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

September 19, 2013

Mr. Dennis L. Koehl
President and CEO/CNO
STP Nuclear Operating Company
South Texas Project
P.O. Box 289
Wadsworth, TX 77483

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2 - 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 NOS. MF0827 AND MF0828)

Dear Mr. Koehl:

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.

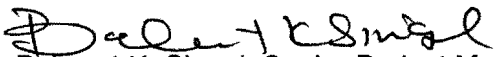
By letter dated February 28, 2013 (ADAMS Accession No. ML13070A006), STP Nuclear Operating Company (the licensee) provided the Overall Integrated Plan (OIP) for South Texas Project (STP), Units 1 and 2, describing how it will achieve compliance with Attachment 2 of Order EA-12-51 by October 28, 2015, for Unit 1, and April 29, 2015, for Unit 2. By letter dated June 7, 2013 (ADAMS Accession No. ML13149A092), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated June 25, 2013 (ADAMS Accession No. ML13190A466), and August 27, 2013 (ADAMS Accession No. ML13249A078).

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 October 31, 2014, 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 301-415-3016 or via e-mail at Balwant.singal@nrc.gov.

Sincerely,



Balwant K. Singal, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

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

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

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 28, 2013 (ADAMS Accession No. ML13070A006), STP Nuclear Operating Company (the licensee) provided the OIP for South Texas Project (STP), Units 1 and 2, describing how it will achieve compliance with Attachment 2 of Order EA-12-51 by October 28, 2015, for Unit 1, and April 29, 2015, for Unit 2. By letter dated June 7, 2013 (ADAMS Accession No. ML13149A092), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated June 25, 2013 (ADAMS Accession No. ML13190A466), and August 27, 2013 (ADAMS Accession No. ML13249A078).

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.

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 license 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

STP, Units 1 and 2, has two independent SFPs, each approximately 26-1/2-feet wide by 52-feet long and 37-feet deep. The pools for both units are essentially identical and are not interconnected in any way.

The licensee submitted its OIP on February 28, 2013. The OIP states that installation of the SFP level instrumentation at STP will be completed by October 28, 2015, for Unit 1, and April 29, 2015, for Unit 2, which is before startup from the second refueling outage for each unit.

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 the OIP, the licensee stated that Level 1 for both units is set at a plant elevation of 64 feet (ft.) 2 inches (in.), which corresponds to 24 ft. 4 in. water above the top of the SFP fuel storage rack. This level provides for more than 1 ft. of water above the top of the SFP cooling pump suction inlet flange. In its letter dated June 25, 2013, the licensee stated, in part, that

> The SFP cooling pumps were analyzed for the conservative worst case operation of the SFP cooling pumps. Maximum values for line resistance, fluid temperature, suction flow and static head were used to calculate NPSH [net positive suction head] parameters for both required and available NPSH ($NPSH_R$ and $NPSH_A$). It was determined that for the worst case scenario, the $NPSH_A$ was significantly higher than the $NPSH_R$. The $NPSH_A$ was calculated to be 42.67 feet (ft) and $NPSH_R$ was calculated to be 18.75 ft.

The NRC staff notes that Level 1 at 64 ft. 2 in. is adequate for normal SFP cooling system operation; it is also sufficient for NPSH and represents the higher of the two points described above.

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 for both units would be set at a plant elevation of 49 ft. 10 in., which corresponds to 10 ft. of water above the top of the SFP fuel storage rack.

The NRC notes that the licensee designated Level 2 using the first of the two options described in NEI 12-02 for Level 2.

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.

The licensee stated in its OIP that Level 3 for both units would be set at plant elevation 40 ft. 4 in., which corresponds to 6 in. of water above the top of the SFP fuel storage rack.

The NRC notes that this elevation is above the highest point of any spent fuel storage rack seated in the spent fuel pool.

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 for both the Unit 1 and Unit 2 SFPs that:

> Both the Primary and Backup Instrument Channels will utilize permanently-installed instruments. The design of the primary and backup instruments will be consistent with the requirements by NEI 12-02 [Rev. 1], the ISG, and this Plan.

