Entergy

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

J. F. Alexander
Director
Nuclear Assessment

10 CFR 50.55a(a)(3)(i)

ENGC. Ltr. 2.00.084
December 27, 2000

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

Docket No. 50-293
License No. DPR-35

Pilgrim Risk-Informed Inservice Inspection Program

Pursuant to 10 CFR 50.55a(a)(3), Entergy Nuclear Generation Company requests NRC approval of the attached Pilgrim Risk-Informed Inservice Inspection Program (RI-ISI) as an alternative to the current 1989 ASME Section XI inspection requirements for Class 1 code category B-J and B-F piping welds. The RI-ISI Program has been developed in accordance with the EPRI methodology contained in EPRI TR-112657, "Risk-Informed Inservice Inspection Evaluation Procedure." EPRI TR 112657 was approved by NRC Safety Evaluation Report, dated October 28, 1999. The attached Pilgrim-specific RI-ISI program supports the conclusion that the proposed alternative provides an acceptable level of quality and safety as required by 10 CFR 50.55a(a)(3)(i).

We request NRC approval of the Pilgrim RI-ISI Program in support of Refueling Outage (RFO) - 13. RFO-13 is scheduled to start on April 14, 2001.

Pilgrim plans to implement the RI-ISI program during the second period of our third inspection interval beginning with RFO - 13. The third ISI interval began in July 1995 and ends in July 2005.

Pilgrim considers the implementation of the RI-ISI Program to be a Cost Beneficial Licensing Action.

NRC has previously approved RI-ISI Programs based upon EPRI Topical Report TR-112657 for Vermont Yankee Nuclear Power Corporation (Docket Number 50-271, TAC. No. M99389, dated November 8, 1998) and James A. Fitzpatrick plant (Docket Number 50-333, TAC No. MA6926 dated September 12, 2000).

A047

If you have any questions regarding the information contained in this letter, please contact Walter Lobo at (508) 830-7940.

J. Alexander

WGL/rfo13RI-ISI.doc
Attachment: Pilgrim RI-ISI Program

CC: Mr. Alan B. Wang, Project Manager
Project Directorate I-3
Office of Nuclear Reactor Regulation
Mail Stop: OWFN 8F2
U. S. Nuclear Regulatory Commission
1 White Flint North
11555 Rockville Pike
Rockville, MD 20852

U.S. NRC, Region 1
475 Allendale Road
King of Prussia, PA 19406

Senior Resident Inspector
Pilgrim Nuclear Power Station

RISK-INFORMED INSERVICE INSPECTION PROGRAM PLAN - PILGRIM NUCLEAR POWER STATION

Table of Contents

1. INTRODUCTION

The Pilgrim Nuclear Power Station (PNPS) is currently in the third inservice inspection (ISI) interval as defined by the ASME Boiler and Pressure Vessel Section XI Code for Program B. The third ISI interval for PNPS commenced on July 1, 1995. Pursuant to 10 CFR 50.55a(g)(4)(ii), the applicable ASME Section XI Code for PNPS is the 1989 Edition, no Addenda (Reference 7.1.1).

The objective of this submittal is to request a change to the ISI Program for Class 1 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." (Reference 7.1.2) 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." (Reference 7.1.3)

2. Relation to NRC Regulatory Guides/PRA Quality

2.1 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" (Reference 7.1.4) and Regulatory Guide 1.178 "An Approach for Plant-Specific Risk-Informed Decisionmaking Inservice Inspection of Piping" (Reference 7.1.5). Further information is provided in Section 4.6.1 relative to defense-in-depth.

2.2 PRA Quality

The original Pilgrim Level 1 and Level 2 Individual Plant Examination (IPE) model (1992) was used as a base model to evaluate the consequences of pipe ruptures for the RI-ISI assessment during power operation (Reference 7.2.1). Conditional core damage probability (CCDP) values from the latest model update (the IPE Supplement in 1995) were used (Reference 7.2.2).

The base core damage frequency (CDF) from the latest IPE model was 2.84E-5 per year. Large Early Release Frequency (LERF) was not calculated. In the original IPE, early containment failure resulted in a 22% conditional probability given core damage, and large release resulted in a 14.5% conditional probability given core damage. Conservatively, in the RI-ISI consequence evaluation, anticipated transient without scram (ATWS) sequences were added to the large release categories, and a large early release was estimated to result in 18% conditional probability given core damage (Reference 7.2.3).

The NRC review of the Pilgrim IPE (including Pilgrim's response to requests for additional information) was issued in October of 1996 (Reference 7.2.4). The Staff Evaluation Report (SER) on the IPE report concluded that the Pilgrim IPE met the intent of Generic Letter 88-20 (Reference 7.1.6). In this evaluation, weaknesses were found in the human reliability analysis portion of the IPE. Specifically, the NRC disagreed with:

(a) the use of small (1E-3) screening human error probabilities to determine the most important human events; and

(b) taking 100% credit for inhibiting ADS under ATWS events (anticipated transient without scram) as well as taking 100% credit for two human actions in the back end analysis (initiating drywell sprays and initiating containment venting)

In the SER, NRC expressed a concern that these weaknesses may limit the use of the PNPS IPE for regulatory purposes other than GL 88-20. However, the NRC went on to say that PNPS modeled the post-initiator human actions typically seen in the IPEs/PRAs for BWRs 3 & 4, and the human error probabilities used for those events appear to be reasonable.

