November 16, 2017

NG-17-0221
10 CFR 50.55a

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

Duane Arnold Energy Center
Docket No. 50-331
Renewed Op. License No. DPR-49

Fifth Inservice Inspection Interval Program Plan, Relief Request No. RR-05

Reference: Letter, Curtland (NextEra) to U.S. NRC, "Fifth Inservice Inspection Interval Program Plan, dated March 7, 2017 (ML17069A172)

In the Referenced letter, NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) submitted our Fifth 10-Year Inservice Inspection (ISI) Interval Program Plan pursuant to 10 CFR 50.55a. In that letter, NextEra Energy Duane Arnold stated that an additional Relief Request for the Fifth 10-Year ISI Interval would be submitted under different correspondence at a later date. Pursuant to 10 CFR 50.55a(z)(1), NextEra Energy Duane Arnold requests approval of the attached Relief Request No. RR-05 for the Fifth 10-Year ISI Interval Program for the Duane Arnold Energy Center (DAEC). The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Rules for Inservice Inspection of Nuclear Power Plant Components, Section XI, 2007 Edition with Addenda through 2008 as amended by 10 CFR 50.55a, is the code of record for the DAEC Fifth 10-Year ISI Interval.

Relief Request No. RR-05 is requested in order to continue the implementation of the previously approved Risk-Informed Inservice Inspection Program (RI-ISI), as an alternative to the current requirements of Class 1 and 2 examination Categories B-F, B-J, C-F-1, and C-F-2 as specified in Table IWB 2500-1, and Table IWC 2500-1 of the 2007 Edition with 2008 Addenda of ASME Code Section XI.

NextEra Energy Duane Arnold requests approval of Relief Request No. RR-05 by August 1, 2018 to allow implementation of the RI-ISI program plan during the first period of DAEC's Fifth 10-Year ISI Interval.

This letter does not contain any new or revised commitments.

If you have any questions or require additional information, please contact Michael Davis at 319-851-7032.

for Dean Curtland

Dean Curtland
Site Director
NextEra Energy Duane Arnold, LLC

Enclosure

cc: NRC Regional Administrator
NRC Resident Inspector
NRC Project Manager

Enclosure to NG-17-0221

Fifth Inservice Inspection Interval Program Plan, Relief Request RR-05

23 pages follow

Duane Arnold Energy Center
10CFR50.55a Request Number RR-05 (Risk-Informed)

Proposed Alternative
In Accordance with 10CFR50.55a(z)(1)

-Alternative Provides Acceptable Level of Quality and Safety-

1. ASME Code Components Affected

All Code Class 1 and 2 piping welds previously subject to the requirements of ASME Section XI, Table IWB-2500-1, Examination Categories B-F and B-J, and Table IWC-2500-1, Examination Categories C-F-1 and C-F-2.

2. Applicable Code Edition and Addenda

The Duane Arnold Energy Center (DAEC) ISI Program for the Fifth Inservice Inspection (ISI) Interval is based on the ASME Boiler and Pressure Vessel Code Section XI, 2007 Edition with the 2008 Addenda as required by 10CFR50.55a.

3. Applicable Code Requirement

The selection process for Code Class 1 and Code Class 2 pipe welds to be examined in the Fifth Inspection Interval is required to be prescriptively determined in accordance with ASME Section XI, Table IWB-2500-1, Examination Categories B-F and B-J, and Table IWC-2500-1, Examination Categories C-F-1 and C-F-2.

4. Reason For Request

Duane Arnold Energy Center is requesting the continued use of a risk-informed process as an alternative for the selection of Class 1 and Class 2 piping welds for examination of the Fifth ISI Interval. Use of the risk-informed selection process has been shown to reduce the probable frequency of core damage and large early release when compared to the prescriptive deterministic selection method. The methodology will continue to be based on Electric Power Research Institute (EPRI) Topical Report TR-112657, Rev. B-A, with identified differences and additional guidance taken from ASME Section XI Nonmandatory Appendix R.

5. Proposed Alternative and Basis for Use

In accordance with 10CFR50.55a(z)(1), Duane Arnold Energy Center requests to continue to use a risk-informed process as an alternative to the ASME Section XI Code requirements for Class 1 and Class 2 piping welds for examination. The risk-informed alternative will continue providing an acceptable level of quality and safety. Other non-related portions of the ASME Section XI Code will be unaffected. EPRI TR-112657, Rev. B-A provides the requirements for defining the relationship between the RI-ISI program and the remaining unaffected portions of ASME Section XI.

Duane Arnold Energy Center
10CFR50.55a Request Number RR-05 (Risk-Informed)

Background

In 2002, a risk-informed (RI) methodology for the Third Interval inservice inspection of Class 1 and 2 piping welds was applied at the Duane Arnold Energy Center based on EPRI TR-112657, Rev. B-A, with identified differences and with additional guidance taken from ASME Code Case N-578. On March 29, 2002, DAEC submitted a letter to the NRC requesting relief from the ASME Section XI Code examination requirements of Class 1 and 2 piping weld inservice inspections (Examination Categories B-F, B-J, C-F-1 and C-F-2) by implementing a Risk-Informed Inservice Inspection (RI-ISI) Program during their Third Interval. DAEC provided supplemental information in a letter to the NRC dated September 6, 2002. Relief was granted by the NRC in a Safety Evaluation Report dated January 17, 2003.

In 2006, the RI-ISI application was evaluated and updated as DAEC entered its Fourth Interval. This resulted in the generation of Relief Request NDE-R005 which addressed the continued use of the RI-ISI application for the Fourth Interval. By letters dated June 30, 2006 and December 21, 2006, DAEC submitted Relief Request NDE-R005 to the NRC for the continued use of their RI-ISI application in lieu of the ASME Section Code examination requirements for Class 1 and 2 piping welds. Relief Request NDE-R005 was approved by the NRC in a Safety Evaluation Report dated January 31, 2007.

RI-ISI Living Program Evaluations and Updates

The original DAEC RI-ISI Program submittal to the NRC contained the following statement related to the evaluation/update process:

> *"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, piping segments will be reviewed and Risk Ranking adjusted as necessary on an ASME period basis. In addition, significant RI-ISI changes may require more frequent adjustment as directed by NRC Bulletin or Generic Letter requirements, or by industry and plant specific feedback."*

The requirement to perform living program evaluations and updates of the RI-ISI Program on a period basis is still applicable. Guidelines for the performance of these living program evaluations and updates are provided in NEI 04-05, "Living Program Guidance To Maintain Risk-Informed Inservice Inspection Programs For Nuclear Plant Piping Systems," published April, 2004. In accordance with NEI 04-05, the following aspects were considered during the periodic reviews for DAEC:

- Plant Examination Results
- Piping Failures
  - Plant Specific Failures

  - Industry Failures

- PRA Updates

- Plant Design Changes
  - Physical Changes
  - Programmatic Changes
  - Procedural Changes

- Changes in Postulated Conditions
  - Physical Conditions
  - Programmatic Conditions

The updated RI-ISI Program resulting from these periodic reviews is the subject of this proposed alternative. The changes from the previous program are attributable to specific issues(s) identified in each review:

