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

October 28, 2013

Mr. Steven D. Capps
Vice President
McGuire Nuclear Station
Duke Energy Carolinas, LLC
12700 Hagers Ferry Road
Huntersville, NC 28078

SUBJECT: MCGUIRE NUCLEAR STATION, 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. MF1062 AND MF1063)

Dear Mr. Capps:

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. ML13086A095), Duke Energy Carolinas, LLC (the licensee) provided the Overall Integrated Plan (OIP) for McGuire Nuclear Station, Units 1 and 2, describing how it will achieve compliance with Attachment 2 of Order EA-12-051 by fall 2014 for Unit 1 and fall 2015 for Unit 2. By letter dated June 13, 2013 (ADAMS Accession No. ML13157A097), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated July 11, 2013 (ADAMS Accession No. ML13197A409) and August 26, 2013 (ADAMS Accession No. ML13242A009).

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 six-month status updates, as the information becomes available. However, the staff requests that all information be provided by March 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.

A final NRC staff evaluation will be issued after the licensee has provided the information requested.

If you have any questions regarding this letter, please contact me at 301-415-5888 or via e-mail at Jason.Paige@nrc.gov.

Sincerely,

Jason C. Paige, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-369 and 50-370

Enclosure:
Interim Staff Evaluation and
Request for Additional Information

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A final NRC staff evaluation will be issued after the licensee has provided the information requested.

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Sincerely,

/RA/

Jason C. Paige, Project Manager
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OFFICE	NRR/DORL/LPL2-1/PM	NRR/DORL/LPL2-1/LA	NRR/DSS/SBPB/BC
NAME	JPaige	SFigueroa	GCasto*
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DATE	10/2/13	10/28/13	10/28/13

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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 DUKE ENERGY CAROLINAS, LLC MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 DOCKET NOS. 50-369 AND 50-370

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. ML13086A095), Duke Energy Carolinas, LLC (the licensee) provided the OIP for McGuire Nuclear Station (MNS), Units 1 and 2, describing how it will achieve compliance with Attachment 2 of Order EA-12-51 by fall 2014 for Unit 1 and fall 2015 for Unit 2. By letter dated June 13, 2013 (ADAMS Accession No. ML13157A097), the NRC staff sent a request for additional information (RAI) to the licensee. The licensee provided supplemental information by letters dated July 11, 2013 (ADAMS Accession No. ML13197A409) and August 26, 2013 (ADAMS Accession No. ML13242A009).

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 this 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

MNS, Units 1 and 2, have separate SFPs, one for each unit.

The licensee submitted its OIP on February 28, 2013. The OIP states that installation of the SFP level instrumentation at MNS will be completed by fall 2014, for Unit 1, and fall 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 its OIP, the licensee stated that Level 1 would be set at elevation 769 feet (ft.) which is the minimum required level to provide adequate pump suction.

In its letter dated July 11, 2013, the licensee stated, in part, that

> The normal SFP water level is 771.4' Elevation. The SFP cooling pump suction piping submergence is lost when water level decreases below 767.8' Elev. Abnormal procedures secure the SFP cooling pump when water level decreases

> to 2' below normal. Thus, the NEI 12-02 "Level 1" datum is considered to be 769.4' Elevation.

The NRC staff notes that Level 1 is located at elevation 769.4 ft. and that this level 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). The staff also notes that this level represents the higher of the two points described in NEI 12-02 for Level 1.

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 would be set at elevation 756 ft. which is the level adequate to provide substantial radiation shielding for a person standing on the SFP operating deck. The licensee also stated that this level provides substantial personnel radiation shielding that would allow implementation of local SFP make-up strategies for a BDB event.

In its letter dated July 11, 2013, the licensee provided a sketch showing the approximate location of the level sensor and the elevations identified as Levels 1, 2 and 3. This sketch shows Level 2 at an elevation of 756 ft. which is approximately 10 ft. above the top of the fuel 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.

In its OIP, the licensee stated that if applicable, the licensee would evaluate adjacent hardware stored in the SFP to ensure it cannot adversely interact with the SFP level instrumentation. In its letter dated June 13, 2013, the NRC staff requested information regarding the impact of the varied dose rates from adjacent hardware stored in the SFP on the identified elevation for Level 2.

