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

December 5, 2013

Mr. James A. Spina
Vice President-Corporate Site Operations
Constellation Energy Nuclear Group, LLC
100 Constellation Way, Suite 200C
Baltimore, MD 21202

SUBJECT: CONSTELLATION ENERGY NUCLEAR GROUP, R.E. GINNA NUCLEAR POWER PLANT, 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. MF1147)

Dear Mr. Spina:

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 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13066A172), as supplemented by letters dated August 27, 2013, (ADAMS Accession No. ML13254A279), and September 23, 2013 (ADAMS Accession No. ML13269A011), Constellation Energy Nuclear Group, LLC, submitted its Overall Integrated Plans (OIPs) for R.E. Ginna Nuclear Power Plant. The OIPs describe the licensees plan to install reliable Spent Fuel Pool (SFP) instrumentation.

The NRC staff has completed its review of the OIP and supplemental information. Due to the need for additional information, the NRC staff is unable to make any final conclusions regarding the acceptability of the licensee's OIP. However, the enclosed interim staff evaluations provide the NRC staff's preliminary conclusions in areas where the licensee has provided sufficient information and the NRC staff has identified areas where additional information is needed.

In order for the NRC staff to review the final licensee's SFP instrumentation OIP and complete the NRC staff's evaluation, all the requested information must be provided no later than September 30, 2014. Our interim staff evaluation for R.E. Ginna Nuclear Power Plant is provided as an enclosure to this letter.

Please contact me at (301) 415-1476 or email Mohan.Thadani@nrc.gov, if you have any questions on this issue.

Sincerely,

Mohan C. Thadani, Senior Project Manager
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Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-244

Cc w/enclosure:

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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"

CONSTELLATION ENERGY NUCLEAR GROUP, LLC

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO 50-244

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 NRC an Overall Integrated Plan (OIP) by February 28, 2013.

By letter dated February 28, 2013 (ADAMS Accession No. ML13066A172), Constellation Energy Nuclear Group, LLC (the licensee) provided the OIP for R. E. Ginna Nuclear Power Plant (GNPP) describing how it will achieve compliance with Attachment 2 of Order EA-12-051 by the second quarter of 2015. By letter dated August 29, 2013 (ADAMS Accession No. ML13226A382), the NRC staff sent a Request for Additional Information (RAI) to the licensee. The licensee provided supplemental information by letters dated August 27, 2013 (ADAMS Accession No. ML13254A279), and September 23, 2013 (ADAMS Accession No. ML13269A011).

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.

Enclosure

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

> The NRC staff considers that the methodologies and guidance in conformance with the guidelines provided in NEI 12-02, Revision 1, subject to the clarifications

and exceptions in Attachment 1 to this ISG, are an acceptable means of meeting the requirements of Order EA-12-051.

3.0 TECHNICAL EVALUATION

3.1 Background and Schedule

The GNPP has a single SFP, located in the west end of the Auxiliary building. The pool is approximately 22 feet (ft.) 3 inches (in.) wide by 38 ft. 2 in. long and 41 ft. 8 in. feet deep.

The licensee's OIP was submitted on February 28, 2013. The OIP states that installation of the SFP level instrumentation at GNPP is scheduled to be completed by the second quarter of 2015, prior to startup from the spring 2015 refueling outage.

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 the Level 1 is the:

> Indicated water level on either the primary or backup instrument channel of greater than elevation 275 ft. 11.5 in. (based on the low water level trip of SFP Pump B)... plus the accuracy of the SFP water level instrument channel....

In its letter dated September 23, 2013, the licensee stated, in part, that

> The Level 1 value is established at Ginna based on the low water level trip of Spent Fuel Pool (SFP) Pump B at 275'-11.5", which is approximately 2' below the Top of the SFP and approximately 2' above the pump upper suction line, and is based on preventing air entrapment that may occur due to vortexing. Refer to Figure I which shows the relative orientation of the SFP Pump B trip setpoint with the other elevations. The Level 1 elevation at the SFP Pump B trip setpoint represents the higher of the two points described in the NEI guidance for this Level 1 in that this elevation represents 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. Engineering analysis shows that for SFP Pump B, with the SFP high and low suction valves open and SFP temperature at 2l2°F, the required NPSH for the minimum flow rate is approximately 275'-11". The level at which reliable suction loss occurs due to uncovering of the coolant inlet pipe (274'-0") is lower than the elevation at which SFP Pump B loses the required net positive suction head (275'-11.5") making the SFP Pump B trip setpoint the higher of the two points selected for the Level 1 value.

The NRC staff notes that the elevation identified as Level 1 is adequate for normal SFP cooling system operation and it is also adequate to ensure the required fuel pool cooling pump Net Positive Suction Head (NPSH). 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, in part, that

> Indicated water level on either the primary or backup instrument channel of greater than elevation 257'-0" plus the accuracy of the SFP water level instrument channel, which will be determined during the engineering and design phase. This elevation is approximately 5'- 7" above the top of the fuel racks and

ensures a minimum water level of 5'-9" above the top of the fuel. With 5'-7" of water above the top of the fuel racks; the calculated dose rate near the edge of the pool is less than 100 mrem/hr. This monitoring level ensures there is adequate water level to provide substantial radiation shielding for personnel to respond to Beyond-Design-Basis External Events and to initiate SFP makeup strategies.

In its letter dated September 23, 2013, the licensee submitted a summary of the assumptions and calculation methodology, providing the basis for establishing Level 2 at 257 ft.-0 in. The licensee stated, in part, that

The SFP was assumed to contain all of the fuel discharged up to the capacity of the SFP. The Region 1, Type 3 racks are assumed to contain the most recent discharged fuel (starting at 100 hours per current plant limitations). Region 2, Type 2 is assumed to contain the discharges after Region I, Type 3 is fully loaded. The remaining discharges are assumed to be loaded in Region 2, Type 1. Westinghouse Vantage 422V+ fuel is assumed for the entire pool. This fuel type has more uranium, has a higher top of active fuel and has a smaller top nozzle than other Ginna fuel types. These assumptions are conservative as they will result in peaking of the dose rates in the pool and at the deck.

