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PG&E Letter DCL-01-015

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Relief Request for Application of an Alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI Examination Requirements for Class 1 and 2 Piping Welds

Dear Commissioners and Staff:

In accordance with the provisions of 10 CFR 50.55a(a)(3)(i), Pacific Gas and Electric Company (PG&E) 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 Diablo Canyon Power Plant (DCPP) Units 1 and 2. The proposed alternative, as described in Enclosure 1, "Risk-Informed Inservice Inspection Program Plan – Diablo Canyon Power Plant Units 1 and 2," provides an acceptable level of quality and safety as required by 10 CFR 50.55 a(a)(3)(i).

The DCPP 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 EPRI TR-112657, Revision B, 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 DCPP 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 DCPP site for your review.

The DCPP RI-ISI program plan was developed in conjunction with RI-ISI program plans for the plants operated by TxU Electric, AmerenUE, Wolf Creek Nuclear

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Operating Corporation, and STP Nuclear Operating Company. DCPP 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. Enclosure 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 identified 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. PG&E will closely monitor the progress of and will assess the recommendations for applicability.

PG&E requests NRC approval of this relief request by August 2001 in order to support DCPP Unit 1 refueling outage 1R11, which is currently scheduled to begin May 2002. PG&E intends to incorporate this risk-based approach for Class 1 and 2 piping weld inspection into the Ten Year Inservice Inspection Plan for the second inspection interval, which began January 1, 1996 for Unit 1 and June 1, 1996 for Unit 2.

Sincerely,

for DHO

David H. Oatley

Enclosures

cc: Edgar Bailey, DHS
Jack N. Donohew
Ellis W. Merschoff
David Proulx
Girija S. Shukla
Diablo Distribution

Risk-Informed Inservice Inspection Program Plan
Diablo Canyon Power Plant Units 1 and 2

RISK-INFORMED INSERVICE INSPECTION PROGRAM PLAN

DIABLO CANYON POWER PLANT, UNITS 1 AND 2

(REVISION 0)

Table of Contents

1. INTRODUCTION

[Diablo Canyon Power Plant (DCPP) Units 1 and 2 are 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. The second ISI interval for DCPP commenced on January 1, 1996 for Unit 1, and June 1, 1996 for Unit 2. Pursuant to 10 CFR 50.55a(g)(4)(ii), the applicable ASME Section XI Code for both units 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 updates summarized in this section represent an enhancement of the original Diablo Canyon Probabilistic Risk Assessment (DCPRA -1988) performed as part of the Long Term Seismic Program (LTSP). The DCPRA -1988 is a full-scope Level 1 PRA. The Nuclear Regulatory Commission (NRC) reviewed the LTSP and issued Supplement No. 34 to NUREG-0675 in June 1991, accepting the DCPRA -1988. The PRA model review is primarily documented in NUREG/CR-5726. The NRC Staff found the model to be "beyond the state of the art." In addition, the Advisory Committee on Reactor Safeguards accepted the NRC's review of the LTSP and DCPRA -1988 and concluded that DCPP "can be operated without undue risk to the health and safety of the public".]

[The DCPRA model uses a method that follows the series of analytical tasks and methods implemented in performing more than 20 full-scope and phased PRAs of U.S. and foreign nuclear power plants. This is commonly referred to as the "large event tree, small fault tree" methodology.]

[As part of maintaining a living PRA, the model is periodically updated. A summary of important updates to the original model is provided below.]

[DCPRA -1991 – This model was used to support Pacific Gas & Electric's (PG&Es) response to Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities" (i.e., the DCPP IPE). Internal flooding and containment performance (Level II) was added to the model. The NRC completed their evaluation of the DCPP IPE June 30, 1993, which included a review of the Level 2. The NRC staff determined

that the DCPP IPE is complete with a level of detail consistent with the information requested in Generic Letter 88-20, Supplement 1 and associated NUREG-1335. In the IPE Safety Evaluation Report (SER), the Staff has cited several positive attributes (seven in all) for their conclusion.]

[DCPRA -1993 -- This model was used to support PG&E's response to Generic Letter 88-20, Supplement 4, "Individual Plant Response to External Events for Severe Accident Vulnerabilities". It updated the PRA database for plant design and operational data through December 31, 1991. The Seismic and Fire PRA models from the DCPRA were updated, along with the internal events model. The NRC completed their evaluation of the DCPP Individual Plant Examination External Events (IPEEE) in 1997. The staff concluded that "the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities, and therefore, that the Diablo Canyon IPEEE has met the intent of Supplement 4 to GL 88-20 and the resolution of specific generic safety issues discussed in this SER."]

