	700	0	230	0
RHRS							258	26			5	0		
CSS							11	2			178	0	239	0
FWS									8	1	442	0		
MSS											167	0		
Total	0	0	26	9	0	0	666	86	85	11	1823	0	526	0

Notes

1. Systems are described in Table 3.1-2.
2. 2 of these 9 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
3. 18 of these 40 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 3.6-1

Unit 1 - Risk Impact Analysis Results

System[1]	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact[3]		LERF Impact[3]	
			DMs	Rank	Section XI[2]	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
RCS	2	High	TASCS, TT	Medium	5	2	-3	-6.96E-10	3.48E-09	-2.82E-10	1.41E-09
RCS	2	High	TASCS	Medium	1	4	3	-7.66E-09	-3.48E-09	-3.10E-09	-1.41E-09
RCS	2	High	TT	Medium	5	1	-4	1.39E-09	4.64E-09	5.64E-10	1.88E-09
RCS	4	High	None	Low	53	43[4]	-10	5.80E-10	5.80E-10	2.35E-10	2.35E-10
RCS	5	Medium	TASCS	Medium	3	2	-1	-1.80E-11	1.00E-11	-1.80E-12	1.00E-12
RCS	5	Medium	TT	Medium	2	5	3	-7.80E-11	-3.00E-11	-7.80E-12	-3.00E-12
RCS	6	Medium	None	Low	3	0	-3	negligible	negligible	negligible	negligible
RCS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
RCS Total								**-6.48E-09**	**5.20E-09**	**-2.59E-09**	**2.11E-09**
CVCS	6	Medium	None	Low	5	0	-5	negligible	negligible	negligible	negligible
CVCS	6	Low	TT	Medium	0	0	0	no change	no change	no change	no change
CVCS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
CVCS Total								**negligible**	**negligible**	**negligible**	**negligible**
SIS	4	High	None	Low	4	18	14	-8.12E-10	-8.12E-10	-3.29E-10	-3.29E-10
SIS	5	Medium	IGSCC	Medium	4	2	-2	2.00E-11	2.00E-11	2.00E-12	2.00E-12
SIS	6	Medium	None	Low	66	0	-66	negligible	negligible	negligible	negligible
SIS	6	Low	IGSCC	Medium	0	0	0	no change	no change	no change	no change
SIS	7	Low	None	Low	8	0	-8	negligible	negligible	negligible	negligible
SIS Total								**-7.92E-10**	**-7.92E-10**	**-3.27E-10**	**-3.27E-10**
RHRS	4	High	None	Low	25	26	1	-5.80E-11	-5.80E-11	-2.35E-11	-2.35E-11
RHRS	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
RHRS Total								**-5.80E-11**	**-5.80E-11**	**-2.35E-11**	**-2.35E-11**

Table 3.6-1

Unit 1 - Risk Impact Analysis Results

System(1)	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact(3)		LERF Impact(3)	
			DMs	Rank	Section XI(2)	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
CSS	4	High	None	Low	3	1	-2	1.16E-10	1.16E-10	4.70E-11	4.70E-11
CSS	6	Medium	None	Low	13	0	-13	negligible	negligible	negligible	negligible
CSS	7	Low	None	Low	14	0	-14	negligible	negligible	negligible	negligible
CSS Total								**1.16E-10**	**1.16E-10**	**4.70E-11**	**4.70E-11**
FWS	5 (3)	Medium	TASCS, (FAC)	Medium (High)	8	1	-7	3.00E-11	7.00E-11	3.00E-12	7.00E-12
FWS	6 (3)	Medium	None (FAC)	Low (High)	23	0	-23	negligible	negligible	negligible	negligible
FWS Total								**3.00E-11**	**7.00E-11**	**3.00E-12**	**7.00E-12**
MSS	6	Medium	None	Low	14	0	-14	negligible	negligible	negligible	negligible
MSS Total								**negligible**	**negligible**	**negligible**	**negligible**
Grand Total								**-7.18E-09**	**4.54E-09**	**-2.90E-09**	**1.82E-09**

Notes

1. Systems are described in Table 3.1-1.
2. Only those ASME Section XI Code inspection locations that received a volumetric examination in addition to a surface examination are included in this count. Inspection locations previously subjected to a surface examination only are not considered in accordance with Section 3.7.1 of EPRI TR-112657.
3. Per Section 3.7.1 of EPRI TR-112657, the contribution of low risk categories 6 and 7 need not be considered in assessing the change in risk. Hence, the word "negligible" is given in these cases in lieu of values for CDF and LERF Impact. In those cases where no inspections were being performed previously via Section XI, and none are planned for RI-ISI purposes, "no change" is listed instead of "negligible".
4. 20 of these 43 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 3.6-2

Unit 2 - Risk Impact Analysis Results

System[(1)]	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact[(3)]		LERF Impact[(3)]	
			DMs	Rank	Section XI[(2)]	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
RCS	2	High	TASCS, TT	Medium	4	2	-2	-1.39E-09	2.32E-09	-5.64E-10	9.40E-10
RCS	2	High	TASCS	Medium	4	6[(4)]	2	-9.74E-09	-2.32E-09	-3.95E-09	-9.40E-10
RCS	2	High	TT	Medium	5	1	-4	1.39E-09	4.64E-09	5.64E-10	1.88E-09
RCS	4	High	None	Low	61	40[(5)]	-21	1.22E-09	1.22E-09	4.94E-10	4.94E-10
RCS	5	Medium	TASCS	Medium	5	2	-3	-6.00E-12	3.00E-11	-6.00E-13	3.00E-12
RCS	5	Medium	TT	Medium	2	5	3	-7.80E-11	-3.00E-11	-7.80E-12	-3.00E-12
RCS	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
RCS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
RCS Total								**-8.61E-09**	**5.86E-09**	**-3.46E-09**	**2.37E-09**
CVCS	5	Medium	TT	Medium	0	1	1	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
CVCS	6	Medium	None	Low	5	0	-5	negligible	negligible	negligible	negligible
CVCS	6	Low	TT	Medium	0	0	0	no change	no change	no change	no change
CVCS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
CVCS Total								**-1.80E-11**	**-1.00E-11**	**-1.80E-12**	**-1.00E-12**
SIS	4	High	None	Low	10	18	8	-4.64E-10	-4.64E-10	-1.88E-10	-1.88E-10
SIS	5	Medium	IGSCC	Medium	4	2	-2	2.00E-11	2.00E-11	2.00E-12	2.00E-12
SIS	6	Medium	None	Low	43	0	-43	negligible	negligible	negligible	negligible
SIS	6	Low	IGSCC	Medium	2	0	-2	negligible	negligible	negligible	negligible
SIS	7	Low	None	Low	6	0	-6	negligible	negligible	negligible	negligible
SIS Total								**-4.44E-10**	**-4.44E-10**	**-1.86E-10**	**-1.86E-10**
RHRS	4	High	None	Low	17	26	9	-5.22E-10	-5.22E-10	-2.12E-10	-2.12E-10
RHRS	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
RHRS Total								**-5.22E-10**	**-5.22E-10**	**-2.12E-10**	**-2.12E-10**

Table 3.6-2
Unit 2 - Risk Impact Analysis Results

System(1)	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact(3)		LERF Impact(3)	
			DMs	Rank	Section XI(2)	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
CSS	4	High	None	Low	0	2	2	-1.16E-10	-1.16E-10	-4.70E-11	-4.70E-11
CSS	6	Medium	None	Low	4	0	-4	negligible	negligible	negligible	negligible
CSS	7	Low	None	Low	16	0	-16	negligible	negligible	negligible	negligible
CSS Total								**-1.16E-10**	**-1.16E-10**	**-4.70E-11**	**-4.70E-11**
FWS	5 (3)	Medium	TASCS, (FAC)	Medium (High)	0	1	1	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
FWS	6 (3)	Medium	None (FAC)	Low (High)	6	0	-6	negligible	negligible	negligible	negligible
FWS Total								**-1.80E-11**	**-1.00E-11**	**-1.80E-12**	**-1.00E-12**
MSS	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
MSS Total								**no change**	**no change**	**no change**	**no change**
Grand Total								**-9.73E-09**	**4.76E-09**	**-3.91E-09**	**1.93E-09**