During the review after the First Period of the Fourth Interval, the following summary was published:

> *The DAEC RI-ISI application is a Class 1 and 2 only application. As such, it is typical that there are little to no changes required of the program as a result of the update process. This review confirmed this assumption as there were some, but not significant, changes to inputs into the RI-ISI program. These changes were captured within existing plant programs and processes (e.g., Generic Letter 88-01 program, FAC program) and had no impact on the risk ranking and element selection results.*

During the review after the Second Period of the Fourth Interval, the following summary was published:

> *Based on this RI-ISI Living Program Evaluation, there is no need to update the RI-ISI Program at this time. However, the interface between weld overlay examinations, IGSCC Program examinations, and RI-ISI Program examinations should be clarified when the RI-ISI Program is updated at the end of the Fourth Interval.*

During the review after the Third Period of the Fourth Interval, the following issues were identified and incorporated:

- Due to an update to the PRA Model, resulting changes to the Consequence Ranking on 21 Consequence IDs and associated 49 segments were updated in the Risk Ranking, Element Selection, and Risk Impact Analysis.
- The Risk Impact Analysis was updated to reflect the new Upper Bound CCDP and CLERP, and the revised Risk Categories.
- The susceptibility to crevice corrosion of the Recirculation Inlet nozzles, Feedwater nozzles and Core Spray nozzles was investigated in the RI-ISI Living Program Update. In November 2005, EPRI published Technical Update Report 1011945 which provided enhanced crevice corrosion criteria for RI-ISI evaluations. Applying the criteria in EPRI Report 1011945, crevice corrosion was eliminated as a degradation mechanism in the RI-ISI application for the Recirculation Inlet (N2) and Core Spray (N5) nozzles, but should remain as a degradation mechanism for the Feedwater (N4) nozzles.
- The existing Risk Ranking Report was updated to a more efficient "one weld per line" format and Risk Groups were assigned. A Risk Group is defined as all welds in the same system that has the same Risk Category and Degradation Mechanism.
- ASME Section XI Nonmandatory Appendix R was used for guidance to supplement EPRI Topical Report TR-112657 Rev. B-A instead of Code Case N-578. As a result, the Risk Ranking Report was updated to replace the superseded Code Items Numbers originally assigned per Code Case N-578 with the Code Item Numbers identified in ASME Section XI, Nonmandatory R.
- The interface between weld overlay examinations, IGSCC Program examinations, and RI-ISI Program examinations was clarified as follows:
  - Welds under the weld overlays have been removed from the RI-ISI Program and are examined as part of the weld overlay examination. The listing of these overlaid welds has been retained in the Risk Ranking to acknowledge their existence, but they are not selected or examined under the RI-ISI application. They have been assigned a RI-ISI Item No. of AUG-NRG in the Risk Ranking to indicate that they are being examined under Generic Letter 88-01 with a frequency specified by BWRVIP-75-A rather than the RI-ISI Program.
  - IGSCC Category "A" welds in the IGSCC Program, as defined in BWRVIP-75-A, are subsumed by the RI-ISI Program.
  - Examinations of IGSCC Category "B" through "E" welds remain governed by the IGSCC (BWRVIP-75-A) Program. However, these welds remain listed in the population of the RI-ISI Program and are evaluated for susceptibility to degradation mechanisms in addition to IGSCC. These welds may be examined concurrently for both the IGSCC Program and the RI-ISI Program.

Risk Impact Analysis

All issues identified in the periodic reviews have been incorporated into the Risk Ranking, Summary, and Matrix. 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. A new Risk Impact Analysis was performed, and the revised program continues to represent a negligible change in risk when compared to the last deterministic Section XI inspection program. The revised program continues to be less than the EPRI criterion with a total change in plant risk of 4.34E-09 in regards to CDF and 4.30E-09 in regards to LERF.

As indicated in the following table, this evaluation has demonstrated that unacceptable risk impacts will not occur for any system from implementation of the RI-ISI Program when the enhanced Probability of Detection (POD) is credited for the RI-ISI examinations as prescribed in (EPRI) Topical Report TR-112657, Rev. B-A.

Risk Impact Results

System	$\Delta Risk_{CDF}$		$\Delta Risk_{LERF}$	
	w/ POD	w/o POD	w/ POD	w/o POD
01RPV	-1.50E-11	-1.50E-11	-1.50E-11	-1.50E-11
02RCR	2.34E-09	1.30E-08	2.34E-09	1.30E-08
03RWCU	6.90E-11	8.50E-11	7.44E-11	7.60E-11
04RCIC	-1.50E-11	-1.50E-11	-1.50E-11	-1.50E-11
05RHR	6.45E-10	3.41E-09	5.91E-10	3.24E-09
06CS	3.15E-10	3.15E-10	3.15E-10	3.15E-10
07HPCI	3.45E-10	3.45E-10	3.45E-10	3.45E-10
08MS	2.85E-10	2.85E-10	2.85E-10	2.85E-10
09FW	4.05E-10	4.15E-09	4.05E-10	4.13E-09
10CRD	-1.50E-11	-1.50E-11	-1.50E-11	-1.50E-11
11SLC	-1.50E-11	-1.50E-11	-1.50E-11	-1.50E-11
Total	**4.34E-09**	**2.15E-08**	**4.30E-09**	**2.14E-08**

Augmented Examination Programs

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

- DAEC applies the BWRVIP-75-A "Technical Basis for Revision to Generic Letter 88-01 Inspection Schedules", which provides alternative frequency requirements to NRC Generic Letter 88-01 for the examination of welds subject to intergranular stress corrosion cracking (IGSCC). Generic Letter 88-01 and BWRVIP-75-A will be implemented concurrently with the RI-ISI Program for the examination of piping welds that are subject to IGSCC. Generic Letter 88-01 specifies the examination extent and BWRVIP-75-A specifies the frequency requirements for austenitic stainless steel welds that are classified as Categories "A" through "G", depending on their susceptibility to IGSCC. In accordance with (EPRI) Topical Report TR-112657, Rev. B-A, piping welds identified as Category "A" are considered resistant to IGSCC, and as such are assigned a low failure potential provided no other damage mechanisms are present. The augmented inspection program for the other piping welds subject to IGSCC is not affected by the RI-ISI submittal.
- The augmented examination 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.

Additional Examinations

Whenever RI-ISI examinations reveal flaws or relevant conditions exceeding acceptance standards, additional examinations shall be performed during the current outage using the criteria of ASME Section XI, Nonmandatory Appendix R, Section R-2430.

Living Program Requirements

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.

Proposed RI-ISI Program Change Request

DAEC requests to resubmit their RI-ISI application in accordance with 10CFR50.55a(z)(1). A comparison between the proposed RI-ISI Program and the previously approved RI-ISI Program is provided in Attachment 1. Per the RI-ISI Program, 11% of Class 1 welds have been selected for examination.

Examinations shall be performed during the interval such that the period examination percentage requirements of ASME Section XI, paragraphs IWB-2412 and IWC-2412 are met.