[DCPRA -1995 and DCPRA -1997 Models -- The main objective of these revisions was to update the model based on the latest plant-specific information on component reliability and unavailability data. Additionally, the model was updated based on the pertinent and important plant hardware and procedural changes. Appropriate industry events, PRA staff comments and observations about the previous model were also incorporated. During the 1997 update, a Large Early Release Model was also developed and the Control Room fire scenarios were reevaluated using the latest fire PRA techniques.]

[DCPRA -00 Model – This update is being carried out in two stages. In stage 1, several important elements of the model were updated using the latest industry standards and publications. The major stage 1 update activities included re-calculation of the initiating event frequencies using NUREG/CR-5750 data, and re-calculation of common cause failure parameters using NUREG/CR-6268 data. The stage 1 model was evaluated by the Westinghouse Owner's Group (WOG) peer review process. The stage 2 update is currently underway. As part of stage 2, the WOG peer review findings are being addressed as well as other improvements resulting from the self-assessment program].

[The seismic, fire and internal events portions of the stage 1 model were used for the RI-ISI program. The total Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) figure of merits, estimated by the DCPRA-00 stage 1 model, are 5.05E-5/year and 1.81E-6/year, respectively. Note that the reported total CDF and LERF include the contribution from the internal events (including internal flooding), internal fires, and seismic events. Since there are uncertainties in the initiating event frequencies, component failure rates, and equipment maintenance unavailability, the uncertainty in the CDF and LERF figures of merit are also analyzed but are not presented here.]

[SUMMARY DISCUSSION OF WOG PEER REVIEW]

[The general assessment of the peer reviewers was that the Diablo Canyon PRA "can be effectively used in risk significance determination." PG&E received strengths in the areas of Completeness of Initiating Events, Level of Detail of Accident Sequences in Plant Modeling, Coverage of Common Cause in the Model, Interactions of PRA Group

with Plant Staff, and Application of PRA to Support Plant Operations, and the Conduct of a detailed Self Assessment.]

[At the time of evaluation, ten of the eleven elements met the quality standards to support risk-informed submittals. The recommended enhancements to the eleventh element were immediately addressed by PG&E and are being implemented in the current revision (stage 2) of the model. At this time, it appears that the original results were conservative and that the implementation of the enhancements has an insignificant impact on the results. The RI-ISI submittal was reviewed against the quality issues identified by the peer review. It has been determined that the issues do not substantially impact the risk ranking of the segments.]

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 is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RI-ISI program.

[• Portions of the DCPP containment spray, chemical and volume control, safety injection and residual heat removal systems contain Class 2 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 an NRC Request for Additional Information, DCPP committed to performing volumetric examinations on a percentage of the welds in "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 commitment.]

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 DCPP. 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-bottom ΔTs 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., RHR 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 DCPP. This constitutes a deviation from 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. Internal events, internal flooding, containment performance, other modes of operation (e.g., shutdown operation), and external events are evaluated in the analysis.

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 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 6.3% of the Class 1 piping welds in Unit 1 and 6.7% in Unit 2 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 6.3% and 6.7% figures for the examination of Class 1 piping locations were a direct result of having a lower than usual population of locations ranked in the "High" consequence category (e.g., 50% versus 60% or higher that is typically seen). This is primarily due to the fact that DCPP 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.]

[This plant specific factor results 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, DCPP decided to add nine examination selections in Unit 1 and 10 examination selections in Unit 2 in order to increase the overall percentage of Class 1 selections. These additional selections also support the defense-in-depth philosophy. The additional welds increased the percentage of Class 1 selections to 7.3% for Unit 1, and 7.8% 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 8.3% for Unit 1 and 8.2% for Unit 2 when considering only Class 1 non-socket welds. With the addition of nine weld selections in Unit 1 and 10 weld selections in Unit 2, the percentage of Class 1 non-socket weld examination selections increased to 10.0% for Unit 1, and 10.1% for Unit 2. It should be noted that non-socket welds are subject to volumetric examination, so these percentages do not rely upon welds that are solely subject to a VT-2 visual examination.]