In its letter dated, July 11, 2013, the licensee stated, in part, that

> Adjacent SFP hardware stored in the vicinity of the primary SFP level instrumentation will be evaluated with-respect to potential physical seismic interaction and interference with proper operation of the primary level instrumentation. The primary SFP level instrumentation located in the SFP area contains no organic materials which are susceptible to degradation due to exposure to radiation, heat, or steam.
>
> The back-up SFP level channel is remotely located from the SFP area, thus there are no associated interaction concern(s) with adjacent hardware/tools stored in the SFP.

The NRC staff has concerns with the licensee's lack of information regarding any additional analysis to be performed to determine the projected dose rate impact and the appropriate Level 2 value adjustments, if necessary. The staff has identified this request as:

RAI #1

Please provide the information regarding the analysis to be performed to determine the projected dose rate impact and the appropriate Level 2 value as a result of any irradiated hardware/tools stored in the SPF.

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 would be set at elevation 746 ft. which is the level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

In its letter dated July 11, 2013, the licensee provided a sketch showing the approximate location of the level sensor and the elevations identified as Levels 1, 2 and 3. This sketch shows Level 3 at an elevation of 746 ft. which is approximately 10 ft. above the top of the fuel rack. The NRC staff reviewed this sketch and notes that the elevation provided for Level 3 is above the highest point of any spent fuel storage rack seated in the SFP.

The licensee's proposed plan, with respect to identification of Levels 1 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, in part, that

> The SFP level instrumentation will consist of two permanently installed instruments for each SFP, which will provide continuous SFP level indication.
>
> The remote level indication range will be specified to support monitoring SFP levels above the minimum allowed Technical Specification 3.7.13, "Spent Fuel Pool Water Level," (e.g. ~769' Elevation or ≥23 ft over the top of irradiated fuel assemblies seated in the storage racks), and the top of the fuel storage racks at 746' Elev. At least one of the instrument channels will provide remote control room indication.

In its letter dated July 11, 2013, the licensee provided a sketch depicting that the approximated level measurement range is 29 ft. from the high pool level elevation to the top of the spent fuel racks.

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, in part that

> In accordance with the guidance in NEI 12-02, the level instruments/channels will be installed in diverse locations and physically 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 SFP.
>
> The associated cabling, power supplies and indication each level instrument/channel will be routed separately from each other. Cable routings will be specified to provide reasonable protection from missiles that may result from damage to the structure over the SFP and refuel floor, as applicable. The conduit and cable routing will be determined by the detailed design.

In its letter dated July 11, 2013, the licensee stated, regarding the primary SFP level channel, in part, that

> The wave guided radar pipe is routed slightly above the SFP operating deck, and through a floor core bore penetration down to the sensor electronics located on the 767' Elevation of the Auxiliary Building, and indication/display is provided in the main control room.
>
> A local control panel is located adjacent to the sensor electronics located on the 767' Elevation of the Auxiliary building. The local control panel houses a field level indication/display and the battery back-up power supply. A field routed cable connects the control panel to the adjacent sensor electronics. The signal cable is routed from the sensor electronics to the cable spread room and to the indication on the main control board 1/2MC9. All associated channel electronics, and power/signal cabling are located in the Seismic Category I Auxiliary Building, and/or Control Room.

In its letter dated July 11, 2013, the licensee stated, regarding the secondary SFP level channel, in part, that

> The back-up SFP level channel is a mechanical pressure gauge and requires no power supply, nor signal cable. The back-up SFP level channel display/read-out is located on the 733' Elevation of the Auxiliary Building in the electrical penetration room.

In its letter dated July 11, 2013, the licensee provided two figures showing the SFP area and primary SFP level channel location. The licensee also provided a figure showing the SFP area and back-up SFP level channel and display location.

