Exelon Generation®

10 CFR 50.90

October 15, 2013

U. S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Extended Power Uprate License Amendment Request – Supplement 13
Response to Request for Additional Information

References:

1. Exelon letter to the NRC, "License Amendment Request - Extended Power Uprate," dated September 28, 2012 (ADAMS Accession No. ML122860201)

2. NRC letter to Exelon, "Request for Additional Information Regarding License Amendment Request for Extended Power Uprate (TAC Nos. ME9631 and ME9632)," dated August 15, 2013 (ADAMS Accession No. ML13221A064) (AHPB-HP RAIs)

3. NRC letter to Exelon, "Request for Additional Information Regarding License Amendment Request for Extended Power Uprate (TAC Nos. ME9631 and ME9632)," dated September 18, 2013 (ADAMS Accession No. ML13261A043) (AHPB, SRXB, EEEB RAIs)

In accordance with 10 CFR 50.90, Exelon Generation Company, LLC (EGC) requested amendments to Renewed Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS) Units 2 and 3, respectively (Reference 1). Specifically, the proposed changes would revise the Renewed Operating Licenses to implement an increase in rated thermal power from 3514 megawatts thermal (MWt) to 3951 MWt. During their technical review of the application, the NRC Staff identified the need for additional information. References 2 and 3 provide the Requests for Additional Information (RAI).

This letter addresses requests from the staff of the Health Physics and Human Performance (AHPB), Electrical Engineering (EEEB), and Reactor Systems (SRXB) Branches of the U. S. Nuclear Regulatory Commission. In addition, it provides a response to a follow-up question from the Fire Protection Branch (AFPB). This information is provided in support of the request for amendment for the extended power uprate.

Responses to RAIs from the Health Physics department of the AHPB are provided in Attachment 1. Responses to RAIs from the Human Performance department of the AHPB are provided in Attachment 2. The response to an RAI from the EEEB is provided in Attachment 3. Responses to RAIs from the SRXB are provided in Attachment 4. Finally, Attachment 5 provides a response to a follow-up question from the AFPB.

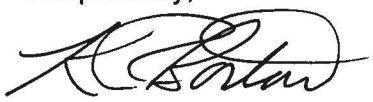
EGC has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the U. S. Nuclear Regulatory Commission in Reference 1. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. Further, the information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), EGC is notifying the Commonwealth of Pennsylvania and the State of Maryland of this application by transmitting a copy of this letter along with the non-proprietary attachments to the designated State Officials.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this letter, please contact Mr. David Neff at (610) 765-5631.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 15th day of October 2013.

Respectfully,



Kevin F. Borton
Manager, Licensing – Power Uprate
Exelon Generation Company, LLC

Attachments:

1. Response to Request for Additional Information – AHPB-HP
2. Response to Request for Additional Information – AHPB
3. Response to Request for Additional Information – EEEB
4. Response to Request for Additional Information – SRXB
5. Response to Follow-up Question Regarding AFPB-RAI-3

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

Attachment 1

Peach Bottom Atomic Power Station Units 2 and 3

NRC Docket Nos. 50-277 and 50-278

Response to Request for Additional Information – AHPB-HP

Response to Request for Additional Information

Health Physics and Human Performance Branch

By letter dated September 28, 2012, Exelon Generation Company, LLC (Exelon) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff has reviewed the information supporting the proposed amendment and by letter dated August 15, 2013 (ADAMS Accession No. ML13221A064) has requested additional information. A response to RAIs 1 and 2 of that letter was provided in PBAPS EPU LAR Supplement 11 on September 13, 2013. The response to RAIs 1 and 2 is provided below.

AHPB-HP-RAI-1

Power Uprate Safety Analysis Report (PUSAR[1]) page 2-512 states, in part, that post-accident vital area access per NUREG-0737, Item II.B.2, mission doses were evaluated in the analyses that support the NRC safety evaluation (SE) for implementation of the Alternate Source Term (AST) license amendment, and that the TID-14844 was retained for these doses. However, the referenced amendment and SE only addressed the control room, not the other vital areas in the plant. In addition, the re-calculated doses for the control room were based on the AST source term. Resolve this apparent discrepancy. Provide a clear description of the technical basis for calculating the II.B.2 mission doses.

RESPONSE

PUSAR page 2-512 paragraphs 4 and 5 require clarification and the Enclosure (Insert D) to this Attachment resolves the discrepancy and supersedes the original paragraphs. As described by the replacement text, the post-accident vital areas are addressed by the EPU evaluation.

The methodology used for the EPU NUREG-0737, Item II.B.2 mission dose calculation was previously reviewed by the NRC as part of the post-TMI action plan as detailed in UFSAR Section 12.3.5 (Reference 1). EPU does not change the vital areas or mission durations, and continues to apply the radiological source terms for post-accident conditions as described in the AST License Amendment (Reference 2). The following four major sources contribute to the total mission doses.

1. Direct shine from secondary containment

[1] A proprietary (i.e., non-publicly available) version and a non-proprietary (i.e., publicly available) of the PUSAR are contained in Attachments 6 and 4, respectively, to the application dated September 28, 2012.

2. Direct shine from radioactive equipment/piping
3. Airborne submergence outside buildings during transit times
4. Airborne submergence inside buildings where vital functions are performed

These sources are scaled for EPU power and adjusted for the reduced Main Steam Isolation Valve (MSIV) leakage defined in PUSAR Section 2.9.2.

