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

November 22, 2013

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236, N09
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION, UNIT NO. 1 - INTERIM STAFF EVALUATION AND REQUEST FOR ADDITIONAL INFORMATION REGARDING THE OVERALL INTEGRATED PLAN FOR IMPLEMENTATION OF ORDER EA-12-051, RELIABLE SPENT FUEL POOL INSTRUMENTATION (TAC NO. MF1031)

Dear Mr. Joyce:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12054A679), to all power reactor licensees and holders of construction permits in active or deferred status. This order requires the licensee to have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

By letter dated February 27, 2013 (ADAMS Accession No. ML130720035), PSEG Nuclear, LLC (the licensee) provided the OIP for Hope Creek Nuclear Generating Station describing how it will achieve compliance with Attachment 2 of Order EA-12-51 by spring 2015. By letter dated July 22, 2013 (ADAMS Accession No. ML13193A291), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated August 20, 2013 (ADAMS Accession No. ML13233A355), and August 22, 2013 (ADAMS Accession No. ML13235A100).

The NRC staff has reviewed these submittals with the understanding that the licensee will update its OIP as implementation of the Order progresses. With this in mind, the staff has included an interim staff evaluation with this letter to provide feedback on the OIP. The staff's findings in the interim staff evaluation are considered preliminary and will be revised as the OIP is updated. As such, none of the staff's conclusions are to be considered final. A final NRC staff evaluation will be issued after the licensee has provided the information requested.

The interim staff evaluation also includes RAIs, response to which the NRC staff needs to complete its review. The licensee should provide the information requested in the 6-month status updates, as the information becomes available. However, the staff requests that all

information be provided by March 31, 2015, to ensure that any issues are resolved prior to the date by which the licensee must complete full implementation of Order EA-12-051. The licensee should adjust its schedule for providing information to ensure that all this information is provided by the requested date.

If you have any questions regarding this letter, please contact me at 301-415-3204 or via e-mail at john.hughey@nrc.gov.

Sincerely,

John D. Hughey, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure:
Interim Staff Evaluation and
Request for Additional Information

cc w/encl: Distribution via Listserv

INTERIM STAFF EVALUATION AND REQUEST FOR ADDITIONAL INFORMATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE OVERALL INTEGRATED PLAN IN RESPONSE TO

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

PSEG NUCLEAR LLC

HOPE CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-051, "Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12054A679), to all power reactor licensees and holders of construction permits in active or deferred status. This order requires, in part, that all operating reactor sites have a reliable means of remotely monitoring wide-range Spent Fuel Pool (SFP) levels to support effective prioritization of event mitigation and recovery actions in the event of a beyond-design-basis (BDB) external event. The order required all holders of operating licenses issued under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," to submit to the NRC an Overall Integrated Plan (OIP) by February 28, 2013.

By letter dated February 27, 2013 (ADAMS Accession No. ML130720035), PSEG Nuclear, LLC (the licensee) provided the OIP for Hope Creek Nuclear Generating Station describing how it will achieve compliance with Attachment 2 of Order EA-12-51 by spring 2015. By letter dated July 22, 2013 (ADAMS Accession No. ML13193A291), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated August 20, 2013 (ADAMS Accession No. ML13233A355), and August 22, 2013 (ADAMS Accession No. ML13235A100).

2.0 REGULATORY EVALUATION

Order EA-12-051 requires all holders of operating licenses issued under 10 CFR Part 50, notwithstanding the provisions of any Commission regulation or license to the contrary, to comply with the requirements described in Attachment 2 to the Order except to the extent that a more stringent requirement is set forth in the license. Licensees shall promptly start implementation of the requirements in Attachment 2 to the Order and shall complete full implementation no later than two refueling cycles after submittal of the OIP or December 31, 2016, whichever comes first.

ENCLOSURE

Order EA-12-051 required the licensee, by February 28, 2013, to submit to the Commission an OIP, including a description of how compliance with the requirements described in Attachment 2 of the Order will be achieved.

Attachment 2 of Order EA-12-051 requires the licensees to have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the SFP operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

Attachment 2 of Order EA-12-051, states that the SFP level instrumentation shall include the following design features:

1.1 Instruments: The instrumentation shall consist of a permanent, fixed primary instrument channel and a backup instrument channel. The backup instrument channel may be fixed or portable. Portable instruments shall have capabilities that enhance the ability of trained personnel to monitor spent fuel pool water level under conditions that restrict direct personnel access to the pool, such as partial structural damage, high radiation levels, or heat and humidity from a boiling pool.

1.2 Arrangement: The spent fuel pool level instrument channels shall be arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool. This protection may be provided by locating the primary instrument channel and fixed portions of the backup instrument channel, if applicable, to maintain instrument channel separation within the spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the spent fuel pool structure.

1.3 Mounting: Installed instrument channel equipment within the spent fuel pool shall be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the spent fuel pool structure.

1.4 Qualification: The primary and backup instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period. This reliability shall be established through use of an augmented quality assurance process (e.g., a process similar to that applied to the site fire protection program).

1.5 Independence: The primary instrument channel shall be independent of the backup instrument channel.

1.6 Power supplies: Permanently installed instrumentation channels shall each be powered by a separate power supply. Permanently installed and portable instrumentation channels shall provide for power connections from sources independent of the plant [alternating current (ac)] and [direct current (dc)] power distribution systems, such as portable generators or replaceable batteries. Onsite generators used as an alternate power source and replaceable batteries used for instrument channel power shall have sufficient capacity to maintain the level indication function until offsite resource availability is reasonably assured.