The OIP also states that each instrument channel will be capable of monitoring SFP water level over a continuous range from the top of the fuel racks to the high pool level elevation (67 ft.).

The NRC 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 for both of its SFPs, 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 it intends to implement one fixed primary level instrument for each fuel pool at STP in the northeast corner of the SFP and one fixed backup level instrument in the northwest corner of the SFP. The licensee stated that "although the level probes may protrude slightly above the level of the spent fuel deck, mounting these in corner locations will provide sufficient protection from missiles and debris required by NEI 12-02."

The licensee's proposed location of the primary and backup level instruments for both of its SFPs appears to be consistent with NEI 12-02, as endorsed by the ISG.

In its letter dated June 25, 2013, the licensee provided a sketch depicting the waveguide piping for the two redundant channels as 1 in. stainless steel pipes. The NRC staff noted that this sketch depicts the two pipes to be run side by side from the through-the-air horn to the sensor receivers located in the Mechanical Auxiliary Building (MAB), and from there, cabling for the two instrument channels seem to be run side by side to the display units mounted in the Radwaste Control Room. The NRC staff has concerns regarding the routing of these two channels in

accordance with the guidance on channel separation as described in NEI 12-02. Additional information is needed to enable the staff to complete its evaluation. The staff has identified this request as:

RAI #1

Please provide additional information describing how the proposed arrangement of the waveguides and routing of the cabling between the radar horns and the electronics in the Radwaste Control Room meets the Order requirement to arrange the SFP level instrument channels in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the SFP.

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, in part, that

> Consideration will be given to the maximum seismic ground motion that occurs at the installation location for the permanently installed equipment which is documented in the UFSAR [Updated Final Safety Analysis Report] Section 3.7. The mountings shall be designed consistent with the highest safety or seismic classification of the SFP. The level sensors will be mounted on seismically qualified brackets.

In its letter dated June 25, 2013, the licensee provided a sketch and description stating that it intends to mount the SFP Level Instrument sensing element to the refueling floor just outside the SFP. The design for this mounting will apply the seismic design criteria applicable to the design basis maximum for the plant, capable of withstanding all active and passive loads, including the effects of pool sloshing during a seismic event. In its June 25, 2013, letter, the licensee also stated:

> The loading on the mounting bracket includes the static weight loads and dynamic weight loads of the horn antenna, waveguide assembly and attached waveguide pipe up to the nearest pipe support. The dynamic loads on the mounting bracket consist of the design basis maximum seismic loads on the bracket and the mounted components, along with hydrodynamic loads produced by impinging surface waves caused by seismically-induced pool sloshing.
>
> The methodology for ensuring the mounting bracket and attached equipment can withstand the seismic dynamic forces will be by analysis of the combined maximum seismic and hydrodynamic forces on the cantilevered portion of the waveguide assembly and horn antenna exposed to the potential seismically induced wave actions. In addition, seismic qualification testing will be performed to seismic response spectra that envelope the maximum seismic ground motion for the installed location.

According to the licensee, this testing will demonstrate that the waveguide and horn assembly will retain its design configuration following a design basis maximum seismic event.

The NRC staff notes that the proposed application of such seismic design criteria appears to be reasonable and addresses the staff-endorsed NEI 12-02 guidance stating that the channel is to be designed to be consistent with the highest seismic or safety classification of the SFP. The licensee's proposed plan, with respect to the seismic design of the mounting, appears to be consistent with NEI 12-02, as endorsed by the ISG. The staff plans to verify the results of the licensee's seismic testing and analysis report when it is completed based on the licensee's response to the following RAI.

RAI #2

Please provide the analyses verifying that the seismic testing of the horn and waveguide assembly and the electronics units, and the analysis of the combined maximum seismic and hydrodynamic forces on the cantilevered portion of the assembly exposed to the potential sloshing effects, show that the SFP instrument design configuration will be maintained during and following the maximum seismic ground motion considered in the design of the SFP structure.