Two discharge streams are assumed for the entire pool: (1) 4.6 weight percent (wt. %) U-235, 50,000 Megawatt-days/Metric Ton of Uranium (MWd/MTU) ("e46b50" run identification) and (2) 5.0 wt. % U-235, 55,000 MWd/MTU ("e50b55" run identification). This is expected to bound post-Extended Power Uprate (EPU) discharges and will dominate the dose rates in the period of extended operation. These assumptions should conservatively represent older fuel as well. The e46b50 depletion models assume a two cycle burnup history at 50 MWIMTU. The e50b55 depletion models assume a three cycle burnup history at 50, 50 and 13.2 MW/MTU. Based on actual powers, these are conservative.

Cycle operation is assumed to consist of 532.86 Effective Full Power Days (EFPD) and 15 days coast down. This is a reasonable assumption for 18 month cycles and will have minimal impact on the source terms provided the desired burnup is achieved. It is assumed that 1/3 of the 45 discharges are e46b50 and 2/3 are e50b55. This is a reasonable representation of post-EPU operation and is expected to be conservative for future operation.

Top of the racks is assumed to be at plant elevation 251 '-5". SFP rack drawings reveal that there are two tops of racks. Region I is at plant elevation 251' 5", while Region 2 is approximately between 251'-1.25" and 251'-1.5". These configurations result in the fuel assemblies sitting below the top of the racks in Region I and slightly above in Region 2, which complicates the MCNP modeling. To standardize the model, the top of the Region 1 racks was used uniformly as this is the one that the water level will reach first during a drain down. The top of the fuel assembly is modeled in MCNP as 1.775" below the top of the racks. The active fuel is modeled in MCNP as 14.3" below the top of the racks at plant elevation 250'-2.75". The air above the water in the SFP is assumed to be void in MCNP and the density of the water is assumed to be 1.0 grams per cubic centimeter (g/cc). The SFP is assumed to be surrounded by 3' of concrete to account for scatter.

The axial burnup distribution is assumed to be the profile that corresponds to 40 to 50 Gigawatt-days (GWD)/MTU fuel without axial blankets. Using fuel without low enriched or natural uranium blankets is conservative as it maximizes the gamma source at the ends of the fuel assembly, which is conservative for dose rates above the racks.

The calculation indicates that water coverage of 5'-6" above the racks is sufficient to ensure dose rates around the SFP deck area meet the acceptance criterion of ≤ 100 milli-rem per hour (mrem/hr). The Level 2 value has been established at ~ 5'-7" above the racks to provide additional margin.

Dose rates in the SFP area are determined using tally volumes and meshes. Dose rates at the SFP edge utilize the maximum dose rate from each of the four edges of the SFP. These dose rates were calculated using tally meshes running the entire length of the SFP edge. Dose rates at the water surface are taken from a circular surface tally with a radius of 240 centimeters (cm) centered over the middle of the racks at 1-foot intervals in the water for the 5-foot case.

Based on the calculation performed, with 5'-6" of water above the top of the SFP racks, Figure 2 depicts the projected dose rate locations on a plan view sketch, from the edge of the SFP up to 1' back from the SFP edge, and from 3' to 6' above the deck elevation. All areas surrounding the SFP under this condition are calculated to be less than 100 mrem/hr as indicated by Figure 2.

The dose calculation assumes that there is no material stored above the SFP racks that contributes to the dose rate. If materials that can contribute to the dose rate are planned to be stored in the SFP in the future, additional analysis will be performed to determine the projected dose rate impact and the appropriate Level 2 value. The addition of irradiated materials to the SFP and any additional analysis will be controlled by a station procedure. Specific requirements of the procedure, including details of the analysis to be performed, will be developed and provided in the August 28, 2015 Ginna OIP status update (Regulatory Commitment #1).

The NRC staff notes the licensee designated Level 2 using the second of the two options described in NEI 12-02 for Level 2. This method requires enough level in the SFP to provide adequate radiation shielding to maintain personnel radiological dose levels within acceptable limits while performing local operations in the vicinity of the pool. Further, NEI 12-02 states that guidance for performing plant-specific shielding calculations considering the emergency conditions that may apply at the time and the scope of necessary local operations may be found in EPA-400, "Manual of Protective Actions Guides and Protective Actions for Nuclear Incidents". The staff notes the licensee performed calculations in accordance with EPA-400 guidance to determine dose rates near the edge of the SFP with 5 ft. – 7 ft. of water above the top of the fuel racks, and found that the dose rate would be lower than 100 mrem/hr. Further, the licensee committed to prepare a procedure for controlling the addition of irradiated materials to the SFP.

The staff notes this dose rate and the commitment to control the addition of irradiated materials to the SFP is reasonable for the licensee to perform actions in the vicinity of the SFP to maintain total dose within regulatory limits.

NEI 12-02 states, in part, that

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

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

> Indicated water level on either the primary or backup instrument channel of greater than elevation 251 ft. 5 in. plus the accuracy of the SFP water level instrument channel...

In its letter dated September 23, 2013, the licensee provided a sketch with an elevation view of the SFP, the elevations identified as Levels 1, 2 and 3 and the SFP level instrument minimum sensor range. The NRC staff reviewed this sketch and notes the elevation identified 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, 2, and 3, and control of materials to the SFP appears to be consistent with NEI 12-02, as endorsed by the ISG.

3.3 Design Features: Instruments

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

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

NEI 12-02 states, in part, that

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

In its OIP, the licensee stated that:

> The primary and backup instrument channels will consist of fixed components. ...the instrument channels will provide continuous level indication over a

> minimum range of about 25 ft. 7 in. from the high SFP water level elevation of 277 ft. 0 in. to the top of the spent fuel racks at elevation 251 ft. 5 in.