1.7 Accuracy: The instrument channels shall maintain their designed accuracy following a power interruption or change in power source without recalibration.

1.8 Testing: The instrument channel design shall provide for routine testing and calibration.

1.9 Display: Trained personnel shall be able to monitor the spent fuel pool water level from the control room, alternate shutdown panel, or other appropriate and accessible location. The display shall provide on-demand or continuous indication of spent fuel pool water level.

Attachment 2 of Order EA-12-051, states that the SFP instrumentation shall be maintained available and reliable through appropriate development and implementation of the following programs:

2.1 Training: Personnel shall be trained in the use and the provision of alternate power to the primary and backup instrument channels.

2.2 Procedures: Procedures shall be established and maintained for the testing, calibration, and use of the primary and backup spent fuel pool instrument channels.

2.3 Testing and Calibration: Processes shall be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup spent fuel pool level instrument channels to maintain the instrument channels at the design accuracy.

On August 29, 2012, the NRC issued an Interim Staff Guidance document (the ISG), JLD-ISG-2012-03, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation" (ADAMS Accession No. ML12221A339), to describe methods acceptable to the NRC staff for complying with Order EA-12-051. The ISG endorses, with exceptions and clarifications, the methods described in the Nuclear Energy Institute (NEI) guidance document NEI 12-02, Revision 1, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,'" dated August 2012 (ADAMS Accession No. ML12240A307). Specifically, the ISG states:

The NRC staff considers that the methodologies and guidance in conformance with the guidelines provided in NEI 12-02, Revision 1, subject to the clarifications and exceptions in Attachment 1 to this ISG, are an acceptable means of meeting the requirements of Order EA-12-051.

3.0 TECHNICAL EVALUATION

3.1 Background and Schedule

Hope Creek Nuclear Generating Station, Unit 1 has a single SFP, located in the Reactor Building. The SFP is approximately 41 feet (ft.) 5 ¼ inches (in.) wide by 37 ft. 1/7 in. long.

The licensee's OIP was submitted on February 27, 2013. The OIP states that installation of the SFP level instrumentation will be completed by Spring 2015, which is prior to startup from the second refueling outage after submittal of this OIP.

The NRC staff has reviewed the licensee's schedule for implementation of SFP level instrumentation provided in its OIP. If the licensee completes implementation in accordance with this schedule, it would appear to achieve compliance with Order EA-12-051 within two refueling cycles after submittal of the OIP and before December 31, 2016.

3.2 Spent Fuel Pool Water Levels

Attachment 2 of Order EA-12-051 states, in part, that

> All licensees identified in Attachment 1 to this Order shall have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system [Level 1], (2) level that is adequate to provide substantial radiation shielding for a person standing on the SFP operating deck [Level 2], and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred [Level 3].

NEI 12-02 states, in part, that

> Level 1 represents the HIGHER of the following two points:
>
> - The level at which reliable suction loss occurs due to uncovering of the coolant inlet pipe, weir or vacuum breaker (depending on the design), or
>
> - The level at which the water height, assuming saturated conditions, above the centerline of the cooling pump suction provides the required net positive suction head specified by the pump manufacturer or engineering analysis.

In its OIP, the licensee stated that Level 1 is the;

> Indicated SFP level on either the Primary or Backup instrument channels of greater than approximately elevation 200 ft. 0 in. based on the level at which loss of reliable suction occurs due to uncovering of the SFP weir.

The NRC staff notes that the elevation identified as Level 1 is adequate for normal SFP cooling system operation and it is also adequate to ensure the required fuel pool cooling pump net positive suction head (NPSH) as the skimmer surge tanks supply the SFP cooling pumps. This level represents the higher of the two points described in NEI 12-02 for Level 1, for both units.

NEI 12-02 states, in part, that

> Level 2 represents the range of water level where any necessary operations in the vicinity of the spent fuel pool can be completed without significant dose consequences from direct gamma radiation from the stored spent fuel. Level 2 is based on either of the following:
>
> - 10 feet (+/- 1 foot) above the highest point of any fuel rack seated in the spent fuel pools, or
>
> - a designated level that provides adequate radiation shielding to maintain personnel radiological dose levels within acceptable limits while performing local operations in the vicinity of the pool. This level shall be based on either plant-specific or appropriate generic shielding calculations, considering the emergency conditions that may apply at the time and the scope of necessary local operations, including installation of portable SFP instrument channel components.

In its OIP, the licensee stated that Level 2 is the:

> Indicated SFP level on either the Primary or Back-up instrument channels of greater than approximately elevation 185 ft. 6 in....

The licensee also stated that:

> This elevation is approximately 10 ft. above the top of the fuel racks...

In its letter dated August 20, 2013, the licensee provided a sketch with depicting the elevations identified as Levels 1, 2 and 3 and the SFP level instrumentation sensor measurement range. The NRC staff reviewed this sketch and notes that Level 2 is identified at 185 ft. 6 in. and that this elevation is approximately 10 ft. above the top of the fuel rack. The staff also notes that the licensee designated Level 2 using the first of the two options described in NEI 12-02 for this level.

NEI 12-02 states, in part, that

> Level 3 corresponds nominally (i.e., +/- 1 foot) to the highest point of any fuel rack seated in the spent fuel pool. Level 3 is defined in this manner to provide the maximum range of information to operators, decision makers and emergency response personnel.

In its OIP, the licensee stated that Level 3 is the:

> Indicated SFP level on either the Primary or Backup instrument channels of greater than approximately elevation 175 ft. 6 in....

