

May 24, 2010

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

Peach Bottom Atomic Power Station, Unit 2  
Renewed Facility Operating License No. DPR-44  
NRC Docket No. 50-277

Subject: Response to Request for Additional Information - License Amendment Request  
for Type A Test Extension

- References:
- 1) Letter from P. B. Cowan (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "License Amendment Request - Type A Test Extension," dated August 28, 2009
  - 2) Letter from J. D. Hughey (U.S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Peach Bottom Atomic Power Station, Unit 2 – Request for Additional Information Regarding License Amendment Request For One-Time Five-Year Containment Type A Integrated Leak Rate Test Interval Extension (TAC NO. ME2159)," dated February 23, 2010
  - 3) Letter from P. B. Cowan (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information - License Amendment Request for Type A Test Extension," dated February 25, 2010
  - 4) Letter from J. D. Hughey (U.S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Peach Bottom Atomic Power Station, Unit 2 – Request for Additional Information Regarding License Amendment Request For One-Time Five-Year Containment Type A Integrated Leak Rate Test Interval Extension (TAC NO. ME2159)," dated May 19, 2010

In the Reference 1 letter, Exelon Generation Company, LLC (EGC) requested a proposed change to modify Technical Specification (TS) 5.5.12, "Primary Containment Leakage Rate Testing Program." Specifically, the proposed change will revise TS 5.5.12 to reflect a one-time extension of the containment Type A Integrated Leak Rate Test (ILRT) from 10 to 15 years. This one-time extension will require the Type A ILRT to be performed no later than October 2015.

In the Reference 4 letter, the U.S. Nuclear Regulatory Commission requested additional information. Attachment 1 contains our response to this request for additional information.

No regulatory commitments are contained in this response.

Should you have any questions concerning this letter, please contact Tom Loomis at (610) 765-5510.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 24<sup>th</sup> of May 2010.

Respectfully,

*P. Cowan*

Pamela B. Cowan  
Director, Licensing & Regulatory Affairs  
Exelon Generation Company, LLC

Attachment: 1) Response to Request for Additional Information - License Amendment  
Request for Type A Test Extension

cc: USNRC Region I, Regional Administrator  
USNRC Senior Resident Inspector, PBAPS  
USNRC Project Manager, PBAPS  
R. R. Janati, Bureau of Radiation Protection, Commonwealth of Pennsylvania  
S. T. Gray, State of Maryland

**Attachment 1**

**Response to Request for Additional Information  
License Amendment Request for Type A Test Extension**

## RM DOCUMENTATION APPROVAL FORM

RM DOCUMENTATION NO. PB-LAR-07 REV: 0 PAGE NO. 1

STATION: Peach Bottom Atomic Power Station

UNIT(s) AFFECTED: 2

TITLE: Response to an additional NRC RAI Related to the License Amendment Request for a Type A Integrated Leak Rate Test Interval Extension for Unit 2

**SUMMARY:**

This document contains responses to an additional PRA related RAI obtained from the NRC for the PBAPS Unit 2 LAR for a one-time extension to the containment Type A integrated leak rate test (ILRT).

This is a Category I RM Document IAW ER-AA-600-1012, which requires independent review and approval.

Review required after periodic Update

Internal RM Documentation

External RM Documentation

Electronic Calculation Data Files: N/A

Method of Review:  Detailed  Alternate  Review of External Document

This RM documentation supersedes: N/A in its entirety.

Prepared by: Donald E. Vanover / Donald E. Vanover / 5/20/10  
Print Sign Date

Reviewed by: Robert J. Wolfgang / Robert J. Wolfgang / 5/20/10  
Print Sign Date

Approved by: Gregory A. Krueger / [Signature] / 5/21/10  
Print Sign Date

## **RAI-06:**

The response to RAI-02 in letter dated February 25, 2010, states that explicit consideration of external events is not warranted. The NRC staff notes that explicit consideration of external events, as described in Section 5.7 of the risk assessment (Attachment 4) in the LAR dated August 28, 2009, would require multiplying the change in core damage frequency ( $\Delta$ CDF) and the change in large early release frequency ( $\Delta$ LERF) by a factor of 12.2. Multiplying the  $\Delta$ LERF by a factor of 12.2 would put the total  $\Delta$ LERF in "Region I" of the Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant Specific Changes to the Licensing Basis," acceptance guidelines (i.e.  $\sim 5.5E-7$  in the LAR +  $\sim 3.2E-6$  in RAI response =  $\sim 3.7E-6$ ).