AHPB-HP-RAI-2

PUSAR page 2-512, 5th paragraph, concludes that "all of the doses are within the limits of GDC 19," with respect to vital area access. However, Table 2.9-11, "Post-LOCA Vital Areas Requiring Infrequent Occupancies," indicates several vital area mission doses that exceed the 5 rem GDC 19 acceptance criteria. Provide a list of all the vital areas (per the definition in II.B.2), the calculated mission dose to operators performing the vital action in these areas in post-accident radiological conditions, and a description of the calculational method used to obtain the dose values.

RESPONSE

Introduction

After further examination, it was determined that the originally submitted PUSAR Table 2.9-11 did not support conformance to GDC-19 for three missions, both at CLTP and EPU. Exelon re-evaluated these missions for both CLTP and EPU. An issue report regarding this error was entered into the PBAPS corrective action program.

The definition of the post–accident vital areas from NUREG-0737, Item II.B.2 was reviewed, and the PBAPS specific vital areas, missions, activity durations and transit pathways were updated to reflect current plant configuration. None of the changes are a result of the EPU. The methodology for calculating the mission doses for these three missions does not change from the original post-TMI action plan as described in the response to AHPB-HP-RAI-1.

Part 1 – List of all the vital areas (per the definition in II.B.2)

The current list of vital areas for PBAPS is provided in Table 2-1. The areas listed are also shown in the revised PUSAR Tables 2.9-10 and 2.9-11 in the Enclosure to Attachment 1 (Inserts B and C).

Table 2-1 PBAPS Post-Accident Vital Areas

NUREG-0737 Item II.B.2 Vital Areas	Required Occupancy	Location
Control Room	Continuous	El 165'
Technical Support Center (TSC)	Continuous	Training Center, 3rd Floor
Sampling Stations	Infrequent	Rad Effluent Stack Monitor, El 195'
Sampling Analysis	Infrequent	Chemistry Lab / Counting Room, PEARL Building, 2nd floor
Emergency Power Supplies	Infrequent	Diesel Generator Bldg.
Security Center	Infrequent	Main Access Facility
Radwaste Panels	Infrequent	Radwaste Control Room, El 135' – Radwaste Panels
Other Areas	Infrequent	Refuel Floor - Makeup water to Spent Fuel Pools (El 234')
	Infrequent	Operations Support Center (OSC) (Administrative Building, 2nd floor)
	Infrequent	Cable Spreading Room (El 150')

Part 2 – Calculated mission dose to operators performing the vital actions

The NUREG-0737, Item II.B.2 calculated mission doses to operators performing vital actions in post-accident radiological conditions are revised to address the current vital areas, missions, activity durations and transit pathways. All mission doses meet the GDC-19 criteria. These results are provided in revisions to PUSAR Tables 2.9-10 and 2.9-11 in the Enclosure to Attachment 1 (Inserts B and C). PUSAR text associated with the tables is also updated in the enclosure (Inserts A and D). The information in the enclosure supersedes that initially provided in the EPU LAR submittal. Changes to the PUSAR tables are discussed below.

PUSAR Table 2.9-10 Changes

The backup counting room is no longer required as the current plant Emergency Plan (Reference 3) does not require any actions to be performed in that location.

PUSAR Table 2.9-11 Changes

The Guard House name was changed to the Main Access Facility (MAF) to match the plant's current nomenclature.

The TSC location name was changed from Unit 1 to the Training Center to match the plant's Emergency Procedures and current nomenclature.

The OSC was moved to the 2nd floor of the site Administrative Building as documented in Reference 3.

The M-G set room is no longer considered a vital area following the elimination of the post- accident sampling system in 2003 as detailed in Reference 5.

Chemistry lab / counting room was relocated from the Turbine Building to the Plant Entrance and Radiochemistry Lab (PEARL) Building as documented in Reference 3.

The post-LOCA Hydrogen Control vital area mission is no longer required. This change to the post-accident mitigation procedures was accepted by the NRC as part of the license amendment (Reference 4) to delete PBAPS Technical Specification 3.6.3.1, "Containment Atmospheric Dilution (CAD) System." Therefore this mission is no longer evaluated and the OSC to CAD mission is deleted.

The radioactive effluent stack monitor cartridge exchange no longer requires access to the refueling floor because the radiation monitor was relocated to the Turbine Building fan room on El. 195. The mission is now performed outside secondary containment.

Access to the refueling floor to provide makeup water to the spent fuel pool is within the GDC-19 criteria as a result of updated mission durations and updated plant configuration.

Two vital areas were broken out onto separate lines in PUSAR Table 2.9-11 as a result of plant changes that are unrelated to EPU. The Chemistry Lab / Counting Room has been moved to the PEARL Building, the HP-OSC has been moved to the OSC, and the OSC has been moved to the Administrative Building. Therefore, they are now each presented as separate line items in PUSAR Table 2.9-11. Mission doses have been calculated and show compliance to GDC-19.