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 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	903	66(4)	1617	39	2520	105
2	949	74(4)	1594	40	2543	114

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 57 weld selections in Unit 1 and 64 weld selections in Unit 2. Nine welds in Unit 1 and 10 welds in Unit 2 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.

[None of the existing DCPP 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 core damage frequency (CDF) and large early release frequency (LERF) be less than 1E-07 and 1E-08 per year per system, respectively.

DCPP 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 [(1.67E-02)] and CLERP [(1.60E-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 $20x_o$. 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. The PBF likelihoods and POD values used in the analysis are consistent with those used in the approved RI-ISI pilot applications at Arkansas Nuclear One, Unit 2, and Vermont Yankee, as documented in References 9 and 14 of EPRI TR-112657.

Table[s] 3.6-1 [and 3.6-2] present summaries 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 [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 pilot application. An example is provided on the following page.

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

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 in the following tables, 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	-1.43E-08	1.09E-9	-1.37E-09	1.04E-10
CVCS	-1.25E-08	-7.19E-09	-1.20E-09	-6.89E-10
SIS	-1.18E-08	-6.48E-09	-1.13E-09	-6.21E-10
RHRS	-9.35E-09	-4.68E-09	-8.96E-10	-4.48E-10
CSS	no change	no change	no change	no change
RWST	-4.18E-10	-4.18E-10	-4.00E-11	-4.00E-11
CCW	no change	no change	no change	no change
FWS	-1.20E-11	4.00E-11	-1.20E-12	4.00E-12
MSS	negligible	negligible	negligible	negligible
Total	**-4.84E-08**	**-1.76E-08**	**-4.64E-09**	**-1.69E-09**

Note

1. Systems are described in Table 3.1-1.

Unit 2 Risk Impact Results

System[(1)]	ΔRisk$_{CDF}$		ΔRisk$_{LERF}$	
	w/ POD	w/o POD	w/ POD	w/o POD
RCS	-1.94E-08	-6.68E-10	-1.86E-09	-6.40E-11
CVCS	-1.30E-08	-7.61E-09	-1.24E-09	-7.29E-10
SIS	-1.78E-08	-9.75E-09	-1.70E-09	-9.34E-10
RHRS	-9.27E-09	-4.59E-09	-8.88E-10	-4.40E-10
CSS	no change	no change	no change	no change
RWST	-4.18E-10	-4.18E-10	-4.00E-11	-4.00E-11
CCW	8.35E-11	8.35E-11	8.00E-12	8.00E-12
FWS	-1.80E-11	3.00E-11	-1.80E-12	3.00E-12
. MSS	negligible	negligible	negligible	negligible
Total	**-5.97E-08**	**-2.29E-08**	**-5.72E-09**	**-2.20E-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 leaks 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 Class 1 and 2 pressure boundaries 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 Units 1 and 2. No changes to the Final Safety Analysis Report Update 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

   (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 second period of its second inspection interval. Up until this point, 33.6% 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 second period of the second interval, the examinations determined by the RI-ISI process will replace those formerly selected per ASME Section XI criteria. Since 33.6% of the examinations have been completed during the first period of the second interval, 66.4% of the RI-ISI examinations will be performed during the second and third periods so that 100% of the selected examinations are performed during the course of the interval.]

[Unit 2 is currently at the start of the second period of its second inspection interval. Up until this point, 32.7% 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 second period of the second interval, the examinations determined by the RI-ISI process will replace those formerly selected per ASME Section XI criteria. Since 32.7% of the examinations have been completed during the first period of the second interval, 67.3% of the RI-ISI examinations will be performed during the second and third periods 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

[DCPP Letter No. DCL-97-119, "Response to Request for Additional Information", dated August 13, 1997]

[DCPP Engineering Calculation No. M-6064, "Degradation Calculation", Rev. 0]

[PG&E Probability Assessment Calculation File No. PRA00-05, "Consequence Evaluation", Rev. 0]

["DCPP Service History Review", dated June 30, 2000]

["DCPP Units 1 and 2 Risk Ranking Summary, Matrix and Report", Rev. 0, dated January 24, 2001]

[Record of Conversation No. ROC-005, "Minutes of the Element Selection Meeting for the Risk-Informed ISI Project at the Diablo Canyon Power Plant", dated August 29th and 30th, 2000]