In its letter dated August 20, 2013, the licensee provided a sketch with depicting the elevations identified as Levels 1, 2 and 3 and the SFP level instrumentation sensor measurement range. The NRC staff reviewed this sketch and notes that Level 3 is identified at 175 ft. 6 in. and that this elevation corresponds to the highest point of any fuel rack seated in the SFP.

The licensee's proposed plan, with respect to identification of Levels 1, 2, and 3, appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.3 Design Features: Instruments

Attachment 2 of Order EA-12-051, states, in part, that

> The instrumentation shall consist of a permanent, fixed primary instrument channel and a backup instrument channel. The backup instrument channel may be fixed or portable. Portable instruments shall have capabilities that enhance the ability of trained personnel to monitor spent fuel pool water level under conditions that restrict direct personnel access to the pool, such as partial structural damage, high radiation levels, or heat and humidity from a boiling pool.

NEI 12-02 states, in part, that

> A spent fuel pool level instrument channel is considered reliable when the instrument channel satisfies the design elements listed in Section 3 [Instrumentation Design Features] of this guidance and the plant operator has fully implemented the programmatic features listed in Section 4 [Program Features].

In its OIP, the licensee stated that both the primary and backup channels will use a fixed instrument providing continuous level measurement over the entire range. The licensee also stated that the measured range will be from approximately elevation 175 ft. 11 in. to approximately elevation 201 ft. 4 in. and that the exact range will be determined during the detailed engineering design.

In its letter dated August 20, 2013, the licensee stated, in part, that

> The sensor's total span (i.e., measurement range that is sensitive to measurement of the fuel pool level) is approximately 25' - 0". The sensor is capable of continuously monitoring level over the entire range from the existing Hi Level Alarm down to the proposed Level 3. Actual length of the sensor will be determined during detailed design.

The NRC staff notes that 201 ft. 4 in. corresponds to the top of the pool curb and that the top of the instrument rack is 175 ft. 6 in., rather than 175 ft. 11 in. However the staff notes that the range specified for the licensee's instrumentation will cover Levels 1, 2, and 3 as described in Section 3.2 above. The licensee's proposed plan, with respect to the number of channels and the range of the instrumentation, appears to be consistent with NEI 12 02, as endorsed by the ISG.

3.4 Design Features: Arrangement

Attachment 2 of Order EA-12-051, states, in part, that

> The spent fuel pool level instrument channels shall be arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool. This protection may be provided by locating the primary instrument channel and the fixed portions of the backup instrument channel, if applicable, to maintain instrument channel separation within the spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the spent fuel pool structure.

NEI 12-02 states, in part, that

> The intent of the arrangement requirement is to specify reasonable separation and missile protection requirements for permanently installed instrumentation used to meet this order. Although additional missile barriers are not required to be installed, separation and shielding can help minimize the probability that damage due to an explosion or extreme natural phenomena (e.g., falling or wind-driven missiles) will render fixed channels of SFP instrumentation unavailable. Installation of the SFP instrument channels shall be consistent with the plant-specific SFP design requirements and should not impair normal SFP function.
>
> Channel separation should be maintained by locating the installed sensors in different places in the SFP area.

In its OIP, the licensee stated that:

> The Primary and Back-up 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 licensee also stated that existing physical barriers will protect the instrument sensors and cables from potential missile hazards generated by an event and that 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. In addition, the licensee stated that the conceptual design locates the indicating transmitter electronics in a readily accessible area of the Auxiliary Building and that 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.

In its letter dated August 20, 2013, the licensee stated, in part, that

> Specifically, the sensors will be in different corners of the SFP and separated by a distance comparable to the shortest side of the pool. The interconnecting cables that extend from the sensors toward the location of the electronics enclosures will be installed using separate routes and separate but existing embedded conduits for transition from the SFP to the first junction point. The existing embedded conduits in the floor concrete provide a physical barrier to protect from potential missile hazards. From the first junction point until the cable leaves the Reactor Building, and transitions into the Auxiliary Building, separate conduit routes are used to protect the cable from potential missile hazards. In the Auxiliary Building, the cables will be routed using HCGS installation criteria for cable separation E-1408 "Wire Cable Notes and Details" (Reference 9) over the entire length of the cable.

Additionally, in its letter dated August 20, 2013, the licensee provided the Hope Creek Spent Fuel Pool Level Sketch Plan View depicting the approximate locations for both the primary and backup level sensors and the proposed cable routing from the level probe to the level recorders in the control room.

The NRC staff reviewed this sketch and notes that the proposed arrangement has the instrument probes and cable routing for the SFP instrument channels, running separately from each other. Thus, the licensee's proposed plan, with respect to arrangement of the SFP level instrumentation, appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.5 Design Features: Mounting

Attachment 2 of Order EA-12-051 states, in part, that

> Installed instrument channel equipment within the spent fuel pool shall be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the spent fuel pool structure.

NEI 12-02 states, in part, that

> The mounting shall be designed to be consistent with the highest seismic or safety classification of the SFP. An evaluation of other hardware stored in the SFP shall be conducted to ensure it will not create adverse interaction with the fixed instrument location(s).

> The basis for the seismic design for mountings in the SFP shall be the plant seismic design basis at the time of submittal of the Integrated Plan for implementing NRC Order EA-12-051.

In its OIP, the licensee stated that:

> 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...

The licensee also stated 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 and the instrument sensors mounted in the SFP will be designed to Seismic Category I.