Because of the NRC concern, the above comments were considered in the RI-ISI application (e.g. as discussed above, ATWS sequences added to large release category), and judged not to have significant effects on the RI-ISI evaluation of the consequences for Class 1 piping.

During 1999, a Boiling Water Reactor Owner's Group (BWROG) Peer Certification was performed on the same model that the NRC reviewed. The following is a brief summary of the Pilgrim probabilistic safety assessment (PSA) Peer Review Certification Process Results (Reference 7.2.5):

"The Pilgrim PSA Peer Review Certification has examined the key elements of the Pilgrim internal events Level 1 and Level 2 PSA and has found that:

- The scope of the PSA supports PSA Applications such as ISI and Maintenance Rule Risk Ranking
- The model is extensive and detailed."

The Pilgrim PSA is presently being refined in order to address the findings of the NRC SER, the BWROG Peer Certification, and to bring the model to the state of the art. These improvements have been considered and will not have an unconservative impact on the conclusions from the RI-ISI evaluation of Class 1 piping.

3. PROPOSED ALTERNATIVE TO CURRENT ISI PROGRAM REQUIREMENTS

3.1 ASME Section XI

ASME Section XI Examination Categories B-F and B-J currently contain the requirements for the nondestructive examination (NDE) of Class 1 piping components (Reference 7.1.1). The alternative RI-ISI program for piping is described in EPRI TR-112657. The RI-ISI program will be substituted for the current program for Class 1 piping (Examination Categories B-F and B-J) in accordance with 10 CFR 50.55a(a)(3)(i) (Reference 7.16) by alternatively providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected. For example, existing pressure testing requirements and Class 2 piping inspection requirements remained unchanged. EPRI TR-112657 provides the methodology for defining the relationship between the RI-ISI program and the remaining unaffected portions of ASME Section XI.

3.2 Augmented Programs

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

- In accordance with the recommendations of EPRI TR-112657, piping welds identified as Category "A" per Generic Letter 88-01 (Reference 7.1.7) are considered resistant to intergranular stress corrosion cracking (IGSCC) and as such are assigned a low failure potential provided no other damage mechanisms are present. The existing augmented inspection program for the other Generic Letter 88-01 piping welds at PNPS (e.g., Categories "B" through "G") remains unchanged at this time.
- The augmented inspection program for flow accelerated corrosion (FAC) per Generic Letter 89-08 (Reference 7.1.8) is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RI-ISI program.
- In PNPS Letter No. 2.89.163, dated 11/6/89, PNPS committed to perform augmented examinations on ten welds in response to NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant System" (References 7.1.9, 7.2.6). The RI-ISI process also evaluated the potential for thermal stratification and this augmented program is subsumed into the RI-ISI program per Section 6.5 of Reference 7.1.2. The results of the RI-ISI evaluation confirmed that six RHR welds listed in the letter were subject to thermal stratification. The two core spray welds were not identified as susceptible to thermal stratification as the criteria for susceptibility in Reference 7.1.2 were not met. The final two welds listed in the letter were from piping that has since been removed from the plant.

4. RISK-INFORMED ISI PROCESS

The RI-ISI process used at PNPS is described in detail in Reference 7.1.2. The following paragraphs summarize the process used at PNPS and is in conformance with 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 PNPS. This deviation is discussed in section 4.7 and is being implemented at PNPS because it better predicts TASCS locations of concern.

4.1 Scope of Program

The systems included in the RI-ISI program are provided in Table 4.1-1. The piping and instrumentation diagrams and additional plant information including the existing plant ISI program were used to define the Class 1 piping system boundaries.

4.2 Consequence Evaluation

The consequence(s) of assumed pressure boundary failures (Reference 7.2.3) were evaluated using the PNPS PRA and other design basis information and ranked (i.e. High, Medium, Low) 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.

4.3 Failure Potential Assessment

Failure potential estimates were generated utilizing industry failure history, plant specific failure history (Reference 7.2.7) and other relevant information including design and operating parameters (e.g. temperature, pressure and flow conditions), materials and piping system configurations. These failure estimates (Reference 7.2.8) were determined using the guidance provided in EPRI TR-112657.

Table 4.3-1 summarizes the failure potential assessment by system for each degradation mechanism that was identified as potentially operative.

4.4 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 (consisting of one or more welds) 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 (Reference 7.2.9) are presented in Table 4.4-1.

4.5 Element and NDE Selection

At this point, the risk significance determination of the piping segments (i.e. groups of welds or inspection locations) within the scope of the application has been determined. The EPRI methodology calls for selecting a sample population for inspection from these groups of welds/inspection locations.

