Entergy

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Marvin L Chase
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RBG-47695

July 27, 2016

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

SUBJECT: Response to NRC Request for Additional Information - RBS License Amendment Request to Extend Type A and Type C Test Frequencies
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

Reference

1) Entergy Letter; License Amendment Request for change to Technical Specification 5.5.13 to be extended to 15 years, Drywell Bypass Test Frequency to 15 Years and Type C Test Frequency to 75 Months (RBG-47620) dated October 29, 2015

2) NRC Email; River Bend Station, Unit 1, Request for Additional Information - RBS License Amendment Request to Extend Type A and Type C Test Frequencies (NEI 94-01, Rev. 3-A) - TAC No. MF7037, dated March 21, 2016

3) Entergy Letter; Response to NRC Request for Additional Information – RBS License Amendment Request to Extend Type A and Type C Test Frequencies (RBG-47675) dated April 19, 2016

4) NRC Email; Request for Additional Information - RBS License Amendment Request to Extend Type A and Type C Test Frequencies (NEI 94-01, Rev. 3-A) and Drywell Bypass Test frequency - TAC No. MF7037, dated May 20, 2016

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc. (Entergy) submitted a request for an amendment to the Technical Specifications (TS) for River Bend Station (RBS), Unit 1. The proposed amendment modifies the existing requirements related to containment leak rate testing.

In Reference 2, the NRC staff requested additional information (RAI) in support of this request. This information was submitted in Reference 3.

A001
NRR

In Reference 4, the NRC staff requested additional information (RAI) in support of this request. Attachment 1 provides responses to the RAI.

This letter does not contain commitments.

If you have any questions or require additional information, please contact B. Burmeister at (225) 381-4148.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 27, 2016.

Sincerely,

MLC/KYH/bmb

Attachment: Response to Request for Information

cc: Regional Administrator
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RBF1-16-0078
LAR 2014-04

Attachment 1

RBG-47695

Response to Request for Information

By application dated October 29, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15307A293), Entergy Operations, Inc. (Entergy, the licensee), submitted a License Amendment Request (LAR) for River Bend Station, Unit 1 (RBS). The LAR would revise Technical Specification (TS) 5.5.13, "Primary Containment Leakage Rate Testing Program," to incorporate Nuclear Energy Institute (NEI) Topical Report 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," which would allow for the extension of the Type A Test (Integrated Leak Rate Test, or ILRT) and Type C Test (Local Leak Rate Test) frequencies from 10 to 15 years and 60 to 75 months, respectively. Surveillance Requirement (SR) 3.6.5.1.3, would also be revised to extend the maximum interval for performing the Drywell Bypass Test (DWBT) from 10 to 15 years in order to remain consistent with the proposed extended Type A Test frequency provided for in NEI 94-01 Revision 3-A.

The U.S. Nuclear Regulatory Commission (NRC) staff has determined that additional information is required in order to complete its review of the LAR. This set of questions relates to the first and second proposed changes to extend the Type A ILRT and the DWBT as they are supported by risk information. The specific questions relate to the NRC Safety Evaluation Limitations and Conditions for EPRI Report No. 1009325, Revision 2[1] and for Regulatory Guide 1.174[2].

APLA RAI-1

1. The LAR, Attachment 3, Section 5.7, provides the evaluation of contributors from hazard groups other than the internally initiated events modeled in the Probabilistic Risk Assessment (PRA). Table 5.7-1 shows the evaluation of an "external events multiplier." As shown in Table 5.7-2, the Large Early Release Frequency (LERF) increase due to external events is derived from the LERF increase due to internal events times the external events multiplier.

    a. For seismic events, the seismic risk analysis should consider the River Bend Mark III containment performance during a seismic event with potentially pre-existing flaws. A pre-existing flaw classified in Class_3a may grow due to the seismic event and may not remain a Class_3a flaw type for some seismic initiators. The external events multiplier method assumes that the initiating event has no impact on the flaw size, whereas a flaw may have growth potential due to seismic initiating event stresses prior to core damage occurring.

[1] U.S. Nuclear Regulatory Commission, Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) 94-01, Revision 2, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix 3" and Electric Power Research Institute (EPRI) Report No. 1009325, Revision 2, August 2007, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals" (TAC No. MC9663), Accession Number ML081140105, June 25, 2008.

[2] U.S. Nuclear Regulatory Commission, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis", Regulatory Guide 1.174, Revision 2, May 2011.

Provide an updated seismic risk contribution due to the ILRT frequency extension, accounting for the River Bend Mark III containment performance with potentially pre-existing flaws, given a seismic initiating event, and describe your method. Include in the discussion your technical justification for the method and results. Alternatively, perform an appropriate sensitivity study to determine the risk significance of Class_3a flaws for the application due to seismic events.

b. The LAR notes that the RBS seismic CDF used for the ILRT extension is one order of magnitude smaller than an NRC-estimated seismic CDF. Determine whether, when using the NRC estimated seismic CDF, the risk acceptance criteria for the ILRT frequency extension can be met, otherwise provide the technical justification for reducing the seismic risk one order of magnitude.

RESPONSE

1a. While only a fraction of Class_3a flaws would grow to a Class_3b flaw due to a seismic initiator, a sensitivity study has been performed by conservatively assuming that all of the Class 3a seismic contribution also goes to LERF (i.e., is equivalent to Class 3b). To do this, the first step is to exclude the seismic contribution from the external events multiplier from Table 5.7-1 of the LAR such that the seismic impact can be accounted for separately. The revised Table 5.7-1 is shown below.

Revised Table 5.7-1

Other Hazard Group Contributor Summary

OTHER HAZARD INITIATOR GROUP	CDF (1/YR)
Seismic [8]	N/A
Internal Fire [9]	2.25E-05
Internal Flood [10]	4.97E-06
High Winds [11]	1.81E-07
External Floods [9]	Screened
Transportation and Nearby Facility Accidents [9]	Screened
Total (for initiators with CDF available)	2.77E-05/yr
Internal Events CDF	2.60E-06
External Events Multiplier (Excluding Seismic)	10.64

For this bounding sensitivity case, the seismic impacts are calculated separately assuming the Class 3a contribution also goes to LERF (i.e., is equivalent to Class 3b). This change requires that the base calculations be re-performed rather than using a straight multiplier approach since the increase in the Class 3b frequency will also influence the calculated change in person-rem and the change in the conditional containment failure probability. Based on this revised conservative assumption, Table 5.7-2, Table 5.7-3, and Table 5.7-4 from the LAR can be updated accordingly. The revised tables are shown below.

Revised Table 5.7-2

RBS 3b (LERF) as a Function of ILRT/DWBT Frequency for Internal and External Events

(Including Age Adjusted Steel Corrosion Likelihood)

	3B FREQUENCY (3-PER-10 YEAR ILRT/DWBT)	3B FREQUENCY (1-PER-10 YEAR ILRT/DWBT)	3B FREQUENCY (1-PER-15 YEAR ILRT/DWBT)	LERF INCREASE(1)
Internal Events Contribution	6.03E-09	2.04E-08	3.11E-08	2.51E-08
Other Hazard Group Contribution (Internal Events CDF x 10.64)	6.41E-08	2.16E-07	3.31E-07	2.67E-07
Seismic Contribution	2.85E-08	9.53E-08	1.44E-07	1.15E-07
Combined	9.87E-08	3.32E-07	5.05E-7	4.07E-07

(1) Associated with the change from the baseline 3-per-10 year frequency to the proposed 1-per-15 year frequency.

Revised Table 5.7-3

Comparison to Acceptance Criteria Including Other Hazard Groups Contribution for RBS

Contributor	ΔLERF	ΔPerson-rem/yr	ΔCCFP
RBS Internal Events	2.51E-8/yr	7.22E-03/yr (0.72%)	1.15%
RBS Other Hazard Groups	2.67E-7/yr	7.68E-02/yr (0.72%)	1.15%
RBS Seismic	1.15E-7/yr	1.91E-02/yr (1.96%)	4.79%
RBS Total	**4.07E-7/yr**	**1.03E-01/yr (0.81%)**	**1.43%**
Acceptance Criteria	**<1.0E-6/yr**	**<1.0 person-rem/yr or <1.0%**	**≤1.5%**

In this bounding sensitivity case, all of the acceptance criteria are met and the bounding 4.07E-07/yr increase in LERF due to the combined hazard events from extending the RBS ILRT/DWBT frequency from 3-per-10 years to 1-per-15 years still falls within Region II between 1E-7 to 1E-6 per reactor year ("Small Change" in risk) of the RG 1.174 acceptance guidelines. Per RG 1.174, when the calculated increase in LERF due to the proposed plant change is in the "Small Change" range, the risk assessment must also reasonably show that the total LERF is less than 1E-5/yr. Similar bounding assumptions regarding the external event contributions that were made above are used for the total LERF estimate.

Revised Table 5.7-4

Impact of 15-yr ILRT Extension on LERF (3b) for RBS

Internal Events LERF	**2.48E-08/yr**
Other Hazard Group LERF (Internal Events LERF x 10.64)	**2.63E-07/yr**
Seismic LERF	**2.38E-08/yr**
Internal Events LERF due to ILRT (at 15 years)	**3.11E-08/yr**
Other Hazard group LERF due to ILRT (at 15 years)	**3.31E-07/yr**

Revised Table 5.7-4

Impact of 15-yr ILRT Extension on LERF (3b) for RBS

Seismic LERF due to ILRT (at 15 years)	**1.44E-07/yr**
Total	**8.17E-07/yr**

As can be seen for this bounding sensitivity case, the estimated upper bound LERF for RBS is estimated as 8.17E-07/yr, which is still less than the RG 1.174 requirement to demonstrate that the total LERF due to internal and external events is less than 1.0E-5/yr.

In summary, the results of the bounding sensitivity case that conservatively assumes that all of the Class 3a seismic contribution also goes to LERF indicated that the acceptance criteria would all still be met. This is a very conservative and bounding assumption as only a fraction of Class_3a flaws would grow to a Class_3b flaw due to a seismic initiator, dependent on both pre-existing flaw size and magnitude of the seismic initiator.

1b. The NRC estimate of Seismic Core Damage Frequency (SCDF) of 2.5E-5/yr for River Bend from the Safety/Risk Assessment (SRA) [1] was based on the 2008 U.S. Geological Survey (USGS) seismic hazard curves and a very conservative estimate of the plant-level seismic capacity. The NRC used information from the River Bend IPEEE submittal [9] to derive the plant-level fragility used to calculate the SCDF. River Bend was identified as a reduced scope IPEEE plant in accordance with NUREG-1407 [2]. Thus, a reduced scope seismic margins assessment (SMA) was performed for the IPEEE. For plants that performed a reduced scope SMA for the IPEEE, the NRC used the plant Safe Shutdown Earthquake (SSE) as the High Confidence of Low Probability of Failure (HCLPF) plant-level seismic capacity value since a HCLPF was not reported. As such, NRC utilized a plant-level seismic capacity of just 0.1g in the SRA for River Bend.

