DRAFT REQUEST FOR ADDITIONAL INFORMATION

OVERALL INTEGRATED PLAN IN RESPONSE TO

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

PSEG NUCLEAR, LLC

HOPE CREEK GENERATING STATION, UNIT 1

DOCKET NUMBER: 50-354

1.0 INTRODUCTION

By letter dated February 27, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13071A579 and ML13071A580), PSEG Nuclear, LLC submitted an Overall Integrated Plan (OIP) in response to the March 12, 2012, U.S. Nuclear Regulatory Commission (NRC), 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 Hope Creek Generating Station. 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 SFP 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 SFP Instrumentation," Revision 0, dated August 29, 2012 (ADAMS Accession No. ML12221A339).

The NRC staff has reviewed the February 27, 2013, response by the licensee and determined that the following Request for Additional Information (RAI) is needed to complete its Technical Review. If any part of this information is not available August 5, 2013 for this RAI, please provide the date this information will be submitted.

2.0 LEVELS OF REQUIRED MONITORING

The OIP states, in part, that

> Level 1 – This is the water level required to support operation of the normal fuel pool cooling system. Indicated SFP level on either the Primary or Back-up instrument channels of greater than approximately elevation 200' – 0" based on the level at which loss of reliable suction occurs due to uncovering of the SFP weir.
>
> Level 2 – This is the water level required to provide substantial radiation shielding for personnel standing on the SFP operating deck. Indicated SFP level on either the Primary or Back-up instrument channels of greater than approximately elevation 185'- 6" (+/- 1' – 0"). This elevation is approximately 10' above the top of the fuel racks and ensures a minimum of 10' above the top of the fuel. This water level ensures there is a sufficient depth for a minimum shielding depth over

Level 3 – This is the water level required such that the spent fuel remains covered. Indicated SFP level on either the Primary or Back-up instrument channels of greater than approximately elevation 175'-6" (+/- 1' – 0"). This water level ensures that there is adequate water level above the stored fuel seated in the fuel racks.

RAI-1

Please provide a clearly labeled sketch depicting the elevation view of the proposed typical mounting arrangement for the portions of the 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. 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 primary and backup channel level sensor probes will be installed in different locations of the SFP for a maximum separation within the limits of the existing SFP design. The primary and backup channels will be physically separated in accordance with the guidelines provided in NEI 12-02 Revision 1. In the conceptual design, the SFP probes bolt to mounting plates for installation at the corner of the SFP, or along the side of the SFP. This mounting will allow the probe to be installed within a few inches of the SFP liner without penetrating the liner thereby minimizing the chances of interference with other structures, and occupying limited space of the SFP deck. Existing barriers will be used to provide a level of protection for the sensor and interconnecting cable located along the SFP wall or on the refueling floor. These physical barriers will protect the instrument sensors and cables from potential missile hazards generated by an event. The final sensor mounting design and cable routing will maintain a low profile to ensure that there is no interference with the existing fuel handling equipment. Specific details will be developed during the detailed design phase.
>
> The primary and backup channel indicating transmitters (electronics) will be located in an environment providing adequate protection from temperature, humidity, and radiation. The conceptual design locates the indicating transmitter electronics in a readily accessible area of the Auxiliary Building. The primary display is integral to the electronics enclosure which is available to personnel for providing prompt information to decision makers. Additional indicators may be provided in the Main Control Room. Specific details will be developed during the detailed design phase.

> All cabling associated with each channel's sensor, power supply, and indicator will be independently routed in separate raceways from cabling associated with the other channel.

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 mounting brackets, 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

> Installed equipment will be qualified to withstand the maximum seismic ground motion considered in the design of the plant area where the equipment will be installed. The basis for the seismically designed mountings will be the plant seismic design basis at the time of the submittal of this integrated plan. The instrument sensors mounted in the SFP will be designed to Seismic Category I. And in the conceptual design, the SFP probes bolt to mounting plates for installation at the corner of the SFP, or along the side of the SFP. This mounting will allow the probe to be installed within a few inches of the SFP liner without penetrating the liner thereby minimizing the chances of interference with other structures, and occupying limited space of the SFP deck.

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 instrument channels installed in the SFP area will be qualified for shock and vibration using one or more of the following methods:
>
> - Components are supplied by manufacturers using commercial quality programs (such as ISO9001, Quality management systems – Requirements (Reference 6)) with shock and vibration requirements included in the purchase specification at levels commensurate with portable hand-held device or transportation applications;
>
> - Components have a substantial history of operational reliability in environments with significant shock and vibration loading, such as portable hand-held device or transportation applications; or
>
> - Components are inherently resistant to shock and vibration loadings, such as cables.
>
> For seismic effects on instrument channel components used after a potential seismic event for only installed components, the following measures will be used to verify that the design and installation is adequate. Applicable components of the instrument channels 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 one or more of the following methods:
>
> - Adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations, (Reference 7), 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 a) the level sensor mounted in the SFP area, and b) 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 instrument channel will be independent of the back-up instrument channel. Both the primary and back-up instrument channels will be of the same technology and manufacturer and model.
>
> Independence will be achieved through physical separation of the final installed devices. The two (2) permanently installed instrument sensors will be separated by a distance comparable to the shortest length of a side of the SFP, to the extent practical, based on the existing SFP geometry and construction. The interconnecting cabling associated with each channel will follow separate and independent routes back to the indicating transmitter (electronics) enclosure. The normal AC power source for each channel will be provided from independent and separate sources.