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: (1) Augmented Quality Process, (2) Post Event Conditions, (3) Shock and Vibration, and (4) Seismic 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 the instrumentation systems will not be safety-related, but will meet the requirements for augmented quality in accordance with NEI 12-02 and the ISG.

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

3.6.2 Post Event Conditions

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.

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

> Both channels will be reliable at temperature, humidity and radiation levels consistent with the SFP water at saturation conditions for no fewer than seven (7) days post-event. Level equipment installed in the SFP and areas in the Fuel Handling Building (FHB) will be designed and tested to remain functional when subjected to the following expected post-event conditions:
>
> - Radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with SFP water at Level 3 as described in ORDER
> - Temperatures of 212 °F and 100% relative humidity environment
> - Boiling Water and/or steam environment
> - Concentrated borated water environment

Related to radiological conditions, in its letter dated June 25, 2013, the licensee stated, in part, that

> The area above and around the pool will be subject to large amounts of radiation in the event that the fuel becomes uncovered. The only parts of the measurement channel in the pool radiation environment are the metallic waveguide and horn, which are not susceptible to the expected levels of radiation. The remote display electronics will be located in an area outside the FHB [fuel handling building] that does not exceed the $1x10^3$ RAD analyzed limit for the electronics.

The NRC staff has concerns with the licensee's lack of information regarding its analysis of the maximum expected radiological conditions for the Radwaste Control Room that might be considered credible under BDB conditions. The NRC staff is also concerned with the lack of

documentation indicating how it was determined that the electronics can withstand a total integrated dose of $1X10^3$ Rads. The staff has identified this request as:

RAI #3

Please provide analysis of the maximum expected radiological conditions (dose rate and total integrated dose) to which the equipment located within the Radwaste Control Room will be exposed. Also, please provide documentation indicating how it was determined that the electronics for this equipment is capable of withstanding a total integrated dose of $1X10^3$ Rads. Please discuss the time period over which the analyzed total integrated dose was applied.

While addressing post-event temperature conditions, the licensee stated in its letter dated June 25, 2013, in part, that

> The postulated temperature in the SFP room that results from a boiling pool is 100°C (212°F). The electronics in the sensor are rated for a maximum temperature of 80°C (176°F). The sensor will be located outside of the spent fuel pool room in an area where the temperature will not exceed the rated temperature of the electronics.

The NRC staff has concerns with the licensee's lack of information regarding the ambient temperature in the vicinity where the electronics equipment will be located under normal and worst case postulated conditions. The staff has identified this request as:

RAI #4

Please provide information indicating a) whether the 80°C rating for the sensor electronics is a continuous duty rating; and, b) what will be the maximum expected ambient temperature in the room in which the sensor electronics will be located under BDB conditions in which there is no ac power available to run heating ventilation and air conditioning (HVAC) systems?

In its letter dated June 25, 2013, the licensee stated, in part, that

> The maximum humidity postulated for the SFP room is 100% relative humidity, essentially a saturated steam environment.

The licensee also described the sensor electronics as being located outside of the SFP room in an area away from the steam atmosphere. According to this description by the licensee, the waveguide tube in the FHB can withstand condensation formed on the inside walls provided there is no pooling of the condensate in the waveguide tube, and that this is ensured by installing weep holes at the low spots in the wave guide pipe. The licensee also stated in this same letter that ability of the radar to "see through" the steam has been demonstrated by test. In addition to testing, the proposed instrument has been used in numerous applications that involve measuring the level of boiling liquids.

The NRC staff has concerns with the licensee's lack of information regarding whether the sensor electronics is capable of continuously performing its required functions under this expected humidity condition. The staff has identified this request as:

RAI #5

Please provide information indicating the maximum expected relative humidity in the room in which the sensor electronics will be located under BDB conditions, in which there is no ac power available to run HVAC systems, and whether the sensor electronics is capable of continuously performing its required functions under this expected humidity condition.