To provide a better estimate of seismic risk at River Bend, Entergy assembled a Seismic Review Team (SRT) tasked with developing an SCDF estimate that more closely reflects the robustness of River Bend [8]. The SRT examined the assumption used by the NRC that the plant HCLPF is equal to the SSE. The SRT calculated revised fragility values by two independent methods. It then selected the more conservative of the two results for use in re-assessing the SCDF. The SRT concluded that a plant-level HCLPF of 0.3g was more appropriate for estimating the seismic risk for River Bend. The SRT reproduced the NRC's reported SCDF results for the PGA, 10 Hz, 5 Hz, and 1 Hz 2008 USGS hazard curves. Then the SRT re-performed the calculations using a plant-level HCLPF of 0.3g instead of 0.1g and estimated a revised SCDF of 2.5E-6/yr (one order of magnitude below the NRC SCDF weakest link value of 2.5E-5/yr). Using the same methods but with the 2010 EPRI hazard curves for River Bend [3], the SRT re-performed the analysis and estimated a revised SCDF of just 8.3E-7/yr [8].

To investigate the importance of the plant-level HCLPF assumption, the SCDF estimates for the 1 Hz, 5 Hz, 10 Hz, and PGA 2008 USGS hazard curves and corresponding weakest link estimates were re-performed over a range of HCLPF values. The results from the NRC analysis at 0.1g are provided first as a reference to demonstrate that the revised analysis can reproduce the NRC methods. Then the results from the updated analysis over a range of HCLPF values are reported in the table which follows. As can be seen, even a modest increase in the assumed plant-level HCLPF value (to just 0.2g) results in an estimated SCDF value of about 5.0E-6/yr, and the revised estimated value with a plant HCLPF at 0.3g is about an order of magnitude less than the NRC estimate.

2008 USGS Hazard Curve SCDF Estimates (/yr) Over a Range of HCLPF Values

HCLPF ->	0.1g (NRC)	0.1g	0.15g	0.2g	0.25g	0.3g [A]
1 Hz	1.5E-5	1.5E-05	2.0E-06	5.2E-07	2.3E-07	1.4E-07
5 Hz	5.9E-6	6.0E-06	2.1E-06	1.1E-06	6.7E-07	4.7E-07
10 Hz	9.8E-6	9.9E-06	4.4E-06	2.4E-06	1.5E-06	1.1E-06
PGA	1.6E-5	1.6E-05	8.1E-06	4.9E-06	3.1E-06	2.1E-06
Weakest Link	2.5E-5	2.5E-05	8.9E-06	5.0E-06	3.2E-06	2.2E-06

[A] Estimated HCLPF value established applicable to RBS.

In 2014, Entergy submitted a response to the NRC request for information pursuant to 10 CFR 50.54(f) regarding recommendation 2.1 of the near term task force review of insights from the Fukushima Dai-ichi accident [4]. The results of the seismic screening evaluation were successful and no further seismic evaluations need to be performed for River Bend. In that assessment, a site-specific control point hazard curve for a broad range of spectral accelerations was computed given the site-specific bedrock hazard curve and site-specific estimates of soil and soft-rock response and associated uncertainties. When these more recent 1 Hz, 5 Hz, 10 Hz, and PGA Hazard curves are utilized, updated SCDF estimates as a function of assumed plant-level HCLPF are provided below. As can be seen in this case, even a modest increase in the assumed plant-level HCLPF value (to just 0.2g) results in an estimated SCDF value of less than 2.5E-6/yr, and the revised estimated value with a plant HCLPF at 0.3g is close to the SRT estimate [8] of 8.3E-7/yr using the 2010 EPRI curves.

2014 Hazard Curve SCDF Estimates (/yr) Over a Range of HCLPF Values

HCLPF ->	0.1g	0.15g	0.2g	0.25g	0.3g [A]
1 Hz	6.2E-06	1.8E-06	8.0E-07	4.3E-07	2.7E-07
5 Hz	4.7E-06	1.7E-06	7.6E-07	4.1E-07	2.5E-07
10 Hz	4.7E-06	1.8E-06	8.6E-07	4.8E-07	3.0E-07
PGA	1.0E-05	4.4E-06	2.3E-06	1.3E-06	8.3E-07
Weakest Link	1.1E-05	4.4E-06	2.3E-06	1.3E-06	8.6E-07

[A] Estimated HCLPF value established applicable to RBS.

Additionally, note that none of these values account for the risk mitigation capabilities of RBS "FLEX" equipment, implemented in response to NRC Order EA-12-049. The seismic contribution to both CDF and LERF is reduced when these risk mitigation capabilities are considered.

Based on these assessments, accounting for the most recent information and additional plant capabilities that now exist to respond to a seismic event, an upper bound estimate for SCDF at River Bend of 2.5E-06/yr (consistent with the LAR) is reasonable, and the actual value is expected to be a much lower value of 8.6E-07/year when the weakest link calculation is performed for a plant level HCLPF of 0.3g with the latest hazard curves. When this value is used for the seismic CDF, then even the bounding sensitivity for Class 3a above does not significantly challenge the acceptance criteria as shown in the revised Table 5.7-3 below.

Revised Table 5.7-3

Comparison to Acceptance Criteria Including Other Hazard Groups Contribution for RBS (Updated Hazard Curve and 0.3g Plant Level HCLPF)

Contributor	ΔLERF	ΔPerson-rem/yr	ΔCCFP
RBS Internal Events	2.51E-8/yr	7.22E-03/yr (0.72%)	1.15%
RBS Other Hazard Groups	2.67E-7/yr	7.68E-02/yr (0.72%)	1.15%

RBS Seismic (Updated)	3.96E-8/yr	6.57E-03/yr (1.96%)	4.79%
RBS Total	**3.31E-7/yr**	**9.05E-02/yr (0.75%)**	**1.25%**
Acceptance Criteria	**<1.0E-6/yr**	**<1.0 person-rem/yr or <1.0%**	**≤1.5%**

APLA RAI-2

2. The LAR Table 5.3-2 contains the following note:

   "(3) The DWBT leakage cases of 10x and 100x with unit coolers unavailable are assumed to lead to an increased frequency of Class 7 (non-LERF)."

   Provide justification for not increasing the Class 7 frequency of LERF also, or update the Class 7 frequency and the risk results for the application.

RESPONSE

Note (3) from Table 5.3-2 refers to the assumption described in Section 5.1 of the LAR for Class 7 sequences. That is, for the core damage scenarios that previously resulted in an intact containment, it was assumed that these DWBT leakage rates could lead to containment failure if unit coolers are unavailable. The assignment to non-LERF was based on the containment capacity where an extended time would be available before failure would occur if the unit coolers were unavailable. With drywell bypass per Technical Specifications, operation of both containment unit coolers is capable of preventing containment failure in transient scenarios in the RBS PRA.

A sensitivity analysis has been performed to demonstrate that the assumption of excluding Class 7 DWBT cases from Class 3b LERF cases does not affect the conclusions of the analysis. In the LAR, the Class 3b contribution excluded the assumed "Class 7 (Non-LERF)" frequency increase as indicated by the "Class 7DWBT" designator below.

$$\begin{aligned} \text{Class\_3b} &= 0.0023 * [\text{CDF} - (\text{Class 2} + \text{Class 7 LERF} + \text{Class 8} + \text{Class } 7_{\text{DWBT}})] \\ &= 0.0023 * [2.60\text{E-}06 - (6.64\text{E-}11 + 5.35\text{E-}09 + 1.93\text{E-}08 + 1.24\text{E-}09)] \\ &= 5.91\text{E-}09/\text{yr} \end{aligned}$$

To address the impact of this assumption, the Class 3b (and Class 3a) contributions can be revised to not exclude the contribution from "Class 7DWBT" as indicated in the Class_3b example below.

$$\begin{aligned} \text{Class\_3b} &= 0.0023 * [\text{CDF} - (\text{Class 2} + \text{Class 7 LERF} + \text{Class 8})] \\ &= 0.0023 * [2.60\text{E-}06 - (6.64\text{E-}11 + 5.35\text{E-}09 + 1.93\text{E-}08)] \\ &= 5.91\text{E-}09/\text{yr} \end{aligned}$$

As can be seen, this has a negligible impact on the overall results (i.e., it is below the resolution of the significant digits displayed), and therefore has a very negligible impact on the results.

APLA RAI-3

3. In the LAR Figure 4.1-1 the highest leakage from the drywell boundary is assumed to be $100DWL_b$, consistent with the limitations and conditions noted in the NRC safety evaluation report dated June 25, 2008 (ADAMS Accession No. ML081140105) for NEI 94-01, Revision 2, and EPRI TR-1009325, Revision 2. This represents an increase from $35DWL_b$, the highest drywell leakage assumed for the one-time DWBT extension license amendment request dated February 16, 2004. The NRC staff safety evaluation for the one-time drywell bypass test extension (ADAMS Accession number ML043200567) stated that for events in which containment unit coolers operate, drywell leakage was assumed to have no impact on the containment's existing leakage category, since the containment coolers would condense any steam that bypasses the suppression pool. Address how the increase in drywell leakage rate from $35DWL_b$ to $100DWL_b$ impacts the assumed containment leakage categories and include updated risk assessment if necessary.

<u>RESPONSE</u>

Note that the overall approach for the ILRT/DWBT extension uses a bounding approach which includes several conservatisms. The DWL_b of 800 scfm was chosen as a reference leakage value for consistency with the prior DWBT extension requests for River Bend. This was conservatively chosen even though none of the DWBTs performed at River Bend have ever exceeded this value. It should also be noted that this reference value is far greater than the allowable containment leakage rate, L_a of 138,434 sccm (i.e., < 5 scfm) as defined for the River Bend ILRT acceptance criteria [5] for which the accepted multipliers of 10 (for Class 3a) and 100 (for Class 3b) were derived. Additionally, per TS SR 3.6.5.1.3 and USAR Section 6.2, the current acceptable $A/k^{1/2}$ design drywell bypass leakage area is 0.81 ft^2 at 3 psid, which corresponds to a flow rate of approximately 32500 scfm (based on 1 ft^2 equating to 40110 scfm in the 2007 DWBT submittal for River Bend [6]).

As noted above, the allowable drywell bypass leakage has considerable margin compared to the allowable containment leakage. The frequencies used for the small and large leakages were also separately derived in Section 4.6.1 of the LAR compared to the frequencies utilized for the containment leakage multipliers for Classes 3a and 3b. Therefore, in retrospect, it is inappropriate to use the same multipliers on the drywell leakage rate as is done on the containment leakage rate. Figure 4.6-1 from the LAR is reproduced below.