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

> If wireless or other advanced technologies are used:
>
> - An evaluation will be performed to address their interaction with other plant systems, failure modes, and impact on cyber security controls.
> - The use of such technologies will be evaluated for any possible adverse impact they may have on other plant equipment likely to be used at the same time as the SFP instrumentation is functioning.
> - The ability to perform in the environment in which they may be called upon to function will be demonstrated consistent with the Qualification requirements of this Integrated Plan.
> - They will meet the same requirements as wired technologies specified in this Integrated Plan.
>
> Wireless technologies that might be used are not Critical Digital Assets as defined in NEI 08-09, *Cyber Security Plan for Nuclear Power Reactors* (Reference II); however, if a wireless technology is utilized, the Ginna cyber security plan will be adhered to with respect to its implementation.
>
> The remaining design requirements will be met through the selection of the sensors during the engineering and design phase.

In its letter dated September 23, 2013, the licensee provided a sketch with an elevation view of the SFP, the elevations identified as Levels 1, 2 and 3 and the SFP level instrument minimum sensor range. The NRC staff reviewed this sketch and notes 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 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. Such protection may be provided by locating the primary instrument channel and the fixed portions of a portable backup channel, if applicable, to maintain instrument channel separation within the fuel pool area, and by utilizing 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 the 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 functions. Channel separation should be maintained by locating the installed sensors in different places in the spent fuel pool area.
>
> Channel separation should be maintained by locating the installed sensors in different places in the spent fuel pool area.

In its OIP, the licensee stated that:

> Primary instrument channel level sensing components will be located in the southeast corner of the SFP. Backup instrument channel level sensing components will be located in the southwest corner of the SFP.

The licensee also stated in its OIP, in part, that:

> ...Transmitters will be located in the decontamination pit. The decontamination pit is located approximately six feet south of the SFP. The SFP and decontamination pit are separated by a reinforced concrete wall which will provide suitable radiation shielding for the electronics. The decontamination pit walls and cover will also provide protection from event generated missiles. These locations provide reasonable protection against missiles and will not interfere with SFP activities.
>
> The block walls in the vicinity of the SFP have been seismically evaluated and are provided with restraints. The East, West and South sides of the SFP are provided with metal and glass barriers that are [installed to meet the seismic protection requirements]. These barriers will also provide protection for SFP instrumentation. The design will credit these barriers where possible.
>
> The personnel walkway located on the East and South sides of the SFP is seismically supported, located above floor level and will provide protection for conduit and equipment located beneath it from seismically generated missiles generated by the event. Credited equipment and cables will be protected from event-generated missiles such as light fixtures and ductwork. On the operating floor, cables will be routed under the existing elevated walkway located on the east and south sides of the SFP. Beyond the walkway, the cable will be routed in rigid steel conduit that will be protected as necessary from seismically and event generated missiles.

> There is an existing pipe penetration from the decontamination pit to the Auxiliary Building mezzanine level. Cables from the transmitters to the remote indication will be routed through this penetration. The Auxiliary Building mezzanine level is protected against external missiles.
>
> Sensor supports will be designed to shield the sensor from event-generated missiles. The sensor will be located such that they cannot interfere with movement of the fuel handling machine. The design of the sensor located in the fuel cask loading area will consider fuel cask transfers.
>
> Cabling for power supplies and indications for each channel will be routed in separate conduits from cabling for the other channel.

In its letter dated August 27, 2013 the licensee, stated that the SFP LI sensors will be located in the northeast and southeast corners of the SFP instead of the northeast and southwest corners to minimize impact/interference with the SFP Bridge Crane as well as minimize length of waveguide to keep signal losses from the transmitter as low as possible. According to the licensee, this also enhances separation of the SFP LI transmitters from the previous conceptual design.

In its letter dated September 23, 2013, the licensee stated, in part, that

> SFP water level sensors will be installed in the northeast and southeast corners of the SFP. The waveguide will route from the southeast horn antenna to its level transmitter seismically mounted on the exterior east wall of the decontamination pit at the 276' elevation level, between the south block wall of the auxiliary building and the new fuel storage building's south wall. The waveguide from the northeast horn antenna will route to its level transmitter seismically mounted at the 276' elevation level, at the exterior SFP east wall directly under the stairwell leading from the spent fuel pool decking to the auxiliary building operating level. The locations of the horn antennas and level transmitters are depicted on Figure 3: Plan View of SFP Showing New SFP Water Level instrumentation.
>
> The northeast channel's level transmitter cabling will route into the adjacent cable tray 68 which penetrates down into the middle level. The cable will route in tray 68 for approximately 18 feet and then head south in conduit to the Chemical & Volume Control System (CVCS) Hold-Up Tank (HUT) room wall. The cable and conduit will then route into the CVCS HUT room opening between tanks I and 2 and run along the north interior wall into the waste gas compressor room. Inside the waste gas compressor room the cable and conduit will run along the north, then east, and then south walls to the new building penetrations made for the new Diesel Driven Auxiliary Feedwater (DDAFW) building. New buried conduit has been installed from these new penetrations through to the east wall of DDAFW building. This wall is also the west wall (shared wall) of the existing Standby Auxiliary Feedwater (SAFW). The cable and conduit will penetrate into the SAFW building (core bore) just south of the walkway between the buildings, and then run north on the west wall to the northwest corner of the building where the control panel will be mounted to the north wall approximately 10 feet east

> from the west wall. (See Figures 4a and 4b: Plan View Showing New SFP Water Level instrumentation.)
>
> The southeast channel's level transmitter cabling will route in conduit northward along the exterior of the decontamination pit wall and into the new fuel storage building. The cabling and conduit will run 11.5 feet along the east concrete wall of the new fuel storage building and then into the middle level CVCS HUT 1 room through a new hole that will be bored into the operating floor. The cable and conduit will then run north along the west wall to the north wall where it will then run eastward and meet up with the other channel's conduit between the HUT room 1 and room 2 areas. The cable and conduit will run the rest of the way to its respective control panel in the same general area as the northeast channel's route. The southeast channel's control panel will be mounted just above the control panel for the northeast channel on the SAFW building's north wall. (See Figures 4a and 4b: Plan View Showing New SFP Water Level instrumentation.)