The Risk-Informed process continues to provide an adequate level of quality and safety for selection of the Class 1 and Class 2 Piping Welds for examination. Therefore, pursuant to 10CFR50.55a(z)(1) it is requested that the proposed alternative be authorized.

6. PRA Quality

The PRA Quality assessment that supports the RI-ISI Program is provided in Attachment 2.

7. Duration of Proposed Alternative

The alternative will be used at DAEC until the end of the Fifth Ten-Year ISI Program Inspection Interval, subject to the review and update guidance of NEI 04-05. The Fifth Inspection Interval is currently scheduled to end October 31, 2026.

8. Precedents

1. Duane Arnold Energy Center – Risk-Informed Inservice Inspection Program SER dated January 17, 2003 (ADAMS Accession No. ML023530046).

2. Duane Arnold Energy Center Fourth Interval RI-ISI Relief Request NDE-R005 was authorized per NRC SER dated January 31, 2007 (ADAMS Accession No. ML070090357). This relief request utilized a similar methodology to the previously approved relief request.

9. References

1. Electric Power Research Institute (EPRI) Topical Report (TR) 112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Rev. B-A, dated December 1999.

2. Letter from W.H. Bateman (NRC) to G.L. Vine (EPRI), “Safety Evaluation Report Related to EPRI Risk-Informed Inservice Inspection Evaluation Procedure (EPRI TR-112657, Revision B, July 1999),” dated October 28, 1999 (ADAMS Accession No. ML993190460 and ML993190474).

3. NEI-04-05, “Living Program Guidance to Maintain Risk-Informed Inservice Inspection Programs for Nuclear Plant Piping Systems,” dated April 2004.

4. NRC Regulator Guide 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,” Revision 2, dated March 2009 (ADAMS Accession No. ML090410014).

10. Attachments

Attachment 1 – DAEC Inspection Location Selection Comparison Between Previously Approved and Revised RI-ISI Program by Risk Category

Attachment 2 – DAEC PRA Model Quality Summary

Attachment 1

DAEC Inspection Location Selection Comparison Between Previously Approved and Revised RI-ISI Program by Risk Category

System	Risk		Consequence Rank	Failure Potential		Previously Approved (Fourth Interval)			Updated (Fifth Interval)		
	Category	Rank		DMs	Rank	Weld Count[1]	RI-ISI	Other[2]	Weld Count[1]	RI-ISI	Other[2]
02RCR	2	High	High	TASCS	Medium	N/A[3]	N/A[3]		5	16	
	2 (2)	High (High)	High	TT, (IGSCC)	Medium (Medium)	69	22		56		
	2 (2)	High (High)	High	TT, CC, (IGSCC)	Medium (Medium)	8			N/A[4]	N/A[4]	
05RHR	2	High	High	TT	Medium	10	3		10	4	
	2 (2)	High (High)	High	TT, (IGSCC)	Medium (Medium)	4			4		
09FW	2 (1)	High (High)	High	TASCS, CC	Medium (High)	12	11		12	6	
	2 (1)	High (High)	High	TASCS, (FAC)	Medium (High)	3			3		
	2 (1)	High (High)	High	TASCS, TT, (FAC)	Medium (High)	8			8		
06CS	2 (2)	High (High)	High	CC, (IGSCC)	Medium (Medium)	2	1		N/A[4]	N/A[4]	
01RPV	4	Medium	High	None	Low	N/A[3]	N/A[3]		17	2	
02RCR	4	Medium	High	None	Low	N/A[3]	N/A[3]		43	11	
	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	34	6		60		
03RWCU	4	Medium	High	None	Low	N/A[3]	N/A[3]		23	3	
	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	1	1		5		
04RCIC	4	Medium	High	None	Low	N/A[3]	N/A[3]		7	1	
05RHR	4	Medium	High	None	Low	5	2		27	3	
	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	2			2		
06CS	4	Medium	High	None	Low	16	8		46	8[5]	
	4 (2)	Medium (High)	High	None (IGSCC)	Low (Medium)	6			8		

Attachment 1 (Cont'd)

DAEC Inspection Location Selection Comparison Between Previously Approved and Revised RI-ISI Program by Risk Category

System	Risk		Consequence Rank	Failure Potential		Previously Approved (Fourth Interval)			Updated (Fifth Interval)		
	Category	Rank		DMs	Rank	Weld Count(1)	RI-ISI	Other(2)	Weld Count(1)	RI-ISI	Other(2)
07HPCI	4	Medium	High	None	Low	52	6		52	6	
08MS	4	Medium	High	None	Low	60	6		60	6	
09FW	4 (1)	Medium (High)	High	None (FAC)	Low (High)	49	5		49	5	
10CRD	4	Medium	High	None	Low	2	1		8	1	
11SLC	4	Medium	High	None	Low	6	0		24	1(5)	
02RCR	5a	Medium	Medium	TASCS	Medium	5	0		N/A(3)	N/A(3)	
03RWCU	5a	Medium	Medium	TT	Medium	2	0		2	1	
05RHR	5a	Medium	Medium	TT	Medium	33	0		33	4	
09FW	5a (3)	Medium (High)	Medium	TASCS (FAC)	Medium (High)	4	1		4	1	
01RPV	6a	Low	Medium	None	Low	27	0		10	0	
	6a (5a)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	4			4		
02RCR	6a	Low	Medium	None	Low	43	0		N/A(3)	N/A(3)	
	6a (5a)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	26					
03RWCU	6a	Low	Medium	None	Low	26	0		3	0	
	6a (5a)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	23			9		
04RCIC	6a	Low	Medium	None	Low	29	0		22	0	
05RHR	6a	Low	Medium	None	Low	431	0		409	0	
	6a (5a)	Low (Medium)	Medium	None (IGSCC)	Low (Medium)	1			N/A(3)	N/A(3)	
06CS	6a	Low	Medium	None	Low	158	0		106	0	
07HPCI	6a	Low	Medium	None	Low	98	0		107	0	
08MS	6a	Low	Medium	None	Low	184	0		185	0	
	6a (3)	Low (High)	Medium	None (FAC)	Low (High)	7			5		

Attachment 1 (Cont'd)

DAEC Inspection Location Selection Comparison Between Previously Approved and Revised RI-ISI Program by Risk Category

System	Risk		Consequence Rank	Failure Potential		Previously Approved (Fourth Interval)			Updated (Fifth Interval)		
	Category	Rank		DMs	Rank	Weld Count[1]	RI-ISI	Other[2]	Weld Count[1]	RI-ISI	Other[2]
09FW	6a (3)	Low (High)	Medium	None (FAC)	Low (High)	5	0		6	0	
10CRD	6a	Low	Medium	None	Low	60	0		39	0	
11SLC	6a	Low	Medium	None	Low	27	0		N/A[3]	N/A[3]	
02RCR	7a	Low	Low	None	Low	4	0		4	0	
03RWCU	7a	Low	Low	None	Low	2	0		2	0	
	7a (6b)	Low (Low)	Low	None (IGSCC)	Low (Medium)	N/A[3]	N/A[3]		10		
04RCIC	7a	Low	Low	None	Low	12	0		12	0	
06CS	7a	Low	Low	None	Low	N/A[3]	N/A[3]		22	0	
07HPCI	7a	Low	Low	None	Low	21	0		12	0	
08MS	7a (5b)	Low (Medium)	Low	None (FAC)	Low (High)	N/A[3]	N/A[3]		2	0	
10CRD	7a	Low	Low	None	Low	N/A[3]	N/A[3]		15	0	
11SLC	7a	Low	Low	None	Low	N/A[3]	N/A[3]		9	0	

