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Update to the Pilgrim Risk-Informed Inservice Inspection Program

Reference: Pilgrim Risk-Informed Inservice Inspection Program, ENGCO letter No. 2.00.084,
dated December 27, 2000.

Attached is an update to the risk-informed inservice inspection (RI-ISI) submittal dated
December 27, 2000 (ENGCO Letter No. 2.00.084).

Section 4.6.2 (page 8) and Table 4.6-1 (pages 21, 22, and 23) of the referenced submittal are revised
with several changes. The highlighted changes more accurately reflect the change in risk assessment
as it pertains to crediting augmented examinations. Although the RI-ISI program (i.e. the number,
location and type of examinations) and the conclusion of the change in risk assessment will not be
impacted by the changes identified in the attached, these replacement pages are provided to assure
that the RI-ISI submittal is complete and accurate.

The attached modification to the Pilgrim-specific RI-ISI program supports the conclusion that the
proposed alternative described in the reference provides an acceptable level of quality and safety as
required by 10 CFR 50.55a(a)(3)(i).

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

A handwritten signature in black ink, appearing to read "J. F. Alexander".

J. F. Alexander

Attachment: Pilgrim RI-ISI Program Revised Section 4.6.2 and Table 4.6-1

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ATTACHMENT

REVISED SECTION 4.6.2 (page 8 of 30)
REVISED TABLE 4.6-1 (pages 21, 22, and 23 of 30)

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 $1\text{E-}07$ and $1\text{E-}08$ 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 ($-3.0\text{E-}08$) for both CDF and LERF) when crediting an improved POD.

Pilgrim conducted a risk impact analysis in accordance with 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 ($2\text{E-}02$) and CLERP ($2\text{E-}02$) from Reference 7.2.3, whereas, for medium consequence category segments, bounding estimates of CCDP ($1\text{E-}04$) and CLERP ($1\text{E-}05$) 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_0 and is expected to have a value less than $1\text{E-}08$. Piping locations identified as medium failure potential have a likelihood of $20x_0$. 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.

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 ⁽⁸⁾	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	6	-9	9.00E-10	9.00E-10	9.00E-10	9.00E-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								-2.82E-09	-1.21E-09	-2.80E-09	-1.20E-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	0	-7	7.00E-10	7.00E-10	7.00E-10	7.00E-10
FW Total								-1.97E-08	-1.30E-09	-1.97E-08	-1.30E-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 ⁽⁸⁾	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	0	-2	2.00E-10	2.00E-10	2.00E-10	2.00E-10
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 ⁽⁸⁾	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								-2.98E-08	1.74E-08	-2.98E-08	1.74E-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.
8. Risk category 4 (1) inspection locations selected for examination by both the FAC and RI-ISI Programs are not included in the count as these are not additional examinations. Risk category 4 (2) inspection locations selected for examination by both the Generic Letter 88-01 IGSCC Program and the RI-ISI Programs are included in the count, since these locations were previously credited in the Section XI Program.