The licensee's proposed location of the primary and backup level instruments for its SFP appears to be consistent with NEI 12-02, as endorsed by the ISG. However, the NRC staff notes that sketches provided in letter dated September 23, 2013, shows a portion of the two conduits to run side by side on the Intermediate Floor (Elevation 253 ft. 0 in.) to the control panels. 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 Intermediate Floor (Elevation 253 ft. 0 in.) 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 that the:

> Mounting will be Seismic Class I and that installed equipment will be seismically qualified to withstand the maximum seismic motion considered in the design of the plant area in which it is installed.

In addition, the licensee stated that:

> An evaluation of other hardware stored in the SFP will be conducted to ensure it will not create an adverse interaction with the fixed SFP instrument locations.

In its letter dated September 23, 2013, the licensee stated, in part, that

> The Ginna SFP Level instrumentation components that are mounted at the SFP edge include a horn antenna, waveguide assembly and mounting bracket. The radar horn antenna is positioned above the SFP water surface. The loading on the mounting bracket includes the static weight loads and dynamic 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 design basis maximum seismic loads of the bracket and the mounted components, along with hydrodynamic loads produced by impinging surface waves caused by seismically-induced SFP sloshing. The design criteria to be used to estimate the total loading on the mounting devices will be based on the plant seismic design bases.
>
> The methodology for ensuring that the mounting bracket and attached equipment can withstand the seismic dynamic forces will be by analysis and/or test of the combined maximum seismic and hydrodynamic forces on the cantilevered portion of the waveguide assembly and horn antenna exposed to potential seismically induced wave action. In addition to the analysis described above, seismic qualification testing will be performed to seismic response spectra that envelope the maximum seismic ground motion for the safe shutdown earthquake (SSE) at the installed location.
>
> Further details of the hydrodynamic/seismic evaluation will be provided by the vendor in accordance with the final procurement specification. It is anticipated that the full qualification will be available upon completion of the final design and will be forwarded to the NRC on February 28, 2014 with the second Ginna OIP status update (Regulatory Commitment #2).
>
> The Through-Air Radar waveguide horn and waveguide piping assembly is attached to a waveguide assembly mounting bracket. Figure 5 provides a visual representation of the SFP edge mounting configuration. There is no portion of the Through-Air Radar level equipment that contacts the SFP water, nor is there any connection to the SFP liner. The horn antenna is cantilevered over the edge

of the SFP and firmly fixed in a direction perpendicular to the SFP water surface. The bracket provides the attachment point for the horn and waveguide assembly to the SFP operating floor. Four bolts at the base of the bracket fasten the bracket to the SFP operating floor. For mounting to a concrete floor, the bolts may be anchor bolts in a range of sizes from 3/8 inch to 3/4 inch. The distance of the two nearest bolts to the SFP edge will be determined by the specific requirements of the anchor bolt size used. For mounting to metal floor, the bracket base may be fastened to the floor by welding. The horn can be away from or next to the SFP liner without impacting the functionality of the level measurement.

The final mounting details for the horn antenna and waveguide assembly will be available upon completion of the final design and will be forwarded to the NRC on February 28, 2014 with the second Ginna OIP status update (Regulatory Commitment #3).

Figure 6 provides a *standard* conceptual arrangement of the elements of the Through-Air Radar system. The waveguide piping that is connected between the waveguide assembly at the SFP edge and the remotely located sensor will be attached to building structures using the applicable site design standards for seismic small bore pipe and supports in accordance with the design change process.

The radar sensor is mounted on a mounting bracket that is fastened to seismically-qualified mounting points, either building structural steel or a concrete wall. Four bolts at the base of the bracket fasten the bracket to the building structure. The fastening method described for the SFP edge mounting bracket applies also to the sensor mounting bracket. Electrical connections to the sensor are made using flexible conduit into one of two available ½" NPT threaded openings in the sensor housing.

The final mounting details for the waveguide piping and radar sensor will be available upon completion of the final design and will be forwarded to the NRC on February 28, 2014 with the second Ginna OIP status update (Regulatory Commitment #3).

Other material stored in the SFP (fuel handling equipment) will not adversely impact the Level instrumentation as the horn antenna is cantilevered over the edge of the SFP and there is no portion that contacts the SFP water. Therefore, interaction with material stored in the SFP is not possible.

The NRC staff notes the proposed application of the seismic design criteria appears to be reasonable and addresses the staff-endorsed NEI 12-02 guidance stating that the channel is to be designed 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 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 the SFP instrument design configuration will be maintained during and following the maximum seismic ground motion considered in the design of the SFP structure.

RAI #3

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

3.6 Design Features: Qualification

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

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

NEI 12-02 states, in part, that

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

The NRC staff's 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 that:

> Augmented quality requirements, similar to those applied to fire protection equipment, will be applied to this project.

The licensee's proposed augmented quality assurance process appears to be consistent with NEI 12-02, as endorsed in 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 and consistent with NEI 12-02 , the licensee stated, in part, that,

> Temperature, humidity, and radiation levels, consistent with conditions in the vicinity of the SFP, and the area of use ,considering normal operational event and post-event conditions, for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies, resulting from Order EA-12-049 (Reference 2); will be addressed in the engineering and design phase. Examples of post-event (beyond-design-basis) conditions that will 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 plan,
> - temperatures of 212°F and 100% relative humidity environment,

- boiling water and/or steam environment,

- a concentrated borated water environment, and...

Related to radiological conditions in its OIP, the licensee stated, in part, that,

> Equipment located in the vicinity of the SFP will be qualified to withstand peak and total integrated radiation dose levels for its installed location, assuming that post-event SFP water level is equal to the top of the spent fuel racks (Level 3) for an extended period of time.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> The area above and around the SFP will be subject to large amounts of radiation in the event that the pool level [SFP Level 1] is severely lowered. The only parts of the measurement channel in the SFP radiation environment are the metallic waveguide and horn, which are not susceptible to the expected levels of radiation. The electronics will be located on the elevation below the SFP operating floor, in an area that does not exceed their 1 x $l0^3$ rad integrated dose limit.
>
> Further details of the qualification and test program used to confirm the reliability of the permanently installed equipment during and following BDB events will be available upon completion of the final design, and will be forwarded to NRC on February 28, 2014, with the second Ginna OIP status update (Regulatory Commitment #4).

