



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 24, 2013

Mr. Michael J. Pacilio  
President and Chief Nuclear Officer  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 - REQUEST FOR ADDITIONAL INFORMATION RE: OVERALL INTEGRATED PLAN IN RESPONSE TO ORDER EA-12-051, "RELIABLE SPENT FUEL POOL INSTRUMENTATION" (TAC NOS. MF0849 AND MF0850)

Dear Mr. Pacilio:

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A390), Exelon Generation Company, LLC submitted an Overall Integrated Plan, for Peach Bottom Atomic Power Station, Units 2 and 3, in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC) Order modifying licenses with regard to requirements for reliable spent fuel pool instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679).

The NRC staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The RAI questions were provided in draft form to Mr. David Helker of your staff via e-mail on June 19, 2013, with a request to respond by July 19, 2013. Note, if any part of the information requested is not available by the July 19, 2013, response date for this RAI, please provide the date the information will be submitted in your response.

If you have any questions, please contact me at (301) 415-1420.

Sincerely,

A handwritten signature in black ink, appearing to read "R B Ennis".

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

Docket Nos. 50-277 and 50-278

Enclosure:  
Request for Additional Information

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION  
OVERALL INTEGRATED PLAN IN RESPONSE TO  
ORDER EA-12-051, "RELIABLE SPENT FUEL POOL INSTRUMENTATION"  
EXELON GENERATION COMPANY, LLC  
PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3  
DOCKET NOS. 50-277 AND 50-278

1.0 INTRODUCTION

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A390), Exelon Generation Company, LLC (the licensee) submitted an Overall Integrated Plan (OIP), for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC) Order modifying licenses with regard to requirements for reliable spent fuel pool (SFP) instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679). The NRC staff endorsed Nuclear Energy Institute (NEI) 12-02, "Industry Guidance for Compliance with NRC Order EA-12-051, To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," Revision 1, dated August 2012 (ADAMS Accession No. ML12240A307), with exceptions, as documented in Interim Staff Guidance (ISG) 2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool; Instrumentation," Revision 0, dated August 29, 2012 (ADAMS Accession No. ML12221A339).

The NRC staff has reviewed the February 28, 2013, response by the licensee and determined that the following Request for Additional Information (RAI) is needed to complete its technical review. The sections that follow are numbered to coincide with the arrangement presented in NEI 12-02.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that key SFP levels will be identified as follows:

**Level 1 - level adequate to support operation of the normal fuel pool cooling system:** For both units, this level on the primary and backup [spent fuel pool instrumentation (SFPI)] channels is greater than 22 feet 9 inches (elevation 232 feet 9 inches) plus instrument accuracy above top of the spent fuel storage racks. This level is based on the design accuracy of the SFPI channel, and a resolution of 1 foot or better for both the primary and backup instrument channels. The daily SFP level is monitored and recorded under an operator's [surveillance test (ST)] procedure. The PBAPS SFPs have weirs that maintain the normal level between 232 feet 9 inches and 233 feet 0 inches, with 232 feet 10 inches the normal level per the ST.

Enclosure

**Level 2 - level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck:** For both units, this level on the primary and backup SFPI channels is greater than 10 feet 0 inches (elevation 220 feet 0 inches) plus instrument accuracy above the top of the spent fuel storage racks. This is based on specification of this level as adequate in NRC JLD-ISG-2012-03 and NEI 12-02, the design accuracy of the SFPI channel, and the relatively low sensitivity of dose rates to water depth changes at this level. This level ensures there is adequate water to provide substantial radiation shielding from direct gamma radiation from stored spent fuel.

**Level 3 - level at which fuel remains covered:** For both units, this level on the primary and backup SFPI channels is greater than 0 feet 0 inches (elevation 210 feet 0 inches) plus instrument accuracy above the top of the spent fuel storage racks. This is based upon the design accuracy of the SFPI channel, and a resolution better than 1 foot for both the primary and backup SFPI channels. This monitoring level assures there is water covering the spent fuel stored in the racks.

#### RAI-1

Please provide the following:

- a) For level 1, specify how the identified location represents the HIGHER of the two points described in the NEI 12-02 guidance for this level.
- b) A clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of instrument channel consisting of permanent measurement channel equipment (e.g., fixed level sensors and/or stilling wells, and mounting brackets). Indicate on this sketch the datum values representing Level 1, Level 2, and Level 3, as well as the top of the fuel racks. Indicate on this sketch, the portion of the level sensor measurement range that is sensitive to measurement of the fuel pool level, with respect to the Level 1, Level 2, and Level 3 datum points.