Part 3 – Description of the calculational method for mission doses

As discussed in the response to AHPB-HP-RAI-1, the method used to calculate the NUREG-0737, Item II.B.2 mission doses, and the vital areas analyzed are defined by the post-TMI action plan as outlined in Reference 1. The revised PUSAR information in Enclosure A presents the post-LOCA doses to the operator derived using the original calculation method and the current plant configuration. The EPU impact on the mission doses is limited to increased source terms and reduced MSIV leakage (see PUSAR Section 2.9.2)

REFERENCES:

1. PBAPS UFSAR Section 12.3.5, Revision 24
2. NRC letter, "Issuance of License Amendments RE: Application of Alternative Source Term Methodology", dated September 5, 2008. (PBAPS License Amendment Nos. 269 (Unit 2) and 273 (Unit 3)) (NRC Accession No. ML082320406)
3. EP-AA-1007, Radiological Emergency Plan Annex for Peach Bottom Atomic Power Station, Revision 28
4. NRC letter "Issuance of License Amendments to Incorporate TSTF-478, Revision 2, "BWR Technical Specifications Changes that Implement the Revised Rule for Combustible Gas Control"," dated January 28, 2010. (PBAPS License Amendment Nos. 274 (Unit 2) and 278 (Unit 3)) (NRC Accession No. ML100130814)
5. NRC letter, "Issuance of Amendment Re: Elimination of Requirements for Post Accident Sampling System", dated May 22, 2003. (PBAPS License Amendments Nos. 248 (Unit 2) and 251 (Unit 3)) (NRC Accession No. ML030980491)

Enclosure to Attachment 1

Mark-up of PUSAR Pages Regarding Mission Dose

(affected pages include 2-495, 2-505, 2-506 and 2-512)

spike) and a value of 0.2 μCi/gm Dose Equivalent I-131 equilibrium iodine activity for continued full power operation.

The EPU post-accident doses for the MSLBA were determined to be within the applicable regulatory limits. The results and regulatory criteria are summarized in Tables 2.9-8 and 2.9-9.

Post-LOCA Vital Area Mission Doses

An additional review of the doses associated with access to vital areas was conducted to determine the effect of EPU. The times required for transit to and work in vital areas are not changed with EPU.

Vital areas are defined in NUREG-0737, Item II.B.2, as those "which will or may require occupancy to permit an operator to aid in the mitigation of or recovery from an accident." Compliance to NUREG-0737, Item II.B.2, assures the shielding adequacy necessary to reduce the whole body (WB) dose (i.e., external dose) to an operator to perform the vital function in a given mission time to less than the allowable limit of 5 rem whole body dose.

Post-LOCA Vital Areas Requiring Continuous Occupancies

Control Room

The post-LOCA CR dose contributions from various radioactive sources are analyzed and listed in Table 2.9-5.

Insert A

Technical Support Center (TSC)

The post-LOCA TSC dose contributions from various radioactive sources are analyzed and listed in Table 2.9-10.

Backup Counting Room (BCR)

Because the BCR and TSC are located in the same building at the different elevations, the post-LOCA TSC doses are conservatively applied to the BCR and listed in Table 2.9-10.

Post-LOCA Vital Areas Requiring Infrequent Occupancies

The vital areas requiring infrequent occupancies to perform the required vital functions are listed in Table 2.9-11, including the resulting doses. The radiation exposures to vital areas are calculated using the occupancy times determined based on the time-motion studies performed for the plant operating license. Projected WB doses for areas within Turbine Hall / Radwaste Building Complex, Operations Support Center (OSC) to CAD Building and TSC to refueling floor (EL-234') to exchange the radioactive effluent monitor cartridge (1 hour after a LOCA) and to maintain the spent fuel water level are expected to exceed the allowable dose limit of 5 rem because the CAD Building and reactor building refueling floor is not accessible during the early phase of the accident. The applicable plant procedures take complete control of the radiation exposure during vital functions by providing the RP coverage to perform radiation surveys, and determining occupancy and radiation protection requirements before the vital functions are performed to maintain the resulting WB exposure to ALARA and within the guideline value.

Table 2.9-8 MSLBA Pre-Incident Iodine Spike Radiological Consequences

	TEDE Dose (REM)		
	Receptor Location		
	CR	EAB	LPZ
Calculated Dose CLTP	3.23	1.97	0.28
Calculated Dose EPU	2.10	5.43	0.82
Allowable TEDE Limit	5.0	25	25

Table 2.9-9 MSLBA Equilibrium Iodine Concentration Radiological Consequences

	TEDE Dose (REM)		
	Receptor Location		
	CR	EAB	LPZ
Calculated Dose CLTP	0.16	0.10	0.01
Calculated Dose EPU	0.11	0.27	0.04
Allowable TEDE Limit	5.0	2.5	2.5

Insert B

Table 2.9-10 Post-LOCA Vital Areas Requiring Continuous Occupancies

Areas Requiring Continuous Occupancy	30-Day Dose (rem TEDE)	
	CLTP	EPU
Control Room	4.69	4.80
Technical Support Center	3.76	3.77
Backup Counting Room	3.76	3.77

Insert C

Table 2.9-11 Post-LOCA Vital Areas Requiring Infrequent Occupancies

Access Route	Time After Accident (hr)	Projected Total Whole Body Dose	
		CLTP (rem)	EPU (rem)
Guard House to TSC & Backup Counting Room	8	0.214	0.245
Guard House to Control Room (EL 165')	8	0.860	0.798
Within Turbine Hall / Radwaste Building Complex (HP-OSC, OSC, Chem Lab / Counting Room, M-G Set Room, Radwaste Control Room, and Cable Spreading Room)	8	1.639	1.304**
OSC to Diesel Generator Building	24	0.818	0.868
OSC to CAD Building*	24	5.328	6.044
TSC to Refueling Floor (EL 234') – Cartridge Exchange at Rad Effluent Monitor*	1	5.491	6.027
TSC to Refueling Floor (EL 234') – Makeup Water to Spent Fuel Pool*	2	5.937	6.531

* Projected whole body (WB) doses for OSC to CAD Building and TSC to refueling floor (EL-234') to exchange the radioactive effluent monitor cartridge (1 hour after a LOCA) and to maintain the spent fuel water level exceeded the allowable dose limit of 5 rem because the CAD Building and reactor building refueling floor is not accessible during the early phase of the accident.