Consistent with the recommendations of EPRI TR-112657, the PNPS applications selected 25% of the locations in the high-risk region and 10% of the locations in the medium risk region for inspection. For locations selected for inspection, appropriate NDE methods tailored to the applicable degradation mechanism defined for ASME Code Case N-578 applications are identified. In addition, as recommended in Section 3.6.4.2 of EPRI TR-112657, the Class 1 elements were selected in such a manner to ensure that the overall inspection percentage did not fall significantly below 10% (Reference 7.2.10). As shown in Table 4.5-1, an 11% sampling of the Class 1 elements has been achieved. A brief summary is provided in Table 4.5-1 and the results of the selection process are presented in Table 4.5-2. It should be noted that no credit was taken for any FAC or IGSCC augmented inspection program locations, beyond those locations selected by the RI-ISI process. Section 4 of EPRI TR-112657 was used as guidance in determining the examination requirements for these locations.

4.5.1 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 in accordance with the requirements of Section XI.

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.

4.5.2 ASME Section XI Program Relief Request Withdrawal

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 (Reference 7.1.11). 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.

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 request can be withdrawn for the reason provided below with all other relief requests remaining in place.

Relief Request	Brief Description and Basis for Withdrawal
PRR-1	Relief Request PRR-1 addresses inaccessible welds that were formerly selected for examination in the ASME Section XI ISI Program, but are not selected for examination in the RI-ISI Program. As such, Relief Request PRR-1 is no longer needed, and is being withdrawn.

4.6 Risk Impact Assessment

The RI-ISI program has been conducted in accordance with Regulatory Guide 1.174 and the methodology of EPRI TR-112657. The risk from implementation of this program is expected to remain neutral or decrease when compared to that estimated from the current ISI program (Reference 7.2.10).

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.

4.6.1 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 (Reference 7.1.12). 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 off, 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 and PNPS ISI Plan regardless of its risk classification.

4.6.2 Quantitative Analysis

Limits are recommended by the EPRI methodology to ensure that the change in risk of implementing RI-ISI as compared to the present Section XI ISI program meets the requirements of Regulatory Guides 1.174 and 1.178. The EPRI criterion recommends that the cumulative change (i.e. an increase) in core damage frequency (CDF) and large early release frequency (LERF) be less than 1E-07 and 1E-08 per year per system, respectively. The PNPS application satisfies the Regulatory Guide and EPRI methodology acceptance criteria. That is, the PNPS application showed a decrease in risk (-3.06E-08) for both CDF and LERF) when crediting an improved POD.

Pilgrim conducted a risk impact analysis per the methodology of Section 3.7 of EPRI TR-112657. The analysis, documented in Reference 7.2.11, estimates the net change in risk due to the positive influence of adding locations and negative influence of 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 (2E-02) and CLERP (2E-02) from Reference 7.2.3, whereas, for medium consequence category segments, bounding estimates of CCDP (1E-04) and CLERP (1E-05) from Reference 7.1.2 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 (References 7.1.13 and 7.1.14). 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 4.6-1 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 and IGSCC were adjusted for in the performance of the quantitative analysis by excluding their impact on the risk ranking. However, in an effort to be as informative as possible, for those systems where FAC and/or IGSCC are present, the information in Table 4.6-1 is presented in such a manner as to depict what the resultant risk categorization is both with and without consideration of FAC and/or IGSCC. This is accomplished by enclosing the FAC and/or IGSCC damage mechanisms, 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.

4.7 TASCS Methodology Deviation

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

$\Delta T > 50^{\circ}F$,

AND

Richardson Number > 4 *(this value predicts the potential buoyancy of a 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. Therefore, TASCS is considered for this configuration. 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. Therefore TASCS is not considered for these configurations. 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 PNPS. This constitutes a deviation to the methodology of EPRI TR-112657 since it 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 (Reference 7.1.10).

5. 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 third inservice inspection interval. 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.

6. PROPOSED ISI PROGRAM PLAN CHANGE

A comparison between the RI-ISI program and 1989 ASME Section XI Code Edition program requirements for in-scope piping is provided in Tables 6-1 and 6-2. Table 6-1 provides a summary comparison by risk region. Table 6-2 provides the same comparison information, but in a more detailed manner by risk category, similar to the format used in Table 4.6-1. Table 6.2-1 is provided as an aid in determining how Table 6-2 was developed.

PNPS is currently at the start of the second period of its third inspection interval. Up until this point, 34% of the examinations required by ASME Section XI have been completed for Examination Category B-F and B-J piping welds. Beginning in the second period of the third interval, the examinations determined by the RI-ISI process will replace those formerly selected per ASME Section XI criteria. Since 34% of the examinations have been completed during the first period of the third interval, 66% of the RI-ISI examinations will be performed during the remaining three refuel outages in the second and third periods so that 100% of the selected examinations are performed during the course of the interval. Additionally, at least 16% of the RI-ISI examinations will be performed by the close of the second period of the third 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, paragraph IWB-2412 are met.