["Risk Impact Analysis for DCPP 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	74	346
CVCS – Chemical and Volume Control System	Class 1 and 2	80	822
SIS – Safety Injection System	Class 1 and 2	96	638
RHRS – Residual Heat Removal System	Class 1 and 2	37	303
CSS – Containment Spray System	Class 2	8	84
RWST – Refueling Water Storage Tank System	Class 2	18	120
CCW – Component Cooling Water System	Class 2	2	13
FWS – Feedwater System	Class 2	12	78
MSS – Main Steam System	Class 2	34	116
Totals		**361**	**2520**

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	80	347
CVCS – Chemical and Volume Control System	Class 1 and 2	72	852
SIS – Safety Injection System	Class 1 and 2	91	657
RHRS – Residual Heat Removal System	Class 1 and 2	36	291
CSS – Containment Spray System	Class 2	8	84
RWST – Refueling Water Storage Tank System	Class 2	18	117
CCW – Component Cooling Water System	Class 2	2	12
FWS – Feedwater System	Class 2	12	65
MSS – Main Steam System	Class 2	34	118
Totals		**353**	**2543**

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	X									
SIS	X	X	X								
RHRS	X										
CSS											
RWST											
CCW											
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	X									
SIS	X	X	X								
RHRS	X										
CSS											
RWST											
CCW											
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			17	17			50	50			1	1	6	6
CVCS			6	6			10	10	3	3	60	60	1	1
SIS			4	4			15	15	8	8	48	48	21	21
RHRS			6	6			17	17			14	14		
CSS											6	6	2	2
RWST							8	8			9	9	1	1
CCW							2	2						
FWS					12[2]	0			0	4	0	8		
MSS											34	34		
Total			**33**	**33**	**12**	**0**	**102**	**102**	**11**	**15**	**172**	**180**	**31**	**31**

Notes

1. Systems are described in Table 3.1-1.
2. Of these 12 segments, 4 segments become Category 5 after FAC is removed from consideration due to the presence of another “medium” failure potential damage mechanism, and 8 segments become 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			17	17			56	56			1	1	6	6
CVCS			5	5			10	10	2	2	55	55		
SIS			4	4			15	15	8	8	46	46	18	18
RHRS			6	6			17	17			13	13		
CSS											6	6	2	2
RWST							8	8			10	10		
CCW							2	2						
FWS					12[2]	0			0	4	0	8		
MSS											34	34		
Total			**32**	**32**	**12**	**0**	**108**	**108**	**10**	**14**	**165**	**173**	**26**	**26**

Notes

1. Systems are described in Table 3.1-2.
2. Of these 12 segments, 4 segments become Category 5 after FAC is removed from consideration due to the presence of another "medium" failure potential damage mechanism, and 8 segments become 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			31	8			294	37[2]			4	0	17	0
CVCS			8	4[3]			76	8[4]	4	1	732	0	2	0
SIS			16	4			89	10	16	2	300	0	217	0
RHRS			12	3			177	18			114	0		
CSS											72	0	12	0
RWST							47	5			69	0	4	0
CCW							13	2						
FWS									28	3	50	0		
MSS											116	0		
Total			**67**	**19**			**696**	**80**	**48**	**6**	**1457**	**0**	**252**	**0**

Notes

1. Systems are described in Table 3.1-1.
2. 7 of these 37 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. 1 of these 4 welds was 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. 1 of these 8 welds was 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			33	10[2]			298	36[3]			3	0	13	0
CVCS			8	4[4]			113	13[5]	4	1	727	0		
SIS			18	6			98	11	17	2	299	0	225	0
RHRS			11	3			175	18			105	0		
CSS											72	0	12	0
RWST							45	5			72	0		
CCW							12	2						
FWS									28	3	37	0		
MSS											118	0		
Total			**70**	**23**			**741**	**85**	**49**	**6**	**1433**	**0**	**250**	**0**