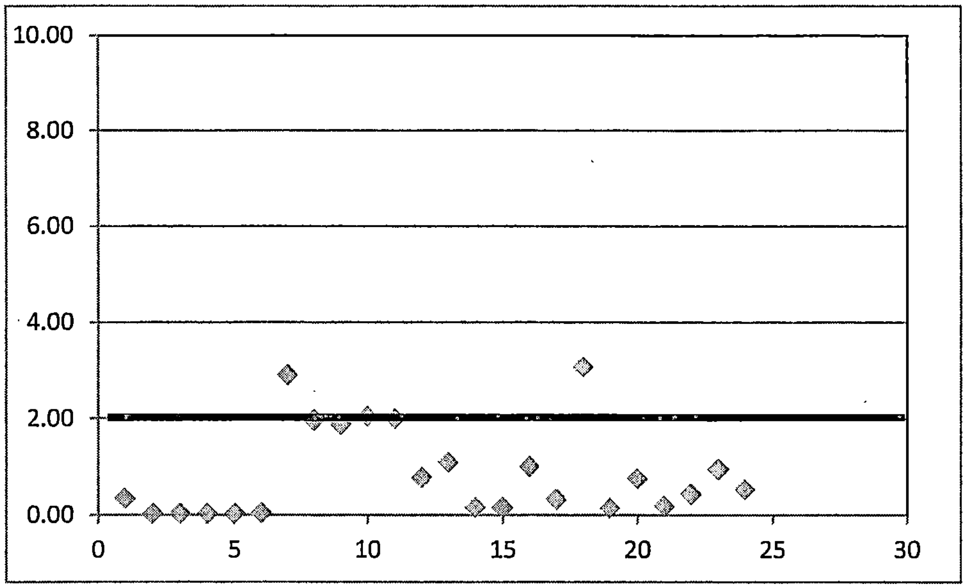
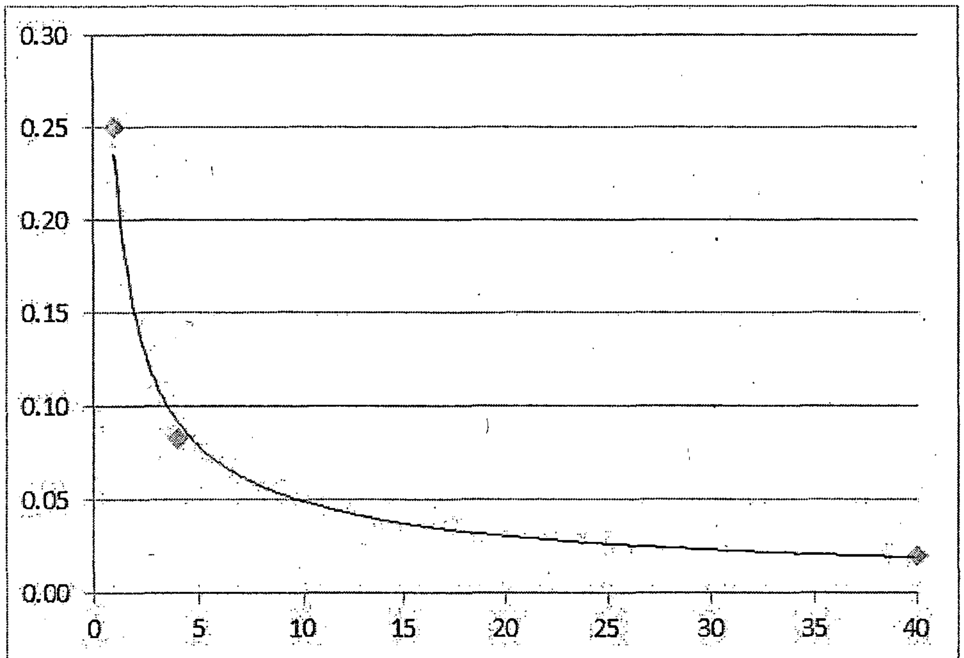


Figure 4.6-1 Mark III DWBT Results Compared to 800 SCFM

In the LAR, the two events above the line were conservatively applied to the 10x category even though none of the values exceeded a factor of 4. If 4x for that category is used as a more reasonable estimate for the multiplier to apply, then correspondingly a value of 40x is more reasonably applied as an upper bound estimate to the large leakage category represented by the Jeffrey's non-informative prior likelihood value.

Consistent with the LAR, when the three revised data points (i.e., > $1L_b$, $4L_b$, and $40L_b$) are plotted on a curve, the trend still appears reasonable as shown in revised Figure 4.6-2. These values are therefore used to provide a more reasonable representation for the base case assessment to represent the DW bypass leakage behavior. Increases to these values are assumed to occur for the different test intervals consistent with the ILRT methodology. The refinement to the drywell leakage values does not change the results of the frequency analysis, but provides additional justification that the larger drywell leakage category is less than the allowable design leakage (i.e., the upper bound 40x DWL_b value is less than allowable design leakage). Therefore, a more reasonable upper bound of 40x DWL_b is very close to the 35 DWL_b used in the prior assessment. As such, the analysis is consistent with the prior DWBT analysis and associated SER (ADAMS Accession number ML043200567) which stated that for events in which containment unit coolers operate, drywell leakage can be similarly assumed to have no impact on the containment's existing leakage category, since the containment coolers would condense any steam that bypasses the suppression pool.



Revised Figure 4.6-2 Estimated Mark III DWBT Leakage Probability Compared to 800 SCFM

APLA RAI-4

4. The LAR Section 5.7 of Attachment 3 to the LAR discusses external events designated as "other" such as external floods and transportation and nearby facility accidents. The LAR references the results from the Individual Plant Examination of External Events (IPEEE) which concluded that no undue risks are present that might contribute to CDF with predicted frequency in excess of 1E-6/yr. However, since the IPEEE is outdated, assess these external events for the current plant, and discuss your assessment for the ILRT extension application.

RESPONSE

In 2014, Entergy submitted a flood hazard re-evaluation report in response to the NRC request for information pursuant to 10 CFR 50.54(f) regarding recommendation 2.1 of the near term task force review of insights from the Fukushima Dai-ichi accident [7]. In 2015, NRC provided an assessment of the flood hazard reevaluation report (FHRR) submitted by Entergy as well as supplemental information resulting from requests for additional information and audits [12]. Part of the NRC's assessment indicates the following for River Bend:

> The NRC staff has concluded that the licensee's reevaluated flood hazards information, as summarized in the Enclosure, is suitable for the assessment of mitigating strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and NRC staff), for River Bend. Further, the staff has concluded that the licensee's reevaluated flood hazard information is a suitable input for other

assessments associated with Near Term Task Force Recommendation 2.1 "Flooding". The NRC staff plans to issue a staff assessment documenting the basis for these conclusions at a later time.

In addition, NEI 12-06 "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" is currently being revised. This revision will include a methodology to perform a Mitigating Strategies Assessment (MSA) with respect to the reevaluated flood hazards. Once this methodology is endorsed by the NRC, flood event duration parameters and applicable flood associated effects should be considered as part of the River Bend MSA. The NRC staff will evaluate the flood event duration parameters (including warning time and period of inundation) and flood-related associated effects developed by the licensee during the NRC staff's review of the MSA.

The River Bend MSA will follow the guidance in Appendix G of NEI 12-06, Revision 2 [13] which was issued in December 2015 to ensure that appropriate mitigating strategies exist to deal with the new flood hazard information. These mitigating strategies combined with the very unlikely nature of these types of events helps to ensure that the risk from external flooding impacts at River Bend remains low.

As recommended by Generic Letter 88-20, Supplement 4, the IPEEE employed a methodology for analyzing other external events at River Bend Station which was a screening approach. The first step in the screening approach was to determine if the criteria of the 1975 Standard Review Plan (SRP) were met. The RBS IPEEE screened external events due to transportation accidents as well as due to accidents at nearby industrial facilities.

RBS design processes continue to assure that there is no adverse impact on the original design basis regarding transportation accidents or accidents at nearby industrial facilities.

The only major change to areas near the plant since the IPEEE was the opening of Louisiana State Highway 10 south of the plant, leading to the John James Audubon Bridge across the Mississippi River, and turning U.S. Highway 61 from a two-lane to a four-lane highway. State Highway 10 runs roughly one mile south of the plant, leading to the John James Audubon Bridge which opened in May 2011. This is roughly the same distance as U.S. Highway 61 is to the northeast of the plant. The distance to both roads exceeds the acceptance criteria on distance of about 1700 feet per Regulatory Guide 1.91, Rev.1, Figure 1 or about 1500 feet per Regulatory Guide 1.91, Rev.0, Figure 2 for Tornado Region I which is applicable to RBS per Regulatory Guide 1.76.

SAR Figure 2.2-1 shows industrial firms and major transportation routes within 5 miles of River Bend Station. The IPEEE documented that the nearest railroad to the plant at the time of plant licensing was the Illinois Central Gulf line, which passed through the plant site. The spur of this line passing through the RBS site is no longer in service; the tracks crossing Parish Road 965 south and west of the plant no longer exist. Consistent with this, there are no railroad crossings on the Highway 10 approach to the Audubon Bridge or on Parish Road 964. The Illinois Central Gulf spur to the Hood Container (formerly Crown Zellerbach at the time of the IPEEE) Mill at the end of Parish Road 964 is currently decommissioned. The Kansas City, Southern Louisiana, and Arkansas Railway line discussed in the IPEEE and shown in SAR Figure 2.2-1 has had its Highway 61 crossing deactivated. Thus, the closest active railway to the plant is the spur to the Big Cajun power plant, described in the IPEEE. This is greater than 3 miles from River Bend Station, across the Mississippi River; this exceeds the roughly 2500 foot distance criteria for boxcars of Figure 1 of Regulatory Guide 1.91, Rev.1, Figure 1 as well as the 3000 foot boxcar criteria of Figure 2 of Regulatory Guide 1.91, Rev.0, for Tornado Region I.

No new industrial facilities have been built in the vicinity of RBS since the IPEEE. FAA Aeronautical Charts for the Baton Rouge area were reviewed, which indicated no new pathways proximate to the River Bend site. SAR Figure 3.5-6 shows FAA aircraft pathways near River Bend Station.

The IPEEE section on Transportation and Nearby Facility Accidents was reviewed by the West Feliciana Parish Emergency Operations Coordinator and by the RBS Emergency Planning department. No additional hazards to the plant beyond those addressed in the IPEEE were identified.

As documented in letter RBG-47618 to the NRC dated September 29, 2015, RBS has completed the required actions and is in full compliance with NRC Order EA-12-049 for Mitigation Strategies for Beyond Design Basis External Events. Implementation of these "FLEX" actions increases mitigation capabilities to restore or maintain core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event, thus will significantly reduce the risk associated with such events.

In summary, the contribution to external events risk from external floods and transportation and nearby facility accidents is still judged to be small and falls well within the bounding assessment for external events impact used in the LAR such that there is no impact on the ILRT extension application.

APLA RAI-5

5. If the evaluations or updates in RAIs 1 through 4 resulted in changes to the LAR results, provide the updated cumulative risk results for the application.