** The airborne WB doses in all vital access areas are reduced due to the reduced MSIV leakage modeled in the EPU dose analysis. The MSIV leakage related decrease is more than the EPU related increase, resulting in a net reduction in the airborne submergence WB dose. The 8-hour airborne average dose in the subject vital area is at least 2 orders of magnitude higher than secondary shine dose. Therefore, the reduction in the airborne WB dose resulted in a reduced total WB dose in the compartment.

The existing radiation protection design (e.g., the maximum designed dose rates for each area of the plant) for areas outside the N-16 affected areas will not change as a result of the increased dose rates associated with EPU. A review was performed for areas expected to be affected by the increased dose rates as a result of EPU. Based on this review, it was concluded that no changes in the shielding requirements will need to be made as a result of EPU. N-16 dose rates may increase by no more than 30%. Steam containing components such as the turbine and condenser are heavily shielded as shown in radiation zone maps, and based on survey data, dose rate increases due to EPU will remain within acceptable zone designations with the current shielding designs.

PBAPS has the following options if necessary for the increased dose rates due to EPU.

1. Use of operational radiation survey data to establish available calculation method related margins.
2. Re-posting and locking areas, as needed, in accordance with 10 CFR 20 requirements and PBAPS policy.
3. Using additional permanent and/or temporary shielding where needed and feasible.
4. Operation of equipment in a manner that compensates for these relatively minor source increases.

Insert D

In summary, individual worker exposures can be maintained within acceptable limits by controlling access to radiation areas using the site ALARA program. Procedural controls compensate for increased radiation levels.

The effect of EPU on access to plant vital areas following an accident (Item II.b.2 of NUREG-0737) was evaluated in the analyses that support the NRC Safety Evaluation for implementation of the Alternative Source Term. The evaluation determined that the existing OLTP analyses, which are based on TID-14844 (Reference 84) rather than the Alternative Source Term, are conservative and bounding.

An additional review of the doses associated with access to vital areas was conducted to determine the effect of EPU. The times required for transit to and work in vital access areas are not changed with EPU. The operator doses are expected to increase by up to 20% compared to OLTP. After evaluating this increase, it was concluded that all of the doses are within the limits of GDC-19.

In summary, analyses and measurements have confirmed that operation under EPU conditions will have a negligible effect on occupational and onsite radiation exposure. Therefore, occupational and onsite radiation exposure meets all CLTR dispositions.

A review was performed of the historical radiation zone maps, which have been historically acceptable, and recent radiation dose surveys to identify areas where the doses resulting from EPU could affect current radiation protection practices. Based on this review and post-EPU surveys, radiation zoning will be updated as necessary. Plant area locations where post-EPU radiation surveys are performed can be found in Section 2.12.1.

Inserts associated with Mark-ups of PUSAR Pages Regarding Mission Dose

Insert A:

Post-LOCA Vital Areas Requiring Infrequent Occupancies

The vital areas requiring infrequent occupancies to perform the required vital functions are listed in Table 2.9-11, including the resulting doses. The radiation exposures to vital areas are calculated using the occupancy times determined based on the time-motion studies performed for the plant operating license. EPU does not change any of the missions. However, EPU does impact the mission doses as a result of the increase in power and change to the MSIV leakage limit. All vital areas requiring occupancy remain accessible post-EPU for required activities.

Insert B:

Table 2.9-10 Post-LOCA Vital Areas Requiring Continuous Occupancy

Areas Requiring Continuous Occupancy	30-Day Dose (rem TEDE)	
	CLTP	EPU
Control Room	4.69	4.80
Technical Support Center	3.76	3.77

Insert C:

Table 2.9-11 Post-LOCA Vital Areas Requiring Infrequent Occupancies

Access Route	Time After Accident (hr)	Projected Total Whole Body Dose	
		CLTP (rem)	EPU (rem)
Main Access Facility to TSC	8	0.214	0.245
Main Access Facility to Control Room (EL 165')	8	0.860	0.798[1]
Within Turbine Hall / Radwaste Building Complex (Radwaste Control Room and Cable Spreading Room)	8	1.639	1.304[1]
Within Admin Building (OSC)	8	1.639	1.304[1]
Within PEARL Building (Chem Lab / Counting Room)	8	1.639	1.304[1]
OSC to Diesel Generator Building	24	0.818	0.868
TSC to Fan Room (EL 195') – Cartridge Exchange at Rad Effluent Monitor	1	3.927	4.428
TSC to Refueling Floor (EL 234') – Makeup Water to Spent Fuel Pool	12[2]	3.979	4.363

1. The airborne WB doses in all vital access areas are reduced due to the reduced MSIV leakage modeled in the EPU dose analysis. The MSIV leakage related decrease is more than the EPU related increase for these missions, resulting in a net reduction in the airborne submergence WB dose. The 8-hour airborne average dose in the subject vital area is at least 2 orders of magnitude higher than secondary shine dose. Therefore, the reduction in the airborne WB dose resulted in a reduced total WB dose in the compartment.
2. The calculation conservatively assumes refilling the spent fuel pool occurs at 12 hours. This is when pool level is projected to decrease based on a bounding time-to-boil evaluation.