3.6.3 Shock and Vibration

NEI 12-02 states, in part, that

> Applicable components of the instrument channels are rated by the manufacturer (or otherwise tested) for shock and vibration 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:
>
> - instrument channel components use known operating principles, are supplied by manufacturers with commercial quality programs (such as ISO9001) with shock and vibration requirements included in the purchase specification and/or instrument design, and commercial design and testing for operation in environments where significant shock and vibration loadings are common, such as for portable hand-held devices or transportation applications;
>
> - substantial history of operational reliability in environments with significant shock and vibration loading, such as transportation applications, or
>
> - use of component inherently resistant to shock and vibration loadings or are seismically reliable such as cables.

Sensor Shock

In its letter dated June 25, 2013, the licensee stated, in part, that the sensor is similar in form, fit, and function to a version of the sensor that was previously shock tested in accordance with MIL-STD-901D, "Requirements for High-Impact Shock Tests, Shipboard Machinery, Equipment, and Systems," dated March 17, 1989. The licensee also indicated that the proposed waveguide piping is not shock sensitive.

The NRC staff notes that the use of MIL-STD-901D is an acceptable method for shock testing. However, the NRC staff has concerns with the licensee's lack of information regarding

description of the tests, applied forces, and the operability condition of the sensor after the tests were completed. The staff has identified this request as:

RAI #6

Please provide information describing the evaluation of the comparative sensor design, the shock test method, test results, and forces applied to the sensor applicable to its successful tests demonstrating that the referenced previous testing provides an appropriate means to demonstrate reliability of the sensor under the effects of severe shock.

Sensor Vibration

In its letter dated August 27, 2013, the licensee stated, in part, that the sensor is similar in form, fit, and function to a version of the sensor that was previously vibration tested in accordance with MIL-STD-167-1, "Department of Defense Test Method Standard--Mechanical Vibrations of Shipboard Equipment (Type I – Environmental and Type II – Internally Excited), May 1, 1974." This vibration testing only applies to the sensor. The licensee also indicated that the proposed waveguide piping is not vibration sensitive.

The NRC staff notes that the use of MIL-STD-167-1 is an acceptable method for vibration testing. However, the staff has concerns with the licensee's lack of information describing the tests, applied forces and their directions and frequency ranges, and the operability condition of the sensor after the tests were completed. The staff has identified this request as:

RAI #7

Please provide information describing the evaluation of the comparative sensor design, the vibration test method, test results, and the forces and their frequency ranges and directions applied to the sensor applicable to its successful tests, demonstrating that the referenced previous testing provides an appropriate means to demonstrate reliability of the sensor under the effects of high vibration.

Electronics Panel Shock and Vibration

In its letter dated June 25, 2013, the licensee described the power and control panel it plans to install, which is similar in form, fit, and function to a mobile version of this product. The readout portion of the display for the mobile version was previously shock and vibration tested with the sensor as described above. The display unit for the mobile version of this product is designed for mobile applications subject to shock and vibration resulting from normal handling, transportation, and setup.

The NRC staff has concerns with the licensee's lack of information regarding description of the manufacturer's shock and vibration ratings for this equipment and the results of any testing performed by the manufacturer to achieve those ratings. The staff also plans to verify the

licensee's comparison of the magnitude of the manufacturer's ratings against postulated plant conditions under design basis events. The staff has identified this request as:

RAI #8

Please provide information describing the evaluation of the comparative display panel ratings against postulated plant conditions. Also provide results of the manufacturer's shock and vibration test methods, test results, and the forces and their frequency ranges and directions applied to the display panel associated with its successful tests.

In its letter dated June 25, 2013, the licensee noted that there are three components within the power and control panel that were not included with the mobile remote display that are similar in construction to those that were tested for shock and vibration and/or mounted on vibration dampeners. Therefore, the power and control panel will be subjected to seismic testing per the requirements of Institute of Electric and Electronics Engineers (IEEE) Standard 344-2004, "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

The NRC staff has concerns with the licensee's lack of information regarding the results of such testing to determine the acceptability of using IEEE 344-2004 as an appropriate means to demonstrate reliability of the display panel under the effects of severe shock and vibration. The staff has identified this request as:

RAI #9

Please provide the results of seismic testing per IEEE 344-2004, to demonstrate the reliability of the components within the power and control panel with regard to shock and vibration effects.