<u>RESPONSE</u>

The results of the bounding sensitivity case in response to APLA RAI-1a and APLA RAI-1b indicate that the acceptance criteria are still met. The responses to the other RAIs were shown to have very negligible impact or not require any changes to the assumptions in the LAR.

APLA RAI-6

6. Appendix A to Attachment 3 to the LAR discusses the peer review of the internal events PRA.

    a. Confirm that the 2011 peer review was a full scope peer review.

    b. The LAR, Section A.2.4, states that the peer review team generated 59 findings. However, only 29 findings are provided in the LAR. Please provide the remaining findings (or observations) other than suggestions, following the same tabular format as in Appendix A to Attachment 3 to the LAR.

RESPONSE

a. The 2011 BWROG peer review of the RBS PRA was a full scope peer review of the RBS internal events PRA, including internal flooding.

b. There were a total of 59 Findings identified during the 2011 RBS PRA peer review. Consistent with what was observed in other License Amendment Requests for extending Integrated Leak Rate Test (ILRT) frequency to 15 years on a permanent basis, Table A.2-1 of Appendix A to Attachment 3 of the RBS submittal documented the 29 open findings, the status of the resolution for each finding, and the potential impact of each finding on this application.

Table RAI-6.1 below provides this information for the 30 Findings which River Bend has resolved and which are considered closed. Note that the RBS LERF model is a NUREG/CR-6595 model, which is defined as Category I per the PRA Standard; thus, since the RBS PRA was assessed against Category II of the standard, seven of these Findings document that the RBS PRA uses a NUREG/CR-6595 LERF model.

Table RAI-6.1
Summary of Industry Peer Review Findings for the RBS Internal Events PRA Model Update
(Closed Findings from 2011 PRA Peer Review)

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
6.1.1	SY-A11 (Met)	**INCLUDE in the system model those failures of the equipment and components that would affect system operability (as identified in the system success criteria), except when excluded using the criteria in SY-A15. This equipment includes both active components (e.g., pumps, valves, and air compressors) and passive components (e.g., piping, heat exchangers, and tanks) required for system operation.**	Based on a sampling review of system notebooks (PRA-RB-01-002S11) and the CAFTA PRA model, it was confirmed that the system models include failures of equipment and components that would affect system operability. The equipment included both active and passive components. However, in the RPS model for mechanical failure to scram, the only failures that are considered are those that affect the SDV valves. In reality, other failure modes (including mechanical binding of the control rods themselves) may be more likely. NUREG/CR-5500 Volume III, for example, estimates control rod binding for a BWR at 2.1E-6. Inclusion of this additional failure mode would increase the computed failure probability of the RPS by a significant amount.	In the RPS model for mechanical failure to scram, the only failures that are considered are those that affect the SDV valves. In reality other failure modes (including mechanical binding of the control rods themselves) may be more likely. NUREG/CR-5500 Volume III, for example, estimates control rod binding for a BWR at 2.1E-6. Inclusion of this additional failure mode would increase the computed failure probability of the RPS by a significant amount.	Revise the RPS fault tree model to consider the complete spectrum of possible failure mechanisms for the RPS and the control rods.	The RBS model does include Common Cause Failure of the control rods to insert, with a probability of 2.5E-07. This plant specific CCF calculation is considered more applicable to RBS than the generic NUREG/CR-5500 value. Accounting for the 2.1E-06 probability of mechanical common cause failure of the Reactor Protection System from NUREG/CR-5500 has only a miniscule impact on calculated core damage frequency. Using the cutsets pre-generated for MSPI purposes with a E-13 truncation limit, the probability of corresponding basic event C71-CRD-CF-CTROD was adjusted from 2.5E-07 to 2.1E-06. The resulting CDF increased from 2.642E-06 to 2.688E-06, a 1.7% increase. Thus, this finding questioning the modeling of common cause mechanical failure probability in the RBS PRA does not impact the ability of the RBS Rev.5 PRA model to be used. Note the applicable Supporting Requirement from the Standard was judged to be Met. This closed Finding does not impact the RBS ILRT extension request.
6.1.2	IFQU-A10 (Not Met)	**For each flood scenario, REVIEW the LERF analysis to confirm applicability of the LERF sequences. If appropriate LERF sequences do not exist, MODIFY the LERF analysis as necessary to account for any unique flood-induced scenarios or phenomena in accordance with the applicable requirements described in 2-2.8.**	This is a finding because the technical requirements were not met.	While the LERF model is used to quantify LERF impacts due to flooding, there is no discussion in PRA-RB-01-006 that the non-flood LERF model was reviewed to determine if any changes were necessary to consider unique flooding impacts. It is possible that new LERF scenarios would be necessary (e.g., for non-recoverable SBO). Therefore, it is necessary that the LERF model be reviewed to ensure that no changes are necessary and to document that review.	Review the LERF model to ensure that no new flood-related LERF scenarios are created. If new scenarios are necessary, then update the LERF model. In any case, document the review.	At the time of the RBS Rev.5 PRA peer review, the Internal Flooding PRA remained based in the previous Rev. 4 PRA. RBS has subsequently (2012) re-performed the internal flooding quantification using Revision 5 of the RBS PRA. At that time, the RBS LERF model was reviewed for potential impacts due to Internal Flooding. It was determined and documented that no LERF model changes were required for the Internal Flooding PRA. This finding is closed and has no impact upon the RBS ILRT Extension Request.
6.1.3	IFQU-A6 (Not Met)	**For all human failure events in the internal flood scenarios, INCLUDE the following scenario-specific impacts on PSFs for control room and ex-control room actions as appropriate to the HRA methodology being used:**	This is a finding because the technical requirements for in-control room operator actions have not been performed.	PRA-RB-01-006 Appendix A documents a review of existing HFEs in the internal events model to determine if modifications are needed to reflect flooding conditions. For actions outside the control room, affected events are set to true (failed) which would be conservative.	Review the in-control room operator actions to assess the flooding impacts pertaining to workload, stress, and impacts on indication.	In-control room actions were assumed to have the same HFE probabilities for flooding as for Internal Events based on operator interviews conducted specifically in support of the Internal Flood PRA. This is documented in the flooding quantification calculation and in the HRA calculation. Flooding specific operator actions credited in

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
		(a) additional workload and stress (above that for similar sequences not caused by internal floods) (b) cue availability (c) effect of flood on mitigation, required response, timing, and recovery activities (e.g., accessibility restrictions, possibility of physical harm) (d) flooding-specific job aids and training (e.g., procedures, training exercises)		However in-control room actions are assumed to be unaffected and the evaluation does not consider additional workload or stress, or the potential for control room indications to be impacted by the flood.		the PRA have been explicitly addressed in the RBS HRA calculation based upon operator interviews. Only limited credit is taken in the RBS Internal Flood PRA for operator actions in response to sump level indications and the IFPRA currently does not credit any sump pumps, one of the conservative simplifications in the model. Thus, this item is considered to be fully addressed in the RBS PRA and to have no impact on the Internal Flooding PRA results. This finding does not impact the ILRT Extension Request.
6.1.4	IFEV-B2 (Met) IFEV-A5 (Not Met)	**IFEV-A5: DETERMINE the flood initiating event frequency for each flood scenario group by using the applicable requirements in 2-2.1. IFEV-B2: DOCUMENT the process used to identify applicable flood-induced initiating events. For example, this documentation typically includes (a) flood frequencies, component unreliabilities/unavailabilities, and HEPs used in the analysis (i.e., the data values unique to the flooding analysis) (b) calculations or other analyses used to support or refine the flooding evaluation (c) screening criteria used in the analysis**	This is a finding since the requirements of this SR are not met.	Flooding initiating event frequencies are documented in the individual flood zones contained within PRA-RB-01-004 revision 0. However, adjustments to initiator frequencies are made based on judgment with only limited discussion of the basis. Also, scenarios that include failure of operator isolation as part of the initiator frequency should be explicitly addressed.	Document the basis for the frequencies that were applied and for exclusions of certain break sizes. Update initiator frequencies if necessary.	This Finding has been addressed through improved documentation as part of the 2012 update to the Internal Flooding PRA. The flooding quantification calculation addresses that operator actions to isolate any failures are not accounted for in initiating event frequencies. The Internal Flooding Analysis document, Section 3.2, addresses adjustments in failure frequency for low risk CNS fiberglass piping, and Section 3.1.6 documents the review of RBS internal flooding operating experience that does not call into question use of EPRI pipe failure frequencies. Thus, this finding is Closed and does not impact the ILRT Extension Request.
6.1.5	HR-D5 (Not Met)	**ASSESS the joint probability of those HFEs identified as having some degree of dependency (i.e., having some common elements in their causes, such as performed by the same crew in the same time-frame).**	This is a finding because the technical requirements of the SR are not met	Dependent pre-initiator dependencies have been assessed. However, several independent pre-initiator human error event assessments are non-conservative and judged to be evaluated too low by RBS analysts. For example, in worksheet hfe_a.xls, the independent event B21-XHE-MC-V658A twice credits the 'Status Check Each Shift or Day'. Once in the ASEP screening questions leading to ASEP case VII and a second time in the 'Adjustment for Average Unavailability'. This double counts potential recovery actions leading to a very low estimate of the independent event at ~1.3 E-07. EN-NE-G-013 (HRA) specifies a minimum individual HEP of 1E-5 and a combined (joint) HEP of 1E-6. Therefore, an independent value assessed at 1.3 E-07 deviates from the Entergy	Reevaluate the HEP estimation methodology such that stated guidelines are being followed.	The statement of the peer review report that certain pre-initiator human error event assessments are non-conservative is an incorrect statement. The ASEP methodology requires separate inputs on whether or not there is a daily or per shift parameter check separately for determination of the Basic Human Error Probability (BHEP) and in a separate calculation for the duration that such an error might be in effect. Additionally, the events such as B21-XHE-MC-V658A which have low calculated probabilities are not directly used in the PRA. Rather, these are events which are developed as part of the calculation of common miscalibration included in the PRA model. It was confirmed that, with a single exception which is being fixed, all these common miscalibration events specified a floor probability value of 1.0E-06 in the RBS PRA database, consistent with methodology for combinations of events. For example, event B21-XHE-MC-V658A would be an input into calculation of event B21-XHWE-MC-N058 for