Insert D:

The effect on access to plant vital areas following an accident (Item II.B.2 of NUREG-0737) at CLTP conditions was evaluated in the analyses that support the implementation of the Alternative Source Term. An additional review of the doses associated with access to vital areas was conducted to determine the effect of EPU. The times required for transit to and work in vital access areas are not changed with EPU. The dose rates assumed in the analysis are scaled up for the EPU power level. After evaluating the effect of increasing power for EPU and the reduction in MSIV leakage, it was concluded that all of the doses are within the limits of GDC-19 as documented in Tables 2.9-10 and 2.9-11.

Attachment 2

Peach Bottom Atomic Power Station Units 2 and 3

NRC Docket Nos. 50-277 and 50-278

Response to Request for Additional Information – AHPB

Response to Request for Additional Information

Health Physics and Human Performance Branch

By letter dated September 28, 2012, Exelon Generation Company, LLC (Exelon) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff has reviewed the information supporting the proposed amendment. PBAPS EPU LAR Supplement 3 dated May 24, 2013 transmitted the responses to 5 RAIs from the Health Physics and Human Performance Branch. NRC letter dated September 18, 2013 (ADAMS Accession No. ML13261A043) transmitted a second round of requests for additional information. The responses to RAIs 6 and 7 are provided below.

AHPB RAI-6

On pages 2 and 3 of Attachment 3 to the supplement dated May 24, 2013, the licensee described changes to current operator actions related to emergency or abnormal operating procedures that will occur as a result of the proposed EPU. Specify what controls are in place to assure the following:

a) Cues exist that alerts the operator to action in a timely manner.
b) Tasks are within the capability of all PBAPS operators.
c) Operator feedback capability exists to determine whether the actions are complete and effective.
d) Training content, method, and frequency are determined and implemented.
e) The location and accessibility of required displays and controls are considered.
f) List the controlled procedures that guide the operator's actions for the cited changes to operator actions.

RESPONSE

a. The PBAPS symptom-based Emergency Operation Procedures (EOP) criteria provide the cues to alert the operator to initiate actions in a timely manner. Operations engagement in the EPU design and modification process as well as the formal reviews of the modification packages provides assurance that the symptom-based procedures contain the appropriate actions at the appropriate points in an event. Plant parameter thresholds (e.g., suppression pool temperature) will be conservatively established so that timely operator action is taken. Use of symptom-based criteria eliminates the need to make an event specific diagnosis. It also aids in timely action while retaining operator flexibility in event mitigation.

b. A Human Factors evaluation was performed for the new EOP and AOP tasks. It has been determined that all new tasks use skills and abilities similar to those required for existing tasks. In addition, both licensed and non-licensed operators have performed plant walkdowns to assess the new required tasks. These activities provide assurance that the new tasks are within the capability of all operators.

c. The EGC Configuration Change Process requires an Operations review of the modification to assess the operations impact of the change. They also review the integration of these actions into the plant procedures. This includes consideration of the expected plant response during these actions and the availability of instrumentation to monitor the plant and equipment conditions and determine the effectiveness of their actions.

d. EGC utilizes the Systematic Approach to Training (SAT) and the ADDIE (Analyze, Design, Develop, Implement, Evaluate) processes to develop and deliver the necessary training for all line organizations. As part of the EGC configuration control process, a review of each modification is required to be performed by the Training Department. The line organizations determine the impact on their procedures and identify specific training needs. EPU Training considers these inputs and develops a training needs analysis document that includes a review of the procedures and training materials being changed and a consideration of the job tasks affected. These controls assure the necessary training content, method, and frequency are developed and implemented.

e. Human factors considerations and Operations impact reviews are required by the EGC Configuration Change Process. These processes assure that the location and accessibility of the required controls and displays are considered.

f. PUSAR Section 2.11.1.1 provides a listing of the affected EOPs and AOPs for the EPU. As the procedure change process is implemented, changes to additional interfacing procedures may be identified. The EGC Configuration Change Process provides assurance that such changes in scope of affected procedures is controlled and completed in order to support the implementation of the EPU.

AHPB RAI-7

Given the number of new operator actions, please discuss how the impacts of the EPU and associated plant modifications were identified and what, if any, analysis was done to understand impacts to operator workload.

RESPONSE

The impact of the EPU and its associated plant modifications on plant operation and operator workload was evaluated and the results documented in PBAPS EPU LAR PUSAR, Section 2.11, Human Performance.

The elimination of containment accident pressure (CAP) credit required to support EPU involves several modifications that result in the new operator actions. Reviews of the approach strategies and the conceptual design of these modifications were performed for human factors considerations including the effect of the modifications on EOPs, CR layout, alarms, indication and function. In addition, a formal Human Factors evaluation was performed to evaluate the new operator actions associated with the design analyses described in the LAR. The evaluation was performed by a multi-discipline team, including a broad base of Engineering personnel, including an engineer knowledgeable in human factors, and dedicated licensed Operations representatives. The human factors evaluation determined that all new actions are assumed to be performed at a time when operators are available to perform them. This evaluation also considered whether the actions were similar in method of execution compared to existing operator actions.

The EGC Configuration Change Process will ensure that any revisions to these modifications consider the impact of the change on Operations and on the conclusions of the human factors evaluation.

Attachment 3

Peach Bottom Atomic Power Station Units 2 and 3

NRC Docket Nos. 50-277 and 50-278

Response to Request for Additional Information – EEEB

Response to Request for Additional Information

Electrical Engineering Branch

By letter dated September 28, 2012, Exelon Generation Company, LLC (Exelon) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff has reviewed the information supporting the proposed amendment. PBAPS EPU LAR Supplement 3 dated May 24, 2013 transmitted the responses to 15 RAIs from the Electrical Engineering Branch. NRC letter dated September 18, 2013 (ADAMS Accession No. ML13261A043) transmitted a second round of requests for additional information. The response to RAI 16 is provided below.