NOTES:

1. The total weld count is less in the Fifth Interval than in the Fourth Interval due to welds under weld overlays being removed from the RI-ISI Program and examined as part of the weld overlay examinations.
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 Rev. B-A. This option was not applicable for the DAEC RI-ISI application. The "Other" column has been retained in this table solely for uniformity purposes with other RI-ISI application template submittals.
3. The Not Applicable "N/A" is the result of changes resulting from the RI-ISI Program Living Program Evaluation and Update performed after the Third Period of the Fourth Interval as described within this relief request. In these instances a change to the Consequence Rank or Failure Potential resulted in the overall Risk Ranking changing within the associated system.
4. In the Fifth Interval update, Crevice Corrosion (CC) is not applicable in these two systems. The associated nozzles screened out per EPRI document 1011945, "Enhanced Crevice Corrosion Criteria in RI-ISI Evaluations", dated November 2005.
5. The SLC system only has one (1) circumferential weld, which was selected for examination in the Fifth Interval. Two (2) circumferential welds in the CS system were selected in lieu of two (2) additional socket welds in the SLC system to improve the robustness of the Fifth Interval RI-ISI selections. All associated welds are Class 1 with a Risk Category of 4.

Attachment 2
DAEC PRA Model Quality Summary

The PRA model quality summary addresses (1) the peer review summary and F&O finding status for internal and flood initiating events, and (2) model change database (MCDB) open items. Based on review of peer review finding resolutions and MCDB open items, the DAEC PRA model is of sufficient quality to support the RI-ISI consequence evaluation.

Internal Events Peer Review Summary

The PRA model utilized for the evaluation of risk impact is the DAEC Full Power Internal Events Revision 7 model of record. The model includes analysis of both Core Damage Frequency (CDF) and Large Early Release Frequency (LERF), and includes changes made to incorporate findings and observations of the most recent PRA peer review. The review was performed against the ASME PRA Standard and Regulatory Guide 1.200.

The DAEC Internal Events PRA model is maintained and upgraded in accordance with DAEC PRA maintenance and update procedures. The model routinely incorporates plant design changes, procedure changes, plant operating data, current industry PRA methods, review comments, and general improvements identified by the NRC. The PRA has undergone a variety of assessments of its technical capability, as summarized in the following paragraphs.

DAEC was the first non-pilot plant to have a PRA Peer Evaluation in 1997. The PRA certification process used a team of experienced PRA and system analysts to provide both an objective review of the PSA technical elements and a subjective assessment based on their PRA experience regarding the acceptability of the PRA elements.

During 2005 and 2006, the PRA model results were evaluated in the BWR Owners' Group (BWROG) PRA cross-comparisons study performed in support of implementation of the mitigating systems performance indicator (MSPI) process.

Following issuance of the ASME PRA Standard and its endorsement by the NRC in RG 1.200 Rev. 1, DAEC performed a detailed self-assessment of the DAEC PRA model and documentation in preparation for the BWROG PRA Peer review in the fall of 2007.

In December 2007, a peer review was held at the NextEra Energy offices in Juno Beach, FL, under the auspices of the BWROG and using the NEI 05-04 PRA Peer Review process. This was a full-scope review of all the Technical Elements of the internal events, at-power PRA. Approximately 83 supporting requirements were identified for which potential gaps to Capability Category II existed. The PRA model was revised to address these gaps.

In March 2011, a focused PRA Peer Review was held at the NextEra Energy offices. Technical elements of the internal events, at-power PRA were reviewed with a focus on

DAEC's disposition of findings and suggestions as a result of the Full Scope Peer Review conducted in 2007. The peer review team determined that a review of all supporting requirements for the Human Reliability Analysis technical element was needed since it involved a broad based change in methodology for calculating human error probabilities. Other upgrades received enhanced attention by the review team, but did not require rereview of all supporting requirements within the respective technical element category. These included use of the Alpha Factor Method for calculating common cause factors, use of convolution methods for calculating AC power recovery terms, incorporation of revised pipe break frequency data to differentiate between steam line breaks and water line breaks, and incorporation of new internal flood frequency data. The set of supporting requirements that needed to be reviewed for each technical element was determined by the peer review team consistent with ASME/ANS Standard RA-Sa-2009. In summary, the 2011 Focused Peer Review entailed a comprehensive review of all PRA upgrades, updates and previous F&Os and is considered to be the Internal Events PRA Peer Review of record.

The full scope PRA Peer Review conducted in 2007 used version RA-Sb-2005 of the ASME Standard as endorsed and clarified by the NRC in Regulatory Guide 1.200, Revision 1. The focused scope peer review conducted in March 2011 focused PRA Peer Review utilized version RA-Sa-2009 of the ASME Standard as endorsed and clarified by the NRC in Regulatory Guide 1.200, Revision 2.

Internal Events F&O Impact Summary

The Focused Peer Review team found that NextEra Energy had appropriately incorporated most of the previously identified gaps into Revision 6 of the PRA. However, not all of the closures were found to fully meet Capability Category I or Capability II requirements. Twelve findings were identified. All of these findings have been addressed and are summarized in Table C-1 for completeness. Given that all findings are addressed, there is no impact on the quantitative risk results and PRA conclusions of the RI-ISI consequence evaluation.