7. REFERENCES/DOCUMENTATION

7.1 INDUSTRY STANDARDS

7.1.1 ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition.

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

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

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

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

7.1.6 Code of Federal Regulations, 10CFR50.55.

7.1.7 Generic Letter, 88-20, "INDIVIDUAL PLANT EXAMINATION FOR SEVERE ACCIDENT VULNERABILITIES," dated November 23, 1988

7.1.8 Generic Letter 88-01, "NRC POSITION ON IGSCC IN BWR AUSTENITIC STAINLESS STEEL PIPING", dated January 25, 1988

7.1.9 Generic Letter 89-08, "EROSION/CORROSION-INDUCED PIPE WALL THINNING", dated May 2, 1989

7.1.10 IE Bulletin 88-08, "THERMAL STRESSES IN PIPING CONNECTED TO REACTOR COOLANT SYSTEMS," dated June 22, 1988

7.1.11 Draft Supplement 2, EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Procedure.

7.1.12 ASME Code Case N460 "Alternative Examination Coverage for Class 1 and 2 Welds, " Section XI, Division 1 July, 1988.

7.1.13 ASME White Paper 92-01-01 Rev. 1, "Evaluation of Inservice Inspection Requirements for Class 1, Category B-J Pressure Retaining Welds," dated July 1995.

7.1.14 ANO-2 Code Case N578 Application Submittals, Letters #2CANO99706, dated September 30, 1997 and #2CANO39808, dated March 31, 1998.

7.1.15 Vermont Yankee Code Case N560 Application Submittals, Letters #BVY97-099, dated August 6, 1997 and #BVY97-106, dated August 15, 1997.

7.2 Supporting Onsite Documentation

7.2..1 Pilgrim Nuclear Power Plant IPE (Revision 0 September 1992) and BECo Letter #95-127, dated December 28, 1995 (Response to NRC on Request for Additional Information)

7.2.2 File Memo - Notes of Meeting at Pilgrim on 6/21/00 between Dave Gerlits (Pilgrim), Pat O'Regan (EPRI), and Jim Moody (Duke Consultant)

7.2.3 Calculation/File No. PNPS-02Q-302, "Risk-Informed Inservice Inspection Consequence Evaluation of Class 1 Piping for Pilgrim Nuclear Power Plant", Revision 0, dated November 3, 2000

7.2.4 NRC Letter dated October 30, 1996 to Boston Edison "Pilgrim Nuclear Power Station – Individual Plant Examination (IPE) Submittal – Internal Events (Generic Letter 88-20) (TAC NO. M74451)"

7.2.5 BWROGs Peer Certification of the PNPS Probabilistic Risk Assessment, 1999.

7.2.6 PNPS 1.2.89.163, "Bulletin 88-08, Supplement 3: Thermal Stresses in Piping Connected to Reactor Coolant System," 11/6/89

7.2.7 Calculation/File No. PNPS-02Q-303, "Pilgrim Service History and Susceptibility Review", Revision 0, dated December 15, 2000

7.2.8 Calculation/File No. PNPS-02Q-301, "Degradation Mechanism Evaluation for Pilgrim", Revision 1, dated November 16, 2000

7.2.9 Calculation/File No. PNPS-02Q-304, "Risk Ranking for the Pilgrim Nuclear Power Station", Revision 0, dated December 15, 2000

7.2.10 File No. PNPS-02Q-103, Record of Conversation No. ROC-001, "Minutes of the Element Selection Meeting for the Risk-Informed ISI Project at the Pilgrim Nuclear Power Station", Revision 1, dated September 14, 2000

7.2.11 Calculation/File No. PNPS-02Q-305, "Risk Impact Analysis for Pilgrim", Revision 0, dated December 15, 2000

Table 4.1-1

System Selection and Segment / Element Definition

System Description	Number of Segments	Number of Elements
RPV – Reactor Pressure Vessel	31	33
MS – Main Steam	25	92
RECIRC – Recirculation	18	70
FW – Feedwater	17	76
RHR – Residual Heat Removal	18	58
SBLC – Standby Liquid Control	3	69
RWCU – Reactor Water Clean Up	17	116
RCIC – Reactor Core Isolation Cooling	6	36
CS – Core Spray	16	44
HPCI – High Pressure Coolant Injection	7	41
Totals	**158**	**635**

Table 4.3-1

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
RPV	X	X	X						X		X
MS		X									X
RECIRC											
FW	X	X									X
RHR	X	X	X								
SBLC											
RWCU			X								X
RCIC											
CS			X								
HPCI	X										

Note

1. Systems are described in Table 4.1-1.

Table 4.4-1

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

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
RPV	8[2]	0	16[3]	6			3	21			4	4		
MS	14[4]	0	1	1	4[5]	0	4	18	2	2	0	4		
RECIRC							16	16					2	2
FW	17[6]	0	0	10			0	7						
RHR			7[7]	4			6	9	2[8]	0	2	4	1	1
SBLC							1	1			2	2		
RWCU	2[9]	0	1[10]	0	1[11]	0	5	8	4[12]	0	3	8	1	1
RCIC							5	5			1	1		
CS			6[13]	0			6	12	2[14]	0	2	4		
HPCI			1	1			5	5			1	1		
Total	**41**	**0**	**32**	**22**	**5**	**7**	**51**	**95**	**10**	**2**	**15**	**28**	**4**	**4**

