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

August 28, 2013

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

SUBJECT: OYSTER CREEK NUCLEAR GENERATING STATION - REQUEST FOR ADDITIONAL INFORMATION REGARDING OVERALL INTEGRATED PLAN FOR RELIABLE SPENT FUEL POOL INSTRUMENTATION (ORDER NUMBER EA-12-051) (TAC NO. MF0823)

Dear Mr. Pacilio:

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A266), Exelon Generation Company, LLC (Exelon or licensee) submitted an Overall Integrated Plan in response to the March 12, 2012, Commission Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Oyster Creek Nuclear Generating Station (Oyster Creek). The U.S. Nuclear Regulatory Commission (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 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 a request for additional information is needed to complete its technical review.

The specific information requested is addressed in the enclosure to this letter. The draft questions were sent via email on August 14, 2013, to Mr. David Helker of your staff, to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed. During a discussion with Mr. Helker of your staff on August 15, 2013, it was agreed that you would provide a response 30 days from the date of this letter.

If you have any questions regarding this letter, please feel free to contact me at (301) 415-3100.

Sincerely,

John G. Lamb, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure:
Request for Additional Information

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

RELATED TO

OVERALL INTEGRATED PLAN IN RESPONSE TO

ORDER EA-12-051, "RELIABLE SPENT FUEL POOL INSTRUMENTATION"

OYSTER CREEK NUCLEAR GENERATING STATION

EXELON GENERATING COMPANY, LLC

DOCKET NO. 50-219

1.0 INTRODUCTION

By letter dated February 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13059A266), Exelon Generation Company, LLC (Exelon or licensee) submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, Commission Order modifying licenses with regard to requirements for Reliable Spent Fuel Pool (SFP) Instrumentation (Order Number EA-12-051; ADAMS Accession No. ML12054A679) for Oyster Creek Nuclear Generating Station (Oyster Creek). The U.S. Nuclear Regulatory Commission (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.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

> Level adequate to support operation of the normal fuel pool cooling system (Level 1): Indicated level on either primary or backup instrument channel of greater than 22 feet 11 inches (elevation 117'-8") plus instrument accuracy above the top of the storage racks based on the design accuracy of the instrument channel (which is to be determined) and a resolution better than 1 foot for both the primary and backup instrument channels. This is based on the height of the SFP weir, demonstrating that a water level of 22 feet 11 inches (elevation 117'-8") is adequate for normal fuel pool cooling system operation.

Level adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck (Level 2): Indicated level on either the primary or backup instrument channel of greater than 10 feet (elevation 104'-9") plus instrument channel accuracy above the top of the storage racks based on specification of this level as adequate in NRC JLD-ISG-2012-03 and NEI 12-02, the specified design accuracy of the instrument channel, and the relatively low sensitivity of dose rates to changes in water depth at this level. This monitoring level ensures there is an adequate water level to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck from direct gamma radiation from stored spent fuel.

Level where fuel remains covered (Level 3): Indicated level on either the primary or backup instrument channel of greater than 0 feet (elevation 94' -9") plus instrument channel accuracy above the top of the storage racks based upon the design accuracy (which is to be determined) of the instrument channel and a resolution better than 1 foot for both the primary and backup instrument channels. This monitoring level assures that water is covering the stored fuel seated in the racks.

RAI-1

Please provide 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

3.1 Arrangement

The OIP states, in part, that

Primary (fixed) instrument channel: The primary instrument channel level sensing components will be located and permanently mounted in the SFP. The primary instrument channel will provide continuous level indication over a minimum range of approximately 23 feet 6 inches from the high pool level elevation of 118'-3" to the top of the spent fuel racks at elevation 94'-9". This continuous level indication will be provided by a guided wave radar system, submersible pressure transducer, or other appropriate level sensing technology that will be determined during the detailed engineering design phase of the project.

Backup instrument channel: The backup instrument channel level sensing components will also be located and permanently mounted in the SFP. The backup instrument channel will provide continuous level indication over a

minimum range of approximately 23 feet 6 inches from the high pool level elevation of 118'-3" to the top of the spent fuel racks at elevation 94'-9". This continuous level indication will be provided by the same level sensing technology as the primary instrument channel.