Table C-1

DAEC Focused Peer Review Findings		
Finding	**Description of Gap**	**Disposition**
SY-A3-03A	The remarks made by the previous peer review under finding SY-A3-03 are still open and still valid. Failure of either vital 4kV bus Start Up Transformer (SUT) breaker, 1A302 [1A402], to trip on LOSP is not modeled – this failure would prevent associated EDG breaker from closing onto the bus. Omission of this is nonconservative. The model should include the necessary dependencies for this event. Specifically, the fault tree model omits a dependency; the failure of the normal supply breaker to each vital 4kV bus to trip upon a loss of offsite power to allow the associated EDG to close onto the bus. More importantly, a common cause failure between the two breakers for the two busses is omitted. This CCF may contribute significantly to SBO sequences. Also, not modeling these breakers will have an impact on the fire model. RECOMMENDATION: These components should be modeled to remove nonconservatism and to address future PRA applications.	Supporting requirement SY-A3 was assessed as MET in the 2011 focused peer review. This associated finding was closed by adding startup transformer breakers 1A302 and 1A402 to the PRA model. The change includes new random and CCF basic events for these breakers. D4160VENCB1A302-FO-- CCF-CKTB-D4160-FTO_1_2 Breakers 1A302 and 1A402 are described in the AC Power System Notebook, Revision 4.
SY-C2-02A	There are no system level cutsets included in the notebooks and as such no evidence that the system models were evaluated to validate they are complete and accurate [i.e. a description of model results]. Based on discussions with DAEC, system level cutsets were reviewed to validate the models, however the results of the review were not documented and the system level cutsets were not included in the notebooks. RECOMMENDATON: Include system level cutsets in the system notebooks along with an assessment.	Supporting requirement SY-C2 was assessed as MET in the 2011 focused peer review. To address this associated finding, system cutsets were prepared and reviewed. As a result, several changes were made to the Revision 6 model and documented in supplements to the PRA notebooks.
DA-C10-01A	No evidence of failure mode level information is provided. This requires documentation of a review of test procedures to determine that test covers all failure modes of a component. For example, a check associated with a pump may or may not be cycled based on the recirculation configuration. RECOMMENDATION: Address this issue by component type (e. g. pump test likely covers all pump failure modes but not failure modes of all downstream valves).	Supporting requirement DA-C10 was assessed as MET CC I in the 2011 focused peer review. To address this associated finding, test procedures were reviewed against their related component failure modes. The assumed failure modes for components were found to be covered. No changes to the PRA model were required. The evaluation is documented in Supplement 2 to the DAEC PRA Data Analysis Notebook.
DA-D4-01A	Appendix C.1 provides graphs of prior and posterior distributions; however, there is no discussion of the reasonableness of the posterior. For example, for TC AS1K FR has a prior mean of 9 E-5 with evidence of 3 failures in 544. It appears that the data is inconsistent with the prior.	Supporting requirement DA-D4 was assessed as MET CC I in the 2011 focused peer review. To address this associated finding, the reasonableness of the prior and posterior distributions was reviewed; it was concluded no model changes were required. The evaluation is documented in Supplement 1 to the DAEC PRA Data Analysis Notebook.
MU-F1-01	Update PRA procedures to meet all MU SRs.	Fleet procedure EN-AA-105-1000, "PRA Configuration Control and Model Maintenance" has been developed to meet all MU supporting requirements for Capability Category I/II/III.
IE-B3-01A	Several findings and suggestions under HLR-A and HLR-B have been dispositioned / resolved, but the subsuming (IE-B3) and screening (IE-C4 (C6)) of initiating events does not meet the standard. The following provides example summarizes (IE Notebook, including Appendix H): • RBCCW (fails CRD, which is credited for early injection) is subsumed by TT, but RBCCW is not failed given TT. • GSW (fails RBCCW, CRD, Feedwater,	Supporting requirement IE-B3 was assessed as NOT MET in the 2011 focused peer review. To address this associated finding, support system initiating event fault trees listed in the finding--with the exception of Reference and Variable Leg Breaks and RBCCW--were developed and incorporated into the Rev 7 model. **Reference and Variable Leg Breaks:** were left as an open item needing additional review. The following provides the basis justifying deferral: Using the Rev 7 model, the conditional core damage

Table C-1

DAEC Focused Peer Review Findings		
Finding	**Description of Gap**	**Disposition**
	etc.) is subsumed by TC, but these systems are not failed given TC. • The impacts of Reference and Variable Leg Breaks are not adequately described and are subsumed by Loss of FW. Most likely would be a manual shutdown with complications verses a Loss of FW. Given that immediate shutdown would occur given a break, these should be modeled. Section 2.4.8 described the low risk from these, but this does not meet standard for screening. • 1A1/1A2 bus failures and partial loss of feedwater (one pump) are binned to TT, but this impact is not modeled given TT. • 1A3/1A4 bus failures are subsumed with TT. Impact on loss of chargers [TS 3.8.4.] etc. and possibility that failure is a problem could lead to an immediate shutdown. Notes 11 and 12 suggest that only normal power source is lost, but emergency power is also unavailable if bus fails. RECOMMENDATION: Follow IE-B3 and IE-C6 with regard to subsuming and screening or more importantly model the above initiating events.	probability (CCDP) was calculated assuming a plant trip and loss of FW, HPCI, and RCIC. The resulting CCDP was 2.60E-5. The CDF is 1.34E-4/yr x 2.6E-5 = 3.5E-09/yr (0.12% of the Rev. 7 PRA CDF). However, there are conservative factors inherent in these bounding values; • Operators may detect a leak and take corrective actions before the second leak occurs. Note that the frequencies used are yearly. Two leaks must occur in close proximity of each other to result in a plant trip. • Breaks are less likely than leaks –mitigation of leaks will likely be successful. • Factors that lead to two lines failing concurrently most likely result from a more significant initiating event. **RBCCW:** An initiator fault tree was developed but not included in the model. It is planned to be added in a future revision. The impact of the RBCCW is not significant since GSW fails RBCCW. The GSW initiator is in the model.
SY-A5-01A	The SBO event tree does not take credit for containment venting using an alternate alignment when the pneumatic supply is lost. DAEC procedure SAMP 706 provides detailed direction for venting PC given an unavailable pneumatic supply. The Containment Vent notebook does not credit/discuss this procedure. RECOMMENDATION: Add containment venting to the event tree.	Supporting requirement SY-A5 was assessed as MET in the 2011 focused peer review. To address this associated finding, fault tree logic was developed for venting the primary containment using SAMP 706. The logic was incorporated into the Revision 7 PRA update.
SY-C2-01A	There is no Fire Water System (Alternate Injection) notebook or equivalent information in another notebook. The operator action to align fire water for injection is modeled but the components are based on the argument that the probability of the action subsumes the component failure rates. RECOMMENDATION: Develop new system notebook for use of fire water as an alternate injection source.	Supporting requirement SY-C2 was assessed as MET in the 2011 focused peer review. To address this associated finding, new HEPs for aligning the in-situ diesel and electric fire pump were updated and failure rates for key components were added. A fire water notebook was prepared but still needs to be reviewed and approved.
HR-A1-01A	HRA Notebook (Appendix J, Table J-1) includes a systematic approach to identifying test and maintenance activities through a system by system review of potential misalignments. This meets the high level requirement to use a "systematic approach" and is judged to be adequate by the Peer Review team. However, the SR wording requires "a review of procedures and practices" which was not followed. As a result, the PR team must assess this SR as "not met." RECOMMENDATION: Reassess this SR when the Addendum B of the PRA Standard is released. The current proposed revision deletes the requirement for "a review of procedures and practices".	Addendum B of the PRA Standard has not yet been released. The approach used in the DAEC PRA was different than currently prescribed in the standard, but is considered capable of accurately identifying pre-initiators. As such this variance from the standard has no impact on this application. Supporting requirement HR-A1 was assessed as NOT MET in the 2011 focused peer review.
HR-A2-01A	HRA Notebook (Appendix J, Table J-1) includes a systematic approach to identifying calibration activities through a system by system review of potential miscalibrations. This meets the high level requirement to use a	Addendum B of the PRA Standard has not yet been released The approach used in the DAEC PRA was different than currently prescribed in the standard, but is considered capable of accurately identifying pre-initiators. As such this variance

