

September 17, 2013

MEMORANDUM TO: Veronica M. Rodriguez, Acting Chief  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

FROM: Richard B. Ennis, Senior Project Manager */RA/*  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3,  
DRAFT REQUEST FOR ADDITIONAL INFORMATION (TAC NOS.  
MF1970 AND MF1971)

The attached draft request for additional information (RAI) was transmitted on September 17, 2013, to Mr. Thomas Loomis of Exelon Generation Company, LLC (Exelon, the licensee). This information was transmitted to facilitate an upcoming conference call in order to clarify the licensee's amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, dated June 10, 2013. The proposed amendment would revise the Technical Specifications (TSs) to: (1) increase the allowable as-found safety relief valve (SRV) and safety valve (SV) lift setpoint tolerance from  $\pm 1\%$  to  $\pm 3\%$ ; (2) increase the required number of operable SRVs and SVs from 11 to 12; and (3) increase the Standby Liquid Control (SLC) System pump discharge pressure from 1255 pounds per square inch gauge (psig) to 1275 psig.

The draft RAI was sent to Exelon to ensure that the questions are understandable, the regulatory basis for the questions is clear, and to determine if the information was previously docketed. This memorandum and the attachment do not convey or represent an NRC staff position regarding the licensee's request.

Docket Nos. 50-277 and 50-278

Attachment: Draft RAI

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**ADAMS ACCESSION NO.: ML13261A157**

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NAME	REnnis
DATE	9/17/13

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DRAFT REQUEST FOR ADDITIONAL INFORMATION

REGARDING PROPOSED LICENSE AMENDMENT

INCREASE THE SAFETY RELIEF VALVE AND SAFETY VALVE SETPOINT TOLERANCE

EXELON GENERATION COMPANY, LLC

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-277 AND 50-278

By application dated June 10, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML131750144), Exelon Generation Company, LLC (Exelon, the licensee), submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would revise the Technical Specifications (TSs) to: (1) increase the allowable as-found safety relief valve (SRV) and safety valve (SV) lift setpoint tolerance from  $\pm 1\%$  to  $\pm 3\%$ ; (2) increase the required number of operable SRVs and SVs from 11 to 12; and (3) increase the Standby Liquid Control (SLC) System pump discharge pressure from 1255 pounds per square inch gauge (psig) to 1275 psig.

The Nuclear Regulatory Commission (NRC) staff has reviewed the information the licensee provided that supports the proposed amendment and would like to discuss the following issues to clarify the submittal. This request for additional information (RAI) is organized by subject area, and a review of information and PBAPS regulatory bases is provided for each topical area. Specific requests are designated with the Reactor Systems Branch (SRXB) and an ordinal indicator (i.e., SRXB RAI-1, SRXB RAI-2, etc.).

**Overpressure Analysis**

With regard to vessel overpressure analysis, the NRC's acceptance criteria are based on (1) draft General Design Criteria (GDC) 9, insofar as it requires that the reactor coolant pressure boundary (RCPB) be designed and constructed so as to have an exceedingly low probability of gross rupture or significant leakage throughout its design lifetime; and (2) final GDC-31, insofar as it requires that the RCPB be designed with sufficient margin to assure that it behaves in a non-brittle manner and that the probability of rapidly propagating fracture is minimized.

The safety evaluation (SE) approving NEDC-31753P, "BWROG In-Service Pressure Relief Technical Specification Revision Licensing Topical Report," requires that the entire operating domain ("plant specific alternate operating modes") be considered in the assessment of the acceptability of the proposed SRV/SV setpoint tolerance increase (reference Attachment 1, Page 4 of the application). The overpressure analysis described in NEDO-33533, "Peach Bottom Atomic Power Station Units 2 and 3 Safety Valve Setpoint Tolerance Increase Safety Analysis Report," considers the increased core flow (ICF) statepoint (reference Attachment 4, Page 2-1 of the application).

At the other full-power extent of the power-flow operating domain, the Maximum Extended Load Line Limit (MELLL) statepoint, which is characterized by significantly reduced recirculation flow, the steady-state initial void fraction could be higher at the fully licensed thermal power level,

Attachment

resulting in a greater void collapse and a higher pre-scrum flux spike. The flux spike could result in the delivery of greater energy to the coolant, causing a faster pressurization and more severe result.

### **SRXB RAI-1**

Please provide information to address the selection of the ICF statepoint for the analysis of this event, relative to the MELL statepoint, to confirm that the ICF initial conditions result in a more limiting overpressure transient.

### **Thermal Limits Assessment**

Condition/Limitation 1 of the SE approving NEDC-31753P requires that licensees provide transient analyses, using NRC-approved methods, of anticipated operational occurrences (AOOs) as described in NEDC-31753P utilizing a  $\pm 3\%$  setpoint tolerance for the safety mode of the SRVs/SVs (reference Attachment 1, Page 3 of the application). Condition/Limitation 3 of the SE approving NEDC-31753P requires that licensees assure that analyses supporting the requested setpoint tolerance increase reflect the TS operability requirements (reference Attachment 1, Page 3 of the application). Condition/Limitation 5 of the SE approving NEDC-31753P requires that the entire operating domain ("plant specific alternate operating modes") be considered in the assessment of the acceptability of the proposed SRV/SV setpoint tolerance increase (reference Attachment 1, Page 4 of the application).