In its letter dated August 20, 2013, the licensee stated, in part, that

a) The design criteria used to estimate total loading, including static and dynamic loads is in accordance with "Design Criteria for Reactor Building for the Hope Creek Generating Station" (Reference 11) for the SFP level sensor assembly mounting and "Design Criteria for Auxiliary Building Control & Diesel Generating Areas for the Hope Creek Generating Station" (Reference 12) for the electronics enclosures. The HCGS Structural Design Criteria provides both the design criteria and the methodology used for determining total loading. Final static and dynamic (seismic and hydrodynamic) loads will be provided by the manufacturer based on their final design and the testing and/or analysis results. The final static, dynamic, and hydrodynamic loads will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

b) The HCGS SFP Level Instrumentation Guided Wave Radar (GWR) sensor design does not include a stilling well. The low mass and reaction to seismic loading permit the sensor assembly's mount to be very simple, lightweight, and require a very small footprint. The sensor assembly can be mounted on the curb's horizontal surface or curb face. The sensor assembly is designed to mount in close proximity to the liner without penetrating it. Therefore, there are no points of attachment to the SFP liner.

   The final mounting details will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that further information regarding mounting of the SFP level instrumentation is not currently available for review and that in its letter dated August 20, 2013, the licensee indicated that the information will be provided to the staff in the August 2014, six-month OIP update. The staff has identified these requests as:

RAI #1

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) **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.**

(This information was previously requested as RAI-3 in NRC letter dated July 22, 2013)

RAI #2

For RAI 1(a) above, please provide the results of the analyses used to verify the design criteria and methodology for seismic testing of the SFP instrumentation and the electronics units, including, design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.

RAI #3

For each of the mounting attachments required to attach SFP Level equipment to plant structures, please describe the design inputs, and the methodology that was used to qualify the structural integrity of the affected structures/equipment.

3.6 Design Features: Qualification

Attachment 2 of Order EA-12-051 states, in part, that

> The primary and backup instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period. This reliability shall be established through use of an augmented quality assurance process (e.g. a process similar to that applied to the site fire protection program).

NEI 12-02 states, in part, that

> The instrument channel reliability shall be demonstrated via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters, as described in the paragraphs below:
>
> - conditions in the area of instrument channel component use for all instrument components,
> - effects of shock and vibration on instrument channel components used during any applicable event for only installed components, and
> - seismic effects on instrument channel components used during and following a potential seismic event for only installed components...

The NRC staff assessment of the instrument qualification is discussed in the following subsections below: (3.6.1) Augmented Quality Process and (3.6.2) Qualification and Reliability.

3.6.1 Augmented Quality Process

Appendix A-1 of the guidance in NEI 12-02 describes a quality assurance process for non-safety systems and equipment that is not already covered by existing quality assurance requirements. Within the ISG, the NRC staff found the use of this quality assurance process to be an acceptable means of meeting the augmented quality requirements of Order EA-12-051.

In its OIP, the licensee stated that augmented quality requirements would be applied, and that if safety related Structures Systems or Components (SSC) are interfaced or affected, then the appropriate quality requirements would be applied

The licensee's proposed augmented quality assurance process appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.6.2 Qualification and Reliability

NEI 12-02 states, in part, that

> The temperature, humidity and radiation levels consistent with conditions in the vicinity of the [SFP] and the area of use considering normal operational, event and post-event conditions for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 should be considered. Examples of post-event (beyond-design-basis) conditions to be considered are:
>
> - radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water level 3 as described in this order,
>
> - temperatures of 212 degrees F and 100% relative humidity environment,
>
> - boiling water and/or steam environment

- a concentrated borated water environment, and...

In its OIP, the licensee stated, consistent with NEI 12-02, in part, that

> Temperature, humidity and radiation levels consistent with conditions in the vicinity of the SFP and the area of use considering normal operational, event and post-event conditions for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 (Reference 2) will be addressed in the engineering and design phase. Examples of post-event BDB conditions that will considered are:
>
> - Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water level 3 as described in this order,
> - Temperatures of 212°F and 100% relative humidity environment,
> - Boiling water and/or steam environment
> - The impact of FLEX mitigating strategies (Reference 5)

In its letter dated August 20, 2013, the licensee stated, in part, that

> a) Reliability of the permanently installed equipment under BDB ambient temperature, humidity, shock, vibration, and radiation conditions will be demonstrated by the manufacturer through their equipment design, testing, and/or analysis as specified in the PSEG procurement specification. Section 7 of the procurement specification (Reference 8) provides performance requirements for temperature, humidity, pressure, radiation, chemistry, shock and vibration, EMI/RFI, and seismic requirements based on the environmental and seismic design criteria from NEI 12-02 Revision 1.
>
> All equipment located in the reactor building will be certified for use by the manufacturer for survivability under post-event conditions including temperatures of at least 100° Centigrade (212° Fahrenheit), 100 percent condensing atmosphere, submerged operation for components located in the SFP, and exposure to postulated radiation levels when the SFP water levels are at the top of the fuel storage rack for an extended period of time. The new electronics enclosures will be installed in the Auxiliary/Control Building, and will be evaluated to ensure reliability under BDB conditions.
>
> Further details of the qualification used to confirm the reliability of the permanently installed equipment will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

b) Dynamic analysis, including the applicable seismic and hydrodynamics loads, will be used to determine the total loads on the sensor assembly and its mounting. Site specific analysis will be performed to demonstrate the structural adequacy of the mounting at the selected location.

The new SFP electronics enclosures will be qualified in accordance with the Seismic Qualification requirements outlined in IEEE-344 2004 (Reference 6) using a bounding set of criteria that will envelope HCGS Auxiliary/Control Building Required Response Spectra (RRS). The electronics enclosures mount will be seismically qualified to reflect the specific plant configuration determined by the final design.