Notes

1. Systems are described in Table 4.1-1.
2. Of these eight segments, four become Category 2 after FAC is removed from consideration due to the presence of other "medium" failure potential damage mechanisms, and four segments become Category 4 after FAC is removed from consideration due to no other damage mechanisms being present.
3. Of these sixteen segments, two segments remain Category 2 after IGSCC is removed from consideration due to the presence of other "medium" failure potential damage mechanisms, and fourteen segments become Category 4 after IGSCC is removed from consideration due to no other damage mechanism being present.
4. These fourteen segments become Category 4 after FAC is removed from consideration due to no other damage mechanisms being present.
5. These four segments become Category 6 after FAC is removed from consideration due to no other damage mechanisms being present.
6. Of these seventeen segments, ten segments become Category 2 after FAC is removed from consideration due to the presence of other "medium" failure potential damage mechanisms, and seven segments become Category 4 after FAC is removed from consideration due to no other damage mechanism being present.
7. Of these seven segments, three segments become Category 4 after IGSCC is removed from consideration due to no other damage mechanism being present.
8. These two segments become Category 6 after IGSCC is removed from consideration due to no other damage mechanism being present.
9. These two segments become Category 4 after FAC is removed from consideration due to no other damage mechanism being present.
10. This one segment becomes Category 4 after IGSCC is removed from consideration due to no other damage mechanism being present.

Notes for Table 4.4-1 (con't)

11. This one segment becomes Category 6 after FAC is removed from consideration due to no other damage mechanism being present.
12. These four segments become Category 6 after IGSCC is removed from consideration due to no other damage mechanism being present.
13. These six segments become Category 4 after IGSCC is removed from consideration due to no other damage mechanism being present.
14. These two segments become Category 6 after IGSCC is removed from consideration due to no other damage mechanism being present.

Table 4.5-1

RI-ISI Inspection Summary

Totals	Description
635[1]	Class 1 Piping Welds
71	RI-ISI Program Selections

Notes

1. Includes all non-exempt Examination Category B-F and B-J locations. 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.

Table 4.5-2

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

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
RPV			6	5[2]			23	4[3]			4	0		
MS			3	1			82	9[4]	3	1	4	0		
RECIRC							66	7					4	0
FW			43	8[5]			33	4[6]						
RHR			15	4			29	3			10	0	4	0
SBLC							30	3			39	0		
RWCU							75	9[7],[8]			39	0	2	0
RCIC							24	3			12	0		
CS							38	5[9]			6	0		
HPCI			2	1			32	4			7	0		
Total			**69**	**19**			**432**	**51**	**3**	**1**	**121**	**0**	**10**	**0**

Notes

1. Systems are described in Table 4.1-1.
2. One of these five welds was selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since crevice corrosion was identified along with IGSCC as a damage mechanism for this weld, the IGSCC examination will include the examination requirements identified in EPRI TR-112657 for crevice corrosion in order to be credited toward both the IGSCC and RI-ISI Programs.
3. Two of these four welds were selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for these welds, the IGSCC examinations will be credited toward both programs.
4. Two of these nine welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC is the only damage mechanism identified for these welds, the FAC examinations will be credited towards both programs.
5. Three of the eight welds were selected for examination by both the FAC and RI-ISI Programs. Since a damage mechanism other than FAC was identified, these welds will be subject to both FAC and RI-ISI examinations.
6. These four welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC was the only damage mechanism identified for these welds, the FAC examinations will be credited toward both programs.
7. Two of these nine welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC was the only damage mechanism identified for these welds, the FAC examinations will be credited toward both programs.

Notes for Table 4.5-1 (con't)

8. One of these nine welds was selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for this weld, the IGSCC examination will be credited toward both programs.
9. Two of these five welds were selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for these welds, the IGSCC examinations will be credited toward both programs.