### 3.0 INSTRUMENTATION DESIGN FEATURES

#### 3.2 Arrangement

The OIP states, in part, that:

The SFPI design will install fixed primary and backup SFP level sensors, considering the northeast and southeast corners of the Unit 2 and Unit 3 SFPs. The sensors on each unit will be separated by a distance in excess of 30 feet. The SFPI design will verify the eastern sides of the SFPs meet arrangement criteria and facilitate associated conduit runs, or will design to a more appropriate arrangement. The sensors will be mounted, to the extent practical, near the pool walls and below the pool curb to minimize their exposure to damaging debris and not interfere with SFP activities. SFPI channel electronics and power supplies will be located in seismic and missile protected areas either below the Reactor

Building Refuel Floor or in buildings other than the Reactor Building. The areas will be selected to provide suitable radiation shielding and environmental conditions for the equipment consistent with instrument manufacturer's recommendations. Power supplies and indication equipment and cabling for each SFPI channel will be separated, equivalent to redundant safety related components.

#### RAI-2

Please provide a clearly labeled sketch or marked-up plant drawing of the plan view of the SFP area, depicting the SFP inside dimensions, the planned locations/placement of the primary and back-up SFP level sensor, and the proposed routing of the cables that will extend from the sensors toward the location of the read-out/display device.

#### 3.3 Mounting

The OIP states, in part, that:

Design of the mounting of the sensors in the SFP shall be consistent with the seismic Class I criteria. Installed equipment will be verified to be seismically adequate for the seismic motions associated with the maximum seismic ground motion considered in the design of the plant area in which it is installed.

#### RAI-3

Please provide the following:

- a) The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology that will be used to estimate the total loading, inclusive of design-basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.
- b) A description of the manner in which the level sensor (and stilling well, if appropriate) will be attached to the refueling floor and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a schematic, the portions of the level sensor that will serve as points of attachment for mechanical/mounting or electrical connections.
- c) A description of the manner by which the mechanical connections will attach the level instrument to permanent SFP structures so as to support the level sensor assembly.

#### 3.4 Qualification

The OIP states, in part, that:

Components of the SFPI channels will be rated by the manufacturer (or otherwise tested) for shock and vibration during and following any applicable event, using one or more of the following methods:

- components use known operating principles, are supplied by using commercial quality programs (such as ISO9001) with shock and vibration requirements included in the purchase specification and instrument design. The components will be designed and tested for operation in environments where significant shock and vibrations are common,
- components have substantial history of operational reliability in environments with significant shock and vibration loadings, such as transportation applications, or
- components are inherently resistant to shock and vibration loadings, such as cables.

SFPI components (except for battery chargers and replaceable batteries) will be rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with postulated design basis event conditions in the area, using one or more of the following methods:...

#### RAI-4

Please provide the following:

- a) A description of the specific method or combination of methods you intend to apply to demonstrate the reliability of the permanently installed equipment under Beyond-Design-Basis (BDB) ambient temperature, humidity, shock, vibration, and radiation conditions.
- b) A description of the testing and/or analyses that will be conducted to provide assurance that the equipment will perform reliably under the worst-case credible design-basis loading at the location where the equipment will be mounted. Include a discussion of this seismic reliability demonstration as it applies to (i) the level sensor mounted in the SFP area, and (ii) any control boxes, electronics, or read-out and re-transmitting devices that will be employed to convey the level information from the level sensor to the plant operators or emergency responders.
- c) A description of the specific method or combination of methods that will be used to confirm the reliability of the permanently installed equipment such that following a seismic event the instrument will maintain its required accuracy.

#### 3.5 Independence

The OIP states, in part, that:

The primary SFPI channel will be independent of the backup SFPI channel. This independence will be achieved through physical and electrical separation of each channels' components commensurate with hazard and electrical isolation needs.

RAI-5

Please provide the following:

- a) A description of how the two channels of the proposed level measurement system meet this requirement so that the potential for a common cause event to adversely affect both channels is minimized to the extent practicable.
- b) Further information describing the design and installation of each level measurement system, consisting of level sensor electronics, cabling, and readout devices. Please address how independence of these components of the primary and back-up channels is achieved through the application of independent power sources, physical and spatial separation, independence of signals sent to the location(s) of the readout devices, and the independence of the displays.

3.6 Power Supplies

The OIP states, in part, that:

The SFPI design will identify power sources from different buses. Upon loss of normal power, individual channel installed batteries will automatically maintain continuous channel operation. The batteries will be replaceable and be sized to maintain channel operation until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049. Each channel will have provisions for connection to another suitable power source, as designed and supplied in accordance with Order EA-12-049.