Notes

1. Systems are described in Table 3.1-2.
2. Only those ASME Section XI Code inspection locations that received a volumetric examination in addition to a surface examination are included in this count. Inspection locations previously subjected to a surface examination only are not considered in accordance with Section 3.7.1 of EPRI TR-112657.
3. Per Section 3.7.1 of EPRI TR-112657, the contribution of low risk categories 6 and 7 need not be considered in assessing the change in risk. Hence, the word "negligible" is given in these cases in lieu of values for CDF and LERF Impact. In those cases where no inspections were being performed previously via Section XI, and none are planned for RI-ISI purposes, "no change" is listed instead of "negligible".
4. 2 of these 6 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
5. 18 of these 40 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 5-1-1

Unit 1 - Inspection Location Selection Comparison Between ASME Section XI Code and EPRI TR-112657 by Risk Region

System[1]	Code Category[2]	High Risk Region					Medium Risk Region					Low Risk Region				
		Weld Count	1986 Section XI		EPRI TR-112657		Weld Count	1986 Section XI		EPRI TR-112657		Weld Count	1986 Section XI		EPRI TR-112657	
			Vol/Sur	Sur Only	RI-ISI	Other[3]		Vol/Sur	Sur Only	RI-ISI	Other[3]		Vol/Sur	Sur Only	RI-ISI	Other[3]
RCS	B-F	1	1	0	0		19	19	0	14[4]						
	B-J	26	10	0	7		275	39	48	36[5]		76	3	7	0	
CVCS	B-J											85	0	15	0	
	C-F-1											231	5	3	0	
SIS	B-J						91	4	19	9		236	25	45	0	
	C-F-1						98	4	0	11		702	49	7	0	
RHRS	B-J						12	5	0	2						
	C-F-1						246	20	0	24		8	0	0	0	
CSS	C-F-1						10	3	0	1		412	27	0	0	
FWS	C-F-2						8	8	0	1		435	23	6	0	
MSS	C-F-2											165	14	2	0	
Total	B-F	1	1	0	0		19	19	0	14						
	B-J	26	10	0	7		378	48	67	47		397	28	67	0	
	C-F-1						354	27	0	36		1353	81	10	0	
	C-F-2						8	8	0	1		600	37	8	0	

Notes

1. Systems are described in Table 3.1-1.
2. The ASME Code Category is based on the 1986 Edition of the ASME Section XI Code.
3. The column labeled "Other" is generally used to identify augmented inspection program locations that are credited beyond those locations selected per the RI-ISI process, as addressed in Section 3.6.5 of EPRI TR-112657. This option was not applicable for the CPSES RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
4. 7 of these 14 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
5. 13 of these 36 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 5-1-2

Unit 2 - Inspection Location Selection Comparison Between ASME Section XI Code and EPRI TR-112657 by Risk Region

System[1]	Code Category[2]	High Risk Region					Medium Risk Region					Low Risk Region				
		Weld Count	1986 Section XI		EPRI TR-112657		Weld Count	1986 Section XI		EPRI TR-112657		Weld Count	1986 Section XI		EPRI TR-112657	
			Vol/Sur	Sur Only	RI-ISI	Other[3]		Vol/Sur	Sur Only	RI-ISI	Other[3]		Vol/Sur	Sur Only	RI-ISI	Other[3]
RCS	B-F	1	1	0	0		20	20	0	14[4]						
	B-J	25	12	0	9[5]		257	48	40	33[6]		65	0	8	0	
CVCS	B-J						1	0	1	1		110	5	24	0	
	C-F-1											213	0	2	0	
SIS	B-J						97	4	0	9		228	18	39	0	
	C-F-1						99	10	0	11		702	33	3	0	
RHRS	B-J						12	2	0	1						
	C-F-1						246	15	0	25		5	0	0	0	
CSS	C-F-1						11	0	0	2		417	20	0	0	
FWS	C-F-2						8	0	8	1		442	6	21	0	
MSS	C-F-2											167	0	13	0	
Total	B-F	1	1	0	0		20	20	0	14						
	B-J	25	12	0	9		367	54	41	44		403	23	71	0	
	C-F-1						356	25	0	38		1337	53	5	0	
	C-F-2						8	0	8	1		609	6	34	0	

Notes

1. Systems are described in Table 3.1-2.
2. The ASME Code Category is based on the 1986 Edition of the ASME Section XI Code.
3. The column labeled "Other" is generally used to identify augmented inspection program locations that are credited beyond those locations selected per the RI-ISI process, as addressed in Section 3.6.5 of EPRI TR-112657. This option was not applicable for the CPSES RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
4. 7 of these 14 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
5. 2 of these 9 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
6. 11 of these 33 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 5-2-1

Unit 1 - Inspection Location Selection Comparison Between ASME Section XI Code and EPRI TR-112657 by Risk Category

System[(1)]	Risk		Consequence Rank	Failure Potential		Code Category	Weld Count	1986 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other[(2)]
RCS	2	High	High	TASCS, TT	Medium	B-J	7	5	0	2	
RCS	2	High	High	TASCS	Medium	B-J	13	1	0	4	
RCS	2	High	High	TT	Medium	B-F	1	1	0	0	
						B-J	6	4	0	1	
RCS	4	Medium	High	None	Low	B-F	19	19	0	14[(3)]	
						B-J	205	34	4	29[(4)]	
RCS	5	Medium	Medium	TASCS	Medium	B-J	20	3	9	2	
RCS	5	Medium	Medium	TT	Medium	B-J	50	2	35	5	
RCS	6	Low	Medium	None	Low	B-J	61	3	7	0	
RCS	7	Low	Low	None	Low	B-J	15	0	0	0	
CVCS	6	Low	Medium	None	Low	B-J	47	0	5	0	
						C-F-1	231	5	3	0	
CVCS	6	Low	Low	TT	Medium	B-J	8	0	7	0	
CVCS	7	Low	Low	None	Low	B-J	30	0	3	0	
SIS	4	Medium	High	None	Low	B-J	79	0	19	7	
						C-F-1	98	4	0	11	
SIS	5	Medium	Medium	IGSCC	Medium	B-J	12	4	0	2	
SIS	6	Low	Medium	None	Low	B-J	82	19	23	0	
						C-F-1	596	47	4	0	
SIS	6	Low	Low	IGSCC	Medium	B-J	22	0	0	0	
SIS	7	Low	Low	None	Low	B-J	132	6	22	0	
						C-F-1	106	2	3	0	

Table 5-2-1

Unit 1 - Inspection Location Selection Comparison Between ASME Section XI Code and EPRI TR-112657 by Risk Category

System[1]	Risk		Consequence Rank	Failure Potential		Code Category	Weld Count	1986 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other[2]
RHRS	4	Medium	High	None	Low	B-J	12	5	0	2	
						C-F-1	246	20	0	24	
RHRS	6	Low	Medium	None	Low	C-F-1	8	0	0	0	
CSS	4	Medium	High	None	Low	C-F-1	10	3	0	1	
CSS	6	Low	Medium	None	Low	C-F-1	178	13	0	0	
CSS	7	Low	Low	None	Low	C-F-1	234	14	0	0	
FWS	5 (3)	Medium (High)	Medium	TASCS, (FAC)	Medium (High)	C-F-2	8	8	0	1	
FWS	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	C-F-2	435	23	6	0	
MSS	6	Low	Medium	None	Low	C-F-2	165	14	2	0	

Notes

1. Systems are described in Table 3.1-1.
2. The column labeled "Other" is generally used to identify augmented inspection program locations that are credited beyond those locations selected per the RI-ISI process, as addressed in Section 3.6.5 of EPRI TR-112657. This option was not applicable for the CPSES RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
3. 7 of these 14 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
4. 13 of these 29 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Table 5-2-2

Unit 2 - Inspection Location Selection Comparison Between ASME Section XI Code and EPRI TR-112657 by Risk Category