Table 4.6-1

Risk Impact Analysis Results

System[(1)]	Category	Consequence Rank [(4)]	Failure Potential [(5,7)]		Inspections [(6)]			CDF Impact[(3)]		LERF Impact[(3)]	
			DMs	Rank	Section XI[(2)]	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
RPV	2 (1)	High	TASCS, TT, CC, (FAC)	Medium (High)	4	4	0	-9.60E-09	no change	-9,60E-09	no change
RPV	2 (2)	High	CC, (IGSCC)	Medium (Medium)	2	1	-1	2.00E-09	2.00E-09	2.00E-09	2.00E-09
RPV	4 (1)	High	None (FAC)	Low (High)	4	1	-3	3.00E-10	3.00E-10	3.00E-10	3.00E-10
RPV	4 (2)	High	None (IGSCC)	Low (Medium)	14	2	-12	1.20E-09	1.20E-09	1.20E-09	1.20E-09
RPV	4	High	None	Low	1	1	0	no change	no change	no change	no change
RPV	6	Medium	None	Low	3	0	-3	negligible	negligible	negligible	negligible
RPV Total								**-6.10E-09**	**3.50E-09**	**-6.10E-09**	**3.50E-09**
MS	2	High	TT	Medium	0	1	1	-3.60E-09	-2.00E-09	-3.60E-09	-2.00E-09
MS	4 (1)	High	None (FAC)	Low (High)	15	8	-7	7.00E-10	7.00E-10	7.00E-10	7.00E-10
MS	4	High	None	Low	0	1	1	-1.00E-10	-1.00E-10	-1.00E-10	-1.00E-10
MS	5	Medium	TT	Medium	0	1	1	-1.80E-11	-1.00E-11	-1.80E-12	-1.00E-12
MS	6 (3)	Medium	None (FAC)	Low (High)	4	0	-4	negligible	negligible	negligible	negligible
MS Total								**-3.02E-09**	**-1.41E-09**	**-3.00E-09**	**-1.40E-09**
RECIRC	4	High	None	Low	18	7	-11	1.10E-09	1.10E-09	1.10E-09	1.10E-09
RECIRC	7	Low	None	Low	0	0	0	no change	no change	no change	no change
RECIRC Total								**1.10E-09**	**1.10E-09**	**1.10E-09**	**1.10E-09**
FW	2 (1)	High	TASCS, TT, (FAC)	Medium (High)	2	4	2	-1.20E-08	-4.00E-09	-1.20E-08	-4.00E-09
FW	2 (1)	High	TT, (FAC)	Medium (High)	5	4	-1	-8.40E-09	2.00E-09	-8.40E-09	2.00E-09
FW	4 (1)	High	None (FAC)	Low (High)	7	4	-3	3.00E-10	3.00E-10	3.00E-10	3.00E-10
FW Total								**-2.01E-08**	**-1.70E-09**	**-2.01E-08**	**-1.70E-09**

Table 4.6-1

Risk Impact Analysis Results

System[1]	Category	Consequence Rank [4]	Failure Potential [5,7]		Inspections [6]			CDF Impact[3]		LERF Impact[3]	
			DMs	Rank	Section XI[2]	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
RHR	2	High	TASCS	Medium	6	3	-3	-3.60E-09	6.00E-09	-3.60E-09	6.00E-09
RHR	2	High	TT	Medium	6	1	-5	3.60E-09	1.00E-08	3.60E-09	1.00E-08
RHR	4 (2)	High	None (IGSCC)	Low (Medium)	1	0	-1	1.00E-10	1.00E-10	1.00E-10	1.00E-10
RHR	4	High	None	Low	8	3	-5	5.00E-10	5.00E-10	5.00E-10	5.00E-10
RHR	6 (5)	Medium	None (IGSCC)	Low (Medium)	2	0	-2	negligible	negligible	negligible	negligible
RHR	6	Medium	None	Low	3	0	-3	negligible	negligible	negligible	negligible
RHR	7	Low	None	Low	2	0	-2	negligible	negligible	negligible	negligible
RHR Total								**6.00E-10**	**1.66E-08**	**6.00E-10**	**1.66E-08**
SBLC	4	High	None	Low	0	3	3	-3.00E-10	-3.00E-10	-3.00E-10	-3.00E-10
SBLC	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
SBLC Total								**-3.00E-10**	**-3.00E-10**	**-3.00E-10**	**-3.00E-10**
RWCU	4 (1)	High	None (FAC)	Low (High)	2	2	0	no change	no change	no change	no change
RWCU	4 (2)	High	None (IGSCC)	Low (Medium)	1	1	0	no change	no change	no change	no change
RWCU	4	High	None	Low	5	6	1	-1.00E-10	-1.00E-10	-1.00E-10	-1.00E-10
RWCU	6 (3)	Medium	None (FAC)	Low (High)	0	0	0	no change	no change	no change	no change
RWCU	6 (5)	Medium	None (IGSCC)	Low (Medium)	1	0	-1	negligible	negligible	negligible	negligible
RWCU	6	Medium	None	Low	10	0	-10	negligible	negligible	negligible	negligible
RWCU	7	Low	None	Low	0	0	0	no change	no change	no change	no change
RWCU Total								**-1.00E-10**	**-1.00E-10**	**-1.00E-10**	**-1.00E-10**
RCIC	4	High	None	Low	1	3	2	-2.00E-10	-2.00E-10	-2.00E-10	-2.00E-10
RCIC	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
RCIC Total								**-2.00E-10**	**-2.00E-10**	**-2.00E-10**	**-2.00E-10**