EEEB-RAI-16

On page 2-135 in Section 2.3.5 of the PUSAR[2], the licensee states that "[e]valuation of the PBAPS Class 1E Battery Capacity has shown that PBAPS has adequate battery capacity to support decay heat removal during a SBO for the required coping duration." Page 2-134 of the PUSAR indicates that SBO was re-evaluated for the proposed EPU using the guidelines of NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors" and NRC Regulatory Guide (RG) 1.155, "Station Blackout."

Explain the design duty cycle of Class 1E battery to support all SBO loads for the required SBO coping duration. Confirm that the PBAPS Class 1E batteries and alternate alternating current sources will have adequate capacity and capability during the plant power uprated condition to support SBO loads for the entire SBO coping duration consistent with RG 1.155 and NUMARC 87-00.

RESPONSE

The PBAPS SBO licensing basis includes an eight-hour coping duration and requires the availability of an alternate AC (AAC) power source within one-hour of the SBO event. For the one hour prior to the AAC power availability, the PBAPS AC safe shutdown loads are powered through the batteries via an inverter. After the first hour, the required electrical loads including the battery chargers are powered from the AAC power supply.

An evaluation of the SBO event at EPU conditions concluded the battery capacity remains adequate to support required coping equipment operation under EPU conditions. The design duty cycle of the class 1E battery during an SBO event (from either CLTP or EPU conditions) is bounded by the FSSD and LOCA/LOOP events. Therefore, the class 1E batteries have adequate capacity and capability to support the required loads to cope with an SBO event at EPU conditions.

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[2] A proprietary (i.e., non-publicly available) version of the PUSAR is contained in Attachment 6 to the application dated September 28, 2012. A non-proprietary (i.e., publicly available) version of the PUSAR is contained in Attachment 4 to the application dated September 28, 2012.

The existing SBO load flow study at CLTP conditions determined that the AAC source will maintain the required voltage levels for the required SBO event loads. Under EPU conditions, none of the required SBO loads increase in size and no additional SBO AC loads are required. Therefore, the AAC power supply has adequate capacity and capability during EPU conditions, to support the required SBO event loads for the balance of the coping duration.

Attachment 4

Peach Bottom Atomic Power Station Units 2 and 3

NRC Docket Nos. 50-277 and 50-278

Response to Request for Additional Information – SRXB

Response to Request for Additional Information

Reactor Systems Branch

By letter dated September 28, 2012, Exelon Generation Company, LLC (Exelon) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff has reviewed the information supporting the proposed amendment. PBAPS EPU LAR Supplements 2 and 9, dated May 7, 2013 and August 22, 2013, respectively, transmitted the responses to the first two rounds of RAIs from the Reactor Systems Branch. NRC letter dated September 18, 2013 (ADAMS Accession No. ML13261A043) transmitted a third round of requests for additional information. The responses to RAIs 29 and 30 are provided below.

SRXB-RAI-29

With regard to the overpressure analyses performed in support of the requested EPU, provide the number of safety relief valves (SRVs) and safety valves (SVs) assumed available, including setpoints and assumed lift setpoint tolerances. Confirm whether the EPU safety analyses bound conditions associated with the proposed SRV and SV lift setpoint tolerance increases that were requested by Exelon's license amendment request for PBAPS, Units 2 and 3, dated June 10, 2013 (ADAMS Accession No. ML131750144).

RESPONSE

The EPU configuration will have a total of 14 SRVs and SVs in each unit. The EPU analyses assumed one SRV out of service (i.e., 13 SRVs and SVs assumed available). The nominal SRV and SV setpoints were not changed for EPU. The lift setpoints assumed in the EPU overpressure analyses (3% setpoint tolerance) are provided in the following table:

Valve Type	Number of Valves Installed	Valve Setpoint	
		Nominal Setpoint	EPU Analysis Value
		(psig)	(psig)
SRV	4	1135.0	1169.1
SRV	4	1145.0	1179.4
SRV	3	1155.0	1189.7
SV	3	1260.0	1297.8

It is confirmed that EPU safety analyses, performed at EPU operating conditions, used the proposed SRV and SV lift setpoint tolerance increases requested by Exelon's license amendment request for PBAPS, Units 2 and 3, dated June 10, 2013 (ADAMS Accession No. ML131750144).

SRXB-RAI-30

Attachment 9 to the application dated September 28, 2012, describes proposed modifications to PBAPS associated with the EPU. Condensate storage tank (CST) modifications are described in Enclosure 9e to Attachment 9. Section 3.1 of Enclosure 9e describes the addition of a CST standpipe to "ensure a CST dedicated usable volume for the HPCI (high pressure coolant injection) and RCIC (reactor core isolation cooling) pumps for SBO (station blackout), ATWS (anticipated transient without scram), and Appendix R events." This section refers to Section 2.3.5, "Station Blackout," of the Power Uprate Safety Analysis Report (PUSAR[3]) and states that "[t]he CST volume needed for SBO at EPU conditions is approximately 94,570 gallons." Provide the EPU SBO analysis that concludes that this is the CST inventory required for mitigation.

RESPONSE

PUSAR Section 2.3.5 provides the results of the SBO analysis for PBAPS EPU. Additional details of the PBAPS EPU SBO analysis are provided below to demonstrate the conclusion that a CST volume of 94,570 gpm is the CST inventory required for the PBAPS SBO coping period of 8-hours.