With regard to the thermal limits assessment, NRC's acceptance criteria are based on final GDC-10, insofar as it requires that the reactor core be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of AOOs.

The plant-specific thermal limits assessment in Chapter 3 of NEDO-33533, which is based on the limiting results from the PBAPS Unit 3, Cycle 18 Supplemental Reload Licensing Report, does not reflect the requested TS operability requirements, nor does it adequately address operation within the entire operating domain. The analysis discussed assumes that all SRVs are in service. Attachment 4, Page 3-1 of the application states, in part, that:

Changing the SRV setpoint tolerance and/or the number of SRVs out-of-service could only effect the protection of the MCPR [minimum critical power ratio] safety limit if it worsened the reactor pressure increase before the peak surface heat flux and the minimum MCPR occur.

The NRC staff does not agree, based on the limited information provided, that the analyses demonstrate that PBAPS operation with one SRV out-of-service and an increased lift setpoint is acceptable. For one reason, in the case of the fast transients, the nuclear flux, void reactivity, reactor vessel water level, and steam flow are expected to oscillate with periods of 1-2 seconds immediately following the initiating event, and the system pressure may continue increasing (potentially causing additional void collapse) for a short period of time following the actuation of the SRVs. These trends would all suggest that the transient may not be returning to a stable condition at the time the present analysis indicates that maximum heat flux has been achieved. Second, the information presented does not characterize the limited transients presented in the context of the entire suite of analyses performed, including the extent of the licensed operating domain and the equipment operability options permitted for PBAPS, including various scram

speeds. Therefore, while the licensee may have provided a limited assessment based on previously analyzed limiting events, the licensee has not demonstrated that these events would be reasonably unaffected by the requested setpoint tolerance increase and valve operability requirements, nor has the licensee demonstrated that other, non-limiting events would become limiting with the SRV/SV changes explicitly analyzed.

### **SRXB RAI-2**

Please provide additional information to justify the thermal limits assessment, or alternatively, satisfy Conditions 1, 3, and 5 of the approving SE for NEDC-31753P directly by providing analyses that reflect the proposed TS operability requirements and SRV/SV setpoint tolerance.

The licensee presents results for a current Unit 3 PBAPS operating cycle (reference Attachment 4, Section 3.2 to the application), and states that the events are re-analyzed on a cycle-specific basis for both Units 2 and 3. The licensee's assessment is based on a present analysis that does not reflect the proposed SRV/SV operability requirements; however, Condition/Limitation 3 of the SE approving NEDC-31753P requires assurance that the analysis reflects the proposed TS operability requirements for SRVs and SVs.

### **SRXB RAI-3**

Please explain how this assurance will be provided on a cycle-specific basis for both Units 2 and 3.

### **Anticipated Transients Without Scram (ATWS) Mitigation Analysis**

Condition/Limitation 2 of the SE approving NEDC-31753P requires analysis of the design basis overpressure event using the increased tolerance limit for the SRV/SV setpoints to confirm that the vessel pressure does not exceed American Society of Mechanical Engineers (ASME) pressure vessel upset limits (reference Attachment 1, Page 3 of the application). Although an ATWS event is technically considered beyond the PBAPS design basis, ATWS mitigation must still ensure that the vessel pressure does not exceed ASME Service Level C limits under the conditions associated with the most severe ATWS event. For analytic purposes, Service Level C limits are commonly accepted as 120-percent of the vessel design pressure, or 1500 pounds per square inch (psig).

Condition/Limitation 5 of the SE approving NEDC-31753P requires that the entire operating domain ("plant specific alternate operating modes") be considered in the assessment of the acceptability of the proposed SRV/SV setpoint tolerance increase (reference Attachment 1, Page 4 of the application).

The ATWS mitigation analysis is discussed in Section 4 of NEDO-33533 (Attachment 4 to the application).

ATWS is defined as an AOO followed by the failure of the reactor portion of the protection system specified in draft GDCs 14 and 15. The regulation in 10 CFR 50.62 requires, in part, that:

- each boiling water reactor (BWR) have an alternate rod injection (ARI) system that is designed to perform its function in a reliable manner and be independent (from the existing reactor trip system) from sensor output to the final actuation device.
- each BWR have a standby liquid control system (SLCS) with the capability of injecting into the reactor vessel a borated water solution with reactivity control at least equivalent to the control obtained by injecting 86 gallons per minute (gpm) of a 13 weight-percent sodium pentaborate decahydrate solution at the natural boron-10 isotope abundance into a 251-inch inside diameter reactor vessel. The system initiation must be automatic.
- each BWR have equipment to trip the reactor coolant recirculation pumps automatically under conditions indicative of an ATWS.

The NRC staff observed that, while the ASME overpressure AOO analysis considered initial conditions in the ICF extent of the operating domain, this analysis conversely considered conditions at the MELLL boundary. It is not clear how these two initiating events, which should have similar transients, would each be more limiting at a different initial statepoint.

#### **SRXB RAI-4**

Please provide additional information to confirm that the licensee appropriately considered ATWS mitigation throughout the entire operating domain, as Condition/Limitation 5 of the SE approving NEDC-31753P would require.