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
				Guidance Document. Also, the NUREG on good HRA practices is NUREG-1792. This NUREG states the following: The total combined probability of all the HFEs in the same accident sequence/cut set should not be less than a justified value. It is suggested that the value not be below ~0.00001 since it is typically hard to defend that other dependent failure modes that are not usually treated (e.g., random events such as even a heart attack) cannot occur. Depending on the independent HFE values, the combined probability may need to be higher.		miscalibration of ATWS RPT sensors B21-PTN058A, B, E, and F; however, despite the individual miscalibration event having a calculated probability of 1.3E-07, the common miscalibration event has an applied probability of 1.0E-06 in the PRA database. The peer review finding had overlooked this adjustment of the values actually used in the model. Thus, the subject Finding had mischaracterized this issue for the River Bend PRA and has been closed. There is no impact on the ILRT Extension Request.
6.1.6	IE-C2 (Not Met)	**When using plant-specific data, USE the most recent applicable data to quantify the initiating event frequencies. JUSTIFY excluded data that is not considered to be either recent or applicable (e.g., provide evidence via design or operational change that the data are no longer applicable).**	This is considered a finding since the SR required justification of the data excluded. This justification is not provided.	PRA-RB-01-002S06, Section 5 Generic data was updated with plant trip data from January 1, 1987 to May 31, 2009 for all transient events except for T3A (which used January 1, 2004 to May 31, 2009). However, justification for excluding data is not provided as required by the SR. In addition, the description in Section 5.1 alludes to assumption #3 as the basis for this exclusion. This assumption instead defines the T3A plant initiator. The appropriate assumption is #1 of Section 2.0. LOSP initiating event frequencies as documented in PRA-RB-01-002S09, revision 1, section 4.2, encompasses generic data from 1999 to 2008. It is documented that River Bend has not had any LOSP events.	Document the process used and the justification for screening / grouping actual plant trip data. Also, correct the assumption number from #3 to #1.	Section 5.0 of the RBS PRA Data calculation includes justification for use of data from January, 2004, for initiating events with a relatively high (>0.5/year) frequency. This applies only to the IE-T3A reactor scram / turbine trip initiator. A review of data showed only negligible impact of neglecting the older data; the IE-T3A frequency changed only from 1.39 per calendar year to 1.32 per calendar year when considering all data since 1987 or the smaller 2004-2009 interval; this would have a miniscule impact upon the final value of 0.846 per reactor critical year calculated using the Bayesian update process. This only impacts IE-T3A, which is the highest frequency IE and is by its nature the initiating event with the lowest CCDP. Thus, this finding has been closed and has negligible impact upon the ILRT Extension Request.
6.1.7	LE-B1 LE-B2	**Findings 19 through 25 refer to Supporting Requirements of the Standard which document that a NUREG/CR-6595 LERF model meets Capability Category I of the PRA Standard.** **The River Bend LERF model is a NUREG/CR-6595 LERF model intended to meet Capability Category I.**	These are findings because use of NUREG/CR-6595 LERF contributors and containment and phenomenological analysis is not adequate to meet the Capability Category II requirements of SRs.	RBS PSA LERF assessment does not identify the credible LERF contributors identified in ASME Table 2-2.8-3 to support Capability Category II. In addition, applicable generic or plant-specific analyses based on LERF contributors identified in ASME Table 2-2.8-3 are not used for most containment challenges.	Include the LERF contributors as listed in ASME Table 2-2.8-3 to support Capability Category II. Use applicable Mark III generic or best estimate plant-specific analyses for all containment	RBS PRA R5 Peer Review findings 19 through 25 document Findings against Cat. II of the RBS LERF model, consistent with BWROG Peer Review practice. The RBS LERF model is a Cat. I NUREG/CR-6595 simplified LERF model that meets Cat. I of the PRA Standard but is not intended to meet Cat. II. These Peer Review Findings confirm that the RBS model meets Capability Category I for the LE Supporting Requirements of the Standard.

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
					challenges listed in ASME Table 2-2.8-3.	Thus, these findings do not impact the ILRT Extension Request.
6.1.8	LE-C1 LE-C4			Plant specific accident sequence challenges are not treated on a plant specific basis and the definition of radionuclide releases is not developed using plant specific analysis. Used NUREG/CR-6595 generic approach for the containment and phenomenological analysis.	Develop plant specific accident sequences on a plant specific basis to adequately address SRs LE-B1 and LE-B2 (as described in Entergy guidance document EN-NE-G-011, Steps 5.2 and 5.3). Provide a realistic estimation of the severe accident sequence progression (take credit for mitigating actions such as fission product scrubbing as accounted for in MAAP analyses).	
6.1.9	LE-C2 LE-C3			Operator actions are not explicitly evaluated to assess the procedural directions and the time available post core damage. No substantial credit has been given for repair.	Incorporate operator actions into the Containment Event Tree (CET) top event fault trees in a realistic manner. Credit repair as deemed appropriate to implement primary and alternate mitigating actions post core-damage.	
6.1.10	LE-C5			PRA-RB-01-002S12, Rev 1 - Used NUREG/CR-6595 generic approach for the containment and phenomenological analysis.	Use engineering guides EN-NE-G-003 and EN-NE-G-011, Sections 5.2, 5.4, and Attachment 6.2 to generate plant specific Level 2 success criteria.	
6.1.11	LE-C10 LE-C11 LE-C12 LE-C9			No credit is taken for equipment survivability or operator actions in adverse environment in PRA-RB-01-002S12.	Perform review of significant accident progression sequences resulting in large early	

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
					release to determine if engineering analysis could support continued equipment operation or operator actions that could reduce LERF.	
6.1.12	LE-C13			PRA-RB-01-002S12, Rev 1 - Containment bypass was treated in a conservative manner (vessel rupture and ATWS sequences going to core damage results in containment bypass). No credit for fission product scrubbing was modeled per NUREG/CR-6595 (although basic event L2-ABSCRUB was modeled to account for RPV venting through the MSIVs with direct release to the condenser, the probability for this event was set to 1.0)	Containment bypass events due to vessel rupture and ATWS events should be treated realistically.	
6.1.13	LE-E2 LE-E3			PRA-RB-01-002S12, Rev 1 - Generic approach to the containment and phenomenological analysis based on NUREG/CR-6595 is used.	Use realistic parameter estimates throughout the LERF accident progression analysis. Include LERF contributors identified from the results of the accident progression analysis by performing appropriate source term analyses using MAAP and other available sources.	
6.1.14	IE-A3 (Met)	**REVIEW the plant-specific initiating event experience of all initiators to ensure that the list of challenges accounts for plant** experience. See also IE-A7.	PRA-RB-01-002S06, Section 4.2 and Appendix A lists the plant-specific events. The IE notebook provides a list of plant trips identified by LERs between 1987 and 2009. Each event is either screened, with justification, or categorized into the appropriate IE. However, many events that would have been categorized as reactor trip / turbine trip were screened based solely	This is considered a finding since a re-screening would result in a change in the initiating event frequency, unless exclusion is justified/ documented. Reactor/Turbine trip initiators that occurred prior to the last 5 years were discarded. The events should be retained unless it can be shown that the plant design/operation has changed. For example, the frequent use of a 25 - 40% scram in lieu of a controlled shutdown would be a valid reason for exclusion. A reactor	Re-screen plant specific events and provide a technical basis (e.g., implementation of a scram reduction program), rather than an age basis, for exclusion of events.	Refer to the response to Finding 6.1.6 (SR IE-C2) which establishes that justification was provided for exclusion of older IE-T3A events, and that there was negligible impact from that exclusion. The 1/16/87 trip is one of those older IE-T3A events for which exclusion has been justified. Note the applicable Supporting Requirement from the Standard was judged to be Met. This Finding has been closed and has negligible impact upon the ILRT Extension Request.

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
			on age. PRA-RB-01-002S09, revision 1, section 4.2.1.1, documents that no LOOP events have occurred at the River Bend site.	trip due to FW reg. valve failure (1/16/87) should not be eliminated if that same failure would cause the same event today.		
6.1.15	IE-A7 (Met)	**In the identification of initiating events, INCORPORATE (a) events that have occurred at conditions other than at-power operation (i.e., during low-power or shutdown conditions), and for which it is determined that the event could also occur during at-power operation (b) events resulting in an unplanned controlled shutdown that includes a scram prior to reaching low-power conditions, unless it is determined that an event is not applicable to at-power operation.**	This is a finding since screening out events that resulted in a scram because they occurred as part of a manual shutdown sequence is not in accordance with section b of this element.	The IE notebook provides a list of plant trips identified by LERs between 1987 and 2009. Each event is either screened, with justification, or categorized into the appropriate IE. Several of the events that screen in were at low power operations. At least 3 events (dated 5/23/07 3/21/08, and 9/1/08) were identified as scrams but were screened out as 'manual shutdowns.'	Re-screen events to which section b applies.	This concerns identification of 3 shutdowns as Manual Shutdowns vice Scrams. 9/1/08 was the shutdown for Hurricane Gustav. This was a controlled plant shutdown. The plant was not in danger of automatic scram at the time but was doing a manual shutdown due to grid stability issues. The plant was shut down prior to what would have been a partial loss of offsite power event a couple of hours after the plant scram from low power. 5/23/07 was a shutdown for Recirculation Flow Control Valve repairs. This was a controlled plant shutdown and the order was given to scram from low power (~30%) instead of continuing to drive rods in. 3/21/08: repairs for a stem-disk separation on a feedwater heater valve. Inserted manual scram once downpowered to 15%. Thus, these were all controlled evolutions and no scram was required as part of the plant shutdown process. Thus, none of these three events qualify as unplanned scrams prior to reaching low power conditions, thus, per SR IE-A7, can be excluded from consideration. Note the applicable Supporting Requirement from the Standard was judged to be Met. Further note these events would be considered IE-T3A events, which are low CCDP events with corresponding low contribution to plant risk (only 3.7% of plant risk per the Rev. 5 Summary calculation) despite having the highest initiating event frequency of 0.846/year of all initiating events. Thus, it is concluded this Finding does not impact the ILRT Extension Request.
6.1.16	IE-C1	CALCULATE the initiating event frequency	PRA-RB-01-002S06, Section 4, IE	The plant-specific reactor/turbine trip rate	This indicates that the	Since the lognormal distribution is based on plant specific