Please provide additional justification with regard to the February 25, 2010, response to RAI-02 that supports the conclusion that the total  $\Delta$ LERF would be in "Region II" of RG 1.174. NRC draft guidance on containment accident pressure credit is provided in Section 2.7 of "NRC Draft Guidance for the Use of Containment Accident Pressure in Determining the NPSH [net positive suction head] Margin of ECCS [emergency core cooling system] and Containment Heat Removal Pumps," (ADAMS Accession No. ML100550869) transmitted by letter to the Boiling Water Reactor Owners Group on March 1, 2010 (ADAMS Accession No. ML100550903).

## **Response:**

The RAI-02 response in the letter dated February 25, 2010 addressed the containment pressure credit for pump net positive suction head in a bounding fashion. Three specific scenarios were analyzed (large LOCAs, anticipated transients without scram (ATWS), and other transients). The potential impact from external events will be addressed for each of these categories, and the impact on the RG 1.174 region in which the bounding analysis results lie are re-examined below:

### **Large LOCAs**

The large LOCA assessment in the RAI-02 response utilized an applicable initiating event frequency value of  $2E-4$ /yr. It was noted that this assumption was conservative compared to the generic large LOCA ( $7.0E-6$ /yr) and medium LOCA ( $1.0E-4$ /yr) frequencies available from NUREG/CR-6928 [Ref. 6-1]. An additional contribution from external events in this category would potentially exist from seismically induced Large LOCA (LLOCA) scenarios. However, the choice of the  $2.0E-4$ /yr applicable LLOCA frequency in the original assessment far exceeds any reasonable representation of an additional contribution from seismic events where most reported values for seismically induced LLOCA frequencies are in the  $E-6$ /yr range or less (e.g., using the NRC RASP

Handbook, Vol. 2 [Ref 6-2] methodologies and data along with the NRC NUREG-1488 [Ref. 6-3] hazard curves for PBAPS results in a seismic induced LLOCA frequency that is <<1% of the internal events LLOCA frequency used in the original RAI response). Additionally, seismically induced LLOCA scenarios would be of sufficient seismic magnitude that they would also cause significant damage to other components and structures at the site such that the presence of a pre-existing containment leakage would likely be a moot point in the accident sequence analysis.

Therefore, no additional changes to the calculated  $\Delta$ CDF and  $\Delta$ LERF values from Large LOCA scenarios is warranted to account for an additional external events impact and the values are as was reported in the RAI-02 response.

$$\Delta\text{CDF} = \Delta\text{LERF} = 2.2\text{E-}7/\text{yr}$$

### ATWS

The ATWS assessment in the RAI-02 response utilized an applicable initiating event frequency value of 1/yr. This is also conservative compared to the actual plant experience over the last several years and to the industry average performance which is trending towards much less than 1 automatic scram per year [e.g. refer to Slide 11 of Ref. 6-4]. An additional contribution from external events in this category could exist from fire, seismic, or other external events, but the use of 1 applicable event per year is judged to be bounding as this value far exceeds any reasonable representation of an additional contribution from external events where the initiating event frequencies are typically much less than this.

Therefore, no additional changes to the calculated  $\Delta$ CDF and  $\Delta$ LERF values from ATWS scenarios is warranted to account for an additional external events impact and the values are as was reported in the RAI-02 response.

$$\Delta\text{CDF} = \Delta\text{LERF} = 2.2\text{E-}8/\text{yr}$$

### Other Transients

The potential impact from other transients was also handled in a bounding fashion. However, the impact from these types of scenarios could also be applicable to external events initiated transient scenarios. In a similar fashion as was provided in Section 5.7 of the Risk Assessment (Attachment 4) in license amendment request (LAR) dated August 28, 2009, the external events contribution could be estimated by multiplying the change in core damage frequency ( $\Delta$ CDF) and the change in large early release frequency ( $\Delta$ LERF) by a factor of 12.2. However, to better account for this added conservatism, further refinement to the initial bounding assessment is needed.