System[1]	Risk		Consequence Rank	Failure Potential		Code Category	Weld Count	1986 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other[2]
RCS	2	High	High	TASCS, TT	Medium	B-J	6	4	0	2	
RCS	2	High	High	TASCS	Medium	B-J	13	4	0	6[3]	
RCS	2	High	High	TT	Medium	B-F	1	1	0	0	
						B-J	6	4	0	1	
RCS	4	Medium	High	None	Low	B-F	20	20	0	14[4]	
						B-J	193	41	0	26[5]	
RCS	5	Medium	Medium	TASCS	Medium	B-J	19	5	10	2	
RCS	5	Medium	Medium	TT	Medium	B-J	45	2	30	5	
RCS	6	Low	Medium	None	Low	B-J	50	0	8	0	
RCS	7	Low	Low	None	Low	B-J	15	0	0	0	
CVCS	5	Medium	Medium	TT	Medium	B-J	1	0	1	1	
CVCS	6	Low	Medium	None	Low	B-J	60	0	16	0	
						C-F-1	213	5	2	0	
CVCS	6	Low	Low	TT	Medium	B-J	8	0	8	0	
CVCS	7	Low	Low	None	Low	B-J	42	0	0	0	
SIS	4	Medium	High	None	Low	B-J	85	0	0	7	
						C-F-1	99	10	0	11	
SIS	5	Medium	Medium	IGSCC	Medium	B-J	12	4	0	2	
SIS	6	Low	Medium	None	Low	B-J	82	14	23	0	
						C-F-1	598	29	3	0	
SIS	6	Low	Low	IGSCC	Medium	B-J	20	2	0	0	
SIS	7	Low	Low	None	Low	B-J	126	2	16	0	
						C-F-1	104	4	0	0	

Table 5-2-2

Unit 2 - Inspection Location Selection Comparison Between ASME Section XI Code and EPRI TR-112657 by Risk Category

System[1]	Risk		Consequence Rank	Failure Potential		Code Category	Weld Count	1986 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other[2]
RHRS	4	Medium	High	None	Low	B-J	12	2	0	1	
						C-F-1	246	15	0	25	
RHRS	6	Low	Medium	None	Low	C-F-1	5	0	0	0	
CSS	4	Medium	High	None	Low	C-F-1	11	0	0	2	
CSS	6	Low	Medium	None	Low	C-F-1	178	4	0	0	
CSS	7	Low	Low	None	Low	C-F-1	239	16	0	0	
FWS	5 (3)	Medium (High)	Medium	TASCS, (FAC)	Medium (High)	C-F-2	8	0	8	1	
FWS	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	C-F-2	442	6	21	0	
MSS	6	Low	Medium	None	Low	C-F-2	167	0	13	0	

Notes

1. Systems are described in Table 3.1-2.
2. The column labeled "Other" is generally used to identify augmented inspection program locations that are credited beyond those locations selected per the RI-ISI process, as addressed in Section 3.6.5 of EPRI TR-112657. This option was not applicable for the CPSES RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
3. 2 of these 6 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
4. 7 of these 14 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.
5. 11 of these 26 welds were added to address the Class 1 selection percentage criteria described in Section 3.6.4.2 of EPRI TR-112657. See Section 3.5 of this submittal for details.

Description of Difference Methodology

1. As discussed in the cover letter, the STARS group developed their respective risk-informed inservice inspection (RI-ISI) program plans (referred to as templates from here on) collaboratively (see Note 5).

2. The templates are similar; where there are differences; the difference will be bracketed []. Plant/Licensee names will not be bracketed to ease readability of the template.

3. Information contained in tables and notes is plant specific and will not be bracketed.

4. To allow for comparison of the templates, below is a table correlating plant specific system nomenclature.

	CPSES	**STP**	**Callaway**	**WCGS**	**DCPP**
Reactor Coolant System	RCS	RCS	BB	BB	RCS
Chemical and Volume Control System	CVCS	CVCS	BG, BN	BG, BN	CVCS
Safety Injection System	SIS	SIS	EM, EP	EM, EP	SIS
Residual Heat Removal System	RHRS	RHRS	EJ	EJ	RHRS
Feedwater System	FWS	FW & AFW	AE	AE	FWS
Main Steam System	MSS	MSS	AB	AB	MSS
Containment Spray System	CSS	CSS	EN	EN	CSS
Sludge Lancing System	--	SLS	--	--	--
Essential Service Water System	--	--	EF	EF	--
Containment Hydrogen Control System	--	--	--	GS	--

5. STP Nuclear Operating Company has an approved ASME Code Class 1 RI-ISI program plan. The STP Nuclear Operating Company application is for ASME Code Class 1 piping sock-o-let welds and class 2 piping welds.

Description of Difference Methodology (continued)

6. The following is a discussion on the process used to develop the template.

   The STARS group contracted with Structural Integrity Associates (SIA) to support the development of the RI-ISI templates. SIA was selected based on their previous work in developing the STP Nuclear Operating Company ASME Code Class 1 template and their team of subcontractors. SIA had teamed with Inservice Engineering and Duke Engineering Services Inc. (DESI). Both subcontractors have experience in developing RI-ISI program plans.

   In order to facilitate technology transfer, the STARS group developed the Degradation Mechanism Evaluation and the Consequence Evaluation. The contractor team provided training, oversight, and technical support in the development of the evaluations.

   In order to maximize the synergies of these common plants, technical representatives from each of the plants met for 3 weeks at CPSES to develop these evaluations. The Inservice Inspection engineers from each plant met together and developed the plant specific Degradation Mechanism Evaluation. This effort was lead by SIA. Each plants drawings, history, and the entire team reviewed other applicable data. Commonalties and differences were discussed; technical issues were resolved and each pipe segment for each plant was subsequently evaluated for potential degradation mechanisms.

   Likewise, probabilistic risk assessment (PRA) engineers from each plant met together and developed their plant specific Consequence Evaluation. This effort was lead by DESI. Again, engineers had their plant specific information, which was reviewed by the entire team. Commonalties and differences were discussed; technical issues were resolved and each event was evaluated for potential consequences.

   Inservice Engineering then combined the work of the two groups to develop the template and perform the delta risk calculation.

– DRAFT –

Richard A. Muench
Vice President Engineering & Information Services

ET 01-0009

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Washington, D. C. 20555

Subject: Docket No. 50-482: Relief Request for Application of an Alternative to the ASME Boiler and Pressure Vessel Code Section XI Examination Requirements for Class 1 and 2 Piping Welds

Gentlemen:

In accordance with the provisions of 10 CFR 50.55a(a)(3)(i), Wolf Creek Nuclear Operating Corporation (WCNOC) requests relief from the ASME Section XI code examination requirements for inservice inspection of Class 1 and 2 piping welds (Categories B-F, B-J, C-F-1, and C-F-2). The proposed alternative, as described in Attachment 1, "Risk-Informed Inservice Inspection Program Plan – Wolf Creek Generating Station," provides an acceptable level of quality and safety as required by 10 CFR 50.55a(a)(3)(i).

The WCGS risk-informed inservice inspection (RI-ISI) program plan has been developed in accordance with the methodology provided in Electric Power Research Institute (EPRI) Topical Report TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Revision B-A. EPRI TR-112657, Revision B, has been reviewed and accepted by the Nuclear Regulatory Commission (NRC). The NRC Staff has found that TR-112657, Revision B, is acceptable for referencing in licensing applications to the extent specified and under the limitations delineated in the report and the NRC Safety Evaluation Report, dated October 28, 1999.

The format of the WCGS RI-ISI program plan is consistent with the Nuclear Energy Institute (NEI)/industry template developed for applications of the EPRI RI-ISI methodology. Additional supporting documentation is available at the WCGS site for your review.

The WCGS RI-ISI program plan was developed in conjunction with RI-ISI program plans for the plants operated by Pacific Gas and Electric Company, AmerenUE, TXU Electric, and STP Nuclear Operating Company. WCGS and these other plants make up an industry consortium of five plants as a result of a mutual agreement known as Strategic Teaming and Resource Sharing (STARS). The other members of the STARS group can also be expected to submit similar plant-specific relief requests. These additional relief requests will be submitted in parallel with this application, in order to reduce the amount of NRC resources required to review and approve the STARS applications. Attachment 2 describes the methodology for identifying differences in the STARS RI-ISI applications to assist in the review of the applications.

The recent event at the V.C. Summer facility in which through-wall cracking was discovered in a 34-inch main loop hot leg reactor pressure vessel nozzle has led to an extensive industry effort to determine generic implications and appropriate corrective actions. As discussed in the Nuclear Energy Institute (NEI) letter from David Modeen to Dr. Brian Sheron dated December 14, 2000, the EPRI Materials Reliability Project will lead the industry effort to address the generic implications of the V.C. Summer event. WCNOC will closely monitor the progress of and will assess the recommendations for applicability.

Attachment 3 provides a summary of regulatory commitments made in this submittal.