Table C-1

DAEC Focused Peer Review Findings		
Finding	**Description of Gap**	**Disposition**
	"systematic approach" and is judged to be adequate by the Peer Review team. However, the SR wording requires "through a review of procedures and practices" which was not followed. As a result, the PR team must assess this SR as "not met." RECOMMENDATION: Reassess this SR when the Addendum B of the PRA Standard is released. The current proposed revision deletes the requirement for "a review of procedures and practices".	from the standard has no impact on this application. Supporting requirement HR-A2 was assessed as NOT MET in the 2011 focused peer review.
HR-C1-01A	FINDING HR-C1-01A: A number of pre-IE HFEs are identified for modeling in the PRA. Generally, these HFEs are at the train or system level, as appropriate. However, a small set were identified at the system level without related train-level HFEs. It is possible that the train level HFE may be important to system unavailability. For example, miscalibration of DG fuel oil level transmitters is done at the system level, but not at the train level. At the train level, the HFE would be 8e-3, compared with independent failure of the level transmitter of 5e-4. In other cases, the HFE is at the train level, but no corresponding system level dependent HFE is included. For example, failure to restore RHR SW post TM is developed at the train level, but no common misalignment of both trains is considered. RECOMMENDATION: Review the differences between the modeling of system impact vs train.	Supporting requirement HR-A1 was assessed as NOT MET in the 2011 focused peer review. To address this associated finding, train level preinitiating event HFEs were added to the Revision 7 PRA.
QU-D6-01A	Table P-1 and P-2: plant position is that initiating event fault trees are not required by the standard (IE) and therefore equipment level of detail is not available or required to meet this SR. A future enhancement has been identified to document in the notebooks the importance of operator actions in support system initiating events, but is awaiting industry clarification. Fault trees are required for support system initiating events in order to satisfy this SR. RECOMMENDATION: Fault trees are required for support system initiating events in order to satisfy this SR [Cat II].	Supporting requirement QU-D6 was assessed as MET CC I in the 2011 focused peer review. To address this associated finding, fault trees for support system initiating events have been developed and incorporated into the Revision 7 PRA as discussed in the description of resolution for finding IE-B3-01A.

Model Change Database Impact Summary

The DAEC Full Power Internal Events PRA was recently updated from Revision 6 to Revision 7. The DAEC PRA model change database was reviewed for potential impacts of open items on the RI-ISI consequence evaluation (Table C-2). In addition, plant modifications assessed as potentially having a PRA impact were reviewed (Table C-3). There are no open items that are judged have a substantial impact on the RI-ISI evaluation.

Table C-2

Item No.	Concern	Status	Estimated RI-ISI Impact
1	Shutdown Cooling added to various event trees.	Shutdown cooling is incorporated into the Revision 7 PRA	
2	RHR Containment Spray Heat Removal (CSS) added to various event trees.	Containment Spray valves are added to suppression pool cooling fault tree logic in the Revision 7 PRA	
3	Power Conversion System Recovery (PCSR) added to various event trees. See new basic event called PCSR-F.	Deferred to future update	This item was considered for consistency with the NRC SPAR model only and not for addressing plant modifications or procedures. Therefore, there is no impact on the RI-ISI application
4	Main Condenser Available (Q) added to IORV and Small LOCA event trees to be consistent with SPAR. See top event CNDSR.	Top event CNDSR is added to various event trees in the Revision 7 PRA	
5	Feedwater/Condensate for High Pressure Injection (Q1) added to large LOCA event trees.	Node Q1 is included in large LOCA event trees in the Revision 7 update	
6	Early and late flooding HEP logic and recovery rule changes.	Incorporated into the Revision 7 update	
7	Turbine building flood impact on Startup Transformer.	Top event TB_FLOOD_SU_XNSFMR was added under gate P1-40-01 in the Revision 7 PRA to address this issue	
8	TSC Fails to use EMG and identify need for SAMPs.	Incorporated into the Revision 7 PRA	
9	Operator Fails to identify EAL or Identify need for EMG and SAMPs.	Incorporated into the Revision 7 PRA	
10	SAMP 701 – Bypass of PCIS Group 4 SDC isolation from high drywell pressure and low RPV water level.	Incorporated into the Revision 7 PRA	
11	SAMP 702 – Alternate water source for SBDG cooling.	Incorporated into the Revision 7 PRA	
12	SAMP 703 – Operators fail to locally start RCIC with no DC power. Actions associated with SAMP 703 are added to RCIC components.	Incorporated into the Revision 7 PRA	
13	SAMP 704 - Powering 125 VDC battery chargers from a portable generator. Includes failure of TSC to identify need for implementing the SAMP.	Incorporated into the Revision 7 PRA	
14	SAMP 705 - Powering non-essential 480 VAC bus using offsite diesel generator. This action allows the Electric Fire Pump to be used for alternate RPV injection per AIP-404.	Incorporated into the Revision 7 PRA	
15	SAMP 706 - Venting the primary containment when pneumatic supply or DC power for the primary containment vent valves is not available.	Incorporated into the Revision 7 PRA	
16	SAMP 707 - Depressurizing the RPV when normal DC power is unavailable or when operation from the control room and/or remote shutdown panel is not available.	Incorporated into the Revision 7 PRA	
17	SAMP 708 - Injecting water into the RPV using the Portable Diesel Fire Pump (PDFP). See also SAMP 715.	Incorporated into the Revision 7 PRA	
18	SAMP 709 - Supplying makeup water to the hotwell with the Portable Diesel Fire Pump (PDFP).	Logic is added under gate Q1-14-10 per section 1.2.11, but only an undeveloped basic event	Impact of this severe accident management procedure on the RI-ISI application is judged to be very small. The current PRA is conservative with respect to this item.
19	SAMP 710 - Transferring water from the Circ Pit to the CSTs using the PDFP.	Deferred to future update	Impact of this severe accident management procedure on the RI-ISI application is judged to be very