The NRC staff has concerns with the licensee's lack of information on analysis of the maximum expected radiological conditions where the electronics will be located, and documentation indicating how it was determined, and that the electronics can withstand a total integrated dose of $1X10^3$ Rads. The NRC staff notes, that further details will be available upon completion of the final design, and will be forwarded to the NRC staff on February 28, 2014. The NRC staff has identified this request as:

RAI #4

Please provide analysis of the maximum expected radiological conditions (dose rate and total integrated dose) to which the equipment will be exposed. Also, please provide documentation indicating how it was determined that the electronics for this equipment are 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 and humidity conditions, in its OIP, the licensee stated, in part, that,

> The primary and backup channels will be reliable at temperature, humidity, and radiation levels consistent with the SFP water at saturation conditions for an extended period. Saturation temperature at the bottom of the SFP, assuming normal water level will be approximately 255° F. Post-event temperature at

sensors located above the SFP is assumed to be 212° F. Post event humidity near and above the SFP is assumed to be 100% with condensing steam. Equipment will be qualified for expected conditions at the installed location assuming that normal power is unavailable, and that the SFP has been at saturation for an extended period.

The equipment mounted in the decontamination pit is at a lower elevation than the operating floor and the temperature in the pit is expected to be lower than the temperature above the SFP. The sensor and cables are relatively insensitive to temperature. Exposure of the electronics to temperatures above 150°F may result in equipment failure. Expected decontamination pit temperatures will be determined during the engineering and design phase to develop the equipment specification and to verify that the equipment will operate at the expected temperatures. As the decontamination pit could flood should the SFP overflow or as a result of efforts to restore SFP water level, equipment mounted in the pit will be installed such that it is protected from flooding.

Sensor mount locations will not be subject to SFP overflow and the mounts and cables connecting the sensor to the transmitters will be qualified for the SFP environment.

In its letter dated September 23, 2013, the licensee stated, in part, that,

Temperature:

The postulated ambient temperature in the SFP area that results from a boiling SFP is l00°C (212°F). The electronics in the sensor are rated for a maximum ambient temperature of 80°C (176°F) on the condition that the process temperature (that which the flange connection is in contact with) is not greater than 130°C (266°F). The level sensor electronics will be located outside of the SFP area at a lower elevation. The temperature will be shown not to exceed the rated temperature.

Humidity:

The maximum humidity postulated for the SFP floor elevation is 100% Relative Humidity (RH), saturated steam. The VEGA electronics will be located outside of the SFP floor area in an area away from the steam atmosphere. The waveguide pipe can withstand condensation formed on the inside walls provided there is no pooling of the condensate in the waveguide pipe. This is ensured by installing a weep hole(s) at the low spots in the wave guide pipe.

The ability of the radar to "see through" the steam has been demonstrated by testing performed by AREVA. In addition to the AREVA test, VEGA Through-Air Radar has been used in numerous applications that involve measuring the level of boiling liquids. Therefore, operating experience has shown that the Through-Air Radar functions at high levels of steam saturation.

The NRC staff has concerns with the licensee's lack of information on the capability of the sensor electronics to continuously perform the required functions under the expected temperature and humidity post event conditions. The staff has identified these requests as:

RAI #5

Please provide information indicating (a) whether the 80°C rating for the sensor electronics is a continuous duty rating; and, (b) the maximum expected ambient temperature in the room in which the sensor electronics will be located under BDB conditions with no ac power available to run Heating Ventilation and Air Conditioning (HVAC) systems.

RAI #6

Please provide information indicating the maximum expected relative humidity in the room in which the sensor electronics will be located under BDB conditions, with no ac power available to run HVAC systems, and whether the sensor electronics are capable of continuously performing their 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.

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

> Components of the instrument channels will be qualified for shock and vibration using one or more of the following methods:
>
> - Components will be supplied by manufacturers using commercial quality programs (such as ISO9001, *Quality management systems - Requirements* (Reference 8)) with shock and vibration requirements included in the

purchase specification at levels commensurate with portable hand-held device or transportation applications;

- Components will have a substantial history of operational reliability in environments with significant shock and vibration loading, such as portable hand-held device or transportation applications; or

- Components will be inherently resistant to shock and vibration loadings, such as cables.

Sensor Shock:

In its letter dated September 23, 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 the proposed waveguide piping is not shock sensitive.

The NRC staff notes the use of MIL-STD-901D is an acceptable method for shock testing. However, the staff has concerns regarding the lack of information describing the tests, applied forces, and the operability condition of the sensor after the tests were completed. The staff has identified this request for information as:

RAI #7

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 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, September 23, 2013, the licensee stated 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 NRC staff has identified this request for information as:

RAI #8

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 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 September 23, 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 on 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 NRC staff has identified this request for information as:

RAI #9

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 September 23, 2013, the licensee noted:

> There are three components within the control panel that were not included with the VEGA Mobile Remote Display but are similar in construction and are tested for shock and vibration and/or mounted on vibration dampeners. This panel also will be subjected to seismic tests.

The NRC staff has concerns with the licensee's lack of information on the results of such testing to determine the reliability of the display panel under the effects of severe shock and vibration. The NRC staff has identified this request for information as:

RAI #10

Please provide the results of seismic testing for shock and vibration effects to demonstrate the reliability of the components within the power and control panel under shock and vibration conditions.

Additionally, in its letter dated, September 23, 2013, the licensee stated, in part, that,

> Further details of the qualification and test program used to confirm the reliability of the permanently installed equipment during and following seismic conditions [BDB events] will be available upon completion of the final design and will be forwarded to the NRC on February 28, 2014 with the second Ginna OIP status update (Regulatory Commitment #4).

The NRC staff notes that further information regarding the qualification and test program used to confirm the reliability of the permanently installed SFP level instrumentation during and following BDB events is not currently available for review and will be provided to the staff on the February 28, 2014, GNPP OIP status update.