WCNOC requests NRC approval of this relief request by August 2001 to support the WCGS refueling outage (RF-12), which is currently scheduled to begin in March 2002. WCGS intends to incorporate this risk-informed approach for Class 1 and 2 piping weld inspection into the second interval WCGS Inservice Inspection Program Plan which began in September 1995, and is in effect until September 2005.

Very truly yours,

Richard A. Muench

RAM/rlr
Attachments

cc: J. N. Donohew (NRC), w/a
W. D. Johnson (NRC), w/a
E. W. Merschoff (NRC), w/a
Senior Resident Inspector (NRC), w/a

RISK-INFORMED INSERVICE INSPECTION PROGRAM PLAN

WOLF CREEK GENERATING STATION

Table of Contents

1. INTRODUCTION

[The Wolf Creek Generating Station (WCGS) is currently in the secondinservice inspection (ISI) interval as defined by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Section XI Code for Program B. Pursuant to 10 CFR 50.55a(g)(4)(ii), the applicable ASME Section XI Code for the WCGS is the 1989 Edition, no Addenda.]

The objective of this submittal is to request a change to the ISI Program for Class [1 and 2] piping through the use of a risk-informed inservice inspection (RI-ISI) program. The RI-ISI process used in this submittal is described in Electric Power Research Institute (EPRI) Topical Report (TR) 112657, Rev. B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure." The RI-ISI application was also conducted in a manner consistent with ASME Code Case N-578, "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B."

1.1 Relation to NRC Regulatory Guides 1.174 and 1.178

As a risk-informed application, this submittal meets the intent and principles of Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," and Regulatory Guide 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking Inservice Inspection of Piping." Further information is provided in Section 3.6.2 relative to defense-in-depth.

1.2 PSA Quality

[The Wolf Creek probabilistic risk assessment (PRA) model used to evaluate the consequences of pipe rupture for the RI-ISI assessment was the most current PRA model update. The Wolf Creek PRA was originally developed to satisfy the requirement of NRC Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," that each licensee perform an Individual Plant Examination (IPE) to search for plant specific severe accident vulnerabilities. The results of the Wolf Creek PRA were submitted to the NRC, pursuant to this requirement, on September 28, 1992. The NRC issued a Safety Evaluation Report (SER) on the Wolf Creek IPE Submittal on November 18, 1996. The SER on the IPE concluded that the Wolf Creek PRA has met the intent of Generic Letter 88-20. Since completion of the Wolf Creek IPE, the PRA model has been used to support various plant programs. These include the Maintenance Rule program and Safety Monitor™ development.]

[The following Wolf Creek PRA results for at power plant operation were obtained from the updated model:

- Core Damage Frequency (CDF) = 5.5E-05 per year (excludes internal floods).
- Large Early Release Frequency (LERF) = 8.3E-07 per year.]

[This LERF value is dominated by Steam Generator Tube Rupture and Interfacing Systems Loss of Coolant Accident (LOCA) initiating events.]

[In August 2000, the Wolf Creek PRA went through the Westinghouse Owner's Group Peer Review process. The overall preliminary assessment concluded the following:

- Risk significance determinations made by PRA are adequate to support regulatory applications when combined with deterministic insights.
- PRA results can support physical plant changes when it is used in conjunction with other deterministic approach.
- PRA results can be used in licensing submittals to the NRC to support position regarding absolute level of safety significance if supported by deterministic evaluations.]

[In order to continue to use the PRA model as a tool to support plant programs, periodic update of the model is necessary. The most recent update of the Wolf Creek PRA was completed in August of 1999, with a freeze date of January 1998. This update included numerous changes to the PRA model to reflect plant modifications, changes to plant specific and generic initiating event frequencies, import of initiating event frequencies for special initiators as fault tree solution files, changes to plant specific component failure rates and test and maintenance unavailability data, and expansion of the modeling scope for a number of systems previously modeled as single failure events.]

2. PROPOSED ALTERNATIVE TO CURRENT ISI PROGRAM REQUIREMENTS

2.1 ASME Section XI

ASME Section XI Examination Categories B-F, B-J, C-F-1 and C-F-2 currently contain the requirements for the nondestructive examination (NDE) of Class 1 and 2 piping components. The alternative RI-ISI program for piping is described in EPRI TR-112657. The RI-ISI program will be substituted for the currently approved program for Class 1 and 2 piping (Examination Categories B-F, B-J, C-F-1 and C-F-2) in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected. EPRI TR-112657 provides the requirements for defining the relationship between the RI-ISI program and the remaining unaffected portions of ASME Section XI.

2.2 Augmented Programs

The following augmented inspection programs were considered during the RI-ISI application:

- The augmented inspection program for flow accelerated corrosion (FAC) per Generic Letter 89-08, "Erosion/Corrosion - Induced Pipe Wall Thinning," is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RI-ISI program.

- [ ]

- [Examinations on Main Steam and Feedwater system piping, defined as "No Break Zone" piping in Section 3.6.2 of the Updated Safety Analysis Report (USAR), shall be performed in accordance with NUREG-0800, Standard Review Plan (SRP) 3.6.2, "Determination of Break Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," and SRP 6.6, "Inservice Inspection of Class 2 and 3 Components." The augmented inspection program for high energy "No Break Zone" piping is not affected by this RI-ISI program.]

3. RISK-INFORMED ISI PROCESS

The process used to develop the RI-ISI program conformed to the methodology described in EPRI TR-112657 and consisted of the following steps:

- Scope Definition
- Consequence Evaluation
- Failure Potential Assessment
- Risk Characterization
- Element and NDE Selection
- Risk Impact Assessment
- Implementation Program
- Feedback Loop

A deviation to the EPRI RI-ISI methodology has been implemented in the failure potential assessment for WCGS. Table 3-16 of EPRI TR-112657 contains criteria for assessing the potential for thermal stratification, cycling and striping (TASCS). Key attributes for horizontal or slightly sloped piping greater than 1" nominal pipe size (NPS) include:

1. Potential exists for low flow in a pipe section connected to a component allowing mixing of hot and cold fluids, or
2. Potential exists for leakage flow past a valve, including in-leakage, out-leakage and cross-leakage allowing mixing of hot and cold fluids, or
3. Potential exists for convective heating in dead-ended pipe sections connected to a source of hot fluid, or
4. Potential exists for two phase (steam/water) flow, or

5. Potential exists for turbulent penetration into a relatively colder branch pipe connected to header piping containing hot fluid with turbulent flow,

   AND

   $\Delta T > 50°F$,

   AND

   Richardson Number > 4 (This value predicts the potential buoyancy of stratified flow.)

These criteria, based on meeting a high cycle fatigue endurance limit with the actual ΔT assumed equal to the greatest potential ΔT for the transient, will identify all locations where stratification is likely to occur, but allows for no assessment of severity. As such, many locations will be identified as subject to TASCS where no significant potential for thermal fatigue exists. The critical attribute missing from the existing methodology that would allow consideration of fatigue severity is a criterion that addresses the potential for fluid cycling. The impact of this additional consideration on the existing TASCS criteria is presented below.

➢ **Turbulent penetration TASCS**

Turbulent penetration typically occurs in lines connected to piping containing hot flowing fluid. In the case of downward facing lines, significant top-to-bottomΔTs can develop in horizontal sections within about 25 pipe diameters, and the conditions can potentially be cyclic. For an upward or horizontal facing branch line connected to the hot fluid source, natural convective effects will fill the line with hot water. In the absence of in-leakage towards the hot fluid source, this will result in a well-mixed fluid condition where significant top-to-bottom ΔTs will not occur. Even in fairly long lines, where some heat loss from the outside of the piping will tend to occur and some fluid stratification may be present, there is no significant potential for cycling. The effect of TASCS will not be significant under these conditions and can be neglected.

➢ **Low flow TASCS**

In some situations, the transient startup of a system (e.g., Residual Heat Removal suction piping) creates the potential for fluid stratification as flow is established. In cases where no cold fluid source exists, the hot flowing fluid will fairly rapidly displace the cold fluid in stagnant lines, while fluid mixing will occur in the piping further removed from the hot source and stratified conditions will exist only briefly as the line fills with hot fluid. As such, since the situation is transient in nature, it can be assumed that the criteria for thermal transients (TT) will govern.

- **Valve leakage TASCS**

  Sometimes a very small leakage flow can occur outward past a valve into a line with a significant temperature difference. However, since this is a generally a "steady-state" phenomenon with no potential for cyclic temperature changes, the effect of TASCS is not significant and can be neglected.