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
	(Met)	accounting for relevant generic and plant-specific data unless it is justified that there are adequate plant-specific data to characterize the parameter value and its uncertainty. (See also IE-C13 for requirements for rare and extremely rare events.)	frequencies were calculated using generic and plant-specific data except those initiators that are rare (LOCAs) in which generic data alone is used and the special initiators for which a fault tree is developed. Generic data for some special initiators was screened based on non-applicability to River Bend. No IE frequencies based solely on plant specific data were observed. LOSP initiating events are analyzed in PRA-RB-01-002S09 revision 1. Removal of events that were determined to not be applicable to the River Bend Site is discussed in section 4.2. Events that occurred in shutdown conditions are shown in Table 4. It was documented that RBS has not experienced a LOSP, therefore, plant data specificity is not an issue. However, the plant-specific reactor/turbine trip rate (T3A) is significantly higher than the generic, with the plant-specific mean well above the generic and updated 95th.	(T3A) is significantly higher than the generic, with the plant-specific mean well above the generic and updated 95th.	PRA should use the plant-specific values without Bayesian updating (reference IE notebook, Appendix B, page 53)	data and that for generic data overlap, it is consistent with Entergy and industry practice to use Bayesian updating for deriving the IE-T3A frequency for use in the RBS PRA. Specifically, the 5% value for the plant specific distribution of 0.637/rx-year is less than that for the generic (0.725) even though the plant specific mean of 1.46 is greater than that of the generic. Entergy practice would be to use only the plant specific data if the 5%-tile of the higher probability event is higher than the 95%-tile of the lower event, a criteria which this data did not meet, thus Bayesian updating is considered valid. The primary reason why Bayesian updating is done in the first place is because it is difficult to obtain a high degree of statistical confidence with plant-specific data only. Again, the underlying assumption in Bayesian analysis is that the generic data is representative of the plant-specific data. Thus, Bayesian updating of data where there is an overlap of the distributions should be used in order to obtain a more accurate estimate of actual future performance. NUREG/CR-6823 as well as standard textbook on the subject (Martz, Harry F and Waller, Ray A, "Bayesian Reliability Analysis") do not provide any specific criteria based on distribution overlap or lack thereof for when Bayesian update results would not be legitimate. The RBS IE-T3A frequency meets the requirements of Entergy Data Analysis guide EN-NE-G-007 to "Check that the mean value is reasonable when compared to the generic value." Even if this Finding had a correct basis, its impact on risk would be small. The site specific raw data resulted in a 1.45/year frequency vice a 0.846 value used in the RBS PRA. Based on a CCDP of 1.15E-07, this would result in a slight increase (2.6%) in base CDF from 2.604E-06/year to 2.673E-06/year. Note the applicable Supporting Requirement from the Standard was judged to be Met. This closed Finding is concluded to have no impact on the ILRT Extension Request.
6.1.17	IE-C12 (Met)	COMPARE results and EXPLAIN differences in the initiating event analysis with generic data sources to provide a reasonableness check of the results.	PRA-RB-01-002S06, Comparison of IE results and explanation of differences is contained in Section 5.4 and presented in Table 10.	Table 10 of the IE notebook provided the required comparison for most initiators. LOOP, breaks outside containment, and ISLOCAs are not discussed in that table. From table 10, the frequency of loss of vital DC buses is	Revise the method to determine the IE frequency for loss of vital dc busses to use a fault tree model.	Initiating Event frequencies for ISLOCA and BOC are developed in the documents for those specific events. When reviewed, the 3 events which are the basis of the NUREG/CR-5750 Loss of DC initiating event frequency are

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
			Reasons for the differences are provided and appear reasonable. LOOP, breaks outside containment, and ISLOCAs are not discussed in that table. From table 10, the frequency of loss of vital DC buses is approximately a factor of 10 below the generic value. The frequency of these 2 initiating events was based on screened generic data. No comparison of LOSP initiating event analysis was noted.	approximately a factor of 10 below the generic value. The frequency of these 2 initiating events was based on screened generic data, indicating that 90% of the generic events were considered not applicable to RB. This is a finding because a possible technical error may exist. The screened IE frequency for loss of vital DC bus is almost a factor of 10 lower than the generic value (reference IE notebook, table 10), meaning that almost 90% of the generic events were deemed not applicable to RB. Three other PRAs were examined; each, through the use of a fault tree, calculated the frequency for loss of a vital DC bus at approximately a factor of 10 larger than that for RB. This great of a difference seems improbable, and should be re-visited.		either applicable to other higher CCDP transients or simply not a transient initiator. Comparison to other plants shows that the RBS value is comparable to that of other similar design plants. Since Loss of DC events have a low CCDP of approximately E-06, and a small generic frequency of 1.17E-03, highly conservative use of the generic frequency would only result in a near-negligible CDF contribution of approximately 1E-09. Note the applicable Supporting Requirement from the Standard was judged to be Met. This Finding has been closed and is concluded to have no impact on the ILRT Extension Request.
6.1.18	IFSN-B2 (Not Met) IFSN-A5 (Not Met)	IFSN-B2: DOCUMENT the process used to identify applicable flood scenarios. For example, this documentation typically includes (a) propagation pathways between flood areas and assumptions, calculations, or other bases for eliminating or justifying propagation pathways (b) accident mitigating features and barriers credited in the analysis, the extent to which they were credited, and associated justification (c) assumptions or calculations used in the determination of the impacts of submergence, spray, temperature, or other flood-induced effects on equipment operability (d) screening criteria used in the analysis (e) flooding scenarios considered, screened, and retained (f) description of how the internal event analysis models were modified to model these remaining internal flood scenarios (g) calculations or other analyses used to support or refine the flooding evaluation (h) any walkdowns performed in support of the identification or screening of flood scenarios	IFSN-B2: The documentation provides some of the information suggested. However, as noted in other SRs, improvements need to be made to fully meet this SR. IFSN-A5: This is a finding because the IF documentation does not clearly identify SSCs included in the internal events analysis. Therefore, the accuracy of the scenarios cannot be determined.	Appendix B, plant walkdown, provides the SSC identification and spatial locations. The walkdown sheets for two flood areas (AB141-1/2/3/4 and AB70-3) were inspected. In both cases inspected, SSC spatial location and vulnerability to spray was identified. The list of SSCs for AB141-1/2/3/4 included many items that were not described in the associated accident sequence description located in section 4.2.1.5. The list of SSCs for AB70-3 included RCIC components that were not included on the RCIC system simplified diagram. There appears to be no documented linkage between SSCs identified for the IF analysis and those identified for analysis in the internal events PRA. Furthermore, there is no explicit identification of PRA SSCs that would be affected due to flooding.	Update documentation to clearly identify the SSC's included in the internal events analysis. Verify that all internal event SSCs susceptible to failure by flooding are accounted for in the Internal Flooding analysis.	This finding has been addressed through Revision 1 of the RBS Internal Flooding Analysis and Internal Flooding Quantification, calculations. All PRA components subject to internal flooding are accounted for in the Internal Flooding Analysis; Appendix E of that document cross-references equipment modeled in the PRA to Internal Flood zones. Explicit identification of components assumed damaged by flooding (e.g., spray or submergence) was included in Appendix D for each individual flooding scenario). The results of the updated IFPRA have been used in the ILRT Extension Request report. This finding has been closed and has no impact on the ILRT Extension Request.

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
		IFSN-A5: For each flood area not screened out using the requirements under other Internal Flood Supporting requirements (e.g. IFSO-A3 and IFSN-A12), IDENTIFY the SSCs located in each defined flood area and along flood propagation paths that are modeled in the internal events PRA model as being required to respond to an initiating event or whose failure would challenge normal plant operation, and are susceptible to flood. For each identified SSC, IDENTIFY, for the purpose of determining its susceptibly per IFSN-A6, its spatial location in the area and any flooding mitigative features (e.g., shielding, flood, or spray capability ratings).				
6.1.19	HR-E3 (Met)	TALK THROUGH (i.e., review in detail) with plant operations and training personnel the procedures and sequence of events to confirm that interpretation of the procedures is consistent with plant observations and training procedures.	This is a finding. While the PRA did perform talk-throughs, the information communicated in the talk throughs (as-operated plant) were not effectively modeled in the operator response analysis.	Appendix C to PRA-RB-01-002S03 documents operator input for the HRA. Per discussion with the RBS HRA analyst, interviews involved discussions of procedural application. However, operator action B21-XHE-FO-INHIB as presented (page 127) coupled the inhibit ADS action with the HPCS terminate and prevent action. In the development of the action in spreadsheet HFE_CP.xls, the action was modeled only as the inhibit ADS function. When the use of operational "hardcards" (as documented on the operator interview sheet) was asked, the more experienced PRA staff did not indicate awareness of this application. HPCS terminate and prevent is a specific "hardcard" shown in OSP-0053 as Attachment 5. While an extensive review could not be conducted, this singular thread could indicate a weakness in confirming (understanding) actual plant operational aspects and procedural usage.	Review the information documented on the talk throughs to ensure the developed HEP's model the as-operated facility.	Findings 5-5 and 5-6 addresses the modeling of terminate-and-prevent EOP actions. Resolution of this finding is primarily documentation in nature as consideration of operator tools is implicit in operator interviews in support of HRA analyses and in other interactions with Operations staff that results in inputs to the plant PRA. Continued interaction with Operations staff, including regular simulator observations by the site PRA engineer, has not identified any deviations between the "Hard Cards" of procedure OSP-0053 (Emergency and Transient Response Support Procedure) and detailed Abnormal Operating Procedure (AOP) instructions. This is as anticipated, as OSP-0053 is intended to provide the same important guidance as in AOP's and per EOP's but in a more streamlined fashion. Per OSP-0053, "Hard Cards" were developed to reduce the probability of operator error in carrying out these actions and are considered an expedited "short form" for response to transients. Note OSP-0053 Hard Cards were mentioned only once during operator interview related to Initiating Events or HRA or for interviews conducted during the Internal Flooding Analysis. Hard Cards also were not a topic brought up during Expert Panel meeting or in various discussions that have occurred with Operations staff regarding PRA models over the past several years. Thus, it is concluded that the reliance on procedures (and plant