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.

3.6 Power Supplies

The OIP states, in part, that

> The normal power supply for each channel will be provided by independent AC or DC power sources such that loss of one power source will not result in the loss of both channels. In addition to the normal plant AC or DC power supply to each channel, a back-up power source will also be provided in the form of a back-up battery independent of the normal AC or DC power sources. The back-up power will have sufficient capacity to support reliable instrument channel operation through the use of replaceable batteries until appropriate off-site resource availability is reasonably assured.

RAI-6

Please provide the following:

a) A description of the electrical AC 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 (UPS)), 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 instrument channels will maintain their designed accuracy following a power interruption or change in power source without requiring recalibration. The instrumentation channels utilize COTS components and, therefore, the final design will ensure vendor published instrument design accuracies are acceptable in accordance with the guidelines of NEI 12-02 Revision 1. Accuracies 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 and 3) without providing conflicting or ambiguous information.
>
> Accuracy requirements will consider all SFP conditions (e.g., saturated water, steam environment). And both the primary and backup channels will utilize a fixed instrument providing continuous level measurement over the entire range. The measured range will be from approximately elevation 175’-11” to

approximately elevation 201'– 4" for a total indicated range of 25'- 5" (305" +/- 12"). The exact range will be determined during the detailed engineering design.

RAI-7

Please provide the following:

a) An estimate of the expected instrument channel accuracy performance (e.g., in % span) under both a) normal SFP level conditions (approximately Level 1 or higher) and b) 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.

c) A description of how, with level three defined as approximately 175'-6" (+/- 1' – 0"), a measured range down to only approximately elevation 175'-11" allows for instrument accuracy sufficient to allow trained personnel to determine when the actual level exceeds the specified level as per the guidance in NEI 12-02.

3.8 Testing

The OIP states, in part, that

> The instrument channel design will provide for routine testing and calibration. Installed sensors will be designed to allow testing and/or calibration via in-situ methods while mounted in the SFP. Removal of the sensor from the SFP will not be required for calibration.
>
> Instrument channel design will provide for routine testing and calibration consistent with Order EA-12-051 and the guidance in NEI 12-02 Revision 1.

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 conceptual design locates the indicating transmitter electronics in a readily accessible area of the Auxiliary Building. The primary display is integral to the electronics enclosure which is available to personnel for providing prompt information to decision makers. Additional indicators may be provided in the Main Control Room. Specific details will be developed during the detailed design phase.
>
> Trained personnel will be capable of monitoring the SFP water level from a location remote to that of the SFP area. The selected location for the display(s) will ensure information related to SFP level is promptly available to plant staff and key decision makers.
>
> The primary display associated with each of the permanently installed (fixed) instrument channels (both Primary and Backup) will be integrated into the instrument transmitter (electronics) enclosure. The electronic enclosure will be located in an appropriate and accessible area to allow the display location to meet the following characteristics:
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> - Occupied or promptly accessible to the appropriate plant staff giving appropriate consideration to various drain down scenarios
> - Outside of the area surrounding the SFP floor, e.g., an appropriate distance from the radiological sources resulting from an event impacting the SFP
> - Inside a structure providing protection against adverse weather
> - Outside of any very high radiation area or locked HIGH RAD area during normal operation
>
> Each instrument channel (Primary and Backup) will also have the capability to drive an external remote instrument loop that can be used to provide level indication at a second display location or be used as an input to the plant computer. Failure of the external remote instrument loop signal will not adversely impact the primary display located in the transmitter (electronics) enclosure.
>
> The conceptual design locates the electronic enclosure and primary display in readily accessible area located within the Auxiliary Building.

RAI-9

Please provide the following:

a) A description of the specific location for the primary and secondary instrument channel displays. A description of the specific location for any secondary displays, and a description of the quality and reliability qualifications of the instrument channel components located between the location of the main display and the location of the secondary displays.

b) If the primary and backup display locations are not within the main control room, then provide a description of the display location that addresses primary and alternate access route evaluation, continuous habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for verbal 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" from a response time perspective. Include consideration of various drain-down scenarios.

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 new SFP instrumentation.

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

> Processes will be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup SFP level instrument channels to maintain the instrument channels as described in JLD-ISG-2012-03 and the guidance in NEI 12-02 Revision 1. Testing and calibration of the instrumentation will be consistent with vendor recommendations and any other documented basis.

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.