Table 4.6-1
Risk Impact Analysis Results

System[1]	Category	Consequence Rank [4]	Failure Potential [5,7]		Inspections [6]			CDF Impact[3]		LERF Impact[3]	
			DMs	Rank	Section XI[2]	RI-ISI	Delta	w/ POD	w/o POD	w/ POD	w/o POD
CS	4 (2)	High	None (IGSCC)	Low (Medium)	8	2	-6	6.00E-10	6.00E-10	6.00E-10	6.00E-10
CS	4	High	None	Low	8	3	-5	5.00E-10	5.00E-10	5.00E-10	5.00E-10
CS	6 (5)	Medium	None (IGSCC)	Low (Medium)	2	0	-2	negligible	negligible	negligible	negligible
CS	6	Medium	None	Low	0	0	0	no change	no change	no change	no change
CS Total								**1.10E-09**	**1.10E-09**	**1.10E-09**	**1.10E-09**
HPCI	2	High	TASCS	Medium	0	1	1	-3.60E-09	-2.00E-09	-3.60E-09	-2.00E-09
HPCI	4	High	None	Low	4	4	0	no change	no change	no change	no change
HPCI	6	Medium	None	Low	3	0	-3	negligible	negligible	negligible	negligible
HPCI Total								**-3.60E-09**	**-2.00E-09**	**-3.60E-09**	**-2.00E-09**
Grand Total								**-3.06E-08**	**1.66E-08**	**-3.06E-08**	**1.66E-08**

Notes

1. Systems are described in Table 4.1-1.
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. Documented in Reference 7.2.3.
5. Documented in Reference 7.2.8.
6. Documented in Reference 7.2.10.
7. Table 4.3-1 identifies which degradation mechanisms are applicable per system. Inspections for each type of degradation mechanism are documented in Reference 7.2.10.

Table 6-1

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

System[1]	Code Category	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		Vol/Sur	Sur Only	RI-ISI	Other		Vol/Sur	Sur Only	RI-ISI	Other[2]
RPV	B-F	6	6	0	5[3]		23	19	4	4[4]		4	3	1	0	
MS	B-J	3	0	1	1		85	15	1	10[5]		4	4	0	0	
RECIRC	B-J						66	18	3	7		4	0	0	0	
FW	B-J	43	7	0	8[6]		33	7	0	4[7]						
RHR	B-F											1	1	0	0	
	B-J	15	12	0	4		29	9	0	3		13	6	0	0	
SBLC	B-J						30	0	6	3		39	0	11	0	
RWCU	B-F						1	0	1	0		1	1	0	0	
	B-J						74	8	11	9[8], [9]		40	10	0	0	
RCIC	B-J						24	1	4	3		12	0	1	0	
CS	B-F						4	4	0	2[10]						
	B-J						34	12	0	3		6	2	0	0	
HPCI	B-J	2	0	0	1		32	4	0	4		7	3	0	0	

Notes

1. Systems are described in Table 4.1-1.
2. The column labeled "Other" is generally used to identify augmented inspection program locations credited per Section 3.6.5 of EPRI TR-112657. The EPRI methodology allows augmented inspection program locations to be credited if the inspection locations selected strictly for RI-ISI purposes produce less than a 10% sampling of the overall Class 1 weld population. As stated in Section 4.5 of this template, PNPS achieved an 11% sampling without relying on augmented inspection program locations beyond those selected by the RI-ISI process. The "Other" column has been retained in this table solely for uniformity purposes with the other RI-ISI application template submittals.
3. One of these five welds was selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since crevice corrosion was identified along with IGSCC as a damage mechanism for this weld, the IGSCC examination will include the examination requirements identified in EPRI TR-112657 for crevice corrosion in order to be credited toward both the IGSCC and RI-ISI Programs.
4. Two of these four welds were selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for these welds, the IGSCC examinations will be credited toward both programs.

Notes for Table 6-1 (con't)

5. Two of these ten welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC is the only damage mechanism identified for these welds, the FAC examinations will be credited towards both programs.
6. Three of the eight welds were selected for examination by both the FAC and RI-ISI Programs. Since a damage mechanism other than FAC was identified, these welds will be subject to both FAC and RI-ISI examinations.
7. These four welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC was the only damage mechanism identified for these welds, the FAC examinations will be credited toward both programs.
8. Two of these nine welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC was the only damage mechanism identified for these welds, the FAC examinations will be credited toward both programs.
9. One of these nine welds was selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for this weld, the IGSCC examination will be credited toward both programs.
10. These two welds were selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for these welds, the IGSCC examinations will be credited toward both programs.

Table 6.2-1
Development of Table 6-2
EXAMPLE

System	Risk		Consequence Rank	Failure Potential	
	Category	Rank(1)		DMs	Rank
FW	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 4.6-1 but it is included in Table 6-2.