3.6.4 Seismic Reliability

The ISG recommends the use of Sections 7, 8, 9, and 10 of IEEE 344-2004 for seismic qualification of the SFP level instrumentation.

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

> The reliability of the permanently installed instrument channel components will be demonstrated through an appropriate combination of design, analysis, operating experience and/or testing of components to meet the seismic conditions in the area of the SFP that are applicable at the time of submittal of this Plan and will meet the seismic reliability requirements of NEI 12-02 [Rev. 1] and the ISG. If changes in the seismic design basis occur, they will be processed in accordance with existing plant procedures.
>
> The reliability of seismic design and installation will be demonstrated in accordance with the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004 . . . or a substantially similar industrial standard.

In its letter dated June 25, 2013, the licensee stated that it plans to perform a seismic shake test using IEEE 344-2004 standard for elements of the instrument to levels anticipated to envelop most, if not all, plants in the United States. The licensee further stated:

> The equipment to be tested includes the sensor, readout and power control panel, horn end of the waveguide, pool end and sensor end mounting brackets, and waveguide piping. The items will be tested to the Required Response Spectra (RRS) contained in [Electric Power Research Institute] EPRI TR-107330, "Generic Requirements Specification for Qualifying a Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants", to account for the potentially high seismic motion that could occur to cabinet-mounted readout and power control panel. This RRS will also envelop the seismic ground motion for items mounted to the building structure, pool edge, etc.

In its letter dated June 25, 2013, the licensee stated that the seismic testing will include testing the instrument for functionality prior to and during post-seismic testing and will include verification of the accuracy of the instrument following exposure to the required test seismic motion.

The NRC staff notes that the licensee will demonstrate the reliability of the seismic design and installation in accordance with NEI 12-02, as endorsed by the ISG. The licensee's planned approach with respect to the seismic reliability of the instrumentation appears to be consistent NEI 12-02, as endorsed by the ISG. However, the staff plans to verify the results of the licensee's seismic test when it is completed. The staff has identified this request as:

RAI #10

Please provide analysis of the seismic testing results and show that the instrument performance reliability, following exposure to simulated seismic conditions representative of the environment anticipated for the SFP structures at STP, has been adequately demonstrated.

3.6.5 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 June 25, 2013, the licensee stated, in part, that

> The design of the electrical power supply to the proposed level measurement system is not complete. Current plans call for powering the channel display panels from 120VAC lighting panels. The lighting panels (LP) are powered independently from different 13.8kV busses. At this stage of the design planning, the two panels selected are LP 13B and LP 13P. LP 13B is powered from motor control center (MCC) 1S1 (2S1) which in turn is powered from 13.8kV bus 1H (2H). LP 13P is powered from MCC 1L3 (2L3) which in turn is powered from 13.8 kV bus 1G (2G). Thus, a failure of one large bus will not cause the loss of both display panels.

In its OIP, the licensee stated that each instrument channel will have a different backup battery power supply for uninterrupted operation of each channel after a loss of power event.

The NRC staff notes that with this arrangement, the loss of one 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 #11

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.

The physical separation of the instruments was previously discussed in Section 3.4, "Arrangement." As stated in Section 3.4, the licensee appears to have routed the waveguides for each of the independent SFP level sensors in close proximity to one another, thus jeopardizing the independence between primary and backup instrument channels that could have been gained from the application of physical separation (Reference RAI # 1).

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[.]

The licensee's proposed normal power supply is discussed in Section 3.7, "Design Features: Independence."

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

> [E]ach instrument channel shall have a backup battery power supply for uninterrupted operation after a loss of power. Power will be of sufficient capacity to maintain level indication until offsite resources become available.