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 following measures will be used to verify that the design and installation is adequate for seismic effects on instrument channel components used after a potential seismic event for installed components (with the exception of battery chargers and replaceable batteries). Applicable components of the instrument channels will be rated by the manufacturer (or otherwise tested) for seismic effects at levels commensurate with those of postulated design basis event conditions in the location of the instrument channel component using one or more of the following methods:
>
> - a substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications. Such a vibration design envelope will be inclusive of the effects of seismic motion imparted to the components proposed at the location of the proposed installation;
>
> - adequacy of seismic design and installation will be demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, *IEEE Recommended Practice for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations*, (Reference 9) or a substantially similar industrial standard;
>
> - proposed devices will be demonstrated to be substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instruments will be installed (g-levels and frequency ranges); or
>
> - the capability to withstand seismic motion consistent with that of existing design basis loads at the installed location will be demonstrated.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> A seismic shake test will be performed to the requirements of IEEE 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations," for elements of the VEGAPULS 62ER Through-Air Radar to levels anticipated to envelop most if not all plants in the US. The equipment to be tested includes the sensor, readout and 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, "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 control panel. This RRS will also envelop the calculated seismic motion for items mounted to the building structure, SFP edge, etc.
>
> The seismic testing described in Response to RAI-4.b above includes testing the VEGAPULS 62ER for functionality prior to and post seismic testing, which includes verification of the instrument's accuracy.
>
> Further details of the qualification and test program used to confirm the reliability of the permanently installed equipment during and following seismic conditions will be available upon completion of the final design and will be forwarded to the NRC on February 28, 2014 with the second Ginna OIP status update (Regulatory Commitment #4).

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 #11

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 GNPP, 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 <u>Design Features: Independence</u>

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 primary instrument channel would be redundant to and independent of the backup instrument channel.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> The two channels of the AREVA Through-Air Radar SFP Level Measurement system meet the requirement for independence in accordance with the guidance in NRC JLD-ISG-2012-03 and NEI 12-02 through separation by distance and electrical independence of one another. The horn antenna for each Level instrument will be installed on the southeast and northeast corners of the SFP. This separation will be maintained for the routing of the stainless steel waveguide piping and each channel's sensor electronics. Wiring from the sensors and wiring to the control panels and displays for each channel will be routed in separate conduits to the SAFW Building.
>
> The instrumentation power sources are provided with independent and battery backed-up supplies... Independence will be maintained throughout the entire channel. Therefore, failure of one power source will not result in a loss of both instrument channels.
>
> Further details on independence and channel separation of the permanently installed equipment will be provided in the August 28, 2015 Ginna OIP status update (Regulatory Commitment #5).

Additionally, in its letter dated September 23, 2013, the licensee stated, in part, that,

> Each control panel will receive an independent non-safety related 120VAC power feed. Power for the northeast channel's control panel will be from ACPDPAF02 (located in the southeast corner of the SAFW building), circuit 8. This panel is fed from MCC E, which is powered from Bus 15. Power for the southeast channel's control panel will be from the planned ACPDPAF05 panel located in the new DDAFW building. This panel will be fed from the RG&E 12kV Sodus Line.

The NRC staff notes 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. 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 #12

Please provide the NRC staff with the final configuration of the power supply source for each channel so the staff may conclude 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.

3.8 Design Features: Power Supplies

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

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

NEI 12-02 states, in part, that,

> The normal electrical power supply for each channel shall be provided by different sources such that the loss of one of the channels primary power supply will not result in a loss of power supply function to both channels of SFP level instrumentation.
>
> All channels of SFP level instrumentation shall provide the capability of connecting the channel to a source of power (e.g., portable generators or replaceable batteries) independent of the normal plant AC and DC power systems. For fixed channels this alternate capability shall include the ability to isolate the installed channel from its normal power supply or supplies. The portable power sources for the portable and installed channels shall be stored at separate locations, consistent with the reasonable protection requirements associated with NEI 12-06 (Order EA-12-049). The portable generator or replaceable batteries should be accessible and have sufficient capacity to support reliable instrument channel operation until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049.
>
> If adequate power supply for either an installed or portable level instrument credits intermittent operation, then the provisions shall be made for quickly and reliably taking the channel out of service and restoring it to service. For example, a switch on the power supply to the channel is adequate provided the power can be periodically interrupted without significantly affecting the accuracy and

reliability of the instrument reading. Continuous indication of SFP level is acceptable only if the power for such indication is demonstrably adequate for the time duration specified in section 3.1[.]

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

> The primary and backup channels will be powered from dedicated batteries and local battery chargers. The battery chargers for both channels will normally be powered from independent, non-safety related, 120V AC power supplies. Minimum battery life of 72 hours will be provided. The battery systems will include provision for battery replacement should the battery charger be unavailable following the event. Spare batteries will be readily available.
>
> During the loss of normal power the battery chargers will be connectable to another 120V AC power source. This will be from portable generators stored onsite, consistent with the reasonable protection requirements associated with NEI 12-06 (Reference 5), or from generators deployed from off-site by the mitigating strategies resulting from Order EA-12-049, at approximately 24 hours after the event.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> Alternate power to the instruments is from self-contained batteries, which are independent from the normal plant AC and DC power systems. Battery capacity is sufficient to support reliable instrument channel operation until offsite resources can be deployed by mitigating strategies resulting from Order EA-12-049.
>
> As required in NEI 12-02, in the event of loss of primary power the instruments can be manually switched to backup power. The VEGAPULS has a self-contained battery (four (4) standard C lithium cells) backup source which will support approximately 2.5 years with 30 minutes of operation per day, or > 300 hours of continuous operation. During this time, it supplies the power to the whole system, i.e., sensor electronics and the display with a power consumption of < 0.5 Watts. The sizing of the battery back-up for each channel of the VEGAPULS 62ER is based on the ability to supply the sensor at full load (20 milliamps (mA)), and the level monitoring display, ensuring that the channel will be available to run reliably and continuously following onset of the BDB/Extended Loss of AC Power (ELAP) event for at least seven days, with built-in margin. The sizing of the battery will be verified by calculation and/or test prior to installation. The self-contained battery system will be independent from existing station batteries.
>
> Further details on the AC and DC power supplies of the permanently installed equipment will be available upon completion of the final design and will be forwarded to the NRC on February 28, 2014 with the second Ginna OIP status update (Regulatory Commitment #6).