The NRC staff notes from the sketch provided for the back-up channel that the centerline of the SFP transfer tube, where the process connection is located, is at elevation 733 ft. 6 inches (in.), while the back-up instrument level display is located at elevation 733 ft. 4 in. The NRC staff has concerns with the slope between the process connection and the display for the back-up instrument. It appears from the sketch that with the current design, an accessible high point vent valve and a low point drain valve will not be provided. The staff has identified this request as:

RAI #2

Please provide a description of the back-up instrument's required slope for the impulse tubing between the process zero reference point and the read-out/display; how the required slope is maintained in the proposed design, and why the distance between the back-up instrument's process zero reference point and the read-out/display is within the plant instrumentation design criteria.

The NRC staff has concerns with the effects that outside temperature and borated water within the impulse line and at the process tap on the SFP transfer tube may have on the back-up instruments. The staff has identified these requests as:

RAI #3

Please describe what precautions will be taken to ensure the back-up instrument's non-flowing sensing line does not become susceptible to freezing during cold outside temperatures.

RAI #4

Please clarify if the back-up instrument contains a sealed capillary system and provide a description of what precautions will be taken to prevent crud build-up within the sensing line.

The NRC staff has concerns with the licensee's lack of information regarding the arrangement of the SFP level instruments. The staff has identified these requests as:

RAI #5

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

(This information was previously requested as RAI-2 in the NRC letter dated June 13, 2013)

RAI #6

Please provide additional information describing how the proposed final arrangement of the primary SFP level instrumentation and routing of the cabling between the level instruments, the electronics and the displays, 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 license stated that the permanently installed instruments would be mounted to retain the component design configuration during and following the maximum seismic ground motion considered in the design SFP structure or applicable structure in which the component is located.

In its letter dated July 11, 2013, the licensee stated regarding the primary and back-up SFP level channels, in part, that

> Potential physical interaction effects of SFP hardware/tools in the vicinity of the primary SFP level sensor will be evaluated as described in response to RAI #1 b), and are not applicable to the remotely located SFP back-up level channel.

As part of the engineering change process, procedural controls are planned to govern storage of SFP equipment and to avoid the potential for adverse interaction with the primary SFP level channel.

The NRC staff has concerns with the licensee's lack of information regarding the seismic design of the mounting for the SFP level instrumentation. The staff has identified these requests as:

RAI #7

Please provide the following:

a) **The design criteria that will be used to estimate the total loading on the mounting device(s), including static weight loads and dynamic loads. Describe the methodology that will be used to estimate the total loading, inclusive of design basis maximum seismic loads and the hydrodynamic loads that could result from pool sloshing or other effects that could accompany such seismic forces.**

b) **A description of the manner in which the level sensor (and stilling well, if appropriate) will be attached to the refueling floor and/or other support structures for each planned point of attachment of the probe assembly. Indicate in a schematic the portions of the level sensor that will serve as points of attachment for mechanical/mounting or electrical connections.**

c) **A description of the manner by which the mechanical connections will attach the level instrument to permanent SFP structures so as to support the level sensor assembly.**

In addition, the staff plans to verify the results of the licensee's seismic testing and analysis when it is completed based on the licensee's response to the following RAIs.

RAI #8

For RAI 7(a) above, please provide 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 #9

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.

In its OIP, the licensee stated that, if applicable, adjacent hardware stored in the SFP would be evaluated to ensure it cannot adversely interact with SFP level instrumentation.

The NRC staff has concerns with the licensee's lack of information regarding the interaction that other adjacent hardware stored in the SFP could have with the SFP level instrumentation during a seismic event. The staff has identified this request as:

RAI #10

Please provide the results of the evaluation performed, if applicable, to ensure that other hardware stored in the SFP cannot adversely interact with the SFP level instrumentation.

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, (3.6.2) Post Event Conditions, (3.6.3) Shock and Vibration, and (3.6.4) 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, in part, that

> Augmented Quality provisions will be applied to ensure the rigor of the qualification documentation reviews and in-plant modification installation oversight is sufficient to ensure compliance with the qualification requirements above. This approach to quality assurance is consistent with the guidance in NRC JLD-ISG-2012-03 and NEI 12-02.

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, and...