Table C-2

Item No.	Concern	Status	Estimated RI-ISI Impact
			small. The current PRA is conservative with respect to this item.
20	SAMP 711 - Supplying water for cooling of core debris and scrubbing of fission products.	Deferred to future update	Impact of this severe accident management procedure on the RI-ISI application is judged to be very small. The current PRA is conservative with respect to this item.
21	SAMP 712 - Supplying makeup greater than 500 gpm or spray greater than 200 gpm to the spent fuel pool.	Not applicable to the FPIE PRA	Not applicable
22	SAMP 713 - Spraying of reactor building or primary containment to reduce the magnitude of fission product releases.	Deferred to future update	Impact of this severe accident management procedure on the RI-ISI application is judged to be very small. The current PRA is conservative with respect to this item.
23	SAMP 714 - Manually isolating RWCU to minimize risk of LOCA outside containment and resultant fission product release.	Deferred to future update	Impact of this severe accident management procedure on the RI-ISI application is judged to be very small. The current PRA is conservative with respect to this item.
24	SAMP 715 - Staging and operating guidance for the PDFP.	Incorporated into the Revision 7 PRA in conjunction with SAMP 708	
25	SAMP 716 - Initial actions for responding to an extreme damaging event with loss of the control room command and control function.	Deferred to future update	Impact of this severe accident management procedure on the RI-ISI application is judged to be very small. The current PRA is conservative with respect to this item.
26	SAMP 717 - Supplying cooling water from an available ESW pump to the opposite loop.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item. Incorporating SAMP 717 would lower importance measures for pipe segments
27	Incorporate new operator action to address giving the operators a second change at emergency depressurization. Applies to late alternate injection in Station Blackout sequences.	Operator action DADS--ANOPSBO01-HE—has been added to assessment of Station Blackout sequences in the Revision 7 PRA	
28	Incorporate new operator action to address giving the operators a second change at emergency depressurization. Applies to late alternate injection in Station Blackout sequences with no DC power.	Operator action DADS--ANOPSP707-HE—has been added to assessment of Station Blackout sequences in the Revision 7 PRA	
29	Add strainer bypass function for ESW, RHRSW, and GSW strainers.	Incorporated into the Revision 7 PRA	
30	Improve modeling of operator actions in response to ECCS suction strainer blockage. Suggestions include 1) backflushing of ECCS strainers, 2) aligning core spray suction to the CSTs, and 3) crediting CST to hotwell makeup in water-LOCA sequences. See also Item #55	Improvements 1) and 2) are incorporated into the Revision 7 PRA. Improvement 3) is deferred	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item. Crediting CST to hotwell makeup would lower importance measures for pipe segments
31	Improve modeling of flood induced failure of the diesel fire pump, the electrical fire pump, and the portable diesel fire pump.	Incorporated into the Revision 7 PRA	
32	Improve modeling of injection with fire water during station blackout.	Incorporated into the Revision 7 PRA	
33	Update PRA with changes made to EOOS in January 2014. These are 1) correct modeling of switchyard breakers J and K, 2) add 36 KV breaker CB5960 as an alternate power supply to LLRPSF transformers XR1 and XR2, 3) Add 161 KV breakers CB7510, CB5950, CB8090,	Incorporated into the Revision 7 PRA	

Table C-2

Item No.	Concern	Status	Estimated RI-ISI Impact
	and CB9180 to the switchyard fault tree, 4) add strainer bypass valve V46-0009 to the GSW system fault tree.		
34	Update PRA with a change made to EOOS in July 2014 to correct high CDF value with both EDG and the startup transformer out-of-service.	Incorporated into the Revision 7 PRA	
35	Consider revising credit for EDG recovery (SDP related change: section 5.0)	Incorporated into the Revision 7 PRA	
36	Develop a diesel fire water notebook that includes a basis for crediting successful application of the diesel fire pump or portable diesel fire pump before 12 hours (SDP related change: section 5.0)	Deferred to future update	EOP updates which extend RPV injection options in Station Blackout sequences were implemented after the Revision 7 PRA update freeze date. The changes however, are expected to be conservative with respect to pipe segment importance measures for RI-ISI
37	Develop a TSC notebook that includes a basis for crediting successful applications of the TSC diesel for more than 12 hours (SDP related change: section 5.0)	Deferred to future update	OP updates which extend RPV injection options in Station Blackout sequences were implemented after the Revision 7 PRA update freeze date. The changes however, are expected to be conservative with respect to pipe segment importance measures for RI-ISI
38	Incorporate FLEX improvements in the ED procedure to clearly define the option to extend RCIC operation beyond 12 hours (SDP related change: section 5.0)	Deferred to future update	OP updates which extend RPV injection options in Station Blackout sequences were implemented after the Revision 7 PRA update freeze date. The changes however, are expected to be conservative with respect to pipe segment importance measures for RI-ISI
39	Consider revising credit for AC power recovery (SDP related change: section 5.0)	Incorporated into the Revision 7 PRA	
40	Review Rev 6 system cutsets with more than one maintenance basic event to assess inclusion in the CAFTA mex file. See Item #56	Incorporated into the Revision 7 PRA	
41	Update the SBO event tree structure to 1) take credit for containment venting with alternate external make-up as a success path, 2) take credit for portable diesels that will improve the reliability of long term DC power during a station blackout (FLEX), and 3) accommodate other FLEX improvements such as portable diesel pumps for low pressure injection, etc.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item. Incorporating the suggested FLEX improvements would lower importance measures for pipe segments
42	Modify top event TSC in the SBO event tree to include both the TSC diesel and the portable diesel generator under an AND gate.	Incorporated into the Revision 7 PRA	
43	Modify top event V1 in the SBO event tree to 1) include diesel fire pump failure modes, 2) correct the portable diesel fire pump model, 3) re-assess use of human action basic events for aligning the diesel fire pump and the portable diesel fire pump, and 3) address three time frames to support more realistic HEP development.	Incorporated into the Revision 7 PRA	
44	Add top event W1 to the SBO event tree to ensure a successful stable state for days, as in the general transient event tree.	Incorporated into the Revision 7 PRA	
45	Re-evaluate top events X and X150 in the SBO event tree in light of differences between depressurizing when high pressure injection is successful versus when it fails, in light of procedure changes, and in light of FLEX.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item. Incorporating the suggested improvements would lower importance measures for pipe segments
46	Revise the event tree for LOOP with one EDG available to 1) remove top event A1 for	Incorporated into the Revision 7 PRA	

Table C-2

Item No.	Concern	Status	Estimated RI-ISI Impact
	feedwater since it is unavailable for LOOP sequences, 2) add top event AC-REC for recovery of AC power after top event QUV, 3) incorporate convolution interface, and 4) Update Event Tree Notebook Table 2-5 footnote to be more complete.		
47	Incorporate FLEX Phase 2 equipment into the SBO event tree to support the alternate injection function.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item. Incorporating the suggested improvements would lower importance measures for pipe segments
48	Incorporate MAAP insights for maintaining RCIC operation with aggressive cooldown into the SBO event tree.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item. Incorporating the suggested improvements would lower importance measures for pipe segments
49	Level 1 gates have been applied in Level 2 event trees without adjusting for the actual initiating events and configurations reflected in the accident classes that are transferred to the containment event trees. A solution would be to expand the CETs.	Deferred to future update	Given that Level 2 results are often the determining parameter for assignment of consequence category in the RIISI evaluation, this item is judged to have little influence on its results.
50	Basic events inserted in the model to address future credit are prevalent in the Level 2 model. These are assigned a value of 1.0. These appear to generate cutsets that are nonsensical	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item since LERF is overestimated when high value basic events are present
51	Investigate if credit for operator initiation of drywell sprays for debris cooling is useful to include in the Level 2 model. The current HEP is 1.0.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item
52	Re-evaluate the binning of several Level 2 end-states as 'early'.	Deferred to future update	The Revision 7 PRA is conservative for the RI-ISI application with respect to this item since some Level 2 end-states are binned as 'early' that could instead be 'intermediate'
53	There are redundant basic events in the BE database for operator action to open MO1942. The unused event should be deleted.	Incorporated into the Revision 7 PRA	
54	Add a basic event for two portable diesel generators that can be rented from Cedar Rapids.	Incorporated into the Revision 7 PRA	
55	Add credit for back-flushing RHR A and RHR B torus suction strainers. See also Item #30	Incorporated into the Revision 7 PRA	
56	Delete co-maintenance terms from the RCIC fault tree. See Item #40	Incorporated into the Revision 7 PRA	
57	Add the capability to address an electronic governor failure by throttling RCIC valve MO2405.	Incorporated into the Revision 7 PRA	
58	Modify logic under the RCIC test line failure gate to maintain consistency with the change made in Item #57.		
59	Delete the gate described as 'Inlet Drain Pot not Drained Causes Water Hammer" from the RCIC fault tree.	The subject gate (RCIC- 07-01) is retained in the Revision 7 model, but is supplied with screening values for events leading to water hammer	The subject gate is a very low contributor to RCIC system failure. Therefore this item has essentially no influence on the RI-ISI application.
60	Incorporate convolution of AC power recovery into the Level 1 PRA.	Incorporated into the Revision 7 PRA	
61	Correct the power supply for HPCI steam supply drain line valve CV2211.	Incorporated into the Revision 7 PRA	
62	Credit the annunciator response procedure that	Incorporated into the Revision	