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
						focus on Procedural Adherence) provides the basis for confirming adequate consideration of plant operational aspects and procedural usage with regard to the HRA and other aspects of PRA modeling. This is consistent with recent observations of simulator scenarios by PRA staff. It is thus concluded that the basis for modeling of Operator actions in HRA analyses is robust and proper. Use of OSP-0053 Hard Cards is sometimes noted as part of simulator observations performed by the plant PRA engineer. The simulator observations along with communications with Operations on risk assessment issues ensures that the plant PRA for River Bend reflects actual plant operational aspects and procedural usage. Thus, this finding has been closed and does not impact the ILRT Extension Request.
6.1.20	IFEV-A7 (Not Met) IFEV-B2 (Not Met)	<u>IFEV-A7:</u> INCLUDE consideration of human-induced floods during maintenance through application of generic data. <u>IFEV-B2:</u> DOCUMENT the process used to identify applicable flood-induced initiating events. For example, this documentation typically includes (a) flood frequencies, component unreliabilities/unavailabilities, and HEPs used in the analysis (i.e., the data values unique to the flooding analysis) (b) calculations or other analyses used to support or refine the flooding evaluation (c) screening criteria used in the analysis	<u>IFEV-A7:</u> The requirement is to consider human induced floods during maintenance. The scope of analysis excluded this consideration. Hence this is a finding <u>IFEV-B2:</u> The documentation provides some of the information suggested. However, as noted in other SRs, improvements need to be made to fully meet this SR.	PRA-RB-01-004 revision 0 Scope of Analysis discussion in Section 2 notes that "In this analysis, all causes of flooding were considered except plant-specific maintenance activities". However, maintenance-induced floods are not considered.	Consider maintenance induced flood events and provide documentation of this analysis.	Maintenance induced flooding is now addressed in section 3.1.6 of the revised Internal Flooding Analysis calculation. Columbia and Clinton Internal Flooding PRA's were consulted in developing Section 3.1.6. Thus, this finding has been closed and does not impact the ILRT Extension Request.
6.1.21	IFEV A6 (Cat.I) IFEV-B2 (not met)	<u>IFEV-A6:</u> *Cat. I:* **In determining the flood initiating event frequencies for flood scenario groups, USE ONE OF THE FOLLOWING:** **(a) generic operating experience** **(b) pipe, component, and tank rupture failure rates from generic data sources** **(c) A COMBINATION OF (A) OR (B) ABOVE with engineering judgment** *Cat. II:* **GATHER PLANT-SPECIFIC INFORMATION ON PLANT DESIGN,**	<u>IFEV-A6:</u> This is considered a finding as the requirement requires the gathering of plant specific information related to plant design, operating practices (maintenance induced flood potentials), etc., which was only identified in a limited manner. <u>IFEV-B2:</u> The documentation provides some of the information suggested. However, as noted in other SRs, improvements	PRA-RB-01-004 revision 0 Section 3.2 provides a discussion of 'focused' problematic issues applicable to the flooding analysis. Judgment / assessment has been provided for not being applicable. However, the discussion appears to be limited, indicating a lack of depth. Operating practices (digging in the yard, clearance program discussion, etc.), or a detailed screening of past plant issues related to flooding potentials was not identified. Generic equipment rupture and leak frequencies used are presented in Tables 3.2.1.1 and 3.2.1.2. As an all-inclusive gathering of plant specific data	Provide a more complete and systematic demonstration of plant-specific applicability.	As part of revising the Internal Flooding Analysis subsequent to the peer review, additional discussion of review of River Bend internal flooding operating experience was provided in Section 3.1.6, along with reference to additional RBS flood history reviews conducted for the 2009 study and additional documentation for the 2012 revision. The RBS specific internal flooding operating experience does not call into question the use of EPRI TR-1013141 pipe failure frequencies except for fiberglass CNS piping, for which RBS applied a plant specific failure rate based on plant experience; note this CNS piping is a very minor contributor to flooding risk.

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
		OPERATING PRACTICES, AND CONDITIONS THAT MAY IMPACT FLOOD LIKELIHOOD (I.E., MATERIAL CONDITION OF FLUID SYSTEMS, EXPERIENCE WITH WATER HAMMER, AND MAINTENANCE-INDUCED FLOODS). **In determining the flood-initiating event frequencies for flood scenario groups, USE A COMBINATION OF THE FOLLOWING:** **(a) generic and PLANT-SPECIFIC operating experience** **(b) pipe, component, and tank rupture failure rates from generic data sources AND PLANT-SPECIFIC experience** **(c) engineering judgment FOR CONSIDERATION OF THE PLANT-SPECIFIC INFORMATION COLLECTED** **<u>IFEV-B2:</u> (documentation)** See Finding 6.1.20 . (IFEV-A7)	need to be made to fully meet this SR.	is not apparent, this SR is viewed to only satisfy Category I. This is considered a finding as the requirement requires the gathering of plant specific information related to plant design, operating practices (maintenance induced flood potentials), etc., which was only identified in a limited manner.		Thus, this finding has been closed and does not impact the ILRT Extension Request.
6.1.22	LE-A2 (Met)	IDENTIFY the accident sequence characteristics that lead to the physical characteristics identified in LE-A1. Examples include (a) type of initiator (1) transients can result in high RCS pressure (2) LOCAs usually result in lower RCS pressure (3) ISLOCAs, SGTRs can result in containment bypass. (b) status of electric power: loss of electric power can result in loss of ECC injection (c) status of containment safety systems such as sprays, fan coolers, igniters, or venting systems: operability of containment safety systems determines status of containment heat removal References [2-14] and [2-15] provide example lists of typical characteristics.	This is a finding since the evaluation for significant accident progression sequences resulting in a large early release was not conservative.	PRA-RB-01-002S12, Rev 1 - Accident sequence characteristics that influence LERF are identified in Section 4.1, RBS Simplified Containment Event Tree. A cursory review of Level 1 event trees in PRA-RB-01-002S01 reveals that these physical characteristics were appropriately considered for each core damage end state. However, the definition of LERF listed in PRA-RB-01-002S12 is releases before the effective implementation of off-site emergency response and protective actions. The document continues to assess timing from the initiating event to off-site emergency response, but did not account for when the sites emergency plan would implement the actions following an event. The actual emergency classification aid EIP-2-001 may not implement off-site emergency response until late in the progression. For example a loss of decay heat removal is only a site area emergency. Therefore the early dismissal of longer term sequences in the event tree as applied is not appropriate for the LERF definition and is not a conservative	Employ the LERF definition provided in PRA-RB-01-002S12 to determine the appropriate accident progression sequences.	This finding concerns the LERF model. Review of sequences was conducted, and several sequences were identified which could potentially contribute to LERF due to timing of declaration of General Emergency with respect to any subsequent release. A sensitivity study was conducted with the LERF model which concluded this would result in a LERF increase of no more than 5.7E-09, resulting in a total LERF of 3.04E-08/reactor year. This small increase in the base PRA LERF value would not impact the conclusions or acceptability of the ILRT Extension Request since those sequences which are already characterized as LERF in the base model are excluded from the ILRT extension delta- risk assessment. Additional discussions with Operations and Emergency Planning personnel result in a conclusion that plant Emergency Implementing Procedures (EIP's) and EOP's will result in an early declaration of General Emergency for those scenarios, thus those scenarios would not contribute to LERF.. Note the applicable Supporting Requirement from the Standard was judged to be Met. As there will be NTTF-related and FLEX-related changes to

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
				evaluation.		EOP's and EIP's implemented, this Finding will be revisited as part of the next PRA Revision to confirm that no changes to the LERF model are required and provide better documentation on the interface between Emergency Declarations and LERF analysis. Other changes, such as credit for improved RCIC room heatup calculations and FLEX plant modifications, are expected to further mitigate LERF as part of that PRA update. This finding thus does not impact the ILRT Extension Request.
6.1.23	IFSO-A3 (Not Met) (also IFSN-A12 thru -A16) (Met) IFSN-B2 (Not Met)	<u>IFSO-A3:</u> SCREEN OUT flood areas with none of the potential sources of flooding listed in IFSO-A1 and IFSO-A2. <u>IFSN-A12 thru -A16:</u> [flood source screening] <u>IFSN-B2:</u> (documentation) Refer to Finding 6.1.18 above.	<u>IFSN-A12 thru A16, IFSO-A3:</u> There is not a documented listing of which sources were screened <u>IFSN-B2:</u> The documentation provides some of the information suggested. However, as noted in other SRs, improvements need to be made to fully meet this SR.	No explicit documentation of flood area screening is provided. However, it appears from a review of Section 4.2, table 4.1.1.1, and the walkdown sheets in appendix B that areas which contain no flood sources were excluded from the analysis. This same issue also applies to flood source screening.	Document screening performed at each step of the analysis.	While there is not a comprehensive list of areas screened, the requirements are fulfilled. The Internal Flooding Analysis has subsequently been revised. Areas without flooding sources have been noted on Table 4.1.1.1. Flood zones without walkdown notes and which are screened from further consideration are documented in Section 4.1.1 and in the introduction to the walkdown notes. Flood zones have not been screened based on operator mitigation actions but a conservative approach is used where HRA's are developed when operator action is credited. Detailed scenario reviews are used to determine if flood sources are insufficient to propagate damage. Generally no credit has been taken for drains and sump pumps other than crediting Control Building drains subject to Preventive Maintenance tasks, and that has been addressed via a detailed scenario discussion rather than a screening. This finding is concluded to identify weaknesses in documentation which have been addressed in the revision to the Internal Flooding Analysis. This closed finding has no impact on the ILRT Extension Request.
6.1.24	IFSN-A2 (Met)	For each defined flood area and each flood source, IDENTIFY plant design features that have the ability to terminate or contain the flood propagation. INCLUDE the presence of (a) flood alarms (b) flood dikes, curbs, sumps (i.e., physical structures that allow for the accumulation and retention of water) (c) drains (i.e., physical structures that can function as drains)	This is a finding since identification of alarms that are generated for each flood scenario is needed to support proper evaluation of human failure events need to support internal flooding quantification.	Plant design features that affect flood propagation are identified in the walkdown sheets shown in Appendix B. The effect of these features on flood scenarios appears to be addressed properly in the propagation analysis shown in Section 4.1.2 of Calculation PRA-RB-01-004 Rev. 0 and the scenario development shown in Section 4.2. However, explicit identification of alarms that would be generated as a result of the flooding does not appear to have been completed.	Document alarms, particularly alarms that are used to cue operator response, that are expected to occur for each flood.	Alarms associated with flooding events and plant locations for alarms (i.e., Main Control Room vs. Auxiliary Control Room) have been explicitly identified, including in individual building discussions in Scenario development section of the Internal Flooding Analysis. Specific alarm response procedures that would be used are included in the spreadsheets of the RBS Human Reliability Analysis calculation. Note the applicable Supporting Requirement from the Standard was judged to be Met.

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		(d) sump pumps, spray shields, water-tight doors (e) blowout panels or dampers with automatic or manual operation capability				This closed Finding does not impact the ILRT Extension Request.
6.1.25	IFSN-A3 (Not Met) IFSN-B2 (Not Met)	For each defined flood area and each flood source, IDENTIFY those automatic or operator responses that have the ability to terminate or contain the flood propagation. IFSN-B2: (documentation) Refer to Finding 6.1.18 above.	IFSN-A3: No specific actions or responses that will terminate any flood were identified. General actions such as "isolate the SSW system" are identified, however, no indication of whether or not the actions are procedurally directed is provided. The quantification methodology will apply a generic isolation operator failure probability to many different scenarios without considering the cues or timing that will initiate the actions. The calculated HEPs for different scenarios could be different for different scenarios. Furthermore, only scenarios where isolation failure occurs are evaluated in the quantification. IFSN-B2: The documentation provides some of the information suggested. However, as noted in other SRs, improvements need to be made to fully meet this SR.	Identification of actions to isolate or terminate floods is required by the SR. Identification of these actions is needed to support evaluation of the feasibility the events when performing the HRA; hence this is a finding.	Identify the actions that can terminate the flood, include the procedural guidance for doing so and the equipment needed.	Actions on flood termination actions have been added in scenario descriptions (4.2) and system information (4.1.4) sections of the Internal Flooding Analysis, and in the HRA calculation, where spreadsheet calculation sheets for flooding are now explicitly included in the calculation. Increased discussion of procedural instructions has been provided. Quantification includes scenarios where isolation is successful as well as where isolation fails. This Finding is Closed and does not impact the ILRT Extension Request.
6.1.26	IFSN-A4	ESTIMATE the capacity of the drains and the amount of water retained by sumps, berms, dikes, and curbs. ACCOUNT for these factors in estimating flood volumes and SSC impacts from flooding.	Identification of these parameters is required by the SR; hence this is a finding. Furthermore, these factors can impact the accident progression by changing timing of cues and, therefore, operator mitigation response. These effects can be significant for small and moderate flow rate scenarios.	No estimation of the amount of water retained by sumps, berms, or curbs was identified in Calculation PRA-RB-01-004 Rev. 0. No calculations for estimating the capacity of drains was identified. However, drain capacity is assumed for some scenarios.	Evaluate and document the capacity of flood mitigation features and revise flooding scenarios to account for these effects.	Information on sump pump flow rates and sump capacities has been added to building discussions (e.g., see discussion of AB70-7/8 sumps and pumps about six pages into Section 4.2.1). Condensate pit volume had been determined and considered in the Rev.0 analysis. Discussion on drain systems were added in Section 4.1.4 of the Internal Flooding Analysis; however, drains and sump pumps are generally not credited in the IFPRA, thus impact on timing of cues and operator mitigation actions for scenarios without detailed HRA's (where this is considered) is negligible. Effects of curb heights have been explicitly considered in the Internal Flooding Analysis. A specific determination of fuel in the fuel oil area beneath the east end of the DG rooms was performed for Rev.1 of the Internal Flooding Analysis, which reduced the assumed