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

> The level instrumentation shall remain functional and maintain required accuracy capability after a Safe shutdown Earthquake, and/or after exposure to any applicable harsh environmental conditions for the equipment location. The level instrumentation and associated cabling will be specified to be reliable at the maximum temperature, humidity, and radiation levels predicted during an extended loss of AC power (ELAP) event at their installed locations.

In its letter dated July 11, 2013, the licensee stated that because the back-up SFP level instrument channel is a mechanical device, it will not be exposed to SFP steam or radiation. Furthermore, the licensee noted that the mechanical pressure gauge will be seismically mounted and its reliability is based on the successful operating history of similar type analog devices. The gauge design temperature limits would be suitable for the location environment.

Regarding the primary SFP level channel, in its letter dated July 11, 2013, the licensee stated that the primary SFP level channel instrumentation reliability would be established based on a combination of similarity analyses, testing, and operating experience.

Related to the impact of post-event temperature conditions on the primary SFP level instrument channel, in its letter dated July 11, 2013, the licensee stated, in part, that

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

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

RAI #11

Please provide information indicating 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.

Related to the impact of post-event humidity conditions on the primary SFP level instrument channel, in its letter dated July 11, 2013, the licensee stated, in part, that

> The maximum humidity postulated for the spent fuel pool area is 100% relative humidity, saturated steam. The radar sensor electronics will be located outside of the spent fuel pool room in an area away from the steam atmosphere. The waveguide pipe can tolerate condensation formation on the inner wall surface, provided condensate pooling does not occur within the waveguide pipe. Condensate pooling is prevented by installing a weep hole(s) at the low point(s) in the wave guide pipe.

Related to the impact of post-event steam conditions on the primary SFP level instrument channel, in its letter dated July 11, 2013, the licensee stated, in part, that

> The ability of the radar wave to propagate through steam has been demonstrated by vendor testing. In addition through air radar has been used in numerous applications that involve measuring the level of boiling liquids. The vendor manual contains a table that provides accuracy correction factors for superimposed gas or vapor including saturated steam at various pressures. Therefore, successful operating experience has demonstrated that the through air radar functions at high levels of steam saturation.

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

appropriate means to demonstrate reliability of the sensor under the effects of severe shock.

The NRC staff notes that the use of MIL-STD-167-1 appears to be a reasonable method for vibration testing. However, the staff has concerns with the lack of information describing the tests, applied forces and their directions and frequency ranges, or the operability condition of the sensor after the tests were completed. The staff has identified this request as:
RAI #15

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.

The NRC staff has concerns with the licensee's lack of information regarding description of the manufacturer's shock and vibration ratings for the comparative display panel 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 #16

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.

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 letter dated July 11, 2013, the licensee stated, in part, that

> A seismic shake test will be performed to the requirements of IEEE 344-2004 for elements of the VEGAPuls 62ER Through Air Radar to levels anticipated to envelope most if not all plants in the United States. 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 EPRI TR-107330 to account for the potentially high seismic motion that could occur to the cabinet-mounted readout and the power control panel. This RRS will also envelop the seismic ground motion for items mounted to the building structure, pool edge, etc. The main control room display/indicator will be seismically mounted, and is seismically qualified based on similarity to other control board indicators.

> The back-up SFP level channel is a mechanical pressure gauge that is considered to be seismically rugged. The pressure gauge will be seismically mounted and its reliability is based on the successful operating history for similar type devices.
>
> The seismic testing described in RAI #4 b) includes testing the VEGAPuls 62ER for functionality prior to and post seismic testing, which includes verification of the instrument's accuracy.
>
> The back-up SFP level channel gauge will be seismically mounted and its reliability is established based on successful operating experience that demonstrates it is seismically rugged.

The NRC staff notes that 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 #17

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 MNS, 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 OIP, the licensee stated that the level instruments and any associated cabling (for each Unit SFP) will be physically separated and electrically independent of one another.