Table C-2

Item No.	Concern	Status	Estimated RI-ISI Impact
	addresses high level in the HPCI system drain pot logic tree.	7 PRA	
63	Research the technical basis for consideration of water hammer in the HPCI and RCIC systems.	Deferred to future update; the water hammer question for HPCI and RCIC drain pots remains open	Modeling of water hammer is a very low contributor to HPCI and RCIC system failure. Therefore, this item has essentially no influence on the RI-ISI application.
64	Combine human actions for control of RPV level following a plant trip into a single human action.	Deferred to future update	The current treatment of human actions to manage water level following plant trips, including ATWS, is believed to be overly conservative and would benefit from refinement. The current model is conservative for the RI-ISI application with respect to this item
65	Review all fault tree negation logic to assure FTREX quantification does not result in overly conservative probabilities.	A fairly extensive review of negation logic in the PRA model has been performed, but it was not comprehensive, nor were clear recommendations made for model changes	No instances of issues involving not-gates were noticed in quantification of RI-ISI cases. Since such issues have previously been found to be conservative, it is not likely to adversely impact any of the RIISI results.
66	Correct offsite AC power logic where having both transformers in maintenance is not going to LOOP and SBO.	Incorporated into the Revision 7 PRA	
67	Revise the Level 2 Notebook to reflect removal of SBGT heaters by EC 283827.	The notebook has not yet been updated	This item is a documentation issue only and has no impact on RI-ISI results
68	Incorporate a new human action into the CRD fault tree for opening of CRD room doors for alternate room cooling.	Incorporated into the Revision 7 PRA	
69	Develop HRACOMB events for the two combinations of human actions causing CDF and LERF to spike when both trains of Control Building HVAC are set to unavailable.	Incorporated into the Revision 7 PRA	
70	Add logic to the Control Building HVAC fault tree which facilitates quantification of both trains of HVAC in maintenance at the same time.	Incorporated into the Revision 7 PRA	
71	Benchmark the MAAP thermal-hydraulic code to the DAEC simulator	Deferred to future update	No specific issues have been identified where thermal-hydraulic modeling with MAAP is insufficient or nonconservative with regard to the DAEC PRA. Therefore, there is no impact on the RI-ISI application
72	Add logic to the RHRSW system fault tree to recognize the possibility of RHR Service Water pump failure due to overheating when started without their normal discharge pathway. See response to CR 02103035 for more detail.	Incorporated into the Revision 7 PRA	

Table C-3

EC Number	EC Title	Status	Status Date	System	PRA Disposition
282081	CABLE REPLACEMENT FOR 1G031 AND 1G021 WETTED CABLE PROJECT	Closed	3/21/2016	24.01	Per the DAEC fire protection engineer, further review is needed to determine whether updating of the Fire PRA is needed for this EC. Revision of the FPIE PRA however, is not necessary.
156057	1P099B ESW PUMPCONTROL CIRCUIT APPENDIX R ISSUES	Closed	2/11/2014	54.00	Change already incorporated into Fire PRA for NFPA 805 implementation. No impact for FPIE PRA
156110	INSTALLATION OF WELL WATER ISOLATION VALVE V44-0509	Closed	1/13/2011	8.00	Failure of new isolation valve V44-0509 to remain open should be added to the Well Water system fault tree. Due to resource constraints however, update of the fault tree and update of the Well Water system notebook are being postponed until after the Rev 7 rollout. This is acceptable based on the low safety significance of well water system isolation valves.
155991	B.5.B PHASE 2 AND 3 ENHANCEMENT MODIFICATIONS	Closed	3/13/2008	13.01	This mod implements phase 2 and phase 3 strategies of the NRC's B.5.b order regarding beyond design basis accidents. These strategies have either been integrated with or superseded by post-Fukushima FLEX mods. Such changes are being incorporated into the Rev 7 PRA as practical through modeling of severe accident management procedures (SAMPs)
281991	RELIABLE HARDENED CONTAINMENT VENT - WETWELL NRC ORDER EA-13-109	Active	10/14/2016	73.01	This mod installs a new hardened containment vent system which satisfies requirements set forth in NRC Order EA-13-109. Changes to the PRA are necessary, but are not incorporated in Rev 7 since completion of the mod is after the Rev 7 freeze date.
156026	REPLACE EXISTING REACTOR FEEDWATER PUMPS (RFP) AND MOTORS WITH RFP AND MOTORS OF LARGER CAPACITY	Active	10/13/2016	45.01	Although the feedwater pumps have been replaced, their function and behavior remains essentially the same. In addition, success criteria for the system is unaffected. Due to resource constraints however, update of equipment IDs and update of the feedwater system notebook are being postponed until after the Rev 7 rollout.
272555	ADD BATTERY CELLS TO 1D1 AND 1D2 125 VDC BATTERIES	Closed	4/24/2015	2.00	This mod adds two additional cells to 125 VDC batteries to allow them to remain operable when battery cells fail testing. Revision of the 125 VDC system fault tree is not necessary since battery reliability is not adversely impacted. However, the system notebook should be reviewed and updated as

Table C-3

EC Number	EC Title	Status	Status Date	System	PRA Disposition
					necessary to reflect the actual design.
278862	FEEDWATER LOW SUCTION PRESSURE TRIP INSTALLATION	Closed	3/26/2015	45.01	This mod installs pressure switch logic for a low pressure suction trip of the Feedwater pumps. The change prevents pump damage when low suction pressure conditions occur. Although the Feedwater system fault tree does not contain trip logic, the system notebook should be updated to reflect the new trip signal.
274778	WELL WATER CROSS-TIE INTO PLANT CHILLED WATER (ESSENTIAL LOOP)	Closed	9/6/2012	30.00	This mod provides an alternate cooling source for the Control Building Air Conditioner Units. The essential chilled water loop has been supplied by a tap from the well water system. The current Control Building HVAC system fault tree should be reviewed to determine whether an alternate source of cooling water is already modeled. There is no need for an immediate update however; worth of the Control Building chillers is low since they are essential for cooling only during extreme hot weather conditions.