The containment response to SBO is determined using the GEH SHEX computer program (Reference PUSAR Table 1-1). Analysis initial conditions and key input parameters are shown in Table SRXB-30-1. PUSAR Table 2.3-4 provides the PBAPS SBO sequence of events. The following are key events in the PBAPS SBO scenario:

The SBO is postulated to occur when the reactor is operating at full power.

At onset of the SBO event, the plant experiences a loss of all AC Power and the reactor scrams. RCIC and HPCI are the only makeup water sources to maintain RPV water level. RCIC and HPCI initially take water suction from the CST. MSIVs start to close and will be fully closed in 3.5 seconds. SRVs begin automatic cycling to control reactor pressure after the RPV isolation and feedwater flow is assumed to ramp down to zero flow in 5 seconds.

At 30 minutes into the event, the operators secure HPCI and continue RCIC operation to maintain reactor water level. Also at 30 minutes, the operators initiate vessel depressurization with a plant cooldown rate of 100°F/hr.

RCIC suction is transferred from the CST to the suppression pool just prior to suppression pool (torus) water volume reaching 138,015 ft^3. This occurs at 9450 seconds after the SBO event initiation. This ends the use of CST inventory for the SBO event. When reactor pressure reaches 165 psia, the operator secures depressurization of the reactor, and maintains the reactor pressure at 165 psia for 30 minutes by manually cycling SRVs.

RCIC is secured 30 minutes after reactor pressure reaching 165 psia. The operators lower reactor pressure using ADS SRVs. The operators use RHR to flood the RPV and enter into Alternate Shutdown Cooling (ASDC).

The SBO coping period ends at 8 hrs.

The SHEX code provides an automatic accounting of the CST usage during the SBO analysis. CST usage will be equal to the RPV makeup via the RCIC and HPCI systems

[3] A proprietary (i.e., non-publicly available) version of the PUSAR is contained in Attachment 6 to the application dated September 28, 2012. A non-proprietary (i.e., publicly available) version of the PUSAR is contained in Attachment 4 to the application dated September 28, 2012.

when the makeup water source to HPCI/RCIC is from the CST. Table SRXB 30-2 provides the duty times of RCIC and HPCI operation for SBO.

Figure SRXB 30-1 is a plot of the PBAPS SBO analysis results for integrated CST usage with an overlay of the HPCI and RCIC makeup duty times with pump suction aligned to the CST. This plot from the analysis results demonstrates the conclusion that the CST volume needed for SBO at EPU conditions is 94,570 gallons.

Table SRXB 30-1: Key Input for PBAPS EPU SBO Analysis

Parameter	Units	EPU Value
Coping Period	hr	8
Core Thermal Power	MWt	3951
Initial Reactor Dome Pressure	psia	1050
Initial Vessel Water Level (AVZ)	inch	562
Decay Heat	NA	ANS 5.1-1979(1)
CST Water Temperature	°F	120
Initial Torus Temperature	°F	86
Initial Torus Water Volume	ft^3	125,100
Initial WW Airspace Temperature	°F	86
Initial WW Airspace Relative Humidity	%	100
Initial WW Airspace Pressure	Psig	2.5
Initial DW Temperature	°F	145
Initial DW Relative Humidity	%	20
Initial DW Airspace Pressure	Psig	2.5
RHR Service Water Temperature	°F	86
RPV Controlled Cooldown Rate	°F/hr	100
RHR Heat Exchanger K-factor	BTU/sec-°F	305
Maximum Torus Water Volume(2)	ft^3	138,015
Maximum Allowable Suction Temperature for Operation of HPCI and RCIC	°F	180 for up to 4 hours
Assumed RRS Seal Leakage	gpm	61

Note:
(1) Decay heat does not include 2-sigma uncertainty. Decay heat includes additional terms specified in GEH SIL 636 (PUSAR Reference 63).
(2) Value used in analysis to require RCIC/HPCI suction transfer from the CST to the suppression pool (torus).

Table SRXB 30-2 – RCIC / HPCI Operation during PBAPS EPU SBO

RCIC			
TIME On (sec)	**Time Off (sec)**	**Duration (sec)**	**Water Source**
95.0	125.7	30.7	CST
590.3	669.2	78.9	CST
1,325.9	1,395.9	70.0	CST
2,061.5	9450	7,388.5	CST
9450	10,522.1	1,072.1	Torus
HPCI			
TIME On (sec)	**Time Off (sec)**	**Duration (sec)**	**Water Source**
55.0	125.7	70.7	CST
590.3	669.2	78.9	CST
1,325.9	1,395.9	70.0	CST