- **Convection heating TASCS**

  Similarly, there sometimes exists the potential for heat transfer across a valve to an isolated section beyond the valve, resulting in fluid stratification due to natural convection. However, since there is no potential for cyclic temperature changes in this case, the effect of TASCS is not significant and can be neglected.

These additional considerations for determining the potential for thermal fatigue as a result of the effects of TASCS were applied in the failure potential assessment for WCGS. This constitutes a deviation to the requirements of EPRI TR-112657 since the methodology does not presently provide any allowance for the consideration of cycle severity in assessing the potential for TASCS effects. For the reasons discussed above, this approach is considered technically justifiable. Furthermore, EPRI concurs with this position and intends to address this issue in a future revision to the methodology.

3.1 Scope of Program

The systems included in the RI-ISI program are provided in Table[ ] 3.1-1 [ ]. The piping and instrumentation diagrams and additional plant information including the existing plant ISI program were used to define the Class [1 and 2] piping system boundaries.

3.2 Consequence Evaluation

The consequence(s) of pressure boundary failures were evaluated and ranked based on their impact on core damage and containment performance (isolation, bypass and large, early release). The impact on these measures due to both direct and indirect effects was considered using the guidance provided in EPRI TR-112657.

3.3 Failure Potential Assessment

Failure potential estimates were generated utilizing industry failure history, plant specific failure history and other relevant information. These failure estimates were determined using the guidance provided in EPRI TR-112657.

Table[ ] 3.3-1 [ ] summarizes the failure potential assessment by system for each degradation mechanism that was identified as potentially operative. [ ]

3.4 Risk Characterization

In the preceding steps, each run of piping within the scope of the program was evaluated to determine its impact on core damage and containment performance (isolation, bypass and large, early release) as well as its potential for failure. Given the results of these steps, piping segments are then defined as continuous runs of piping potentially susceptible to the same type(s) of degradation and whose failure will result in similar consequence(s). Segments are then ranked based upon their risk significance as defined in EPRI TR-112657.

The results of these calculations are presented in Table[ ] 3.4-1 [ ].

3.5 Element and NDE Selection

In general, EPRI TR-112657 requires that 25% of the locations in the high risk region and 10% of the locations in the medium risk region be selected for inspection using appropriate NDE methods tailored to the applicable degradation mechanism. In addition, per Section 3.6.4.2 of EPRI TR-112657, if the percentage of Class 1 piping locations selected for examination falls substantially below 10%, then the basis for selection needs to be investigated. [For WCGS, the percentage of Class 1 welds selected for examination per the RI-ISI process is 8.8%, which is not a significant departure from 10%.]

A brief summary is provided below, and the results of the selection process are presented in Table[ ] 3.5-1 [ ]. It should be noted that no credit was taken for any FAC or existing high energy "No Break Zone" piping augmented inspection program locations in meeting the sampling percentage requirements. Section 4 of EPRI TR-112657 was used as guidance in determining the examination requirements for these locations.

Unit	Class 1 Piping Welds(1)		Class 2 Piping Welds(2)		All Piping Welds(3)	
	Total	Selected	Total	Selected	Total	Selected
1	705	62	1384	58	2089	120

Notes

1. Includes all Category B-F and B-J locations.
2. Includes all Category C-F-1 and C-F-2 locations.
3. All in-scope piping components, regardless of risk classification, will continue to receive Code required pressure testing, as part of the current ASME Section XI program. VT-2 visual examinations are scheduled in accordance with the station's pressure test program that remains unaffected by the RI-ISI program.

3.5.1 Additional Examinations

The RI-ISI program in all cases will determine through an engineering evaluation the root cause of any unacceptable flaw or relevant condition found during examination. The evaluation will include the applicable service conditions and degradation mechanisms to establish that the element(s) will still perform their intended safety function during subsequent operation. Elements not meeting this requirement will be repaired or replaced.

The evaluation will include whether other elements in the segment or segments are subject to the same root cause conditions. Additional examinations will be performed on these elements up to a number equivalent to the number of elements required to be inspected on the segment or segments initially. If unacceptable flaws or relevant conditions are again found similar to the initial problem, the remaining elements identified as susceptible will be examined. No additional examinations will be performed if there are no additional elements identified as being susceptible to the same root cause conditions.

3.5.2 Program Relief Requests

An attempt has been made to select RI-ISI locations for examination such that a minimum of >90% coverage (i.e., Code Case N-460 criteria) is attainable. However, some limitations will not be known until the examination is performed, since some locations may be examined for the first time by the specified techniques.

At this time, all the RI-ISI examination locations that have been selected provide >90% coverage. In instances where locations may be found at the time of the examination that do not meet the >90% coverage requirement, the process outlined in EPRI TR-112657 will be followed.

[None of the existing WCGS relief requests are being withdrawn due to the RI-ISI application.]

3.6 Risk Impact Assessment

The RI-ISI program has been conducted in accordance with Regulatory Guide 1.174 and the requirements of EPRI TR-112657, and the risk from implementation of this program is expected to remain neutral or decrease when compared to that estimated from current requirements.

This evaluation identified the allocation of segments into High, Medium, and Low risk regions of the EPRI TR-112657 and ASME Code Case N-578 risk ranking matrix, and then determined for each of these risk classes what inspection changes are proposed for each of the locations in each segment. The changes include changing the number and location of inspections within the segment and in many cases improving the effectiveness of the inspection to account for the findings of the RI-ISI degradation mechanism assessment. For example, for locations subject to thermal fatigue, examinations will be conducted on an expanded volume and will be focused to enhance the probability of detection (POD) during the inspection process.

3.6.1 Quantitative Analysis

Limits are imposed by the EPRI methodology to ensure that the change in risk of implementing the RI-ISI program meets the requirements of Regulatory Guides 1.174 and 1.178. The EPRI criterion requires that the cumulative change in CDF and LERF be less than 1E-07 and 1E-08 per year per system, respectively.

Wolf Creek Nuclear Operating Corporation (WCNOC) conducted a risk impact analysis per the requirements of Section 3.7 of EPRI TR-112657. The analysis estimates the net change in risk due to the positive and negative influence of adding and removing locations from the inspection program. A risk quantification was performed using the "Simplified Risk Quantification Method" described in Section 3.7 of EPRI TR-112657. The conditional core damage probability (CCDP) and conditional large early release probability (CLERP) used for high consequence category segments was based on the highest evaluated CCDP [(1.03E-02)] and CLERP [(6.07E-04)], whereas, for medium consequence category segments, bounding estimates of CCDP (1E-04) and CLERP (1E-05) were used. The likelihood of pressure boundary failure (PBF) is determined by the presence of different degradation mechanisms and the rank is based on the relative failure probability. The basic likelihood of PBF for a piping location with no degradation mechanism present is given as x_o and is expected to have a value less than 1E-08. Piping locations identified as medium failure potential have a likelihood of $20x_o$. These PBF likelihoods are consistent with References 9 and 14 of EPRI TR-112657. In addition, the analysis was performed both with and without taking credit for enhanced inspection effectiveness due to an increased POD from application of the RI-ISI approach.

Table[ ] 3.6-1 [ ] presents a summary of the RI-ISI program versus [1989] ASME Section XI Code Edition program requirements and identifies on a per system basis each applicable risk category [ ]. The presence of FAC was adjusted for in the performance of the quantitative analysis by excluding its impact on the risk ranking. However, in an effort to be as informative as possible, for those systems where FAC is present, the information in Table 3.6-1 is presented in such a manner as to depict what the resultant risk categorization is both with and without consideration of FAC. This is accomplished by enclosing the FAC damage mechanism, as well as all other resultant corresponding changes (failure potential rank, risk category and risk rank), in parenthesis. Again, this has only been done for information purposes, and has no impact on the assessment itself. The use of this approach to depict the impact of degradation mechanisms managed by augmented inspection programs on the risk categorization is consistent with that used in the delta risk assessment for the Arkansas Nuclear One, Unit 2 (ANO-2) pilot application. An example is provided below.

System	Risk		Consequence Rank	Failure Potential	
	Category	Rank(1)		DMs	Rank
AE	5 (3)	Medium (High)	Medium	TASCS, TT, (FAC)	Medium (High)

In this example if FAC is not considered, the failure potential rank is "medium" instead of "high" based on the TASCS and TT damage mechanisms. When a "medium" failure potential rank is combined with a "medium" consequence rank, it results in risk category 5 ("medium" risk) being assigned instead of risk category 3 ("high" risk).