In addition to the above, the electronics enclosures will be qualified by the manufacturer for use at temperatures, humidity, and radiation levels consistent with other electronic devices containing digital components located in mild environments. The inherent shielding of the structures between the fuel handling building and the Auxiliary/Control Building will result in negligible radiation exposure to the electronics enclosures located in the Lower Relay Room.

Further details of the qualification by testing and/or analysis used to confirm the reliability of the permanently installed equipment during and following seismic event will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

c) The new SFP level instrumentation system will be tested and/or analyzed using a bounding set of seismic response spectra that will meet the seismic design and qualification requirements for HCGS (Reference 8). Testing and/or analysis will confirm that the system maintains its required accuracy following a seismic event.

Further details of the qualification by testing and/or analysis used to confirm the reliability of the permanently installed equipment during and following seismic event will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that further information regarding qualification and reliability of the SFP level instrumentation is not currently available for review. In its letter dated August 20, 2013, the licensee indicated that the information will be provided to the staff in the August 2014, six-month OIP update. The staff has identified these requests as:

RAI #4

Please provide the following:

a) **A description of the specific method or combination of methods that will be applied to demonstrate the reliability of the permanently installed equipment under 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.**

(This information was previously requested as RAI-4 in the NRC letter dated July 22, 2013)

In addition, the staff plans to verify the results of the licensee's testing and analysis used to demonstrate the qualification and reliability of the installed equipment when it is completed based on the licensee's response to the following RAI.

RAI #5

For RAI 4 above, please provide the results from the selected methods, tests and analyses used to demonstrate the qualification and reliability of the installed equipment in accordance with the Order requirements.

3.6.3 Qualification Evaluation Summary

Upon acceptable resolution of the RAIs in Section 3.6, the NRC staff will be able to make a conclusion regarding the instrument qualification.

3.7 Design Features: Independence

Attachment 2 of Order EA-12-051 states, in part, that

> The primary instrument channel shall be independent of the backup instrument channel.

NEI 12-02 states, in part, that

> Independence of permanently installed instrumentation, and primary and backup channels, is obtained by physical and power separation commensurate with the hazard and electrical isolation needs. If plant AC or DC power sources are used then the power sources shall be from different buses and preferably different divisions/channels depending on available sources of power.

In its letter dated August 20, 2013, the licensee stated, in part, that

> 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.

In its letter dated August 20, 2013, the licensee also stated

> For HCGS, the primary and back-up level sensors will be located in different corners of the SFP, the transmitter electronics enclosures are located in the Lower Relay Room within the Auxiliary/Control Building, and HCGS E-1408 "Wire, Cable Notes and Details" (Reference 9) for instrument cabling will be applied to the design. Refer to the sketch provided in response to RAI-2. Additionally, the HCGS Reactor Building and Auxiliary/Control Building are Seismic Class 1 structures designed to withstand seismic, flooding and wind events and therefore provide reasonable protection in accordance with assumptions used for FLEX strategies outlined in NEI 12-06 (Reference 5).
>
> The HCGS SFP level instrumentation system will be designed to be a complete integrated solution that meets the requirements set forth in EA-12-051 (Reference 2), NEI 12-02 Revision 1 (Reference 1), and JLD-ISG-2012-03 (Reference 3). The system provides two completely independent channels of instrumentation providing indication of SFP water level. Each channel is comprised of a GWR sensor, the sensor mount, and an electronics enclosure (transmitter, signal conditioner, communications circuitry, display panel, and internal battery). The electronics for each channel will be equipped with appropriate connections to provide a signal to the remote displays. The normal power supply for each channel will be provided using separate and independent station 120VAC power sources that are fed from battery backed inverters (vital supplies) such that loss of one power source will not result in the loss of both channels. In addition to the normal AC power supply, each channel will contain a back-up battery and will automatically transfer from AC power to the battery back-up upon a loss of AC power.

The NRC staff notes that with this arrangement, the loss of one primary or backup power supply will not affect the operation of the independent channel under BDB event conditions. The implementation of such design provisions appears to be consistent with NEI 12-02, as endorsed by the ISG, and the electrical functional performance of each level measurement channel would be considered independent of the other channel. However, the NRC staff plans to verify the final electrical power supply design information when it is provided. The NRC staff has identified this request as:

RAI #6

Please provide the NRC staff with the final configuration of the power supply source for each channel so that the staff may conclude that the two channels are independent from a power supply assignment perspective.

3.8 Design Features: Power Supplies

Attachment 2 of Order EA-12-051, states in part, that

> Permanently installed instrumentation channels shall each be powered by a separate power supply. Permanently installed and portable instrumentation channels shall provide for power connections from sources independent of the plant ac and dc power distribution systems, such as portable generators or replaceable batteries. Onsite generators used as an alternate power source and replaceable batteries used for instrument channel power shall have sufficient capacity to maintain the level indication function until offsite resource availability is reasonably assured.

NEI 12-02 states, in part, that

> The normal electrical power supply for each channel shall be provided by different sources such that the loss of one of the channels primary power supply will not result in a loss of power supply function to both channels of SFP level instrumentation.
>
> All channels of SFP level instrumentation shall provide the capability of connecting the channel to a source of power (e.g., portable generators or replaceable batteries) independent of the normal plant AC and DC power systems. For fixed channels this alternate capability shall include the ability to isolate the installed channel from its normal power supply or supplies. The portable power sources for the portable and installed channels shall be stored at separate locations, consistent with the reasonable protection requirements associated with NEI 12-06 (Order EA-12-049). The portable generator or replaceable batteries should be accessible and have sufficient capacity to support reliable instrument channel operation until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049.
>
> If adequate power supply for either an installed or portable level instrument credits intermittent operation, then the provisions shall be made for quickly and

> reliably taking the channel out of service and restoring it to service. For example, a switch on the power supply to the channel is adequate provided the power can be periodically interrupted without significantly affecting the accuracy and reliability of the instrument reading. Continuous indication of SFP level is acceptable only if the power for such indication is demonstrably adequate for the time duration specified in section 3.1[.]