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						time to fill that volume (however, that time is not actually credited in the Internal Flooding PRA analyses). This Finding is Closed and does not impact the ILRT Extension Request.
6.1.27	IFSN-A6 (Not Met) (IFSN-A7) (Met)	IFSN-A6: For the SSCs identified in IFSN-A5, IDENTIFY the susceptibility of each SSC in a flood area to flood-induced failure mechanisms. INCLUDE FAILURE BY SUBMERGENCE AND SPRAY in the identification process. EITHER (a) ASSESS qualitatively the impact of flood-induced mechanisms that are not formally addressed (e.g., using the mechanisms listed under Capability Category III of this requirement), by using conservative assumptions; OR (b) NOTE that these mechanisms are not included in the scope of the evaluation. IFSN-A7: In applying SR IFSN-A6 to determine susceptibility of SSCs to flood-induced failure mechanisms, TAKE CREDIT for the operability of SSCs identified in IFSN-A5 with respect to internal flood impacts only if supported by an appropriate combination of (a) test or operational data (b) engineering analysis (c) expert judgment	IFSN-A6: Section 3.2 of Calculation PRA-RB-01-004 Rev. 0 states that the effects of steam from pipe breaks are limited to the room in which the break occurs. This assumption is not supported. Effects of a high-energy line break (HELB) can propagate across large areas of the plant and effect equipment through temperature or humidity. Furthermore, HELBs can actuate fire protection systems thereby exacerbating the flood. Operator actions to mitigate a HELB-induced flood can be significantly impaired compared to a flood from a low-temperature fluid. Pipe whip and jet impingement were not addressed. Consideration of these effects is required by the clarification in Reg Guide 1.200. IFSN-A7: In general, all equipment in an affected flood area is assumed failed. One exception is failure due to temperature or humidity effects noted in SR IFSN-A6. Another exception is failure of air-operated or hydraulic-operated valves. Table 3.1.4.1 notes that these valves are assumed to remain functional for spray and steam environments. However, this assumption is not supported.	Consideration of these effects is required by the SR; hence this is a finding. These effects can be significant contributors to overall risk because they are difficult for operators to diagnose and mitigate.	Perform and document consideration of HELB induced floods. Document how potential jet impingement could affect equipment availability and flood scenario progression.	This was considered a documentation issue, as noted in the review comment. Revision 1 of the Internal Flooding Analysis included in Appendix D listings of the components and/or zones which are subject to local damage mechanisms (e.g., spray, HELB effects, etc.) and subject to flood propagation effects (e.g., submergence). Due to the general small volumes of important RBS locations, generally all equipment in a Flood Zone was conservatively assumed subject to local damage mechanisms, so that there is no difference in the components assumed damaged due to HELB effects versus spray effects in the same flood zone. Environmental effects, including those due to HELB, have been thoroughly considered, as documented for the case of internal flooding in Att.2 to letter RBG-46944 dated August 11, 2009, and as discussed in the Internal Flooding Analysis document. Steam propagation effects are accounted for through the RBS EQ program, as discussed in that letter. Steam propagation for steam and feedwater lines were also considered in development of damaged equipment sets for the Turbine Building. This Finding is closed and does not impact the ILRT Extension Request.
6.1.28	IFSN-A7 (Met)	In applying SR IFSN-A6 to determine susceptibility of SSCs to flood-induced failure mechanisms, TAKE CREDIT for the operability of SSCs identified in IFSN-A5 with respect to internal flood impacts only if	In general, all equipment in an affected flood area is assumed failed. One exception is failure due to temperature or humidity effects noted in SR IFSN-A6. Another exception is failure of air-	This is a finding since the SR requires that availability of equipment after a flood must be supported by data, analysis, or judgment. The ability of air or hydraulic valves to operate in a spray or steam environment is not supported.	Provide a basis for air and hydraulic valve operation for post-flood conditions or reevaluate scenarios	For the revised Internal Flooding Analysis, all active valves are assumed to fail due to spray or steam unless otherwise specifically justified in the scenario development. Note the applicable Supporting Requirement from the

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
		supported by an appropriate combination of (a) test or operational data (b) engineering analysis (c) expert judgment	operated or hydraulic-operated valves. Table 3.1.4.1 notes that these valves are assumed to remain functional for spray and steam environments. However, this assumption is not supported.	Failure of such equipment could impact accident progression and risk.	considering such equipment failed.	Standard was judged to be Met. This Finding is Closed and does not impact the ILRT Extension Request.
6.1.29	IFSN-A8 (Met)	IDENTIFY interarea propagation through the normal flow path from one area to another via drain lines; and areas connected via backflow through drain lines involving failed check valves, pipe and cable penetrations (including cable trays), doors, stairwells, hatchways, and HVAC ducts. INCLUDE potential for structural failure (e.g., of doors or walls) due to flooding loads.	Inter-area propagation via drain line back flow is evaluated and described in Section 4.1.2 of Calculation PRA-RB-01-004 Rev. 0. Propagation between rooms on the 70' aux building is included for flow through the HVAC ducts. No pipe or cable penetrations are identified for walls between these rooms. However, pipe penetrations below the level of the HVAC ducts would be expected. Although these penetrations would be sealed for a design-basis flood, their ability to withstand a higher water level should be evaluated. No water-filled fluid systems were identified as being located inside HVAC ducts. Therefore, failure of systems inside HVAC ducts is not evaluated. The documentation for two flood areas (AB141-1/2/3/4 and AB70-3) was inspected. For these two areas, propagation of flooding to other areas was addressed: (a) backflow through drains, (b) pipe and cable penetrations (note -- no cable trays pathways were identified), (c) hatchways, and (d) HVAC ducting. Propagation through a failed door was addressed in area AB70-3. Barrier unavailability was not addressed for either area.	It appears that propagation for pathways identified was properly considered. However, it is unusual to see no pipe penetrations below the level of the HVAC ducts in the lower levels of the aux building. Also, chilled water is provided to cooling coils and failure of these cooling coils could allow propagation through the ducting to other equipment could occur and these scenarios are addressed. Consideration of these situations is required by the SR; hence this is a finding.	Confirm that there are no pipe penetrations between rooms in the lower elevations of the aux building. If some are identified, then evaluate their ability to withstand floods considered in the PRA. Confirm that no water sources are located inside HVAC ducts. If some are, include new scenarios to evaluate these sources.	It has been confirmed that there are no piping penetrations which would serve as flood propagation pathways exist in the lower elevations of the auxiliary building. It has also been confirmed that HVAC ducts do not contain water sources. Note the applicable Supporting Requirement from the Standard was judged to be Met.. This Finding is closed and does not impact the ILRT Extension Request.
6.1.30	IFSN-A3 (Not Met) IFQU-A5 (Not Met)	IFSN-A3: For each defined flood area and each flood source, IDENTIFY those automatic or operator responses that have the ability to terminate or contain the flood propagation.	IFSN-A3: No specific actions or responses that will terminate any flood were identified. General actions such as "isolate the SSW system" are identified, however, no indication of whether or	This is a finding since following any break, loss of equipment failed due to immediate impacts along with loss of systems due to flood isolation should be considered as a minimum. Omission of these scenarios could significantly	Model and include in the quantification scenarios where isolation is successful but equipment is failed due to the	The generic operator actions to isolate within 60 or 120 minutes (FL-HEEHFL120MIN and FL-HEEHFL60MIN) are included in the documentation but have not been used in the Update to the Internal Flooding Analysis. HRA's specific to the system and building for the flood event are developed and documented. The scenario development

Finding	SR and Assessment	SR description	Basis for Peer Review Finding	Peer Review Comment	Possible Resolution	Disposition and Impact on ILRT
		IFQU-A5: If additional human failure events are required to support quantification of flood scenarios, PERFORM any human reliability analysis in accordance with the applicable requirements described in 2-2.5.	not the actions are procedurally directed is provided. The quantification methodology will apply a generic isolation operator failure probability to many different scenarios without considering the cues or timing that will initiate the actions. The calculated HEPs for different scenarios could be different for different scenarios. Furthermore, only scenarios where isolation failure occurs are evaluated in the quantification. IFQU-A5: Additional human error events were added to model termination of various flood scenarios. These are noted in the flood quantification notebook (PRA-RB-01-006, Appendix A) and documented in the HRA notebook (PRA-RB-01-002S03. The flooding HFEs are defined and quantified in a manner similar to the other HFEs in the non-flooding model. However, it appears that a single HFE is applied to multiple flooding scenarios. Given that the time available to terminate various floods may vary, it is not clear if the HEPs used are appropriate for all of the scenarios in which termination is credited.	underestimate risk. Also, application of a single HEP to multiple scenarios may not be appropriate, since the timing and other conditions may differ.	immediate effects of the break along with loss of systems that may occur due to flood isolation. Ensure that the scenario-specific operator actions are appropriate.	process credits operator success to isolate a failure only for extremely long times (e.g., six hours). Thus, isolation failure is assumed in the quantification process except when a successful operator mitigating action is applied. Note in many cases the successful operator action does not eliminate Core Damage but mitigates (greatly reduces) the CCDP / CLERP for the scenario. More aggressive application of operator recovery actions would reduce the summed CDF/LERF for flooding, as discussed in the Internal Flooding Quantification document. The Internal Flooding Analysis and its quantification considered immediate effects of pipe failures, including specifying the loss of systems due to the flood initiator. This is part of the quantification process. Timing and cues for operator response are documented in the spreadsheets for the HRA calculation. For simplicity due to the number of RBS Internal Flooding scenarios, conservative bounding calculations are performed where HRA operator actions are credited and applied for multiple scenarios. Differences in results with and without successful isolation are considered in the quantification process. This finding is closed and does not impact the ILRT Extension Request.

References

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