Notes

1. Systems are described in Table 3.1-2.
2. 2 of these 10 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. 5 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.
4. 1 of these 4 welds was 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 13 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	3	3	0	-6.01E-09	no change	-5.76E-10	no change
RCS	2	High	TASCS	Medium	2	3	1	-7.01E-09	-1.67E-09	-6.72E-10	-1.60E-10
RCS	2	High	TT	Medium	2	2	0	-4.01E-09	no change	-3.84E-10	no change
RCS	4	High	None	Low	70	37(4)	-33	2.76E-09	2.76E-09	2.64E-10	2.64E-10
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								**-1.43E-08**	**1.09E-9**	**-1.37E-09**	**1.04E-10**
CVCS	2	High	TASCS, TT	Medium	0	3(5)	3	-9.02E-09	-5.01E-09	-8.64E-10	-4.80E-10
CVCS	2	High	TT	Medium	0	1	1	-3.01E-09	-1.67E-09	-2.88E-10	-1.60E-10
CVCS	4	High	None	Low	2	8(6)	6	-5.01E-10	-5.01E-10	-4.80E-11	-4.80E-11
CVCS	5	Medium	TASCS, TT	Medium	0	1	1	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
CVCS	5	Medium	TT	Medium	0	0	0	no change	no change	no change	no change
CVCS	6	Medium	None	Low	26	0	-26	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								**-1.25E-08**	**-7.19E-09**	**-1.20E-09**	**-6.89E-10**
SIS	2	High	TT	Medium	0	4	4	-1.20E-08	-6.68E-09	-1.15E-09	-6.40E-10
SIS	4	High	None	Low	12	10	-2	1.67E-10	1.67E-10	1.60E-11	1.60E-11
SIS	5	Medium	TASCS	Medium	0	0	0	no change	no change	no change	no change
SIS	5	Medium	IGSCC	Medium	5	2	-3	3.00E-11	3.00E-11	3.00E-12	3.00E-12
SIS	6	Medium	None	Low	24	0	-24	negligible	negligible	negligible	negligible
SIS	6	Low	IGSCC	Medium	1	0	-1	negligible	negligible	negligible	negligible
SIS	7	Low	None	Low	2	0	-2	negligible	negligible	negligible	negligible
SIS Total								**-1.18E-08**	**-6.48E-09**	**-1.13E-09**	**-6.21E-10**
RHRS	2	High	TASCS	Medium	1	3	2	-8.02E-09	-3.34E-09	-7.68E-10	-3.20E-10
RHRS	4	High	None	Low	2	18	16	-1.34E-09	-1.34E-09	-1.28E-10	-1.28E-10
RHRS	6	Medium	None	Low	10	0	-10	negligible	negligible	negligible	negligible
RHRS Total								**-9.35E-09**	**-4.68E-09**	**-8.96E-10**	**-4.48E-10**