In its letter dated July 11, 2013, the licensee stated, in part, that

> The primary and back-up SFP level channels employ diverse sensing technology. The primary SFP level channel consists of a wave guided radar pipe and horn sensing assembly located on the SFP operating deck. The primary channel includes a remote sensor/transmitter and battery back-up power supply that are located in the 767' Elevation of the Auxiliary Building and provide remote control room level display/indication.
>
> The back-up SFP level channel is a mechanical pressure gauge that is remotely located from the SFP area and any primary level channel components/cabling. The back-up level channel monitors SFP level via a process connection to the fuel transfer tube. The associated impulse tubing is routed through the reactor building annulus area to the 733' Elevation of the Auxiliary Building, where the read-out/display is located. The back-up level channel does not require electrical power. The back-up level channel is spatially separated and electrically independent from the primary channel.

In addition, in its letter dated July 11, 2013, the licensee noted that the primary SFP level channel is provided nonessential AC power from a local area termination cabinet on 767 ft. Elevation of the Auxiliary Building. Also, the licensee explained that the field routed cable would connect the control panel to the adjacent sensor electronics. Specifically, the signal cable would be routed from the sensor electronics to the cable spread room and to the indication on the main control board 1/2MC9. Regarding the back-up level instrument, the licensee stated that this instrument would not require electrical cables/power, nor battery back-up.

The NRC staff notes that the licensee's proposed independence and physical and power separation appears to be consistent with NEI 12-02, as endorsed by the ISG. This proposed arrangement would not affect the operation of the independent channel under BDB event conditions, and the electrical functional performance of each level measurement channel would be considered independent of the other channel. This independence would result in a reliable SFP level measurement. However, the NRC staff plans to review the final electrical power supply design information to complete its review. The NRC staff has identified this request as:

RAI #18

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

> Power supplies (if required) for each SFP instrument/channel shall be electrically separate. If powered, the level instrumentation shall have provisions for emergency back-up power source such as batteries, which are rechargeable or replaceable. The back-up power source(s) must have sufficient capacity to maintain the level indication function until offsite power or other offsite emergency resources provided by FLEX procedures becomes available, consistent with the guidance of NEI 12-02.

In its letter dated July 11, 2013, the licensee stated that the primary channel would have battery back-up capacity and that because the secondary channel is a mechanical pressure gauge, it would not require power or battery back-up. In addition, the licensee stated, in part, that

> The primary SFP level channel dedicated battery capacity is based on ability of the sensor to supply full load (20 mA) for the duration specified in the plant FLEX mitigation strategy with built-in safety margin. The battery capacity will be verified by analyses, and/or test prior to installation. The preliminary estimate of battery capacity is expected to be at approximately 6-7 days. It is estimated that a minimum battery capacity of 72 hours is required to align with the FLEX mitigation plan. If required, battery replacement provisions will be included in the FLEX Phase III strategy to provide continued SFP level monitoring capability.

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 #19

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 that the new SFP level instrumentation will be designed to maintain their design accuracy without recalibration following a power interruption or change in power source.

In its letter dated July 11, 2013, the licensee stated, in part, that

> The manufacturer reference accuracy for the primary SFP level channel is no greater than ±1 inch based on tests performed by AREVA. This is the design accuracy value that will be specified for the primary SFP level instrument channel. This value is subject to change dependent on the actual performance with the installed waveguide.

The accuracy of the primary SFP level channel is minimally affected by postulated BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post shock conditions). The stainless steel horn antenna and waveguide pipe that is exposed to BDB conditions is unaffected by radiation, temperature and humidity other than a minor effect of condensation forming on the waveguide inner walls that will have a slight slowing 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 accuracy is the length of the overall measurement path can change due to temperature related expansion of the waveguide pipe. The waveguide pipe permits the sensor electronics to be located in mild environment conditions so that the effect of elevated temperature on accuracy is also limited. Based on VEGA operating instructions for the VEGAPULS 62ER, a small correction factor is applied to account for the impact of saturated steam at atmospheric pressure on the radar beam velocity. Testing performed by AREVA using saturated steam and saturated steam combined with smoke indicate that the overall effect on the instrument accuracy is minimal. The overall accuracy due to BDB conditions described above is estimated to not exceed ±3 inches.