In this example if FAC were considered, the failure potential rank would be "high" instead of "medium". If a "high" failure potential rank were combined with a "medium" consequence rank, it would result in risk category 3 ("high" risk) being assigned instead of risk category 5 ("medium" risk).

Note

1. The risk rank is not included in Table 3.6-1 but it is included in Table 5-2.

As indicated below, this evaluation has demonstrated that unacceptable risk impacts will not occur from implementation of the RI-ISI program, and satisfies the acceptance criteria of Regulatory Guide 1.174 and EPRI TR-112657.

System(1)	ΔRisk$_{CDF}$		ΔRisk$_{LERF}$	
	w/ POD	w/o POD	w/ POD	w/o POD
AB	negligible	negligible	negligible	negligible
AE	-3.00E-11	-1.00E-11	-3.00E-12	-1.00E-12
BB	-1.36E-08	-8.24E-10	-8.01E-10	-4.86E-11
BG	-9.56E-09	-5.43E-09	-5.65E-10	-3.21E-10
BN	negligible	negligible	negligible	negligible
EF	negligible	negligible	negligible	negligible
EJ	-7.67E-09	1.55E-10	-4.52E-10	9.10E-12
EM	4.15E-11	4.15E-11	2.04E-12	2.04E-12
EN	negligible	negligible	negligible	negligible
EP	3.19E-10	3.19E-10	1.92E-11	1.92E-11
GS	no change	no change	no change	no change
Total	**-3.05E-08**	**-5.75E-09**	**-1.80E-09**	**-3.40E-10**

Note

1. Systems are described in Table 3.1-1.

3.6.2 Defense-in-Depth

The intent of the inspections mandated by ASME Section XI for piping welds is to identify conditions such as flaws or indications that may be precursors to leaks or ruptures in a system's pressure boundary. Currently, the process for picking inspection locations is based upon structural discontinuity and stress analysis results. As depicted in ASME White Paper 92-01-01, Rev. 1, "Evaluation of Inservice Inspection Requirements for Class 1, Category B-J Pressure Retaining Welds," this method has been ineffective in identifying leaks or failures. EPRI TR-112657 and Code Case N-578 provide a more robust selection process founded on actual service experience with nuclear plant piping failure data.

This process has two key independent ingredients, that is, a determination of each location's susceptibility to degradation and secondly, an independent assessment of the consequence of the piping failure. These two ingredients assure defense in depth is maintained. First, by evaluating a location's susceptibility to degradation, the likelihood of finding flaws or indications that may be precursors to leak or ruptures is increased. Secondly, the consequence assessment effort has a single failure criterion. As such, no matter how unlikely a failure scenario is, it is ranked High in the consequence assessment, and at worst Medium in the risk assessment (i.e., Risk Category 4), if as a result of the failure there is no mitigative equipment available to respond to the event. In addition, the consequence assessment takes into account equipment reliability, and less credit is given to less reliable equipment.

All locations within the reactor coolant pressure boundary will continue to receive a system pressure test and visual VT-2 examination as currently required by the Code regardless of its risk classification.

4. IMPLEMENTATION AND MONITORING PROGRAM

Upon approval of the RI-ISI program, procedures that comply with the guidelines described in EPRI TR-112657 will be prepared to implement and monitor the program. The new program will be integrated into the second inservice inspection interval. No changes to the [USAR] are necessary for program implementation.

The applicable aspects of the ASME Code not affected by this change will be retained, such as inspection methods, acceptance guidelines, pressure testing, corrective measures, documentation requirements, and quality control requirements. Existing ASME Section XI program implementing procedures will be retained and modified to address the RI-ISI process, as appropriate.

The monitoring and corrective action program will contain the following elements:

A. Identify
B. Characterize
C. (1) Evaluate, determine the cause and extent of the condition identified
D. Evaluate, develop a corrective action plan or plans
E. Decide
F. Implement
G. Monitor
H. Trend

The RI-ISI program is a living program requiring feedback of new relevant information to ensure the appropriate identification of high safety significant piping locations. As a minimum, risk ranking of piping segments will be reviewed and adjusted on an ASME period basis. In addition, significant changes may require more frequent adjustment as directed by NRC Bulletin or Generic Letter requirements, or by industry and plant specific feedback.

5. PROPOSED ISI PROGRAM PLAN CHANGE

A comparison between the RI-ISI program and ASME Section XI Code program requirements for in-scope piping is provided in Tables [5-1 and 5-2]. Table[5-1] provide[s] a summary comparison by risk region. Table[5-2] provide[s] the same comparison information, but in a more detailed manner by risk category, similar to the format used in Table[ ] 3.6-1 [ ].

[WCGS is currently in the middle of the second period of its second inspection interval. Up until this point, 33% of the examinations required by ASME Section XI have been completed for Examination Categories B-F, B-J, C-F-1, and C-F-2 piping welds. The final outage scheduled for the second period is Refuel Outage 12 (RF-12), which will occur in Spring 2002. In RF-12, the examinations determined by the RI-ISI process will replace those formerly selected per ASME Section XI criteria. Since 33% of the examinations have been completed thus far in the second interval, 67% of the RI-ISI examinations will be performed during RF-12 and the remaining refueling outages in the third period so that 100% of the selected examinations are performed during the course of the interval.]

Subsequent ISI intervals will implement 100% of the examination locations selected per the RI-ISI program. These examinations will be distributed between periods such that the period percentage requirements of ASME Section XI, paragraphs IWB-2412 and IWC-2412 are met.

6. REFERENCES/DOCUMENTATION

EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Rev. B-A.

ASME Code Case N-578, "Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1."

Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis."

Regulatory Guide 1.178, "An Approach for Plant-Specific Risk-Informed Decisionmaking Inservice Inspection of Piping."

Supporting Onsite Documentation

[Calculation No. AN-00-35, "STARS Risk-Informed ISI Project – Consequence Evaluation," Wolf Creek Generating Station, Rev. 0.]

[Calculation No. WCRE-12, "Risk-Informed ISI Basis Document," Wolf Creek Generating Station, Rev. 0.]

["Wolf Creek Risk Ranking Summary, Matrix and Report," Rev. 0, dated October 10, 2000.]

[Record of Conversation No. ROC-002, "Minutes of the Element Selection Meeting for the Risk-Informed ISI Project at the Callaway Plant and Wolf Creek Generating Station," dated August 24th and 25th, 2000.]

["Risk Impact Analysis for the Wolf Creek Generating Station," Rev. 0.]

Table 3.1-1

System Selection and Segment / Element Definition

System Description	ASME Code Class	Number of Segments	Number of Elements
AB – Main Steam System	Class 2	16	154
AE – Main Feedwater System	Class 2	13	124
BB – Reactor Coolant System	Class 1	81	337
BG – Chemical and Volume Control System	Class 1 and 2	50	192
BN – Borated Refueling Water Storage System	Class 2	29	125
EF – Essential Service Water System	Class 2	8	26
EJ – Residual Heat Removal System	Class 1 and 2	49	524
EM – High Pressure Coolant Injection System	Class 1 and 2	67	397
EN – Containment Spray System	Class 2	14	93
EP – Accumulator Safety Injection System	Class 1	20	115
GS – Containment Hydrogen Control System	Class 2	1	2
Totals		**348**	**2089**

Table 3.3-1

Failure Potential Assessment Summary

System[1]	Thermal Fatigue		Stress Corrosion Cracking				Localized Corrosion			Flow Sensitive	
	TASCS	TT	IGSCC	TGSCC	ECSCC	PWSCC	MIC	PIT	CC	E-C	FAC
AB											
AE	X										X
BB	X	X									
BG	X	X									
BN											
EF											
EJ	X	X									
EM		X	X								
EN											
EP			X								
GS											

Note

1. Systems are described in Table 3.1-1.

Table 3.4-1

Number of Segments by Risk Category With and Without Impact of FAC

System[1]	High Risk Region						Medium Risk Region				Low Risk Region			
	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Category 7	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
AB											16	16		
AE					13[2]	0			0	4	0	9		
BB			22	22			53	53			2	2	4	4
BG			9	9			21	21	5	5	10	10	5	5
BN							3	3			26	26		
EF											8	8		
EJ			12	12			31	31			3	3	3	3
EM			8	8			9	9	8	8	37	37	5	5
EN											14	14		
EP							4	4	4	4	12	12		
GS													1	1
Total			51	51	13	0	121	121	17	21	128	137	18	18

Notes

1. Systems are described in Table 3.1-1.
2. Of these 13 segments, 4 segments become Category 5 after FAC is removed from consideration due to the presence of another "medium" failure potential damage mechanism, and 9 segments become Category 6 after FAC is removed from consideration due to no other damage mechanisms being present.