RAI-6

Please provide the following:

- a) A description of the electrical alternating current power sources and capacities for the primary and backup channels.
- b) If the level measurement channels are to be powered through a battery system (either directly or through an Uninterruptible Power Supply), please provide the design criteria that will be applied to size the battery in a manner that ensures, with margin, that the channel will be available to run reliably and continuously following the onset of the BDB event for the minimum duration needed, consistent with the plant mitigation strategies for BDB external events (Order EA-12-049).

3.7 Accuracy

The OIP states, in part, that:

The SFPI design will select components designed to maintain their accuracy following a power interruption or change in power source without recalibration. SFPI channel including display accuracy, to be determined during detailed design, will consider SFP conditions, as identified in the Qualification section.

SFPI channel accuracy will be sufficient to allow trained personnel to determine when the actual level reaches the specified lower level of each indicating range (Levels 1, 2 or 3) without conflicting or ambiguous indications.

RAI-7

Please provide the following:

- a) An estimate of the expected instrument channel accuracy performance (e.g., in % of span) under both: (i) normal SFP level conditions (approximately Level 1 or higher); and (ii) at the BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions) that would be present if the SFP level were at the Level 2 and Level 3 datum points.
- b) A description of the methodology that will be used for determining the maximum allowed deviation from the instrument channel design accuracy that will be employed under normal operating conditions as an acceptance criterion for a calibration procedure to flag to operators and to technicians that the channel requires adjustment to within the normal condition design accuracy.

3.8 Testing

The OIP states, in part, that:

The SFPI design will provide for routine testing and calibration consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02, such as in-situ testing and calibration. Details will be determined during detailed engineering design, in accordance with established processes and procedures.

RAI-8

Please provide the following:

- a) A description of the capability and provisions the proposed level sensing equipment will have to enable periodic testing and calibration, including how this capability enables the equipment to be tested in-situ.
- b) A description of how such testing and calibration will enable the conduct of regular channel checks of each independent channel against the other, and against any other permanently-installed SFP level instrumentation.
- c) A description of how calibration tests and functional checks will be performed and the frequency at which they will be conducted. Discuss how these surveillances will be incorporated into the plant surveillance program.
- d) A description of what preventative maintenance tasks are required to be performed during normal operation, and the planned maximum surveillance interval that is necessary to ensure that the channels are fully conditioned to accurately and reliably perform their functions when needed.

### 3.9 Display

The OIP states, in part, that:

The primary and backup instrument displays will be located at the control room, alternate shutdown panel, or other appropriate and accessible location. The specific location will be determined during detailed design.

#### RAI-9

Please provide the following:

- a) The specific location for the primary and backup instrument channel display.
- b) If the primary or backup display location is other than the main control room, then provide justification for prompt accessibility to displays including primary and alternate route evaluation, habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for communications with decision makers for the various SFP drain-down scenarios and external events.
- c) The reasons justifying why the locations selected enable the information from these instruments to be considered "promptly accessible" to various drain-down scenarios and external events.

### 4.0 PROGRAM FEATURES

#### 4.2 Procedures

The OIP states, in part, that:

Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation and abnormal response issues associated with the SFPI primary and backup channels.

#### RAI-10

Please provide the following:

- a) A list of the operating (both normal and abnormal response) procedures, calibration/test procedures, maintenance procedures, and inspection procedures that will be developed for use of the SFP instrumentation in a manner that addresses the order requirements.
- b) A brief description of the specific technical objectives to be achieved within each procedure. If your plan incorporates the use of portable spent fuel level monitoring components, please include a description of the objectives to be achieved with regard to the storage location and provisions for installation of the portable components when needed.



#### 4.3 Testing and Calibration

The OIP states, in part, that:

The testing and calibration of the SFPI will be consistent with vendor recommendations or other documented basis. Calibration will be specific to the mounted instruments and the displays. The Improved Instrument Setpoint Control Program (IISCP) will control the SFPI. The preventative maintenance process will control the recurring calibration task scope and frequency.

#### RAI-11

Please provide the following:

- a) Further information describing the maintenance and testing program the licensee will establish and implement to ensure that regular testing and calibration is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. Include a description of your plans for ensuring that necessary channel checks, functional tests, periodic calibration, and maintenance will be conducted for the level measurement system and its supporting equipment.
- b) A description of how the guidance in NEI 12-02, Section 4.3 regarding compensatory actions for one or both non-functioning channels will be addressed.
- c) A description of the compensatory actions to be taken in the event that one of the instrument channels cannot be restored to functional status within 90 days.

Mr. Michael J. Pacilio  
President and Chief Nuclear Officer  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

June 24, 2013

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Sincerely,

**/RAI**

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

Docket Nos. 50-277 and 50-278

Enclosure:  
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\*via memo dated 06/18/13

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