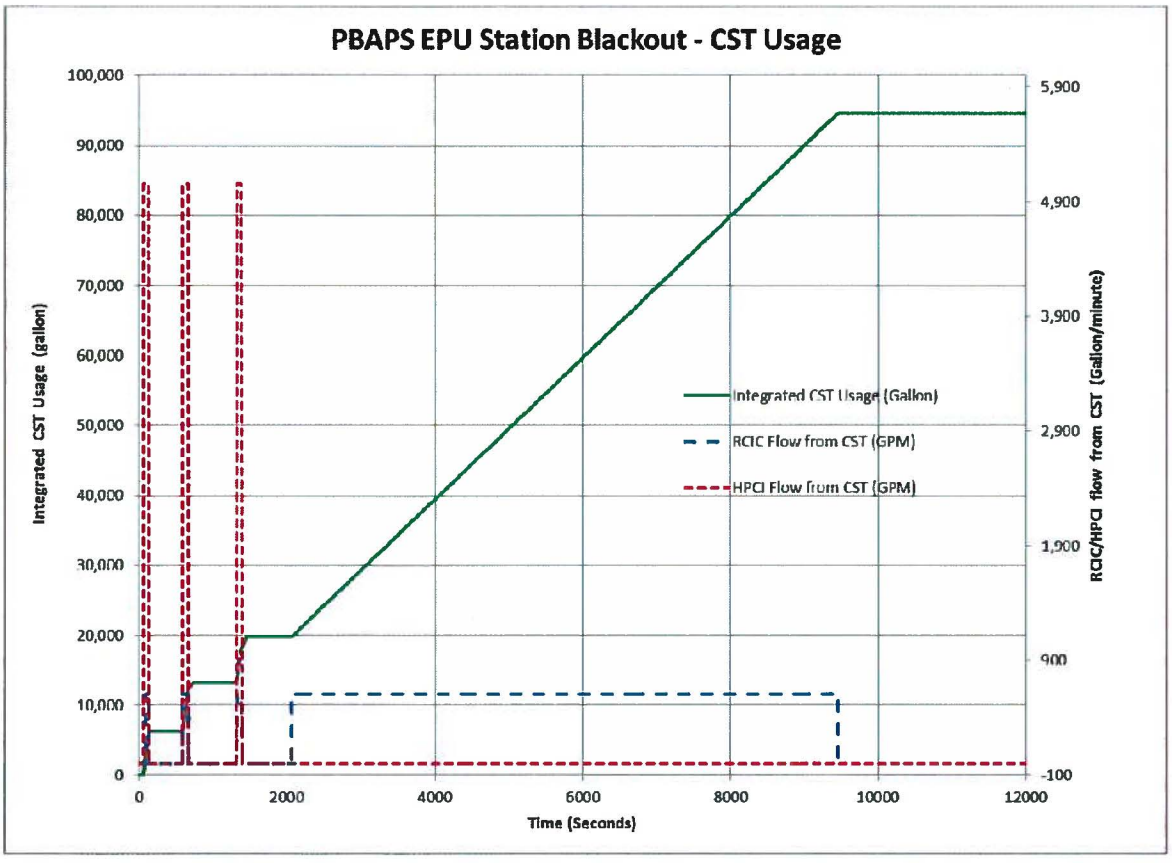

Figure SRXB 30-1

Attachment 5

Peach Bottom Atomic Power Station Units 2 and 3

NRC Docket Nos. 50-277 and 50-278

Response to Follow-up Question Regarding AFPB-RAI-3

Response to Follow-up Question Regarding AFPB-RAI-3

Fire Protection Branch

By letter dated September 28, 2012, Exelon Generation Company, LLC (Exelon) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff has reviewed the information supporting the proposed amendment. PBAPS EPU LAR Supplement 3 dated May 24, 2013 transmitted the response to three questions from the Fire Protection Branch. Based on their review of the response, the NRC provided a follow-up question. For clarity, the original RAI and response and the follow-up question and its response are presented below.

AFPB-RAI-3

Some plants credit aspects of their fire protection system for other than fire protection activities (e.g., utilizing the fire water pumps and water supply as backup cooling or inventory for non-primary reactor systems). If PBAPS credits its fire protection system in this way, the licensee should identify the specific situations and discuss to what extent, if any, the EPU affects these "non-fire-protection" aspects of the plant fire protection system. If PBAPS does not take such credit, the NRC staff requests that the licensee verify this as well.

RESPONSE (as provided in Supplement 3)

PBAPS does not use the Fire Protection System for non-fire protection activities in any Design Basis scenario. The PUSAR (Section 2.5.1.4.1) does describe non-fire suppression uses when outside the plant design basis. The non-fire protection uses, which are not affected by EPU, are:

1. Reactor Pressure Vessel injection when preferred water sources are not available,
2. Makeup to the Spent Fuel Pool,
3. Radiological release scrubbing, and
4. Direct makeup to the Emergency Cooling Tower, and
5. External makeup to the condensate system hotwell.

These uses of the fire protection system are beyond the plant design bases. These uses of the fire protection system for non-fire suppression functions are consistent with industry-accepted guidelines.

There is no other approved non-fire suppression use of fire protection water. Thus, the fire protection system design demands will not be impacted except in the case of a beyond design basis event where system use could be directed consistent with industry accepted guidelines.

FOLLOW-UP QUESTION

Does this [referring to the last sentence of the original response] include a concurrent fire where the fire protection system is needed for fire-fighting purposes?

RESPONSE

The beyond design basis event referred to in the original response is the Design Basis Threat that includes a concurrent fire. The Fire Protection System (FPS) would be used for fire-fighting purposes and may be used for non-fire protection purposes. The original response identified five potential non-fire suppression uses of the Fire Protection System (FPS). These potential uses are part of the current configuration and are not impacted by EPU.

In any of the beyond design basis events, the operators will respond in accordance with the symptom-based Emergency Operating Procedures and Severe Accident Management Guidelines (EOPs / SAMGs).

The use of the FPS for non-fire suppression purposes during such events involving a concurrent fire would involve decisions by shift operations and onsite and offsite Emergency Response Organization (ERO) personnel in accordance with existing Emergency Operations Procedure and Severe Accident Management procedures and the Emergency Plan. This includes the use of existing PBAPS equipment available for mitigation of extreme damage events. These decisions will be based on protection of the health and safety of the public and site personnel, and on the capability of available plant equipment and site personnel. In such events, offsite fire protection equipment would be brought onsite if necessary to augment the onsite FPS capability.