Table 3.5-1

Number of Elements Selected for Inspection by Risk Category Excluding Impact of FAC

System[1]	High Risk Region						Medium Risk Region				Low Risk Region			
	Category 1		Category 2		Category 3		Category 4		Category 5		Category 6		Category 7	
	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected	Total	Selected
AB											154	0		
AE									16	2	108	0		
BB			38	11			281	26			6	0	12	0
BG			18	5			98	12	7	2	51	0	18	0
BN							3	0			122	0		
EF											26			
EJ			18	6			456	47			3	0	47	0
EM			8	0			22	3	20	2	309	0	38	0
EN											93	0		
EP							20	2	12	2	83	0		
GS													2	0
Total			82	22			880	90	55	8	955	0	117	0

Notes

1. Systems are described in Table 3.1-1.

Table 3.6-1

Risk Impact Analysis Results

System(1)	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact(3)		LERF Impact(3)	
			DMs	Rank	Section XI(2)	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
AB	6	Medium	None	Low	14	0	-14	negligible	negligible	negligible	negligible
AB Total								**negligible**	**negligible**	**negligible**	**negligible**
AE	5 (3)	Medium	TASCS, (FAC)	Medium (High)	1	2	1	-3.00E-11	-1.00E-11	-3.00E-12	-1.00E-12
AE	6 (3)	Medium	None (FAC)	Low (High)	11	0	-11	negligible	negligible	negligible	negligible
AE Total								**-3.00E-11**	**-1.00E-11**	**-3.00E-12**	**-1.00E-12**
BB	2	High	TASCS, TT	Medium	2	3	1	-4.33E-09	-1.03E-09	-2.55E-10	-6.07E-11
BB	2	High	TASCS	Medium	3	2	-1	-1.85E-09	1.03E-09	-1.09E-10	6.07E-11
BB	2	High	TT	Medium	4	6	2	-8.65E-09	-2.06E-09	-5.10E-10	-1.21E-10
BB	4	High	None	Low	50	26	-24	1.24E-09	1.24E-09	7.28E-11	7.28E-11
BB	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
BB	7	Low	None	Low	0	0	0	no change	no change	no change	no change
BB Total								**-1.36E-08**	**-8.24E-10**	**-8.01E-10**	**-4.86E-11**
BG	2	High	TASCS	Medium	0	2	2	-3.71E-09	-2.06E-09	-2.19E-10	-1.21E-10
BG	2	High	TT	Medium	0	3	3	-5.56E-09	-3.09E-09	-3.28E-10	-1.82E-10
BG	4	High	None	Low	7	12	5	-2.58E-10	-2.58E-10	-1.52E-11	-1.52E-11
BG	5	Medium	TT	Medium	0	2	2	-3.60E-11	-2.00E-11	-3.60E-12	-2.00E-12
BG	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
BG	7	Low	None	Low	0	0	0	no change	no change	no change	no change
BG Total								**-9.56E-09**	**-5.43E-09**	**-5.65E-10**	**-3.21E-10**
BN	4	High	None	Low	0	0	0	no change	no change	no change	no change
BN	6	Medium	None	Low	9	0	-9	negligible	negligible	negligible	negligible

Table 3.6-1

Risk Impact Analysis Results

System(1)	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact(3)		LERF Impact(3)	
			DMs	Rank	Section XI(2)	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
BN Total								**negligible**	**negligible**	**negligible**	**negligible**
EF	6	Medium	None	Low	2	0	-2	negligible	negligible	negligible	negligible
EF Total								**negligible**	**negligible**	**negligible**	**negligible**
EJ	2	High	TASCS, TT	Medium	1	0	-1	6.18E-10	1.03E-09	3.64E-11	6.07E-11
EJ	2	High	TASCS	Medium	1	2	1	-3.09E-09	-1.03E-09	-1.82E-10	-6.07E-11
EJ	2	High	TT	Medium	5	4	-1	-4.33E-09	1.03E-09	-2.55E-10	6.07E-11
EJ	4	High	None	Low	30	47	17	-8.76E-10	-8.76E-10	-5.16E-11	-5.16E-11
EJ	6	Medium	None	Low	1	0	-1	negligible	negligible	negligible	negligible
EJ	7	Low	None	Low	9	0	-9	negligible	negligible	negligible	negligible
EJ Total								**-7.67E-09**	**1.55E-10**	**-4.52E-10**	**9.10E-12**
EM	2	High	TT	Medium	0	0	0	no change	no change	no change	no change
EM	4	High	None	Low	4	3	-1	5.15E-11	5.15E-11	3.04E-12	3.04E-12
EM	5	Medium	IGSCC	Medium	1	2	1	-1.00E-11	-1.00E-11	-1.00E-12	-1.00E-12
EM	6	Medium	None	Low	19	0	-19	negligible	negligible	negligible	negligible
EM	7	Low	None	Low	2	0	-2	negligible	negligible	negligible	negligible
EM Total								**4.15E-11**	**4.15E-11**	**2.04E-12**	**2.04E-12**
EN	6	Medium	None	Low	8	0	-8	negligible	negligible	negligible	negligible
EN Total								**negligible**	**negligible**	**negligible**	**negligible**
EP	4	High	None	Low	8	2	-6	3.09E-10	3.09E-10	1.82E-11	1.82E-11
EP	5	Medium	IGSCC	Medium	3	2	-1	1.00E-11	1.00E-11	1.00E-12	1.00E-12
EP	6	Medium	None	Low	6	0	-6	negligible	negligible	negligible	negligible
EP Total								**3.19E-10**	**3.19E-10**	**1.92E-11**	**1.92E-11**

Table 3.6-1
Risk Impact Analysis Results

System(1)	Category	Consequence Rank	Failure Potential		Inspections			CDF Impact(3)		LERF Impact(3)	
			DMs	Rank	Section XI(2)	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
GS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
GS Total								**no change**	**no change**	**no change**	**no change**
Grand Total								**-3.05E-08**	**-5.75E-09**	**-1.80E-09**	**-3.40E-10**

Notes

1. Systems are described in Table 3.1-1.
2. Only those ASME Section XI Code inspection locations that received a volumetric examination in addition to a surface examination are included in this count. Inspection locations previously subjected to a surface examination only are not considered in accordance with Section 3.7.1 of EPRI TR-112657.
3. Per Section 3.7.1 of EPRI TR-112657, the contribution of low risk categories 6 and 7 need not be considered in assessing the change in risk. Hence, the word "negligible" is given in these cases in lieu of values for CDF and LERF Impact. In those cases where no inspections were being performed previously via Section XI, and none are planned for RI-ISI purposes, "no change" is listed instead of "negligible".

Table 5-1

Inspection Location Selection Comparison Between 1989 ASME Section XI Code and EPRI TR-112657 by Risk Region

System(1)	Code Category(2)	High Risk Region					Medium Risk Region					Low Risk Region				
		Weld Count	1989 Section XI		EPRI TR-112657		Weld Count	1989 Section XI		EPRI TR-112657		Weld Count	1989 Section XI		EPRI TR-112657	
			Vol/Sur	Sur Only	RI-ISI	Other(3)		Vol/Sur	Sur Only	RI-ISI	Other(3)		Vol/Sur	Sur Only	RI-ISI	Other(3)
AB	C-F-2											154	14	0	0	
AE	C-F-2						16	1	0	2		108	11	0	0	
BB	B-F	1	1	0	0		13	13	0	5						
	B-J	37	8	7	11		268	37	14	21		18	0	2	0	
BG	B-J	18	0	10	5		33	0	12	5		12	0	4	0	
	C-F-1						72	7	3	9		57	0	0	0	
BN	C-F-1						3	0	0	0		122	9	1	0	
EF	C-F-2											26	2	0	0	
EJ	B-J	14	6	0	3		22	3	0	3		2	1	0	0	
	C-F-1	4	1	0	3		434	27	0	44		48	9	0	0	
EM	B-J	8	0	3	0		40	5	4	5		104	2	24	0	
	C-F-1						2	0	0	0		243	19	0	0	