The current plan is to install SFP level sensors in the northwest corner and on the east side of the SFP next to the casking structure separated by in excess of 20 feet. The sensors themselves 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. Instrument channel electronics and power supplies will be located in seismic and missile protected areas either below the SFP operating floor or in buildings other than the RB [reactor building]. The areas to be selected will provide suitable radiation shielding and environmental conditions for the equipment consistent with instrument manufacturer's recommendations. Equipment and cabling for power supplies and indication for each channel will be separated equivalent to that provided for redundant safety related services.

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 sensors, and the proposed routing of the cables that will extend from the sensors toward the location of the local electronics cabinets and read-out/display devices in the main control room or alternate accessible location.

3.2 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.

3.3 Qualification

The OIP states, in part, that

> For seismic effects on instrument channel components used after a potential seismic event for only installed components (with the exception of battery chargers and replaceable batteries), the following measures will be used to verify that the design and installation is adequate. Applicable components are rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using several methods.
>
> - instrument channel components use known operating principles and are supplied by manufacturers with commercial quality programs (such as ISO9001). The procurement specification and/or instrument channel design shall include the seismic requirements and specify the need for commercial design and testing under seismic loadings consistent with design basis values at the installed locations;
>
> - substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications. Such a vibration design envelope shall be inclusive of the effects of seismic motion imparted to the components proposed at the location of the proposed installation;
>
> - adequacy of seismic design and installation is demonstrated based on the guidance in Sections 8, 9, and 10 of IEEE [Institute of Electrical and Electronics Engineers] Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1 E Equipment for Nuclear Power Generating Stations", or a substantially similar industrial standard;
>
> - demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g levels and frequency ranges); or
>
> - seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

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.

3.4 Independence

The OIP states, in part, that

> The primary instrument channel will be independent of the backup instrument 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 in each pool 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.

3.5 Power Supplies

The OIP states, in part, that

> Each channel will be normally powered from a different 120Vac [volts alternating current] bus. Upon loss of normal ac 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. Additionally, each channel will have provisions for connection to another suitable power source.

RAI-6

Please provide the following:

a) A description of the normal electrical AC power sources and capacities for the primary and backup channels. Describe how these AC sources are independent, and how they may be restored following an extended loss of AC event.

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).

3.6 Accuracy

The OIP states, in part, that

> The instrument channels will be designed to maintain their design accuracy following a power interruption or change in power source without recalibration. Instrument channel accuracy, to be determined during detailed design, will consider Spent Fuel Pool conditions (e.g., saturated water, steam environment, concentrated borated water), as well as, other applicable radiological and environmental conditions and include display accuracy. Instrument channel accuracy will be sufficient to allow trained personnel to determine when the actual level exceeds 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.

3.7 Testing

The OIP states, in part, that

> Instrument channel design will provide for routine testing and calibration consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02. Details will be determined during detailed design engineering.

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 displays.

b) If the primary and backup displays are not located in the main control room, please provide a description of the selected location(s) for the primary and backup displays, including prompt accessibility to displays, 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 will enable the information from these instruments to be considered "promptly accessible." Include consideration of various drain-down scenarios.

4.0 PROGRAM FEATURES

4.1 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 primary and backup channels of Spent Fuel Pool instrumentation.
>
> If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel component must be replaced, it may be replaced with a commercially available component that may or may not meet all of the qualifications noted above to maintain instrument channel functionality.

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.

c) Describe how the replacement of an instrument channel component with a commercially available one that may not meet all of the qualifications noted in the OIP submittal would still be considered to be in compliance with the Order requirements. Which qualification provisions described in the OIP would not be followed?

4.2 Testing and Calibration

The OIP states, in part, that

> The testing and calibration of the instrumentation will be consistent with vendor recommendations or other documented basis. Calibration will be specific to the mounted instruments and the displays. Preventive Maintenance (PM) will be generated per Exelon Procedure WC-AA-120 (Preventive Maintenance Program Requirements). This procedure will generate the PM and assign actions to the planner to define the testing and calibration criteria and frequency for the instrument.

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.

If you have any questions regarding this letter, please feel free to contact me at (301) 415-3100.

Sincerely,

/ra/

John G. Lamb, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-219

Enclosure:
Request for Additional Information

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