The back-up SFP level channel is estimated have a total loop uncertainty of ± 7" for normal conditions and ± 14" for BDB conditions.

As part of the engineering change process, the overall level channel uncertainties will be formally documented by an instrument uncertainty calculation performed per Engineering Design Manual (EDM) 102.

Operational surveillance procedures will perform periodic channel checks for the primary and back-up SFP level instrumentation to verify proper operation. The acceptance criteria will consider the respective overall channel uncertainty contributions for accuracy, calibration setting tolerance, resolution, and drift (as applicable). The instrument uncertainty contributions will be considered to have random independent influences.

The NRC staff notes that the total loop uncertainty for the back-up SFP level channel is ± 14" during BDB conditions. The staff has concerns regarding calculation of this loop uncertainty. Further, the staff has concerns regarding capability of the back-up instrument to indicate SFP level when it exceeds the indicating range for the proposed Levels 2 and 3. The staff has identified these requests as:

RAI #20

Please provide the following:

a) **Results of the total loop uncertainty calculation for the back-up SFP level channel.**

b) **Explanation on how the back-up instrument would allow trained personnel to identify when the actual SFP level exceeds the specified Level 2 and 3. NEI 12-02,**

Section 2.3.2 and 2.3.3, states that level indication for Levels 2 and 3 (where BDB conditions can occur) should be with ± 1 foot uncertainty.

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 #21

Please provide analysis verifying that the proposed instrument performance is consistent with these estimated accuracy normal and BDB values. Please demonstrate that the primary channel 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 would provide for routine testing and calibration, and testing would be consistent with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02.

In its letter dated July 11, 2013, the licensee stated, in part, that

> The primary SFP level channel has multi-point testing capability, in-that the radar horn antenna can be rotated away from the SFP water surface and aimed at a movable metal target that is positioned at known distances from the horn. This allows checking for correct readings at various points across the instrument measurement range and validates the functionality of the installed system.
>
> The back-up SFP level channel design readily supports periodic calibration across its monitoring range. The instrument is to be equipped with a calibration test tee and can be isolated from the process for routine calibrations.

Additionally, in its letter dated July 11, 2013, the licensee stated, in part, that

> The channel checks will be accomplished by comparison between the wide-range channel indications, or by comparison to the narrow range SFP level indication and/or known SFP physical level elevation reference markings.

The NRC staff notes that by comparing the levels in the instrument channels and the maximum level allowed deviation for the instrument channel design accuracy, the operators could determine if recalibration or troubleshooting is needed. Also, the staff notes that 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 OIP, the licensee stated that the instrument displays for each SFP level instrument will be provided in the main control room or other accessible location.

In its letter dated July 11, 2013, the licensee stated, in part, that

> The primary SFP level channel has a local display on the Auxiliary Building on 767' Elevation, and in the main control room.
>
> The back-up SFP level channel display read-out is in an accessible location in the Auxiliary Building on 733' Elevation. The location is in the electrical penetration room, which is adjacent to the "B" train essential switchgear room.
>
> The back-up SFP channel display is located outside of the main control room and remote from the SFP area. The display location is located outside of any locked high radiation areas, and is accessible by operations personnel during postulated BDB event. The back-up level channel read-out displays are located in Seismic Category I structures, which are protected from potential threats posed by external natural phenomena events, such as flooding, seismic and tornado missiles. Personnel access to the display location relies upon the stairwells which provide access the Auxiliary Feedwater Pump Rooms and Auxiliary Shutdown Panels. During a postulated Extended Loss of AC Power (ELAP) event ambient temperatures at this location would be not be expected to prohibit periodic personnel access to monitor SFP levels. Formal analyses in support of the FLEX strategy will be completed to validate that area room temperatures will support personnel access. The estimated time for personnel to access the back-up channel display is 10-15 minutes, after personnel dispatch. The location of the back-up display is in close proximity to the vital battery and essential switchgear rooms, areas to which Operations personnel would potentially be dispatched as part of the FLEX strategy. Personnel accessing this area would rely on portable hand-held lighting, and hand-held radio communication with the main control room, and/or SFP inventory replenishment personnel. Based on the foregoing discussion, this location is considered to be promptly accessible for the purposes of monitoring SFP level during a postulated BDB event.