In its OIP, the licensee stated, 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.

In its letter dated August 20, 2013, the licensee stated, in part, that

> The level measurement channels will use separate and independent station 120VAC power sources that are fed from a battery-backed inverter as the normal supply. Back-up power is provided by means of batteries internal to each electronics enclosure. The design criteria applied to the instrument specification is for continuous system operation for 72 hours following loss of AC power. System power consumption will be based on the specified values provided by the manufacturer which will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that the proposed criteria for the AC power sources and the sizing of the battery backup appears to be consistent with NEI 12 02, as endorsed by the ISG. However, the staff plans to evaluate the AC source in more detail and to verify the results of the licensee's calculation for required duty cycle given the final design load of the instrument channel for its installed configuration. The staff has identified this request as:

RAI #7

Please provide final design information for the power supply for the SFP level instrumentation and the results of the calculation depicting the battery backup duty cycle requirements demonstrating that its capacity is sufficient to maintain the level indication function until offsite resource availability is reasonably assured.

(This information was previously requested as RAI-6 in the NRC letter dated July 22, 2013. However, based on feedback from the licensees, it was revised as above.)

3.9 Design Features: Accuracy

Attachment 2 of Order EA-12-051 states, in part, that

> The instrument channels shall maintain their designed accuracy following a power interruption or change in power source without recalibration.

NEI 12-02 states, in part, that

> Accuracy should consider operations while under SFP conditions, e.g., saturated water, steam environment, or concentrated borated water. Additionally, instrument accuracy should 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 conflicting or ambiguous indication.

In its OIP, the licensee stated, 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.

In its letter dated August 20, 2013, the licensee stated, in part, that

a) The selected SFP level instrumentation system is expected to have a design reference accuracy of better than +/- 1 % of span and will maintain this accuracy over the entire range of operating conditions, including BDB conditions. It will maintain its design accuracy following a power interruption without the need for recalibration. The final design accuracy information will be provided by the manufacturer and will be available upon completion of the final design, The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

b) The maximum allowed deviation from the channel design accuracy for channel check and calibration tolerances will be developed as part of the detailed design using the standard HCGS Setpoint Methodology Technical Standard (Reference 10). The final tolerances will be developed from design accuracy information provided by the manufacturer and will be available upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

c) This section of the OIP should have identified a nominal value of 175'- 6" as the low end of the measurement range, consistent with Level 3. The sensor will be

> capable of continuously monitoring level over the entire range from the existing Hi Level Alarm down to the proposed Level 3...
>
> The final length of the sensor, instrument span and accuracy will provide sufficient information to allow trained personnel to determine when the actual level exceeds the specified level per the guidance in NEI 12-02 Revision 1. The final details will be provided by the manufacturer upon completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that the estimated instrument channel design accuracies and methodology appear to be sufficient to maintain the instrument channels to within their designed accuracies before significant drift can occur. The staff plans to verify that the licensee's proposed instrument performance is consistent with these estimated accuracy values. Further, the NRC staff plans to verify that the channels will retain these accuracy performance values following a loss of power and subsequent restoration of power. The staff has identified this request as:

RAI #8

Please provide analysis verifying that the proposed instrument performance is consistent with these estimated accuracy normal and BDB values. Please demonstrate that the channels will retain these accuracy performance values following a loss of power and subsequent restoration of power.

3.10 Design Features: Testing

Attachment 2 of Order EA-12-051 states, in part, that

The instrument channel design shall provide for routine testing and calibration.

NEI 12-02 states, in part, that

> Static or non-active installed (fixed) sensors can be used and should be designed such that testing and/or calibration can be performed in-situ. For microprocessor based channels the instrument channel design shall be capable of testing while mounted in the pool.

In its OIP, the licensee stated that the instrument channel design will provide for routine testing and calibration and that the installed sensors will be designed to allow testing and/or calibration via in-situ methods while mounted in the SFP.

In its letter dated August 20, 2013, the licensee stated, in part, that

> a) A description of the capability and provisions for the proposed level sensing equipment as well as specific periodic testing and calibration capabilities enabling the equipment to be tested in-situ will be provided by the manufacturer. This information is not yet available and will be available upon

completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

b) The two independent channels of the SFP level instrumentation system will be crosschecked against each other. Since the two wide range level channels are independent, a channel check tolerance based on the design reference accuracy of each channel will be applied for cross comparison between the two channels. The overall channel tolerance will be determined using the HCGS Instrument Setpoint Technical Standard (Reference 1 0) and instrument reference accuracy information provided by the manufacturer.

c) Specific details of the functional and calibration test program, including frequencies, will be developed as part of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

d) Specific details of the preventative maintenance program, including maximum frequencies, will be developed as part of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that further information regarding the design of the SFP level instrumentation to provide for routine testing and calibration is not currently available for review. In its letter dated August 20, 2013, the licensee indicated that the information will be provided to the staff in the August 2014, six-month OIP update. The staff has identified this request as:

RAI #9

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 the calibration tests and functional checks that will be performed and the frequency at which they will be conducted. Discuss how these surveillances will be incorporated into the plant surveillance program.

c) A description of the preventive maintenance tasks 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.