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	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
CSS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
CSS Total								**no change**	**no change**	**no change**	**no change**
RWST	4	High	None	Low	0	5	5	-4.18E-10	-4.18E-10	-4.00E-11	-4.00E-11
RWST	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
RWST	7	Low	None	Low	0	0	0	no change	no change	no change	no change
RWST Total								**-4.18E-10**	**-4.18E-10**	**-4.00E-11**	**-4.00E-11**
CCW	4	High	None	Low	2	2	0	no change	no change	no change	no change
CCW Total								**no change**	**no change**	**no change**	**no change**
FWS	5 (3)	Medium	TASCS, (FAC)	Medium (High)	7	3	-4	-1.20E-11	4.00E-11	-1.20E-12	4.00E-12
FWS	6 (3)	Medium	None (FAC)	Low (High)	3	0	-3	negligible	negligible	negligible	negligible
FWS Total								**-1.20E-11**	**4.00E-11**	**-1.20E-12**	**4.00E-12**
MSS	6	Medium	None	Low	16	0	-16	negligible	negligible	negligible	negligible
MSS Total								**negligible**	**negligible**	**negligible**	**negligible**
Grand Total								**-4.84E-08**	**-1.76E-08**	**-4.64E-09**	**-1.69E-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. 7 of these 37 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. 1 of these 3 welds was 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. 1 of these 8 welds was 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	3	3	0	-6.01E-09	no change	-5.76E-10	no change
RCS	2	High	TASCS	Medium	3	4[4]	1	-9.02E-09	-1.67E-09	-8.64E-10	-1.60E-10
RCS	2	High	TT	Medium	2	3[5]	1	-7.01E-09	-1.67E-09	-6.72E-10	-1.60E-10
RCS	4	High	None	Low	68	36[6]	-32	2.67E-09	2.67E-09	2.56E-10	2.56E-10
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								**-1.94E-08**	**-6.68E-10**	**-1.86E-09**	**-6.40E-11**
CVCS	2	High	TASCS, TT	Medium	0	3[7]	3	-9.02E-09	-5.01E-09	-8.64E-10	-4.80E-10
CVCS	2	High	TT	Medium	0	1	1	-3.01E-09	-1.67E-09	-2.88E-10	-1.60E-10
CVCS	4	High	None	Low	2	13[8]	11	-9.19E-10	-9.19E-10	-8.80E-11	-8.80E-11
CVCS	5	Medium	TASCS, TT	Medium	0	1	1	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
CVCS	5	Medium	TT	Medium	0	0	0	no change	no change	no change	no change
CVCS	6	Medium	None	Low	26	0	-26	negligible	negligible	negligible	negligible
CVCS	6	Low	TT	Medium	0	0	0	no change	no change	no change	no change
CVCS Total								**-1.30E-08**	**-7.61E-09**	**-1.24E-09**	**-7.29E-10**
SIS	2	High	TT	Medium	0	6	6	-1.80E-08	-1.00E-08	-1.73E-09	-9.60E-10
SIS	4	High	None	Low	14	11	-3	2.51E-10	2.51E-10	2.40E-11	2.40E-11
SIS	5	Medium	TASCS	Medium	0	0	0	no change	no change	no change	no change
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	23	0	-23	negligible	negligible	negligible	negligible
SIS	6	Low	IGSCC	Medium	1	0	-1	negligible	negligible	negligible	negligible
SIS	7	Low	None	Low	1	0	-1	negligible	negligible	negligible	negligible
SIS Total								**-1.78E-08**	**-9.75E-09**	**-1.70E-09**	**-9.34E-10**
RHRS	2	High	TASCS	Medium	1	3	2	-8.02E-09	-3.34E-09	-7.68E-10	-3.20E-10
RHRS	4	High	None	Low	3	18	15	-1.25E-09	-1.25E-09	-1.20E-10	-1.20E-10
RHRS	6	Medium	None	Low	10	0	-10	negligible	negligible	negligible	negligible