Additionally, in its letter dated July 11, 2013, the licensee stated, in part, that

> The primary SFP level display is located within the continuously occupied main control room. The estimated time for personnel to access the back-up SFP level display is 10-15 minutes, after personnel dispatch. The location of the back-up SFP level display is in close proximity to the vital battery and essential

> switchgear rooms, in which Operations personnel would potentially be dispatched as part of the FLEX strategy.

The NRC staff notes that the NEI guidance for "Display" specifically mentions the control room as an acceptable location for SFP instrumentation displays as it is occupied or promptly accessible, outside the area surrounding 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. The licensee's proposed location for the primary SFP level instrumentation displays appears to be consistent with NEI 12-02, as endorsed by the ISG. However, the staff notes that for the back-up display location the licensee stated that event ambient temperature would not be expected to prohibit periodic personnel access to monitor SFP levels and that formal analyses will be completed to validate that area room temperatures will support personnel access. The staff plans to review the results of this analyses when completed. Additionally, the staff has concerns with the licensee's lack of information regarding the SFP level instrumentation display location. The staff has identified this request as:

RAI #22

For the back-up SFP level instrumentation displays location, 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.

the requirements for scheduling, reviewing and evaluation of periodic operational tests. The OMP requires unacceptable test results to be documented within the Corrective Action Program (Nuclear Station Directive 208).

Preventive maintenance tasks will be established in accordance with Nuclear Station Directive 411, which governs the Preventive Maintenance program bases, task planning and scheduling, execution, feedback, and change process. The preventive maintenance tasks will entail periodic level channel calibration, and functional checks as described in the response to RAI #8 c).

Subsequent to the performance of maintenance activities, post maintenance testing will be performed to ensure the SFP level instrumentation is properly functioning prior to return to service. Work Process Manual 501 and Nuclear Station Directive 408 govern the station requirements for testing.

FLEX Support Guides (FSGs), Emergency and/or Abnormal operating procedures will incorporate use of the primary and back-up SFP level instrumentation for monitoring/maintaining SFP inventory for BDB events, as appropriate.

The NRC staff notes that a new Selected Licensee Commitment (SLC) will be established and that further information with regard to testing, calibration and compensatory actions is still in development. The staff has identified this request as:

RAI #23

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 OIP, the licensee stated, in part that

> Testing and calibration of the instrumentation will be consistent with vendor recommendations or other documented basis. Calibration will be specific to the mounted instrument(s) and the display(s).
>
> Station procedures and preventive maintenance will be developed to perform required instrumentation maintenance, testing, periodic calibrations, and/or functional checks.
>
> Existing station work control processes will be utilized to control maintenance and testing.

In its letter dated July 11, 2013, the licensee stated, in part, that

> Periodic channel checks will be established for the primary and back-up SFP level channels to verify proper instrument operation. The frequency of the channel checks is expected to be at least monthly (± 25% grace period). This frequency will readily satisfy NEI 12-02 (section 4.3) requirements to verify functionality 60 days prior to a planned refueling outage.
>
> Instrument channel calibration frequency will be based on the manufacture recommended frequency, and/or as established based on operating experience within the preventive maintenance program. As part of the periodic calibration surveillance for the primary SFP level channel, further functional verifications will be performed to verify proper operation of the battery backup feature on a simulated loss of normal AC power.
>
> The channel checks will be performed by Operations surveillance procedures, and the instrument calibrations will be performed by Maintenance instrumentation calibration surveillance procedures. Model work orders will be established within the periodic maintenance program to govern the scheduling and performance of the periodic calibrations.
>
> Routine preventive maintenance required during normal operation is limited to periodic channel calibration, and/or battery replacement (primary channel only).

Additionally, in its letter dated July 11, 2013, the licensee provided a list of the compensatory actions for single channel and both channels out of service beyond 90 days.

The NRC staff notes that a new SLC will be established and that further information with regard to testing, calibration and compensatory actions is still in development. The staff has identified this request as:

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.