In its letter dated June 25, 2013, the licensee stated that sizing of the battery backup for the instrument is based on ability of the sensor to supply full load (20 mA) for a duration to be specified, with built-in safety margin. The licensee stated that sizing of the battery will be verified by calculation and/or test prior to installation. The battery backup will be dedicated to the instrument. Currently installed station batteries will not be used for this battery backup.

The NRC staff notes that the proposed criteria for sizing of the battery backup appears to be consistent with NEI 12-02, as endorsed by the ISG. However, the staff plans 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 #12

Please provide 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.

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 minimum accuracy for the channel will be maintained following a loss of power, without calibration and will consider the effect of environmental conditions on the accuracy. Minimum accuracy requirements shall meet the requirements of NEI 12-02. Additionally, instrument accuracy will be sufficient to allow trained personnel to determine when the actual level exceeds the specified lower level of each indicating range (levels 1, 2 and 3) without conflicting or ambiguous indication.

Further, in its letter dated June 25, 2013, the licensee stated that the reference accuracy for the instrument has been demonstrated to be ±1 in., based on testing by attaching a waveguide to the instrument for transmitting the signal and using water as a target at normal SFP level conditions. This is the design accuracy value that will be used for the SFP level instrument channels.

However, the NRC staff notes that this value is subject to change dependent on the actual performance with the installed waveguide. In its letter dated June 25, 2013, the licensee stated, in part, that

> The accuracy of the instrument channel is affected under BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post-shock conditions). The

> stainless steel horn antenna and waveguide pipe that are exposed to BDB conditions are largely unaffected by radiation, temperature and humidity other than a minor effect of condensation forming on the waveguide inner walls which will have a slight delay effect on the radar pulse velocity. Condensation is prevented from pooling in the waveguide and thus blocking the radar signal by placement of weep holes at low points in the waveguide pipe. A minor effect on the length of the overall measurement path can occur due to temperature related expansion of the waveguide pipe. The waveguide pipe permits the sensor receiver to be located in mild environment conditions (i.e. the MAB) so that the effect of elevated temperature on sensor receiver accuracy is also limited. Based on the [...] Operating Instruction Manual for the [...] instrument, a small correction factor is applied on the radar beam velocity to account for the impact of saturated steam at atmospheric pressure. Testing performed in saturated steam and saturated steam combined with smoke environments indicates that the overall effect on the instrument accuracy is minimal. The overall accuracy due at BDB conditions is conservatively estimated to not exceed ± 3 inches....

Finally, in its letter dated June 25, 2013, the licensee stated, in part, that

> 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 will be based upon the difference between readings from the Primary and Backup level instruments. The estimated design accuracy for each instrument is ±1 in. The maximum deviation between the two instrument channels for determining that instrument calibration is needed will be ±2 inches based on a still water level in the pool. This maximum deviation is subject to change if the design accuracy discussed in the response to RAI-7a above changes.

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 NRC 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 #13

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, in part, that

> Specific test procedures will be implemented for functional testing of the installed instrument systems, from the sensor through the display, as defined in Section 11.0 [of the OIP].

In addition, in its letter dated June 25, 2013, the licensee stated, in part, that

> Multi-point testing is enabled by the capability to rotate the radar horn antenna away from pointing to the SFP water surface and instead aimed at a movable metal target that is positioned at known distances from the horn. This allows for checking for correct readings of all indicators along a measurement range and validates the functionality of the installed system.

The NRC staff requested that the licensee provide a description of how such testing and calibration will enable the conduct of routine channel checks of each independent channel against the other, and against any other permanently installed SFP level instrumentation. In its letter dated June 25, 2013, the licensee stated, in part, that

> The Primary and Backup instrument channels will have indicators that can be compared against each other and against any other permanently-installed SFP level instrumentation. This comparison can be performed at suitable times and frequencies.

The NRC staff notes that the results of the comparison between the SFP level instrument channels can be compared with the acceptance criteria described in Section 3.9 above to determine if recalibration or troubleshooting is needed.

The licensee's proposed design, with respect to routine in-situ instrument channel functional and calibration tests, appears to be consistent with NEI 12-02, as endorsed by the ISG.