The NRC staff notes the proposed criteria for sizing of the battery backup appear 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 #13

Please provide the results of the calculation depicting the battery backup duty cycle requirements, demonstrating battery 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,

> Instrument channels will be designed such that they will maintain their design accuracy following a power interruption or change in power source without recalibration.
>
> Accuracy will consider SFP conditions, e.g., saturated water, steam environment, or concentrated borated water. Additionally, instrument accuracy will be sufficient to allow trained personnel to determine when the actual water level exceeds the specified lower level of each indicating range (levels 1, 2 and 3) without conflicting or ambiguous indication. The accuracy will consider the resolution requirements of Figure 1 of NEI 12-02. Actual accuracy for the indication under all required conditions will be determined during the engineering and design phase.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> The reference accuracy for the instrument defined by the manufacturer is ± 2 millimeters (mm) based on sensor horn without a waveguide using a metal target. However, with a waveguide and water as a target, accuracy under normal SFP level conditions has been demonstrated to be ± 1 inch based on tests performed by AREVA. This represents an accuracy of approximately 0.327% of the 25'-6" measurement range from normal SFP level to SFP Level 3. This is the

design accuracy value that will be used for the SFP Level instrument channels. This accuracy value is subject to change dependent on the actual performance with the installed waveguide constructed to support the desired installation location for each channel. The final instrument accuracy will be determined following installation testing implemented as part of the design change acceptance process.

The accuracy of the instrument channel is little affected under BDB conditions (i.e., radiation, temperature, humidity, post-seismic and post shock conditions). The stainless steel horn antenna and waveguide pipe that would be exposed to BDB conditions is 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 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 based 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 to be located on the elevation below the SFP operating floor in mild environment conditions so that the effect of elevated SFP operating floor temperatures on accuracy is also limited. 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 at BDB conditions described above is conservatively estimated to not exceed ± 3 inches or 0.980% of the 25'-6" measurement range, which is within the required ± 1 foot described in NEI 12-02.

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 of the Primary and Backup Level instruments. The estimated design accuracy for each instrument is ± 1 inch. The combined maximum deviation between the two instruments after which calibration is needed is therefore ± 2 inches, based on a still water Level in the SFP. A change to design accuracy discussed in the Response to RAI-7.a above will likewise cause a proportionate change to the maximum allowable deviation value. The final instrument accuracy will be determined following installation testing implemented as part of the design change acceptance process.

The NRC staff notes the estimated instrument channel design accuracies and methodology appear to be sufficient to maintain the instrument channels within their designed accuracies before significant drift can occur. The NRC staff plans to verify the licensee's proposed instrument performance is consistent with these estimated accuracy values. Further, the NRC staff plans to verify 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 #14

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

3.10 Design Features: Testing

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

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

NEI 12-02 states, in part, that,

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

In its OIP, the licensee stated that the:

> Instrument channel design will provide for routine testing and calibration that can be performed in-situ consistent with Order EA-12-051 and the guidance in NEI 12-02.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> Multi-point testing is enabled by means of a radar horn antenna capable of being 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 of all indicators along a measurement range and validates the functionality of the installed system.
>
> 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. Since the two level channels are independent, a channel check tolerance based on the final design accuracy of each channel will be applied for cross comparison between the two channels. The final accuracy of the instrumentation will be determined following installation testing to develop acceptance criteria for whether recalibration or troubleshooting is needed.

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. However, the staff has concerns regarding whether the licensee's proposed method of calibration will be accurate enough. This is discussed in Section 3.14 below.

3.11 <u>Design Features: Display</u>

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:

> Remote indication will be provided in the new Standby Auxiliary Feedwater Diesel Generator Building.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> Primary and Backup channel remote indication will be provided in the SAFW Building (Figure 4b). The primary and alternate access route evaluation, continuous habitability at display location(s), continual resource availability for personnel responsible to promptly read displays, and provisions for verbal communications with decision makers for the various SFP drain down scenarios and external events will be evaluated as part of the response to Order EA-12-049. This information will be provided in the August 28, 2015 Ginna OIP status update (Regulatory Commitment #9).
>
> The reasons justifying why the locations selected enable the information from these instruments to be considered "promptly accessible" from a response time perspective, including a discussion of various drain-down scenarios, will be provided in the August 28, 2015, Ginna OIP status update (Regulatory Commitment #10).

The NRC staff notes that further information regarding the accessibility, habitability, availability of personnel and communications as they relate to the location of the SFP level instrumentation display is not currently available for review. In its letter dated September 23, 2013, the licensee indicated the information will be provided to the staff in the August 28, 2015 OIP status update. The staff has identified this request as:

RAI #15

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

3.12 <u>Programmatic Controls: Training</u>

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,

> The Systematic Approach to Training (SAT) will be used to identify the population to be trained and to determine both the initial and continuing elements of the required training. Training will be completed prior to placing the instrumentation in service.

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

3.13 Programmatic Controls: Procedures

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

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

NEI 12-02 states, in part, that,

> Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation and abnormal response issues associated with the new SFP instrumentation.

In its OIP, the licensee stated that:

> Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation, and abnormal response issues associated with the new SFP instrumentation."

In its letter dated September 23, 2013, the licensee stated, in part, that ,

> A list of procedures for use of SFP instrumentation has not been developed. Procedures for operating (both normal and abnormal response), calibration/test, maintenance and inspection will be developed for use of the spent fuel pool instrumentation in a manner that addresses the order requirements.
>
> Procedures will be developed utilizing vendor instructions in accordance with existing controlled station administrative procedures that govern procedure development. These procedures ensure standardization of format, content, and terminology and human performance considerations.

> The Ginna OIP does not incorporate the use of portable SFP level monitoring components. Consequently, a description of the objectives to be achieved with regard to the storage location and provisions for installation of the portable components is not provided.
>
> The list of procedures for operating (both normal and abnormal response), calibration/test, maintenance and inspection, along with the technical objectives to be achieved within each procedure will be provided in the August 28, 2015 Ginna OIP status update (Regulatory Commitment #11).