(This information was previously requested as RAI-8 in NRC letter dated July 22, 2013)

3.11 Design Features: Display

Attachment 2 of Order EA-12-051 states, in part, that

> Trained personnel shall be able to monitor the spent fuel pool water level from the control room, alternate shutdown panel, or other appropriate and accessible location. The display shall provide on-demand or continuous indication of spent fuel pool water level.

NEI 12-02 states, in part, that

> The intent of this guidance is to ensure that information on SFP level is reasonably available to the plant staff and decision makers. Ideally there will be an indication from at least one channel of instrumentation in the control room. While it is generally recognized (as demonstrated by the events at Fukushima Daiichi) that SFP level will not change rapidly during a loss of spent fuel pool cooling scenario more rapid SFP drain down cannot be entirely discounted. Therefore, the fact that plant personnel are able to determine the SFP level will satisfy this requirement, provided the personnel are available and trained in the use of the SFP level instrumentation (see Section 4.1) and that they can accomplish the task when required without unreasonable delay.
>
> SFP level indication from the installed channel shall be displayed in the control room, at the alternate shutdown panel, or another appropriate and accessible location (reference NEI 12-06). An appropriate and accessible location shall have the following characteristics:
>
> - 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, and
> - outside of any very high radiation areas or LOCKED HIGH RAD AREA during normal operation.
>
> If multiple display locations beyond the required "appropriate and accessible location" are desired, then the instrument channel shall be designed with the capability to drive the multiple display locations without impacting the primary "appropriate and accessible" display.

In its OIP, the licensee stated that the conceptual located the electronic enclosure and primary display in readily accessible area located within the Auxiliary Building. The licensee also stated that 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. According to the licensee the failure of

this external remote instrument loop signal would not adversely impact the primary display located in the transmitter (electronics) enclosure.

In its letter dated August 20, 2013, the licensee stated, in part, that

a) Both the primary and back-up channels displays will be located in the Lower Relay Room of the Auxiliary/Control Building. This is a Seismic Category 1 structure designed to withstand flooding, wind and seismic events. Each electronics enclosure will provide both a local display and a retransmitted signal to a remote display located in the main control room. Refer to the sketch provided with the response for RAI-2.

b) Final design details for the display units, including justification for prompt accessibility from the main control room, habitability, resource availability and communications with decision makers is scheduled to be completed as part of the BDB mitigating strategies assessments and included in applicable processes and procedures. Final details of the display location(s) will be developed as part of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that further information regarding the accessibility, habitability, resource availability and communications with decision-makers as it relates to the location for the SFP level instrumentation displays is not currently available for review. In its letter dated August 20, 2013, the licensee indicated that the information will be provided to the staff in the August 2014, six-month OIP update. The staff has identified this request as:

RAI #10

For any SFP level instrumentation displays located outside the main control room, please describe the evaluation used to validate that the display location can be accessed without unreasonable delay following a BDB event. Include the time available for personnel to access the display as credited in the evaluation, as well as the actual time (e.g., based on walk-throughs) that it will take for personnel to access the display. Additionally, please include a description of the radiological and environmental conditions on the paths personnel might take. Describe whether the display location remains habitable for radiological, heat and humidity, and other environmental conditions following a BDB event. Describe whether personnel are continuously stationed at the display or monitor the display periodically.

3.12 Programmatic Controls: Training

Attachment 2 of Order EA-12-051 states, in part, that

> Personnel shall be trained in the use and the provision of alternate power to the primary and backup instrument channels.

NEI 12-02 states, in part, that

> The personnel performing functions associated with these SFP level instrumentation channels shall be trained to perform the job specific functions necessary for their assigned tasks (maintenance, calibration, surveillance, etc.). SFP instrumentation should be installed via the normal modification processes. In some cases, utilities may choose to utilize portable instrumentation as a portion of their SFP instrumentation response. In either case utilities should use the Systematic Approach to Training (SAT) to identify the population to be trained. The SAT process should also determine both the initial and continuing elements of the required training.

In its OIP, the licensee stated, in part, that

> Standard plant training processes will be used to identify the population to be trained and to determine both the initial and continuing elements of the required training. Training will be completed prior to placing the instrumentation in service.
>
> Specific details regarding training will be reviewed and determined between the plant and the supplier as part of the procurement process for the new instruments.

The licensee's proposed plan, with respect to the training personnel in the use and the provision of alternate power to the primary and backup instrument channels, including the approach to identifying the population to be trained, appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.13 Programmatic Controls: Procedures

Attachment 2 of Order EA-12-051 states, in part, that

> Procedures shall be established and maintained for the testing, calibration, and use of the primary and backup spent fuel pool instrument channels.

NEI 12-02 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.

In its OIP, the licensee stated 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.

In its letter dated August 20, 2013, the licensee stated, in part, that

> Procedures for operation (both normal and abnormal response), calibration, testing, maintenance, inspection, and administrative controls associated with the SFP level instrumentation will be developed in accordance with existing controlled station administrative and technical procedures that govern procedure development. These procedures ensure standardization of format and terminology and ease of use, along with assurance of a consistent level of quality. Specific details of the procedures for inspection, maintenance, repair, operation, abnormal response, and administrative controls will be developed as part of the final design package. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.
>
> The specific technical objectives associated with the procedures are yet to be developed. There are no portable instruments associated with the new SFP level instrumentation system that are required for normal operation. Consequently, specific procedures for storage and installation are not required. Specific technical objectives associated with the procedures will be developed as part of the final design package. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

The NRC staff notes that further information regarding the licensee's plan to establish and maintain procedures for the testing, calibration, and use of the primary and backup SFP pool instrument channels is not currently available for review. In its letter dated August 20, 2013, the licensee indicated that the information will be provided to the staff in the August 2014, six-month OIP update. The staff has identified this request as:

RAI #11

Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection that will be developed for use of the spent SFP instrumentation. The licensee is requested to include a brief description of the specific technical objectives to be achieved within each procedure.