Therefore, rather than use the very conservative factor of 2.0 in the assessment for impacts on Human Failure Events (HFEs), it is more reasonable to assume that at most a 50% increase in the Human Error Probability (HEP) values that contribute to the relevant scenarios occurs. This is still bounding, however, since as noted in the original response, although the pre-existing containment breach may lead to an earlier loss of ECCS injection, the actual available time to respond to utilize alternate forms of injection prior to reaching core damage would not substantially change. For the types of HFEs that would be involved in these scenarios, most HEP evaluation methods would predict minimal or no impact due to these timing changes since the difference between the time of the cue and the available time to respond would be on the order of a few hours in both cases and not minutes. For example, the HEP for refilling the Condensate Storage Tank to maintain long term injection from an external source (which is one of the most important actions that would be needed to respond to these types of events) would in fact not be impacted by the timing changes based on the HEP methodology utilized in the Peach Bottom PRA model (i.e. the EPRI cause based decision trees). In any event, a bounding assessment is utilized by assuming that all of the relevant scenarios are impacted by a 50% increase as shown below.

$$CDF_{base} = LERF_{base} = 8.3E-7/yr * 2.7E-3 * 1.5 = 3.4E-9/yr$$

$$CDF_{15\text{ yr ILRT}} = LERF_{15\text{ yr ILRT}} = 8.3E-7/yr * 2.7E-3 * 1.5 * 5.0 = 1.7E-8/yr$$

$$\Delta CDF = \Delta LERF = 1.7E-8/yr - 3.4E-9/yr = 1.4E-8/yr$$

To further account for the potential impact from external events, this value can be multiplied by 12.2 as was done in the August 28, 2009 LAR. As noted in the LAR, the use of this 12.2 multiplier is also judged to be bounding for the external events impact.

$$\Delta CDF = \Delta LERF = 12.2 * 1.4E-8/yr = 1.7E-7/yr$$

### RAI-06 Conclusions

The incorporation of these bounding assessment results leads to the following totals for  $\Delta CDF$  and  $\Delta LERF$ .

<b>Contributor</b>	<b><math>\Delta CDF</math></b>	<b><math>\Delta LERF</math></b>
LAR Submittal Internal Events	0.0	4.5E-8/yr
LAR Submittal External Events	0.0	5.1E-7/yr
Containment Pressure Credit - Large LOCAs (Internal and External)	2.2E-7/yr	2.2E-7/yr
Containment Pressure Credit – ATWS (Internal and External)	2.2E-8/yr	2.2E-8/yr
Containment Pressure Credit – Other Transients (Internal and External)	1.7E-7/yr	1.7E-7/yr
<b>Total:</b>	<b>4.1E-7/yr</b>	<b>9.7E-7/yr</b>

In summary, the results of these assessments, although bounding in nature, still indicate that the increase in LERF due to the combined internal and external events challenges from extending the PBAPS ILRT frequency from 3 per 10 years to 1 per 15 years remains in Region II between 1E-7 to 1E-6 per reactor year ("Small Change" in risk) of the Regulatory Guide 1.174 acceptance guidelines. Additionally, the postulated change in CDF is less than 1E-6 per reactor year, which is in the less restrictive Region III ("Very Small Change" in risk) of the Regulatory Guide 1.174 acceptance guidelines.

#### RAI-06 References

- [6-1] Eide, S. A. et. al., "Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants," NUREG/CR-6928, January 2007.
- [6-2] USNRC, "Risk Assessment of Operational Events Handbook, Volume 2, External Events", Revision 1, September 2007.
- [6-3] USNRC, "Revised Livermore Seismic Hazard Estimates for 69 Sites East of the Rocky Mountains," NUREG-1488, April 1994.
- [6-4] Borchardt, Bill, Executive Director of NRC Operations, "An Overview of NRC Operations," Regulatory Information Conference, March 9, 2010. Available at <http://www.nrc.gov/public-involve/conference-symposia/ric/past/2010/slides/openingborchardtbpv.pdf>.