RHRS Total								**-9.27E-09**	**-4.59E-09**	**-8.88E-10**	**-4.40E-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	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
CSS	7	Low	None	Low	0	0	0	no change	no change	no change	no change
CSS Total								**no change**	**no change**	**no change**	**no change**
RWST	4	High	None	Low	0	5	5	-4.18E-10	-4.18E-10	-4.00E-11	-4.00E-11
RWST	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
RWST Total								**-4.18E-10**	**-4.18E-10**	**-4.00E-11**	**-4.00E-11**
CCW	4	High	None	Low	3	2	-1	8.35E-11	8.35E-11	8.00E-12	8.00E-12
CCW Total								**8.35E-11**	**8.35E-11**	**8.00E-12**	**8.00E-12**
FWS	5 (3)	Medium	TASCS, (FAC)	Medium (High)	6	3	-3	-1.80E-11	3.00E-11	-1.80E-12	3.00E-12
FWS	6 (3)	Medium	None (FAC)	Low (High)	4	0	-4	negligible	negligible	negligible	negligible
FWS Total								**-1.80E-11**	**3.00E-11**	**-1.80E-12**	**3.00E-12**
MSS	6	Medium	None	Low	15	0	-15	negligible	negligible	negligible	negligible
MSS Total								**negligible**	**negligible**	**negligible**	**negligible**
Grand Total								**-5.97E-08**	**-2.29E-08**	**-5.72E-09**	**-2.20E-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. 1 of these 4 welds was 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. 1 of these 3 welds was 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. 5 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.
7. 1 of these 3 welds was 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.
8. 2 of these 13 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	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]
RCS	B-F	1	1	0	0		21	21	0	2						
	B-J	30	6	2	8		273	49	24	35[4]		21	0	7	0	
CVCS	B-J	8	0	2	4[5]		60	0	16	7[6]		63	0	15	0	
	C-F-1						20	2	0	2		671	26	39	0	
SIS	B-J	16	0	5	4		41	12	0	6		351	17	65	0	
	C-F-1						64	5	0	6		166	10	0	0	
RHRS	B-J											18	5	0	0	
	C-F-1	12	1	0	3		177	2	0	18		96	5	0	0	
CSS	C-F-1											84	0	0	0	
RWST	C-F-1						47	0	0	5		73	0	0	0	
CCW	C-F-2						13	2	0	2						
FWS	C-F-2						28	7	0	3		50	3	0	0	
MSS	C-F-2											116	16	0	0	
Total	B-F	1	1	0	0		21	21	0	2						
	B-J	54	6	9	16		374	61	40	48		453	22	87	0	
	C-F-1	12	1	0	3		308	9	0	31		1090	41	39	0	
	C-F-2						41	9	0	5		166	19	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 DCPP 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 35 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. 1 of these 4 welds was 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. 1 of these 7 welds was 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	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]
RCS	B-F	1	1	0	0		21	21	0	2						
	B-J	32	7	2	10[4]		277	47	24	34[5]		16	0	5	0	
CVCS	B-J	8	0	4	4[6]		96	0	23	12[7]		60	0	14	0	
	C-F-1						21	2	1	2		667	26	37	0	
SIS	B-J	18	0	7	6		43	11	0	6		357	18	68	0	
	C-F-1						72	7	0	7		167	7	0	0	
RHRS	B-J											20	5	2	0	
	C-F-1	11	1	0	3		175	3	0	18		85	5	0	0	
CSS	C-F-1											84	0	0	0	
RWST	C-F-1						45	0	0	5		72	0	0	0	
CCW	C-F-2						12	3	0	2						
FWS	C-F-2						28	6	0	3		37	4	0	0	
MSS	C-F-2											118	15	0	0	
Total	B-F	1	1	0	0		21	21	0	2						
	B-J	58	7	13	20		416	58	47	52		453	23	89	0	
	C-F-1	11	1	0	3		313	12	1	32		1075	38	37	0	
	C-F-2						40	9	0	5		155	19	0	0	