The NRC staff notes that further information regarding the procedures that should be established and maintained for the testing, calibration, and use of the primary and backup SFP instrument channels is not currently available for review. In its letter dated September 23, 2013, the licensee indicated that the information will be provided to the staff in the August 28, 2015 OIP status update. The staff has identified this request as:

RAI #16

Please provide a list of the procedures addressing operation (both normal and abnormal response), calibration, test, maintenance, and inspection that will be developed for use of the 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,

> Processes will be established and maintained for scheduling and implementing necessary testing and calibration of the primary and backup SFP water level instrument channels to maintain the instrument channels at the design accuracy. Testing and calibration of the instrumentation will be consistent with vendor recommendations and any other documented basis. Calibration will be specific to the mounted instrument and the monitor. Out of service time as identified in NEI 12-02 will be incorporated consistent with the programmatic process used for compliance with NRC Order EA-12-049, Issuance of Order to Modify Licenses

> with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Reference 2). Functionality testing will be performed at the frequency specified in NEI 12-02. Additional testing and calibration information is provided in Section XI of this plan.
>
> Instrument channel out of service times as identified in NEI 12-02 will be implemented and controlled consistent with the programmatic process used for compliance with NRC Order EA-12-051.

In its letter dated September 23, 2013, the licensee stated, in part, that,

> Functional checks will be performed on a regularly scheduled basis. The functional check includes visual inspection, verification of the instrument display reading, verification of proper power supply voltage, and testing of the battery backup on simulated loss of normal power. Multi-point calibration tests will also be made on a regularly scheduled basis. The frequency as prescribed in NEI 12-02 will be adopted to perform functional testing within 60 days of a planned refueling outage considering normal testing schedule allowances (e.g., 25%) and not to exceed more than once every 18 months. The multi-point test method is described in the Response to RAI-8.a. Calibration tests and functional checks will be incorporated into procedures as part of the plant surveillance program. See the Response to RAI-10.
>
> The maintenance and testing program for the SFP Level instruments will meet the requirements in NEI 12-02. Periodic functional tests will be scheduled to occur within 60 days of each planned refueling outage. The functional tests will verify that the readings for the Primary and Backup channels are consistent with the actual SFP level. The Through-Air Radar instrument requires no regular preventative maintenance, except for routine replacement of the backup lithium battery cells in the control panel. This will be performed during regularly scheduled checks and testing.
>
> Specific details of the functional and calibration test program, including frequencies, will be developed as part of the final instrument design and will be forwarded to the NRC on August 28, 2014 with the third Ginna OIP status update (Regulatory Commitment #8).

Additionally, in its letter dated September 23, 2013, the licensee stated, in part, that

> The maintenance and testing of the SFP Level instrumentation system will be incorporated into the normal station work control processes based on vendor recommendations for maintenance and periodic testing. The calibration and maintenance program will include testing to validate the functionality of each instrument channel within 60 days of a planned refueling outage considering normal testing scheduling allowances (e.g., 25%).
>
> The preventive maintenance, test and calibration program will be developed consistent with the vendor's recommendations. This information will be available

following completion of the final design and will be summarized in the August 28, 2014 Ginna OIP status update (Regulatory Commitment #12).

In the event a channel of SPF Level instrumentation is out of service for any reason, the out-of-service time will be administratively tracked with an action to restore the channel to service within 90 days. Functionality of the other channel will be confirmed via appropriate testing measures within the following 7 days and every 90 days thereafter until the non-functioning channel is restored to service.

The appropriate compensatory actions have not yet been specified for both channels out of service. The determination of these actions, administrative requirements, and implementation procedures will be available and the information summarized in the August 28, 2015 Ginna OIP status update (Regulatory Commitment #13).

In the event that a channel cannot be restored to service within the 90 day period, expedited actions to restore the channel would be initiated and tracked via Ginna's Corrective Action Program. If both channels are determined to be non-functional, Ginna will initiate appropriate compensatory actions within 24 hours. The expedited and compensatory actions will be defined in the applicable maintenance procedure.

The appropriate compensatory actions have not yet been specified. The determination of these actions, administrative requirements, and implementation procedures will be available and the information summarized in the August 28, 20 IS Ginna OIP status update (Regulatory Commitment #14).

The licensee's proposed plan, with respect to defining processes for scheduling and implementing necessary testing and calibration and compensatory actions when a channel is out of service or when one of the instrument channels cannot be restored to functional status within 90 days appears to be consistent with NEI 12-02, as endorsed by the ISG. The NRC staff notes that further information on SFP level instrumentation testing, calibration and compensatory actions is not currently available for review. The staff also notes that in its letter dated September 23, 2013, the licensee indicated the information will be provided to the staff in the August 28, 2015 OIP status update. The staff has identified this request as:

RAI #17

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 the 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) Information describing compensatory actions when both channels are out-of-order, and the implementation procedures.

(c) Additional information describing expedited and compensatory actions in the maintenance procedure to address a condition when one of the instrument channels cannot be restored to functional status within 90 days.

The staff notes that Order EA-12-051 requires that the programmatic processes described above are designed to be established "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 licensee's description in Section 3.10 on provisions for such testing and calibration does not describe how the design accuracy described in Section 3.9 (± 1 inch under normal conditions) will be maintained. Specifically, the staff has concerns with the practicality of the licensee's proposed method for performing in-situ calibration using the procedure described above in Section 3.10, as repeated here:

> "Multi-point testing is enabled by means of a radar horn antenna capable of being 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 of all indicators along a measurement range and validates the functionality of the installed system."

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.

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 that:

> Reliability of the primary and backup instrument channels will be assured by conformance with the guidelines of NRC JLD-ISG-2012-03 and NEI 12-02, as discussed in Section VII, Qualification...

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.

Please contact me at (301) 415-1476 or email Mohan.Thadani@nrc.gov, if you have any questions on this issue.

Sincerely,

/ra/

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Plant Licensing Branch I-1
Division of Operating Reactor Licensing
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Docket No. 50-244

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