Table 5-1

Inspection Location Selection Comparison Between 1989 ASME Section XI Code and EPRI TR-112657 by Risk Region

System[1]	Code Category[2]	High Risk Region					Medium Risk Region					Low Risk Region				
		Weld Count	1989 Section XI		EPRI TR-112657		Weld Count	1989 Section XI		EPRI TR-112657		Weld Count	1989 Section XI		EPRI TR-112657	
			Vol/Sur	Sur Only	RI-ISI	Other[3]		Vol/Sur	Sur Only	RI-ISI	Other[3]		Vol/Sur	Sur Only	RI-ISI	Other[3]
EN	C-F-1											93	8	0	0	
EP	B-J						32	11	0	4		83	6	11	0	
GS	C-F-2											2	0	0	0	
Total	B-F	1	1	0	0		13	13	0	5						
	B-J	77	14	20	19		395	56	30	38		219	9	41	0	
	C-F-1	4	1	0	3		511	34	3	53		563	45	1	0	
	C-F-2						16	1	0	2		290	27	0	0	

Notes

1. Systems are described in Table 3.1-1.
2. The ASME Code Category is based on the 1989 Edition of the ASME Section XI Code.
3. The column labeled "Other" is generally used to identify augmented inspection program locations that are credited beyond those locations selected per the RI-ISI process, as addressed in Section 3.6.5 of EPRI TR-112657. This option was not applicable for the Wolf Creek Generating Station RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.

Table 5-2

Inspection Location Selection Comparison Between 1989 ASME Section XI Code and EPRI TR-112657 by Risk Category

System(1)	Risk		Consequence Rank	Failure Potential		Code Category	Weld Count	1989 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other(2)
AB	6	Low	Medium	None	Low	C-F-2	154	14	0	0	
AE	5 (3)	Medium (High)	Medium	TASCS, (FAC)	Medium (High)	C-F-2	16	1	0	2	
AE	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	C-F-2	108	11	0	0	
BB	2	High	High	TASCS, TT	Medium	B-J	11	2	0	3	
BB	2	High	High	TASCS	Medium	B-J	6	3	0	2	
BB	2	High	High	TT	Medium	B-F	1	1	0	0	
						B-J	20	3	7	6	
BB	4	Medium	High	None	Low	B-F	13	13	0	5	
						B-J	268	37	14	21	
BB	6	Low	Medium	None	Low	B-J	6	0	2	0	
BB	7	Low	Low	None	Low	B-J	12	0	0	0	
BG	2	High	High	TASCS	Medium	B-J	9	0	2	2	
BG	2	High	High	TT	Medium	B-J	9	0	8	3	
BG	4	Medium	High	None	Low	B-J	26	0	6	3	
						C-F-1	72	7	3	9	
BG	5	Medium	Medium	TT	Medium	B-J	7	0	6	2	
BG	6	Low	Medium	None	Low	B-J	12	0	4	0	
						C-F-1	39	0	0	0	
BG	7	Low	Low	None	Low	C-F-1	18	0	0	0	
BN	4	Medium	High	None	Low	C-F-1	3	0	0	0	
BN	6	Low	Medium	None	Low	C-F-1	122	9	1	0	
EF	6	Low	Medium	None	Low	C-F-2	26	2	0	0	

Table 5-2

Inspection Location Selection Comparison Between 1989 ASME Section XI Code and EPRI TR-112657 by Risk Category

System	Risk		Consequence Rank	Failure Potential		Code Category	Weld Count	1989 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other(2)
EJ	2	High	High	TASCS, TT	Medium	B-J	2	1	0	0	
EJ	2	High	High	TASCS	Medium	B-J	8	1	0	2	
EJ	2	High	High	TT	Medium	B-J	4	4	0	1	
						C-F-1	4	1	0	3	
EJ	4	Medium	High	None	Low	B-J	22	3	0	3	
						C-F-1	434	27	0	44	
EJ	6	Low	Medium	None	Low	B-J	2	1	0	0	
						C-F-1	1	0	0	0	
EJ	7	Low	Low	None	Low	C-F-1	47	9	0	0	
EM	2	High	High	TT	Medium	B-J	8	0	3	0	
EM	4	Medium	High	None	Low	B-J	20	4	0	3	
						C-F-1	2	0	0	0	
EM	5	Medium	Medium	IGSCC	Medium	B-J	20	1	4	2	
EM	6	Low	Medium	None	Low	B-J	104	2	24	0	
						C-F-1	205	17	0	0	
EM	7	Low	Low	None	Low	C-F-1	38	2	0	0	
EN	6	Low	Medium	None	Low	C-F-1	93	8	0	0	
EP	4	Medium	High	None	Low	B-J	20	8	0	2	
EP	5	Medium	Medium	IGSCC	Medium	B-J	12	3	0	2	
EP	6	Low	Medium	None	Low	B-J	83	6	11	0	
GS	7	Low	Low	None	Low	C-F-2	2	0	0	0	

Notes

1. Systems are described in Table 3.1-1.
2. The column labeled "Other" is generally used to identify augmented inspection program locations that are credited beyond those locations selected per the RI-ISI process, as addressed in Section 3.6.5 of EPRI TR-112657. This option was not applicable for the WCGS RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.

Description of Difference Methodology

1. As discussed in the cover letter, the STARS group developed their respective risk-informed inservice inspection (RI-ISI) program plans (referred to as templates from here on) collaboratively (see Note 5).

2. The templates are similar; where there are differences, the difference will be bracketed [ ]. Plant/Licensee names will not be bracketed to ease readability of the template.

3. Information contained in tables and notes is plant specific and will not be bracketed.

4. To allow for comparison of the templates, below is a table correlating plant specific system nomenclature.

	CPSES	STP	Callaway	WCGS	DCPP
Reactor Coolant System	RCS	RCS	BB	BB	RCS
Chemical and Volume Control System	CVCS	CVCS	BG, BN	BG, BN	CVCS
Safety Injection System	SIS	SIS	EM, EP	EM, EP	SIS
Residual Heat Removal System	RHRS	RHRS	EJ	EJ	RHRS
Feedwater System	FWS	FW & AFW	AE	AE	FWS
Main Steam System	MSSS	MSS	AB	AB	MSSS
Containment Spray System	CSS	CSS	EN	EN	CSS
Sludge Lancing System		SLS			
Essential Service Water System			EF	EF	
Containment Hydrogen Control System				GS	

5. STP Nuclear Operating Company has an approved ASME Code Class 1 RI-ISI program plan. The STP Nuclear Operating Company application is for ASME Code Class 1 piping socket welds and Class 2 piping welds.

6. The following is a discussion on the process used to develop the template.

   The STARS group contracted with Structural Integrity Associates (SIA) to support the development of the RI-ISI templates. SIA was selected based on their previous work in developing the STP Nuclear Operating Company ASME Code Class 1 template and their team of subcontractors. SIA had teamed with Inservice Engineering and Duke Engineering Services Incorporated (DESI). Both subcontractors have experience in developing RI-ISI program plans.

   In order to facilitate technology transfer, the STARS group developed the Degradation Mechanism Evaluation and the Consequence Evaluation. The contractor team provided training, oversight, and technical support in the development of the evaluations.

In order to maximize the synergies of these common plants, technical representatives from each of the plants met for 3 weeks at CPSES to develop these evaluations. TheInservice Inspection engineers from each plant met together and developed the plant specific Degradation Mechanism Evaluation. This effort was lead by SIA. Each plants drawings, history, and other applicable data were reviewed by the entire team. Commonalities and differences were discussed; technical issues were resolved and each pipe segment for each plant was subsequently evaluated for potential degradation mechanisms.

Likewise, probablistic risk assessment (PRA) engineers from each plant met together and developed their plant specific Consequence Evaluation. This effort was lead by DESI. Again, engineers had their plant specific information, which was reviewed before by the entire team. Commonalities and differences were discussed; technical issues were resolved and each event was evaluated for potential consequences.

Inservice Engineering then combined the work of the two groups to develop the template and perform the delta risk calculation.

LIST OF COMMITMENTS

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation (WCNOC) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Tony Harris, Manager Regulatory Affairs at Wolf Creek Generating Station, (316) 364-4038.

COMMITMENT	Due Date/Event
WCNOC will closely monitor the progress of and will assess the industry recommendations resulting from the EPRI- Materials Reliability Project evaluation of the V.C. Summer event.	Ongoing