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 letter dated June 25, 2013, the licensee stated, in part, that

> The [primary and backup instrument channel] displays will be located in the Radwaste Control Room. The Radwaste Control Room is located in an area that

> is accessible to the MAB Plant Operator from two different paths from outside the MAB. One path is from the Electrical Auxiliary Building (EAB) and the other path is from outside entrance to the MAB. The MAB is a seismic Class 1 safety related structure and the Radwaste Control Room, inside the MAB, is a considerable distance from the FHB and SFP.

To describe the accessibility of the Radwaste Control Room, in its letter dated June 25, 2013, the licensee stated in part, that

> The distance from the nearest SFP boundary to the FHB/MAB boundary is approximately 49 feet. The distance from the FHB/MAB boundary to the nearest Radwaste Control Room wall is approximately 65 feet with an elevation change from 68 feet (the SFP operating deck level) to 41 feet.... Access to the Radwaste Control Room is achieved on the east side of the MAB and EAB whereas the FHB and SFP are on the west side of the MAB. As such, the Radwaste Control Room should be promptly accessible for any event in the FHB.

The NRC staff has concerns with the licensee's lack of information regarding the time it would take for assigned personnel to access the display panels in the Radwaste Control Room and provide information to decision makers, necessary to demonstrate that personnel can access the display without unreasonable delay. This is addressed in RAI #14 below.

In its letter dated June 25, 2013, the licensee also described the habitability for this location during various drain down scenarios and external events as follows:

> The Radwaste Control Room is located on the 41 foot level of the MAB and will not receive a significant increase in background radiation levels in the event the SFP water level reduces to Level 3. The concrete walls around the SFP are 5 feet thick. The building walls between the FHB and the MAB are 5 feet 6 inches thick. An additional 2 foot thick wall separates the Radwaste Control Room and the penetration area next to the FHB.

The NRC staff has concerns with the licensee's lack of information regarding the potential dose rates for personnel accessing the Radwaste Control Room from the identified paths, and the potential for the location to remain habitable for airborne radiological, extreme heat and humidity, and other environmental conditions that may exist. This is addressed in RAI #14 below.

The licensee also stated within its June 25, 2013 letter, in part, that

> Adequate Operations resources are available on shift to periodically monitor the SFP level at the display location primarily because of its central location with respect to their other duties. Communications between the control room and the plant operators will be provided by a variety of means including radios and sound-powered phones.

The NRC staff has concerns with the lack of information regarding the about licensee's plans for occupying the display location and how personnel availability will be assured such that on-

demand display information will be provided without unreasonable delay. Additionally, the staff has concerns regarding how the availability and operability of relied-upon communications will be ensured. The staff had identified this request as:

RAI #14

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 we 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.

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

> In addition, the Primary and Backup Channel Instruments will drive remote indication located in the Main Control Room.

The NRC staff has concerns regarding the licensee's lack of information provided to demonstrate that the control room display will be suitably isolated from and not impact the licensee's proposed primary display in the Radwaste Control Room. The staff had identified this request as:

RAI #15

Please provide information to demonstrate that the control room display will be suitably isolated from and not impact the licensee's proposed primary display in the Radwaste Control Room.

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

> Procedures for the maintenance and testing, and the training of the required personnel on these procedures will be completed prior to the required date for completion of plant modifications per Section 3.0.
>
> Existing procedures for the Spent Fuel Pool will be revised as required and training of the required personnel on the revised procedures will be completed prior to the date for completion of these modifications per Section 3.0.

The NRC staff has concerns with the licensee's lack of information regarding the training of personnel for activities such as use of the instrument channels, provision for alternate power, and calibration and surveillance of the SFP instrumentation. Another staff concern is the lack of information on the licensee's approach to training with respect to the SFP instrumentation. The staff has identified this request as:

RAI #16

Please describe the activities for which personnel will be trained, such as use of the instrument channels, provision of alternate power, calibration and surveillance. Describe the approach to training used to identify the population to be trained and determined the initial and continuing elements of the required training for the SFP instrumentation.