3.14 Programmatic Controls: Testing and Calibration

Attachment 2 of Order EA-12-051 states, in part, that

> Processes shall be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup spent fuel pool level instrument channels to maintain the instrument channels at the design accuracy.

NEI 12-02 states, in part, that

> Processes shall 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 at the design accuracy. The testing and calibration of the instrumentation shall be consistent with vendor recommendations or other documented basis.

In its OIP, the licensee stated that processes will be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup SFP level instrument channels.

In its letter dated August 20, 2013, the licensee stated, in part, that

> The maintenance and testing of the SFP level instrumentation system will be incorporated into the normal station preventative maintenance and work control processes based on manufacturer recommendations for maintenance and periodic testing. The calibration and maintenance program will include testing to validate the functionality of each instrument channel within 60 days of a planned refueling outage, considering normal testing scheduling allowances as outlined in NEI 12-02 Revision 1. The new systems will receive unique identification numbers and be entered into the PSEG preventative maintenance program. A recurring task for the required maintenance frequency will be established. Normal station administrative controls will be used to schedule regular testing and calibration to demonstrate conformance within design and system limits.
>
> The preventative maintenance, test and calibration program will be developed consistent with manufacturer recommendations. This information will be available following completion of the final design. The final design is scheduled for completion by the end of the second quarter of 2014. Details will be provided to the NRC in the August 2014, six-month OIP update.

Further in its letter dated August 20, 2013, the licensee stated regarding level instrument being out-of-service, in part, that

> In the event that either a primary or backup SFP level instrumentation channel must be taken out of service or is inoperable for any reason, a notification will be entered into PSEG corrective action program to restore the channel to service within 90 days. The determination of required compensatory actions is part of the overall effort to develop the FLEX Program administrative controls and implementing procedures. In the event that a channel cannot be restored to service within the 90 day period, expedited actions to restore the channel would be initiated and tracked via PSEG's Corrective Action Program. If both channels are determined to be non-functional, PSEG will initiate appropriate actions within 24 hours to restore one of the instrument channels and implement compensatory actions within 72 hours.
>
> The FLEX Program will incorporate the guidance of NEI 12-02 Revision 1, including the requirements associated with out of service times and compensatory actions. The FLEX program is expected to be sufficiently developed to provide details to the NRC in the August of 2014, six-month OIP update.

Since the sensor and interconnecting cables are passive devices, their simultaneous failure is not considered credible and therefore compensatory actions are not expected to be required for failure of both sensors. PSEG intends to purchase a portable version of the level instrument electronics to use for testing and for monitoring of a single channel whenever necessary for compensatory measures; however, the appropriate compensatory measures have yet to be defined and the determination of these actions is part of the overall effort to develop the FLEX program administrative controls and implementing procedures. The FLEX Program will incorporate the guidance of NEI 12-02 Revision 1, including the requirements associated with out of service time. The FLEX program is expected to be sufficiently developed to provide details to the NRC in the August 2014, six-month OIP update.

The licensee's proposed plan, with respect to defining processes for scheduling and implementing necessary testing and calibration and compensatory actions when a channel is out of service or when one of the instrument channels cannot be restored to functional status within 90 days appears to be consistent with NEI 12-02, as endorsed by the ISG.

The NRC staff notes that further information regarding the testing, calibration and compensatory actions for the SFP level instrumentation is not currently available for review. In its letter dated August 20, 2013, the licensee indicated that the information will be provided to the staff in the August 2014, six-month OIP update. The staff has identified these requests as:

RAI #12

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 PSEG's plans for implementing the guidance in NEI 12-02, Section 4.3 regarding compensatory actions for one or both non-functioning channels.**

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.**

(This information was previously requested as RAI-11 in NRC letter dated July 22, 2013)

RAI #13

Please provide a description of the in-situ calibration process at the SFP location that will result in the channel calibration being maintained at its design accuracy.

3.15 Instrument Reliability

NEI 12-02 states, in part, that

> A spent fuel pool level instrument channel is considered reliable when the instrument channel satisfies the design elements listed in Section 3 [Instrument Design Features] of this guidance and the plant operator has fully implemented the programmatic features listed in Section 4 [Program Features].

In its OIP, the licensee stated that the level instrument channel design would meet Section 3 of the NEI guidance and that reliability would be assured through implementation of the programmatic controls that are consistent with the applicable guidance in NEI 12-02.

Upon acceptable resolution of the RAIs noted above, the NRC staff will be able to make a conclusion regarding the reliability of the SFP instrumentation.

4.0 CONCLUSION

The NRC staff is unable to complete its evaluation regarding the acceptability of the licensee's plans for implementing the requirements of Order EA-12-051 due to the need for additional information as described above. The staff will issue an evaluation with its conclusion after the licensee has provided the requested information.

information be provided by March 31, 2015, to ensure that any issues are resolved prior to the date by which the licensee must complete full implementation of Order EA-12-051. The licensee should adjust its schedule for providing information to ensure that all this information is provided by the requested date.

If you have any questions regarding this letter, please contact me at 301-415-3204 or via e-mail at john.hughey@nrc.gov.

Sincerely,

/ra/

John D. Hughey, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure:
Interim Staff Evaluation and
Request for Additional Information

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