Table 6-2

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]
RPV	2 (1)	High (High)	High	TASCS, TT, CC, (FAC)	Medium (High)	B-F	4	4	0	4	
RPV	2 (2)	High (High)	High	CC, (IGSCC)	Medium (Medium)	B-F	2	2	0	1[3]	
RPV	4 (1)	Medium (High)	High	None (FAC)	Low (High)	B-F	4	4	0	1	
RPV	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	B-F	14	14	0	2[4]	
RPV	4	Medium	High	None	Low	B-F	5	1	4	1	
RPV	6	Low	Medium	None	Low	B-F	4	3	1	0	
MS	2	High	High	TT	Medium	B-J	3	0	1	1	
MS	4 (1)	Medium (High)	High	None (FAC)	Low (High)	B-J	78	15	0	8[5]	
MS	4	Medium	High	None	Low	B-J	4	0	0	1	
MS	5	Medium	Medium	TT	Medium	B-J	3	0	1	1	
MS	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	B-J	4	4	0	0	
RECIRC	4	Medium	High	None	Low	B-J	66	18	3	7	
RECIRC	7	Low	Low	None	Low	B-J	4	0	0	0	
FW	2 (1)	High (High)	High	TASCS, TT, (FAC)	Medium (High)	B-J	19	2	0	4	
FW	2 (1)	High (High)	High	TT, (FAC)	Medium (High)	B-J	24	5	0	4[6]	
FW	4 (1)	Medium (High)	High	None (FAC)	Low (High)	B-J	33	7	0	4[7]	

Table 6-2

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

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)
RHR	2	High	High	TASCS	Medium	B-J	8	6	0	3	
RHR	2	High	High	TT	Medium	B-J	7	6	0	1	
RHR	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	B-J	5	1	0	0	
RHR	4	Medium	High	None	Low	B-J	24	8	0	3	
RHR	6 (5)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	B-J	2	2	0	0	
RHR	6	Low	Medium	None	Low	B-J	8	3	0	0	
RHR	7	Low	Low	None	Low	B-F	1	1	0	0	
						B-J	3	1	0	0	
SBLC	4	Medium	High	None	Low	B-J	30	0	6	3	
SBLC	6	Low	Medium	None	Low	B-J	39	0	11	0	
RWCU	4 (1)	Medium (High)	High	None (FAC)	Low (High)	B-J	14	2	0	2(8)	
RWCU	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	B-J	3	1	0	1(9)	
RWCU	4	Medium	High	None	Low	B-F	1	0	1	0	
						B-J	57	5	11	6	
RWCU	6 (3)	Low (High)	Medium	None (FAC)	Low (High)	B-J	1	0	0	0	
RWCU	6 (5)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	B-J	5	1	0	0	
RWCU	6	Low	Medium	None	Low	B-F	1	1	0	0	
						B-J	32	9	0	0	
RWCU	7	Low	Low	None	Low	B-J	2	0	0	0	

Table 6-2

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]
RCIC	4	Medium	High	None	Low	B-J	24	1	4	3	
RCIC	6	Low	Medium	None	Low	B-J	12	0	1	0	
CS	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	B-F	4	4	0	2[10]	
						B-J	11	4	0	0	
CS	4	Medium	High	None	Low	B-J	23	8	0	3	
CS	6 (5)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	B-J	2	2	0	0	
CS	6	Low	Medium	None	Low	B-J	4	0	0	0	
HPCI	2	High	High	TASCS	Medium	B-J	2	0	0	1	
HPCI	4	Medium	High	None	Low	B-J	32	4	0	4	
HPCI	6	Low	Medium	None	Low	B-J	7	3	0	0	

Notes

1. Systems are described in Table 4.1-1.
2. The column labeled "Other" is generally used to identify augmented inspection program locations credited per Section 3.6.5 of EPRI TR-112657. The EPRI methodology allows augmented inspection program locations to be credited if the inspection locations selected strictly for RI-ISI purposes produce less than a 10% sampling of the overall Class 1 weld population. As stated in Section 4.5 of this template, PNPS achieved an 11% sampling without relying on augmented inspection program locations beyond those selected by the RI-ISI process. The "Other" column has been retained in this table solely for uniformity purposes with the other RI-ISI application template submittals.
3. This weld was selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since crevice corrosion was identified along with IGSCC as a damage mechanism for this weld, the IGSCC examination will include the examination requirements identified in EPRI TR-112657 for crevice corrosion in order to be credited toward both the IGSCC and RI-ISI Programs.
4. These two welds were selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for these welds, the IGSCC examinations will be credited toward both programs.
5. Two of these eight welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC is the only damage mechanism identified for these welds, the FAC examinations will be credited towards both programs.
6. Three of the four welds were selected for examination by both the FAC and RI-ISI Programs. Since a damage mechanism other than FAC was identified, these welds will be subject to both FAC and RI-ISI examinations.
7. These four welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC was the only damage mechanism identified for these welds, the FAC examinations will be credited toward both programs.

Notes for Table 6-2 (con't)

8. These two welds were selected for examination by both the FAC and RI-ISI Programs. Since FAC was the only damage mechanism identified for these welds, the FAC examinations will be credited toward both programs.
9. This weld was selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for this weld, the IGSCC examination will be credited toward both programs.
10. These two welds were selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Program. Since IGSCC was the only damage mechanism identified for these welds, the IGSCC examinations will be credited toward both programs.