Notes

1. Systems are described in Table 3.1-2.
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 DCPP RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
4. 2 of these 10 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. 5 of these 34 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. 1 of these 4 welds was 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.
7. 2 of these 12 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	1989 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	8	3	0	3	
RCS	2	High	High	TASCS	Medium	B-J	9	2	0	3	
RCS	2	High	High	TT	Medium	B-F	1	1	0	0	
						B-J	13	1	2	2	
RCS	4	Medium	High	None	Low	B-F	21	21	0	2	
						B-J	273	49	24	35[(3)]	
RCS	6	Low	Medium	None	Low	B-J	4	0	2	0	
RCS	7	Low	Low	None	Low	B-J	17	0	5	0	
CVCS	2	High	High	TASCS, TT	Medium	B-J	4	0	0	3[(4)]	
CVCS	2	High	High	TT	Medium	B-J	4	0	2	1	
CVCS	4	Medium	High	None	Low	B-J	56	0	15	6[(5)]	
						C-F-1	20	2	0	2	
CVCS	5	Medium	Medium	TASCS, TT	Medium	B-J	2	0	1	1	
CVCS	5	Medium	Medium	TT	Medium	B-J	2	0	0	0	
CVCS	6	Low	Medium	None	Low	B-J	9	0	2	0	
						C-F-1	671	26	39	0	
CVCS	6	Low	Low	TT	Medium	B-J	52	0	12	0	
CVCS	7	Low	Low	None	Low	B-J	2	0	1	0	
SIS	2	High	High	TT	Medium	B-J	16	0	5	4	
SIS	4	Medium	High	None	Low	B-J	29	7	0	4	
						C-F-1	60	5	0	6	
SIS	5	Medium	Medium	TASCS	Medium	C-F-1	4	0	0	0	
SIS	5	Medium	Medium	IGSCC	Medium	B-J	12	5	0	2	
SIS	6	Low	Medium	None	Low	B-J	135	15	16	0	
						C-F-1	158	9	0	0	
SIS	6	Low	Low	IGSCC	Medium	B-J	7	1	1	0	
SIS	7	Low	Low	None	Low	B-J	209	1	48	0	
						C-F-1	8	1	0	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	1989 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other[(2)]
RHRS	2	High	High	TASCS	Medium	C-F-1	12	1	0	3	
RHRS	4	Medium	High	None	Low	C-F-1	177	2	0	18	
RHRS	6	Low	Medium	None	Low	B-J	18	5	0	0	
						C-F-1	96	5	0	0	
CSS	6	Low	Medium	None	Low	C-F-1	72	0	0	0	
CSS	7	Low	Low	None	Low	C-F-1	12	0	0	0	
RWST	4	Medium	High	None	Low	C-F-1	47	0	0	5	
RWST	6	Low	Medium	None	Low	C-F-1	69	0	0	0	
RWST	7	Low	Low	None	Low	C-F-1	4	0	0	0	
CCW	4	Medium	High	None	Low	C-F-2	13	2	0	2	
FWS	5 (3)	Medium (High)	Medium	TASCS, (FAC)	Medium (High)	C-F-2	28	7	0	3	
FWS	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	C-F-2	50	3	0	0	
MSS	6	Low	Medium	None	Low	C-F-2	116	16	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 DCPP 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 35 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. 1 of these 3 welds was 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. 1 of these 6 welds was 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	1989 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	9	3	0	3	
RCS	2	High	High	TASCS	Medium	B-J	10	3	0	4[3]	
RCS	2	High	High	TT	Medium	B-F	1	1	0	0	
						B-J	13	1	2	3[4]	
RCS	4	Medium	High	None	Low	B-F	21	21	0	2	
						B-J	277	47	24	34[5]	
RCS	6	Low	Medium	None	Low	B-J	3	0	2	0	
RCS	7	Low	Low	None	Low	B-J	13	0	3	0	
CVCS	2	High	High	TASCS, TT	Medium	B-J	5	0	3	3[6]	
CVCS	2	High	High	TT	Medium	B-J	3	0	1	1	
CVCS	4	Medium	High	None	Low	B-J	92	0	23	11[7]	
						C-F-1	21	2	1	2	
CVCS	5	Medium	Medium	TASCS, TT	Medium	B-J	2	0	0	1	
CVCS	5	Medium	Medium	TT	Medium	B-J	2	0	0	0	
CVCS	6	Low	Medium	None	Low	B-J	8	0	2	0	
						C-F-1	667	26	37	0	
CVCS	6	Low	Low	TT	Medium	B-J	52	0	12	0	
SIS	2	High	High	TT	Medium	B-J	18	0	7	6	
SIS	4	Medium	High	None	Low	B-J	30	7	0	4	
						C-F-1	68	7	0	7	
SIS	5	Medium	Medium	TASCS	Medium	C-F-1	4	0	0	0	
SIS	5	Medium	Medium	IGSCC	Medium	B-J	13	4	0	2	
SIS	6	Low	Medium	None	Low	B-J	134	16	17	0	
						C-F-1	158	7	0	0	
SIS	6	Low	Low	IGSCC	Medium	B-J	7	1	2	0	
SIS	7	Low	Low	None	Low	B-J	216	1	49	0	
						C-F-1	9	0	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	1989 Section XI		EPRI TR-112657	
	Category	Rank		DMs	Rank			Vol/Sur	Sur Only	RI-ISI	Other[2]
RHRS	2	High	High	TASCS	Medium	C-F-1	11	1	0	3	
RHRS	4	Medium	High	None	Low	C-F-1	175	3	0	18	
RHRS	6	Low	Medium	None	Low	B-J	20	5	2	0	
						C-F-1	85	5	0	0	
CSS	6	Low	Medium	None	Low	C-F-1	72	0	0	0	
CSS	7	Low	Low	None	Low	C-F-1	12	0	0	0	
RWST	4	Medium	High	None	Low	C-F-1	45	0	0	5	
RWST	6	Low	Medium	None	Low	C-F-1	72	0	0	0	
CCW	4	Medium	High	None	Low	C-F-2	12	3	0	2	
FWS	5 (3)	Medium (High)	Medium	TASCS, (FAC)	Medium (High)	C-F-2	28	6	0	3	
FWS	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	C-F-2	37	4	0	0	
MSS	6	Low	Medium	None	Low	C-F-2	118	15	0	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 DCPP RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
3. 1 of these 4 welds was 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. 1 of these 3 welds was 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. 5 of these 34 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. 1 of these 3 welds was 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.
7. 2 of these 11 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 Strategic Teaming and Resource Sharing (STARS) group developed their respective risk-informed inservice inspection (RI-ISI) program plans (referred to as templates from here on) collaboratively (see Note 6).

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	--

CPSES – Comanche Peak Steam Electric Station
STP – South Texas Project
Callaway – Callaway Plant
WCGS – Wolf Creek Generating Station
DCPP – Diablo Canyon Power Plant

5. STP Nuclear Operating Company has an approved American Society of Mechanical Engineers (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 of 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 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.