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, in part, that

> Procedures for the maintenance and testing, and the training of the required personnel on these procedures will be completed prior to the required date for completion of plant modifications per Section 3.0.
>
> Existing procedures for the Spent Fuel Pool will be revised as required and training of the required personnel on the revised procedures will be completed prior to the date for completion of these modifications per Section 3.0.

In its letter dated June 25, 2013, the licensee stated, in part, that

> The standards, guidelines and/or criteria that will be utilized to develop procedures for activities described in the RAI associated with the SFP level instrumentation, as well as storage and installation of portable instruments, have not been determined. However, information such as the following is being considered:
>
> - INPO AP-913 and Maintenance Rule,
> - RG 1.33, Quality Assurance Program Requirements (Operation), Revision 2, and
> - ANSI 18.7-1976, Administrative Controls and Quality Assurance for Operational Phase of Nuclear Power Plants.
>
> Information regarding the utilization of standards, guidelines and/or criteria to develop these procedures will be provided in 6 month updates to the NRC.

The NRC staff has concerns with the licensee's lack of information about its plans to develop procedures. The staff previously requested this information as RAI-10 in NRC letter dated June 7, 2013. However, based on feedback from licensees, the staff revised this RAI as follows:

RAI #17

Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection procedures 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 letter dated June 25, 2013, the licensee stated, in part, that

> The maintenance and testing program as well as compensatory actions for non-functioning channels have not been developed. As these procedures are developed, information will be provided in 6 month updates to the NRC.
>
> Functional checks will be performed periodically. Functional checks will include visual inspection, verification of the instrument display reading, and testing of the battery backup on simulated loss of normal power. Calibration tests will be performed but the frequency has not been established.... It has not been determined how the checks and testing will be incorporated into current processes or how frequent the checks and testing will be performed. As this information is developed, it will be provided in 6 month updates to the NRC.

The NRC staff has concerns regarding the feasibility of the licensee's process for in-situ calibration to ensure that the design accuracy will be maintained. The staff has identified the following requests as:

RAI #18

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.

RAI #19

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. Please 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 what compensatory actions are planned 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 June 7, 2013)

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 channel design will meet Section 3 of the NEI guidance and that reliability will be assured through implementation of the programmatic controls that are consistent with the applicable guidance in NEI 12-02. The licensee stated that the reliability of the primary and backup channels is to be assured through conformance with the guidance in NEI 12-02 and the NRC staff's ISG, and that such reliability will be demonstrated through testing, analysis, qualification, and operating experience.

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.

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 October 31, 2014, 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 301-415-3016 or via e-mail at Balwant.singal@nrc.gov.

Sincerely,

/RA/

Balwant K. Singal, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:
Interim Staff Evaluation and
Request for Additional Information

cc w/encl: Distribution via Listserv

DISTRIBUTION:
PUBLIC
LPLIV Reading
RidsAcrsAcnw_MailCTR Resource
RidsNrrDeEicb Resource
RidsNrrDorlLpl4 Resource
RidsNrrDssSbpb Resource
RidsNrrLAJBurkhardt Resource
RidsNrrPMSouthTexas Resource
RidsRgn4MailCenter Resource
CRoque-Cruz, NRR
DRahn, NRR
GCasto, NRR
MMitchell, NRR
RKuntz, NRR
BPurnell, NRR

ADAMS Accession No. ML13254A210 ***via email**

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA*	NRR/DSS/SBPB/BC*
NAME	BSingal	JBurkhardt	GCasto
DATE	9/13/13	9/12/13	9/18/13
OFFICE	NRR/DE/EICB/BC*	NRR/DRA/AHPB/BC*	OGC - NLO
NAME	JThorp	UShoop (SGarry for)	BKlukan
DATE	9/18/13	9/18/13	9/18/13
OFFICE	NRR/DORL/LPL4/BC	NRR/DORL/LPL4/PM	
NAME	MMarkley	BSingal	
DATE	9/19/13	9/19/13	

OFFICIAL RECORD COPY